2024 CFA®
Exam Prep

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LEVEL I

KAPLAN SCHWESER

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Level I CFA®

2024

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SCHWESER'S SECRET SAUCE®: 2024 LEVEL I CFA®

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FOREWORD

This book will be a valuable addition to the study tools of any CFA exam candidate. It offers a concise and readable explanation of the major parts of the Level I CFA curriculum. Here is the disclaimer: this book does not cover every Learning Outcome Statement (LOS) and, as you are aware, any LOS is "fair game" for the exam. We have tried to include those LOS that are key concepts in finance and accounting, have application to other LOS, are complex and difficult for candidates, require memorization of characteristics or relationships, or are a prelude to LOS at Levels II and III.

We suggest you use this book as a companion to your other, more comprehensive study materials. It is easier to carry with you and will allow you to study these key concepts, definitions, and techniques over and over, which is an important part of mastering the material. When you get to topics where the coverage here appears too brief or raises questions in your mind, this is your clue to go back to your SchweserNotes™ or the textbooks to fill in the gaps in your understanding. For the great majority of you, there is no shortcut to learning the very broad array of subjects covered by the Level I curriculum, but this volume should be a valuable tool for reviewing and retaining the material as you complete your preparations in the weeks leading up to your exam day.

Pass rates for most Level I exams in recent years have been 40% or less, and returning candidates make comments such as, "I was surprised at how difficult the exam was." You should not despair because of this, but you should definitely not underestimate the task at hand. Our study materials, mock exams, question bank, videos, seminars, and *Secret Sauce* are all designed to help you study as efficiently as possible, help you to grasp and retain the material, and apply it with confidence come exam day.

Best regards,

Craig S. Prochaska, CFA
Senior Manager, Content,
Advanced Designations

Kaplan Schweser

QUANTITATIVE METHODS

Weight on Exam	6% to 9%
SchweserNotes™ Reference	Book 1, pages 1–136

Understanding time value of money (TVM) computations is essential for success, not only for quantitative methods, but also other sections of the Level I exam. Candidates who are unfamiliar with TVM calculations, or simply need a refresher, should review them in the CFA Institute prerequisite material for Quantitative Methods. TVM is actually a larger portion of the exam than just quantitative methods because of its integration with other topics. Any portion of the exam that requires discounting cash flows will require TVM calculations. Examples include evaluating capital projects, valuing bonds, and using dividend discount models to value equities. No matter where it shows up on the exam, the key to any TVM problem is to draw a timeline and be certain of when the cash flows will occur so you can discount those cash flows appropriately.

RATES AND RETURNS

Interest rates measure the time value of money. Equilibrium interest rates are the **required rate of return** for a particular investment. Interest rates are also referred to as **discount rates**. We can also view interest rates as the opportunity cost of current consumption.

The **real risk-free rate** is a theoretical interest rate on a single-period loan with no risk of inflation or default. The real risk-free rate represents **time preference**, the degree to which current consumption is preferred to equal future consumption.

A **nominal risk-free rate** contains an inflation premium:

(1 + nominal risk-free rate) = (1 + real risk-free rate)(1 + expected inflation rate)

This relation is approximated as:

nominal risk-free rate ≈ real risk-free rate + expected inflation rate.

Risk increases the required rate of return. Types of risks include **default risk**, that a borrower will not make the promised payments on time; **liquidity risk** of receiving less than fair value if an investment must be sold quickly; and **maturity risk**, because

the prices of longer-term bonds are more volatile than those of shorter-term bonds. Thus, we can state:

$$
\begin{aligned}
\text{nominal interest rate} \approx\ & \text{real risk-free rate} \\
&+ \text{inflation premium} \\
&+ \text{default risk premium} \\
&+ \text{liquidity risk premium} \\
&+ \text{maturity risk premium}
\end{aligned}
$$

Return Measures

A **holding period return (HPR)** is the percentage increase in the value of an investment over a given period.

$$
\text{holding period return} = \frac{\text{end-of-period value}}{\text{beginning-of-period value}} - 1
$$

To **annualize** an HPR that is realized over a specific number of days, use the following formula:

$$
\text{annualized return} = (1 + \text{HPR})^{365/\text{days}} - 1
$$

The **arithmetic mean return** is the simple average of a series of periodic returns. The **geometric mean return** is a compound rate:

$$
\text{geometric mean return} = \sqrt[n]{(1 + R_1) \times (1 + R_2) \times \ldots \times (1 + R_n)} - 1
$$

A **harmonic mean return** is used for certain computations, such as the average cost of shares purchased over time. Some refer to this practice as **cost averaging**.

Returns data may include **outliers**, extreme values that distort mean return measures. A **trimmed mean** and a **winsorized mean** are techniques for dealing with outliers. A trimmed mean excludes a stated percentage of the most extreme observations. A 1% trimmed mean, for example, would discard the lowest 0.5% and the highest 0.5% of the observations. To compute a winsorized mean, instead of discarding the highest and lowest observations, we substitute a value for them. To calculate a 90% winsorized mean, for example, we would determine the 5th and 95th percentile of the observations, substitute the 5th percentile for any values lower than that, substitute the 95th percentile for any values higher than that, and then calculate the mean of the revised dataset.

A **money-weighted return** is the internal rate of return on a portfolio that includes all cash inflows and outflows. The beginning value of the account and all deposits into the account are inflows. All withdrawals from the account and its ending value are outflows.

A **time-weighted return** measures compound growth over a specified time horizon. In the investment management industry, time-weighted return is the preferred method of performance measurement because portfolio managers typically do not control the timing of deposits to and withdrawals from the accounts they manage. The annual time-weighted return for an investment may be computed as follows:

Step 1: Form subperiods that correspond to the dates of deposits and withdrawals.

Step 2: Compute an HPR of the portfolio for each subperiod.

Step 3: Compute the product of (1 + HPR) for each subperiod to obtain a total return for the entire measurement period, and annualize the result.

If funds are contributed to an investment portfolio just before a period of relatively poor portfolio performance, the money-weighted rate of return will tend to be lower than the time-weighted rate of return. On the other hand, if funds are contributed to a portfolio at a favorable time (just before a period of relatively high returns), the money-weighted rate of return will be higher than the time-weighted rate of return.

Gross return refers to the total return on a security portfolio before deducting fees for management and administration. **Net return** refers to the return after these fees have been deducted.

Pretax nominal return refers to the return before paying taxes. **After-tax nominal return** refers to the return after the tax liability is deducted.

Real return is nominal return adjusted for inflation. Consider a nominal return of 7% in a year when inflation is 2%. The approximate real return is 7% − 2% = 5%. The exact real return is slightly lower: 1.07 / 1.02 − 1 = 4.9%.

Leveraged return is a gain or loss as a percentage of an investor's cash investment. For some investments, such as derivatives or real estate, the cash invested is only a fraction of the value of the underlying assets. Leverage magnifies both gains and losses on an investment.

Compounding Periods

More frequent compounding increases the effective return on an investment, increasing the future value of a given cash flow and decreasing the present value of a given cash flow. The general formula for present value given a compounding frequency is as follows:

$$PV = FV_N\left(1 + \frac{r}{m}\right)^{-mN}$$

where:
r = quoted annual interest rate
N = number of years
m = compounding periods per year

The mathematical limit of shortening the compounding period is **continuous compounding**. We use the natural logarithm (ln) to state a continuously compounded rate of return:

$$R_{CC} = \ln(1 + HPR)$$

THE TIME VALUE OF MONEY IN FINANCE

With discrete compounding periods, the relationship between present values and future values is:

$$FV = PV(1 + r)^t \qquad \text{or} \qquad PV = FV(1 + r)^{-t}$$

where:
r = interest rate per compounding period
t = number of compounding periods

With continuous compounding, the relationship is:

$$FV = PV \times e^{rt} \qquad \text{or} \qquad PV = FV \times e^{-rt}$$

Common applications of TVM in finance include valuing:

- A single future cash flow, such as a zero-coupon bond.
- A finite series of future cash flows, such as a coupon bond.
- An infinite series of equal future cash flows, such as a perpetuity or a preferred stock.
- A growing series of future cash flows, such as a common stock with a constant growth rate of dividends.

A **zero-coupon bond** pays a single cash flow equal to its face value at maturity. Assuming a positive yield, the investor pays less than the face value to buy the bond.

It is possible for the yield to be negative. In this case an investor would pay more than the face value to buy a zero-coupon bond.

A **fixed-coupon bond** is only slightly more complex. The investor receives a cash interest payment each period and the face value (along with the final interest payment) at maturity. The bond's **coupon rate** is a percentage of the face value and determines the amount of the interest payments. *The coupon rate and the yield are two different things.* We only use the coupon rate to determine the coupon payment (PMT). The yield to maturity (I/Y) is the discount rate implied by the bond's price.

The relationship between prices and yields is inverse. When the price decreases, the yield to maturity increases. When the price increases, the yield to maturity decreases. Or, equivalently, when the yield increases, the price decreases. When the yield decreases, the price increases.

An **amortizing bond** is one that pays a level amount each period, including its maturity period. We can determine an annuity payment using a financial calculator.

A bond with no maturity date is a **perpetuity**. The present value of a perpetuity is simply the payment divided by the yield (as a decimal).

A **preferred stock** is similar to a perpetuity and we calculate its present value the same way:

$$\text{preferred stock value} = \frac{\text{dividend per period}}{\text{the market's required return}}$$

Common stock typically does not promise a fixed dividend payment. Instead, the company's management decides whether and when to pay common dividends. Because the future cash flows are uncertain, we must use models to estimate a common stock's value.

- If we assume a *constant future dividend*, we can value a common stock the same way we value a preferred stock.

- If we assume a *constant growth rate of dividends*, we can use a model called the constant growth dividend discount model or the Gordon growth model. We will illustrate this model later in the Equity Investments section of this book.

- If we assume a *changing growth rate of dividends*, we must choose an appropriate model. One example (which we will also demonstrate in the Equity Investments section) is a multistage dividend discount model, in which we assume a period of rapid growth followed by a period of constant growth.

The **cash flow additivity principle** states that the PV of any stream of cash flows equals the sum of the PVs of the cash flows. If we have two series of cash flows, the sum of the PVs of the two series is the same as the PVs of the two series taken together. We can also divide up a series of cash flows any way we like, and the PV of the "pieces" will equal the PV of the original series.

The cash flow additivity principle is the basis for the **no-arbitrage principle**, or "law of one price," which says that if two sets of future cash flows are identical under all conditions, they will have the same price today. (If they don't, investors will quickly buy the lower-priced one and sell the higher-priced one, which will drive their prices together). We apply the no-arbitrage condition when we calculate forward exchange rates or forward interest rates, and when we value options using a binomial model.

STATISTICAL MEASURES OF ASSET RETURNS
Measures of Central Tendency

The **arithmetic mean** is the sum of the observation values divided by the number of observations. It is the most widely used measure of central tendency. An example of an arithmetic mean is a **sample mean**, which is the sum of all the values in a sample divided by the number of observations in the sample.

The **median** is the midpoint of a dataset, where the data are arranged in ascending or descending order. Half of the observations lie above the median, and half are below.

The **mode** is the value that occurs most frequently in a dataset. A dataset may have more than one mode, or even no mode. When a distribution has one value that appears most frequently, it is said to be **unimodal**. For continuous data, such as investment returns, we typically do not identify a single outcome as the mode. Instead we divide the relevant range of outcomes into intervals and identify the **modal interval** as the one into which the largest number of observations fall.

As mentioned earlier, we can use a *trimmed mean* or a *winsorized mean* to lessen the effects of outliers.

Measures of Location and Dispersion

Examples of **quantiles** include the following:

- **Quartile**. A distribution is divided into quarters. The difference between the third quartile and the first quartile is known as the **interquartile range**.

- **Quintile**. A distribution is divided into fifths.

- **Decile**. A distribution is divided into tenths.

- **Percentile**. A distribution is divided into hundredths (percentages). Any quantile can be expressed as a percentile. For example, the third quartile is the 75th percentile.

Dispersion is variability around the central tendency. In finance and investments, central tendency measures expected return and dispersion measures risk.

The **range** of a dataset is the difference between its largest and its smallest value.

The **mean absolute deviation (MAD)** is the average of the absolute values of the deviations of individual observations from the arithmetic mean. It uses absolute values because actual deviations from the arithmetic mean always sum to zero.

The **sample variance** is the measure of dispersion that applies when we are evaluating a sample of n observations from a population. Sample variance is calculated using the following formula:

$$s^2 = \frac{\sum_{i=1}^{n}(X_i - \overline{X})^2}{n-1}$$

The computed variance is in squared units of measurement. We can address this problem by using the **standard deviation**, which is the square root of the variance. The units of standard deviation are the same as the units of the data:

$$s = \sqrt{\frac{\sum_{i=1}^{n}(X_i - \overline{X})^2}{n-1}}$$

Relative dispersion is the amount of variability in a distribution around a reference point or benchmark. Relative dispersion is commonly measured with the **coefficient of variation (CV)**, which measures the amount of dispersion in a distribution relative to its mean:

$$CV = \frac{\text{standard deviation}}{\text{arithmetic mean}}$$

In an investments setting, the CV is used to measure the risk (variability) per unit of expected return (mean). A lower CV is better.

In some situations, it may be more appropriate to consider only **downside risk**, or outcomes less than the mean (or some other specific value).

One measure of downside risk is **target downside deviation**, which is also known as **target semideviation**:

$$s_{target} = \sqrt{\frac{\sum\limits_{all\ X_i - B}^{n}(X_i - B)^2}{n - 1}}$$

where B = the target

Skewness, or skew, refers to the extent to which a distribution is not symmetrical. Nonsymmetrical distributions may be either positively or negatively skewed and result from the occurrence of outliers in the dataset. A *positively skewed* distribution has outliers greater than the mean (in the upper region, or right tail) and is said to be skewed right. A *negatively skewed* distribution has outliers less than the mean that fall within its lower (left) tail and is said to be skewed left.

Skewness affects the location of the mean, median, and mode:

- For a symmetrical distribution, the mean, median, and mode are equal.
- For a positively skewed distribution, the mode is less than the median, which is less than the mean.
- For a negatively skewed distribution, the mean is less than the median, which is less than the mode.

Kurtosis is the degree to which a distribution is more or less peaked than a normal distribution. **Leptokurtic** describes a distribution that is more peaked than a normal distribution, whereas **platykurtic** refers to a distribution that is less peaked, or flatter than a normal one. A distribution is **mesokurtic** if it has the same kurtosis as a normal distribution.

A distribution is said to exhibit **excess kurtosis** if it has either more or less kurtosis than the normal distribution. The computed kurtosis for all normal distributions is three. Statisticians, however, sometimes report excess kurtosis, which is defined as kurtosis minus three. Thus, a normal distribution has excess kurtosis equal to zero, a leptokurtic distribution has excess kurtosis greater than zero, and platykurtic distributions have excess kurtosis less than zero.

Securities returns tend to exhibit both skewness and kurtosis. If returns are modeled using an assumed normal distribution, the predictions will not take into account the potential for extremely large, negative outcomes. Most risk managers put little emphasis on the mean and standard deviation and focus more on returns in the tails of the distribution—that is where the risk is.

Covariance measures how two variables move together. Sample covariance is calculated as follows:

$$s_{XY} = \frac{\sum_{i=1}^{n}\left\{\left[X_i - \overline{X}\right]\left[Y_i - \overline{Y}\right]\right\}}{n-1}$$

where:

X_i = an observation of variable X

Y_i = an observation of variable Y

$\overline{X}$ = mean of variable X

$\overline{Y}$ = mean of variable Y

n = number of periods

Like the variance, the units of covariance are the square of the units used for the data. The value of covariance depends on the units of the variables, and we cannot use it to interpret the relative strength of the relationship. To address these issues, we use a standardized measure of the linear relationship between two variables called the **correlation coefficient**. The correlation between two variables, X and Y, is:

$$\rho_{XY} = \frac{s_{XY}}{s_X s_Y}$$

Correlation has no units. Its values range from −1 to +1. If correlation is +1 (perfect positive correlation), a change in one random variable results in a proportional change in the other. If correlation is −1 (perfect negative correlation), a change in one random variable results in a proportional but opposite change in the other. If correlation is zero, the two variables have no linear relationship.

Two variables might have a *nonlinear* relationship that the correlation coefficient does not reflect. Analysts often use **scatter plots**, with one variable on the vertical axis and the other on the horizontal axis, to reveal nonlinear relationships. Variables can exhibit **spurious correlation** that results from chance or from their association with a third variable.

PROBABILITY TREES AND CONDITIONAL EXPECTATIONS

The **expected value** of a random variable is the weighted average of the possible outcomes for the variable:

$$E(X) = \Sigma P(x_i)x_i = P(x_1)x_1 + P(x_2)x_2 + \ldots + P(x_n)x_n$$

where:

$P(x_i)$ = probability of outcome x_i

Variance (from a probability model) can be calculated as the probability-weighted sum of the squared deviations from the expected value. The standard deviation is the positive square root of the variance.

When we estimated standard deviation from sample data, we divided the sum of the squared deviations from the mean by the sample size minus one. With a probability model, by contrast, we have no past observations (and therefore no "n − 1" to divide

by). We use probability weights instead, as they describe the entire distribution of outcomes.

A general framework called a **probability tree** is used to show the probabilities of various outcomes. The following figure shows an example.

Figure 1: A Probability Tree for an Investment Problem
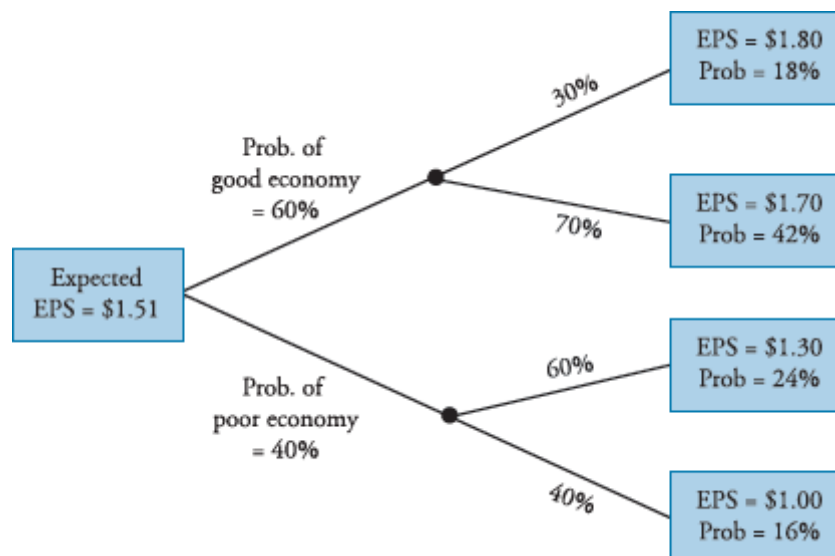
Conditional expected values depend on the outcome of some other event. An analyst can use a conditional expected value to revise his expectations when new information arrives.

Bayes' formula is used to update a given set of prior probabilities for a given event in response to the arrival of new information. The rule for updating prior probability of an event is as follows:

$$\text{updated probability} =$$
$$\frac{\text{probability of new information for a given event}}{\text{unconditional probability of new information}} \times \text{prior probability of event}$$

PORTFOLIO MATHEMATICS

The **expected return and variance for a portfolio** of assets can be determined using the expected returns and weights of the individual assets in the portfolio:

$$E(R_P) = w_A R_A + w_B R_B$$
$$Var_P = w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + 2w_A w_B \sigma_A \sigma_B \rho_{A,B}$$

or:

$$Var_P = w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + 2w_A w_B Cov_{A,B}$$

We can calculate **covariance of returns** two assets in a portfolio as follows:

$$Cov_{A,B} = E\{[R_A - E(R_A)][R_B - E(R_B)]\}$$

Shortfall risk is the probability that a portfolio's return or value will be below a specified target return or value over a specified period. **Roy's safety-first criterion** states that the optimal portfolio minimizes the probability that the return of the portfolio falls below some minimum acceptable "threshold" level.

Roy's **safety-first ratio (SFRatio)** shows how many standard deviations the expected return is above the threshold return (R_L):

$$SFRatio = \frac{E(R_p) - R_L}{\sigma_p}$$

A portfolio with a higher SFRatio is preferred. The greater the SFRatio, the lower the probability that returns will be below the threshold return, and therefore the lower the shortfall risk.

SIMULATION METHODS

If x is normally distributed, $Y = e^x$ is lognormally distributed. The **lognormal distribution** is positively skewed as shown in the following figure.

Figure 2: Lognormal Distribution
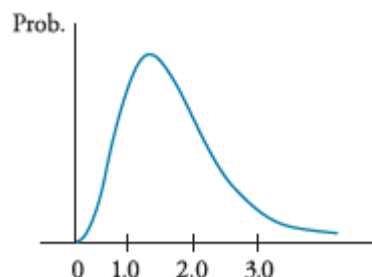
The lognormal distribution is useful for modeling asset prices if we think of an asset's future price as the result of a continuously compounded return on its current price. That is:

$$P_T = P_0 e^{r_{0,T}}$$

where:
P_T = asset price at time T
P_0 = asset price at time 0 (today)
$r_{0,T}$ = continuously compounded return on the asset from time 0 to time T

In many pricing models, we assume returns are **independently and identically distributed**.

- If returns are *independently* distributed, past returns are not useful for predicting future returns.

- If returns are *identically* distributed, they exhibit "stationarity," in that their mean and variance do not change over time.

Monte Carlo simulation is performed by making assumptions about the distributions of prices or risk factors and using a large number of computer-generated random

values for the relevant risk factors or prices to generate a distribution of possible outcomes (e.g., project NPVs, portfolio values). An advantage of Monte Carlo simulation is that its inputs are not limited to the range of historical data. Its limitations are that it is fairly complex, can provide answers that are no better than the assumptions used, and is a statistical method that cannot offer the insights provided by an analytic method.

Resampling is another method for generating data inputs to use in a simulation. To conduct resampling, we start with the observed sample and repeatedly draw subsamples from it, each with the same number of observations. From these samples, we can infer parameters for the population, such as its mean and variance.

In **bootstrap resampling**, we draw repeated samples from the full dataset, replacing the sampled observations each time so that they might be redrawn in another sample. We can then directly calculate the standard deviation of these sample means as our estimate of the standard error of the sample mean. Simulation using data from bootstrap resampling follows the same procedure as Monte Carlo simulation. The difference is the source and scope of the data. For example, if a simulation uses bootstrap resampling of historical returns data, its inputs are limited by the distribution of actual outcomes.

ESTIMATION AND INFERENCE

Probability sampling refers to selecting a sample when we know the probability of each sample member in the overall population.

- With **simple random sampling**, each item or person in the population has the same likelihood of being included in the sample.
- Another way to form an approximately random sample is **systematic sampling**, selecting every nth member from a population.
- **Stratified random sampling** separates a population into groups based on one or more characteristics, then takes a random sample from each group based on its size. For example, in constructing bond index portfolios, we may first divide the bonds into groups by maturity, rating, and embedded options, then pick bonds from each group in proportion to the number of index bonds in that group. This ensures that our "random" sample has similar maturity, rating, and call characteristics to the index.
- **Cluster sampling** is also based on subsets of a population, but assumes that each subset (cluster) is representative of the overall population. In **one-stage cluster sampling**, a random sample of clusters is selected and all the data in those clusters comprise the sample. In **two-stage cluster sampling**, random samples from each of the selected clusters comprise the sample. To the extent that the subgroups do not have the same distribution as the entire population of the characteristic we are interested in, cluster sampling will have greater sampling error than simple random sampling and two-stage cluster sampling can be expected to have greater sampling error than one-stage cluster sampling.

Non-probability sampling is based on either low cost or easy access to some data items, or on using the judgment of the researcher in selecting specific data items. Less randomness in selection may lead to greater sampling error.

- **Convenience sampling** refers to selecting sample data based on its ease of access, using data that are readily available.
- **Judgmental sampling** refers to samples for which each observation is selected from a larger data set by the researcher, based on her experience and judgment.

Central Limit Theorem

The **central limit theorem** of statistics states that in selecting simple random samples of size n from a population with a mean μ and a finite variance σ^2, the sampling distribution of the sample mean approaches a normal probability distribution with mean μ and a variance equal to σ^2/n as the sample size becomes sufficiently large ($n \geq 30$).

The **standard error of the sample mean** is the standard deviation of the sample divided by the square root of n, the number of observations in the sample. As the sample size increases, the sample mean gets closer, on average, to the true mean of the population.

There are alternatives to calculating the standard error of the sample mean:

- With the **jackknife method**, we calculate multiple sample means, each with one of the observations removed from the sample. The standard deviation of these sample means can then be used as an estimate of the standard error of sample means.
- With the more computationally demanding **bootstrap method**, we draw repeated samples of size n from the full data set (replacing the sampled observations each time) and then calculate the standard deviation of these means. The bootstrap method can be used to estimate the distributions of complex statistics, including those that do not have an analytic form.

HYPOTHESIS TESTING

A **hypothesis** is a statement about a population parameter that is to be tested. For example, "The mean return on the S&P 500 Index is equal to zero."

Steps in Hypothesis Testing

- State the hypothesis.
- Select a test statistic.
- Specify the level of significance.
- State the decision rule for the hypothesis.
- Collect the sample and calculate statistics.
- Make a decision about the hypothesis.
- Make a decision based on the test results.

Null and Alternative Hypotheses

The **null hypothesis**, designated as H_0, is the hypothesis the researcher wants to reject. It is the hypothesis that is actually tested and is the basis for the selection of the test statistics. Thus, if you seek to show that the mean return on the S&P 500 Index is different from zero, the null hypothesis will be that the mean return on the index *equals* zero.

The **alternative hypothesis**, designated H_a, is what is concluded if there is sufficient evidence to reject the null hypothesis. It is usually the alternative hypothesis you are really trying to support. Why? Since you can never really prove anything with statistics, when the null hypothesis is rejected, the implication is that the (mutually exclusive) alternative hypothesis is valid.

A **test statistic** is calculated from sample data and is compared to a critical value to evaluate H_0. The most common test statistics are the *z*-statistic and the *t*-statistic. **Critical values** come from tables and are based on the researcher's desired level of significance. If the test statistic exceeds the critical value (or is outside the range of critical values), the researcher rejects H_0. As the level of significance gets smaller, the critical value gets larger and it becomes more difficult to reject the null hypothesis. The **p-value** of a test statistic is the lowest significance value that will result in rejection of the null hypothesis.

Type I and Type II Errors

When testing a hypothesis, there are two possible types of errors:

- **Type I error**. Rejection of the null hypothesis when it is actually true.
- **Type II error**. Failure to reject the null hypothesis when it is actually false.

The **power of a test** is 1 − P(Type II error). The more likely that a test will reject a false null, the more powerful the test. A test that is unlikely to reject a false null hypothesis has little power.

The significance level is the probability of making a Type I error (rejecting the null when it is true) and is designated by the Greek letter alpha (α). You can think of this as the probability that the test statistic will exceed or fall below the critical values by chance even though the null hypothesis is true. A significance level of 5% (α = 0.05) means there is a 5% chance of rejecting a true null hypothesis.

Figure 3: Type I and Type II Errors in Hypothesis Testing

Decision	True Condition	
	H_0 is true	H_0 is false
Do not reject H_0	Correct decision	Incorrect decision Type II error
Reject H_0	Incorrect decision Type I error Significance level, α, = P(Type I error)	Correct decision Power of the test = $1 - $ P(Type II error)

Types of Hypothesis Tests

- For a hypothesis concerning the *value of a population mean*, we use a *t*-test (or a *z*-test if the sample size is large enough).
- To test a hypothesis concerning the *equality of two population means*, we use a *t*-test. The nature of that test depends on whether the samples are independent (a difference in means test) or dependent (a paired comparisons test).
- For a hypothesis concerning the *value of a population variance*, we use a chi-square test.
- To test a hypothesis concerning the *equality of two population variances*, we use an *F*-test.

The following table summarizes the test statistics used for each type of hypothesis test.

Figure 4: Types of Test Statistics

Hypothesis tests of:	Use a:	With degrees of freedom:
One population mean	*t*-statistic	$n - 1$
Two population means	*t*-statistic	$n - 1$
One population variance	Chi-square statistic	$n - 1$
Two population variances	*F*-statistic	$n_1 - 1, n_2 - 1$
Correlation	*t*-statistic	$n - 2$
Independence	Chi-square statistic	(rows $- 1$) $\times$ (columns $- 1$)

PARAMETRIC AND NON-PARAMETRIC TESTS OF INDEPENDENCE

Parametric tests, like the *t*-test, *F*-test, and chi-square test, make assumptions regarding the distribution of the population from which samples are drawn. **Non-parametric tests** either do not consider a particular population parameter or have few assumptions about the sampled population.

A parametric test of whether two random variables are independent uses a hypothesis that their correlation coefficient equals zero. Its test statistic follows a *t*-distribution

with n − 2 degrees of freedom and increases with the sample size as well as with the sample correlation coefficient:

$$\frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

where:
r = sample correlation
n = sample size

The **Spearman rank correlation test**, a nonparametric test, can be used to test whether two sets of ranks are correlated. Ranks are simply ordered values.

A **contingency table** is a two-dimensional array with rows that represent attributes of one of the variables and with columns that represent attributes of the other variable. The values in each cell are the frequencies with which we observe two attributes simultaneously. A hypothesis test of whether two characteristics of a sample are independent uses a Chi-square statistic calculated from a contingency table. The test compares the actual table values to what the values would be if the two characteristics were independent.

SIMPLE LINEAR REGRESSION

Simple linear regression is used to estimate the linear relationship between two variables and evaluate the significance of the relationship. A researcher determines which variable likely explains the variation in the other.

The **dependent variable** (the *Y* variable) is also referred to as the explained variable, the endogenous variable, or the predicted variable.

The **independent variable** (the *X* variable) is also referred to as the explanatory variable, the exogenous variable, or the predicting variable.

The following **linear regression model** is used to describe the relationship between variables *X* (independent) and *Y* (dependent):

$Y_i = b_0 + b_1 X_i + \varepsilon_i$, with i = 1 to n

where:

Y_i = *i*th observation of the dependent variable, Y
X_i = *i*th observation of the independent variable, X
b_0 = regression intercept term
b_1 = regression slope coefficient
ε_i = **residual** for the *i*th observation (also referred to as the error term)

Based on this regression model, the regression process estimates an equation for a line through a scatter plot of the data that best explains the observed values for *Y* in terms of the observed values for *X*. This **regression line** takes the following form:

$$\hat{Y}_i = \hat{b}_0 + \hat{b}_1 X_i, \text{ for } i = 1 \text{ to } n$$

where:

$\hat{Y}_i$ = estimated value of Y_i given X_i

$\hat{b}_0$ = estimated intercept term

$\hat{b}_1$ = estimated **slope coefficient**

The regression line is the line through the scatter plot of X and Y that minimizes the sum of the squared errors [differences between the Y-values predicted by the regression equation $\hat{Y}_i$ and the observed Y-values (Y_i)]. The sum of these squared differences is called the **sum of squared errors (SSE)**.

The slope coefficient for the regression line is an estimate of the change in Y for a one-unit change in X. The slope term is calculated as follows:

$$\hat{b}_1 = \frac{\text{Cov}_{XY}}{\sigma_X^2}$$

The **intercept term** is the regression line's intersection with the Y-axis at X = 0. The intercept term may be expressed as follows

$$\hat{b}_0 = \bar{Y} - \hat{b}_1 \bar{X}$$

In other words, the regression line passes through a point with coordinates equal to the means of the independent and dependent variables.

Assumptions of Simple Linear Regression

Linear regression assumes the following:

1. A linear relationship exists between the dependent and the independent variables.
2. The variance of the residual term is constant for all observations (homoskedasticity). **Heteroskedasticity** refers to the situation when this assumption is violated.
3. The residual term is independently distributed; that is, the residual for one observation is not correlated with that of another observation.
4. The residual term is normally distributed.

Analysis of Variance (ANOVA)

ANOVA is a statistical procedure for analyzing the total variation in the dependent variable. Three of the measures in an ANOVA table are as follows:

- **Sum of squares total (SST).** Sum of the squared differences between the actual Y-values and the mean of Y. SST measures the total variation in the dependent variable.
- **Sum of squares regression (SSR).** Sum of the squared differences between the predicted Y-values and the mean of Y. SSR measures the variation in the dependent variable that *is* explained by the independent variable.

- **Sum of squared errors (SSE).** Sum of the squared differences between the actual *Y*-values and the predicted *Y*-values. SSE measures the variation in the dependent variable that *is not* explained by the dependent variable.

From these, we can calculate the **coefficient of determination**, or ***R*-squared**, which is the proportion of the total variation in the dependent variable that is explained by the independent variable:

$$R^2 = SSR / SST$$

The **mean square regression (MSR)** is equal to the SSR divided by the regression's degrees of freedom. For a simple linear regression the degrees of freedom are one, because we have one independent variable.

The **mean squared error (MSE)** is the SSE divided by its degrees of freedom, which for a simple linear regression is the number of observations minus two.

$$MSE = \frac{SSE}{n-2}$$

The **standard error of estimate (SEE)** for a regression is the standard deviation of its residuals. The lower the SEE, the better the model fit.

$$SEE = \sqrt{MSE}$$

Dividing the MSR by the MSE gives us an *F*-statistic that we can use to test whether the slope coefficient is statistically significant.

$$F = MSR / MSE$$

Hypothesis Test of the Slope Coefficient

For a simple linear regression, the *F*-test is equivalent to a *t*-test of the significance of the estimated slope coefficient (b_1). The test statistic is as follows:

$$t = \frac{\hat{b}_1 - b_1}{s_{\hat{b}_1}}$$

where:

b_1 = hypothesized value of slope coefficient

$s_{\hat{b}_1}$ = standard error of slope coefficient = $\dfrac{SEE}{\sqrt{\sum\limits_{i=1}^{n} (X_i - \overline{X})^2}}$

Degrees of freedom for this *t*-test are n − 2. The null hypothesis is that $b_1 = 0$ (the independent variable has no significant explanatory power for the value of the dependent variable).

Predicted Values and Confidence Intervals

We use a regression model to predict values of the dependent variable, given predicted values for the independent variable. For example, given the following regression equation:

$$\hat{Y} = -2.3\% + 0.64\hat{X}$$

If we have a forecast value for *X* of 10%, the predicted value of *Y* is –2.3% + 0.64(10%) = 4.1%.

We can construct a confidence interval around the predicted value, as follows:

$$Y \pm (t_c \times s_f)$$

where:

t_c = two-tailed critical *t*-value at the desired level of significance with df = n – 2

s_f = standard error of the forecast = $SEE^2 \left[1 + \frac{1}{n} + \frac{(X - \overline{X})^2}{(n-1)_{\overline{X}}^2} \right]$

On the Level I exam, we believe any question that requires the standard error of the forecast is highly likely to provide a value for it.

Linear Regression with Transformed Variables

If one or both of the variables appear to be growing at a constant rate in percentage terms (constant compound, or exponential, rate of growth), we can transform them using the natural logarithm and then apply simple linear regression. Such a model is called a **log-lin model** if the dependent variable is transformed while the independent variable is linear, a **lin-log model** if the independent variable is transformed while the dependent variable is linear, or a **log-log model** if both variables are transformed.

INTRODUCTION TO BIG DATA TECHNIQUES

The term **fintech** refers to developments in technology that can be applied to the financial services industry. Examples include tools and techniques for analyzing very large datasets, such as artificial intelligence.

Big Data is an expression that refers to all the potentially useful information that is generated in the economy, from traditional sources (financial markets, company financial reports, and economic statistics) as well as **alternative data** from nontraditional sources (data from individuals' online activity, **corporate exhaust** such as bank records and retail scanner data, and data from the **Internet of Things** such as smartphones and smart buildings).

Characteristics of Big Data include its volume, velocity, and variety. The *volume* of data continues to grow by orders of magnitude and is now measured in terabytes (1,000 gigabytes) and even petabytes (1,000 terabytes). *Velocity* refers to how quickly data are communicated. Real-time data are said to have low **latency** while data communicated with a lag have high latency. The *variety* of data ranges from structured forms such as

spreadsheets and databases, to semistructured forms such as photos and web page code, to unstructured forms such as video.

Data science describes methods for processing and visualizing data. Processing methods include *capture* (collecting data), *curation* (assuring data quality), *storage* (archiving and accessing data), *search* (finding needed information in stored data), and *transfer* (moving data to where they are needed). Visualization techniques include charts and graphs for structured data, and tools such as word clouds or mind maps for less structured data.

Artificial intelligence, or computer systems that can be programmed to simulate human cognition, may be applied to organize unstructured data. **Neural networks** are an example of artificial intelligence. In **machine learning**, a computer algorithm is given inputs of source data and designed to learn how to recognize patterns in the input data or model output data.

In **supervised learning**, the input and output data are labeled, the machine learns to model the outputs from the inputs, and then the machine is given new data on which to use the model. In **unsupervised learning**, the input data are not labeled, and the machine learns to describe the structure of the data. **Deep learning** uses layers of neural networks to identify patterns, and may employ supervised or unsupervised learning. Image and speech recognition are among the applications of deep learning.

Overfitting occurs when the machine creates a model that is too complex: the machine learns the input and output data too exactly and identifies spurious patterns and relationships. **Underfitting** occurs when the model is not complex enough to describe the data: the machine fails to identify actual patterns and relationships.

Applications of fintech that are relevant to investment management include text analytics, natural language processing, risk governance, and algorithmic trading.

- **Text analytics** refers to the analysis of unstructured data in text or voice forms. It has the potential to partially automate tasks such as evaluating company regulatory filings.
- **Natural language processing** refers to the use of computers and artificial intelligence to interpret human language. Possible applications in finance could be to check for regulatory compliance in employee communications, or to evaluate large volumes of research reports to detect subtle changes in sentiment.
- **Risk governance** requires an understanding of a firm's exposure to a wide variety of risks. Machine learning and other techniques related to Big Data can be useful in modeling and testing risk, particularly if firms use real-time data to monitor risk exposures.
- **Algorithmic trading** is computerized securities trading based on predetermined rules. This can be useful for optimizing execution instructions, dividing large orders across exchanges in the best way, or to carry out **high-frequency trading** that takes advantage of intraday securities mispricings.

|	
Weight on Exam	6% to 9%
SchweserNotes™ Reference	Book 1, pages 137–235

FIRMS AND MARKET STRUCTURES

Breakeven and Shutdown

In the short run, a firm may be selling at less than average total cost (ATC), generating an economic loss. Such a firm should continue to operate in the short run as long as price is greater than average variable cost (AVC). In this case, the losses from shutting down (producing zero output) in the short run would be greater (equal to total fixed costs [TFC]) than the losses from continued operation. If selling price is less than AVC, the firm will minimize its losses in the short run by ceasing operations.

In the long run, a firm should shut down if price is expected to remain less than the ATC. These cases are illustrated in Figure 1. At prices below P_1 but above P_2, a profit-maximizing (loss-minimizing) firm should continue to operate in the short run but shut down in the long run. At prices below P_2, the firm should shut down in the short run as well. We refer to this price (minimum AVC) as the **short-run shutdown point**.

Figure 1: Shutdown and Breakeven
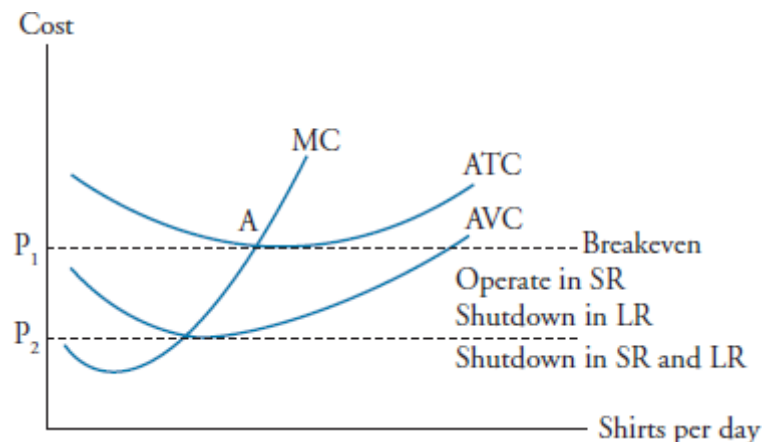
Economies and Diseconomies of Scale

In the long run, firms can adjust their scale of operations (i.e., capital is variable). The minimum ATC at each possible scale of operations is shown on the **long-run average total cost (LRATC)** curve.

The downward-sloping segment of the LRATC curve presented in Figure 2 indicates that **economies of scale** (or *increasing returns to scale*) are present. Economies of scale result from factors such as labor specialization, mass production, and investment in more efficient equipment and technology. In addition, the firm may be able to negotiate lower input prices with suppliers as firm size increases and more resources are purchased. The lowest point on the LRATC curve corresponds to the scale or plant size at which the ATC of production is at a minimum. This scale is sometimes called the **minimum efficient scale**. At larger firm sizes, minimum ATCs begin to increase, indicating that there are **diseconomies of scale** beyond the minimum efficient scale.

Figure 2: Economies and Diseconomies of Scale
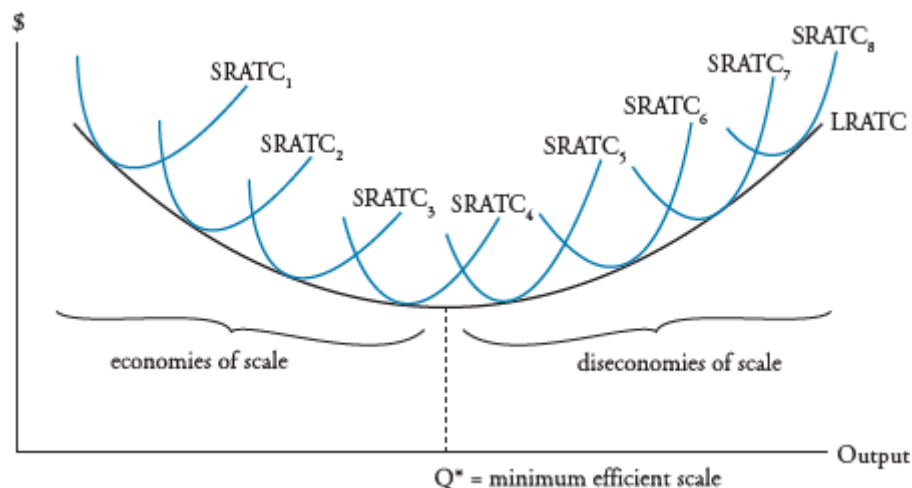
Characteristics of Market Structures

We can differentiate among four types of markets based on the following characteristics:

- Number of firms and their relative sizes
- Degree to which firms differentiate their products
- Bargaining power of firms with respect to pricing
- Barriers to entry into or exit from the industry
- Degree to which firms compete on factors other than price

At one end of the spectrum is **perfect competition**, in which many firms produce identical products and competition forces them all to sell at the market price. At the other extreme, we have **monopoly**, where only one firm is producing the product. In between are **monopolistic competition** (many sellers and differentiated products) and **oligopoly** (few firms that compete in various ways).

Markets can be differentiated by several characteristics, including number of seller firms, their market shares or industry concentration, the degree of product differentiation, the nature of competition, and barriers to entry into and exit from the industry. We can identify four primary types of market structures. An analyst, however, may be most concerned with the pricing power a particular firm has. To identify the type of market in which a firm operates, an analyst should focus on the number of firms

in the market, their market shares, the nature of competition, the availability of substitute goods, and barriers to entry into and exit from the industry.

Perfect competition is characterized by the following:

- Many firms, each small relative to the market
- Very low barriers to entry into or exit from the industry
- Homogeneous products that are perfect substitutes
- No advertising or branding
- No pricing power

Monopolistic competition is characterized by the following:

- Many firms
- Low barriers to entry into or exit from the industry
- Differentiated products, heavy advertising, and high marketing expenditure
- Firms that have some pricing power

Oligopoly markets are characterized by the following:

- Few sellers
- High barriers to entry into or exit from the industry
- Products that may be homogeneous or differentiated by branding and advertising
- Firms that may have significant pricing power

Monopoly is characterized by the following:

- A single firm that comprises the whole market
- Very high barriers to enter or exit the industry
- Advertising used to compete with any substitute products (normally no good substitutes)
- Significant pricing power

Demand Characteristics

Perfect competition	Price = marginal revenue = marginal cost (in equilibrium)
	Perfectly elastic firm demand curve
	Zero economic profit in equilibrium
Monopolistic competition	Price > marginal revenue = marginal cost (in equilibrium)
	Downward-sloping firm demand curve
	Zero economic profit in long-run equilibrium
Oligopoly	Price > marginal revenue = marginal cost (in equilibrium)
	Downward-sloping firm demand curve
	May have positive economic profit in long-run equilibrium
	Tends toward zero economic profit over time
Monopoly	Price > marginal revenue = marginal cost (in equilibrium)
	Downward-sloping firm demand curve
	May have positive economic profit in long-run equilibrium
	Profits may be zero because of expenditures to preserve monopoly

The nature of competition in oligopoly markets can be described by alternative models. At one extreme, competition within an oligopoly market is strong, the product undifferentiated, and the result is very much like perfect competition in the long run. At the other extreme, if oligopolistic firms successfully collude (mostly illegally), they will charge the price a monopolist would and agree to share the economic profits. Between these extremes, we have the following three models:

1. The **kinked demand curve model** is based on an assumption that a firm's competitors will not follow a price increase, but they will cut their prices in response to a price decrease by a competitor. Under this model, each firm faces a demand curve with a kink at the current market price—more elastic above the current price and less elastic below the current price.

2. The **Cournot model** assumes that the firms in a two-firm oligopoly have identical cost structures and react only to the price charged by the other firm in the prior period. Each firm will produce half the industry output and charge the same price in equilibrium. This is a special case of a **Nash equilibrium**, defined as a situation in which no firm can increase profits by changing its price or output choice. The incentive for firms to cheat on a collusive agreement that is not a Nash equilibrium is one reason that collusive agreements are difficult to maintain.

3. In the **dominant firm model**, one firm is assumed to have the lowest cost structure and a significant proportion of the market. In this case, the dominant firm essentially

sets the price for the industry, and competitors set their output quantities, taking this price as given.

Concentration measures for a market or industry are often used as an indicator of market power. One concentration measure is the **N-firm concentration ratio**, which is calculated as the sum of the percentage market shares of the largest *N* firms in a market. While this measure is simple to calculate and understand, it does not directly measure market power or elasticity of demand.

One limitation of the N-firm concentration ratio is that it may be relatively insensitive to mergers of two firms with large market shares. This problem is reduced by using an alternative measure of market concentration, the **Herfindahl-Hirschman Index (HHI)**. The HHI is calculated as the sum of the squares of the market shares of the largest firms in the market.

A second limitation that applies to both concentration measures is that barriers to entry are not considered. Even a firm with high market share may not have much pricing power if barriers to entry are low and there is *potential competition* in that a competitor may enter the market if the price is high enough to produce economic profits.

UNDERSTANDING BUSINESS CYCLES

The business cycle has four phases: **expansion** (real GDP is increasing), **peak** (real GDP stops increasing and begins decreasing), **contraction** or **recession** (real GDP is decreasing), and **trough** (real GDP stops decreasing and begins increasing).

Figure 3: Business Cycle
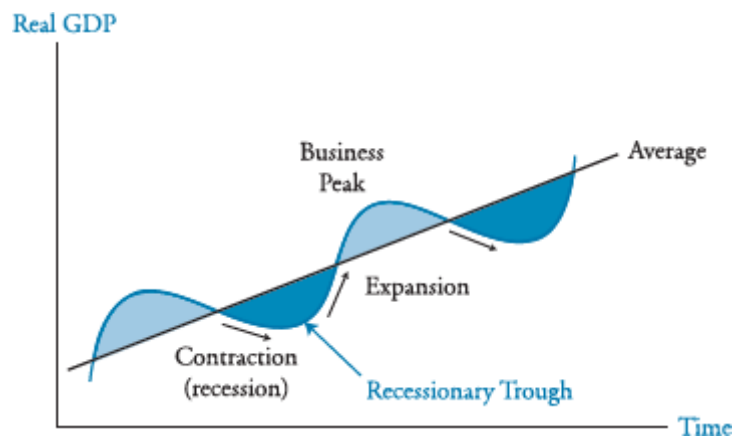
Inventory-to-sales ratios typically increase late in expansions (when sales slow) and decrease near the end of contractions (when sales begin to accelerate). As firm expectations change, firms decrease or increase production to restore their inventory-to-sales ratios to their desired levels.

Because hiring and laying off employees have high costs, firms prefer to adjust their use of current employees. As a result, firms are slow to lay off employees early in contractions and slow to add employees early in expansions.

Firms use their physical capital more intensively during expansions, investing in new capacity only if they believe the expansion is likely to continue. They use physical capital less intensively during contractions, but they are more likely to reduce capacity by deferring maintenance and not replacing equipment than by selling their physical capital.

Consumer spending increases during expansions and decreases during contractions. Spending on durable goods is highly cyclical because they are often higher-value purchases, and consumers are more willing to purchase them when incomes are increasing and economic confidence is high. Spending on discretionary services is also positively correlated with business cycle phases, while spending on nondurable goods and nondiscretionary services tends to be relatively stable over the business cycle.

Credit Cycles

Credit cycles refer to cyclical fluctuations in interest rates and the availability of loans. Typically, lenders are more willing to lend and offer lower interest rates during economic expansions; they are less willing to lend and require higher interest rates when the economy is contracting. Historical data suggest credit cycles have been longer in duration on average than business cycles, and their fluctuations are more pronounced.

Leading, Coincident, and Lagging Indicators

Economic indicators are used by analysts to assess the current state of the economy and to provide information about future economic activity. Indicators are classified by how they rise and fall relative to the phases of the business cycle:

- *Leading indicators* have turning points that tend to precede those of the business cycle.
- *Coincident indicators* have turning points that tend to coincide with those of the business cycle and are used to indicate the current phase of the business cycle.
- *Lagging indicators* have turning points that tend to occur after those of the business cycle.

FISCAL POLICY

Fiscal policy is a government's use of taxation and spending to influence the economy. Objectives of fiscal policy can include the following:

- Influencing the level of economic activity
- Redistributing wealth or income
- Allocating resources among industries

Fiscal policy is implemented by government changes in taxing and spending policies. A government has a **budget surplus** when tax revenues exceed government spending and a **budget deficit** when spending exceeds tax revenue.

There are arguments for being concerned about the size of a fiscal deficit:

- Higher future taxes lead to disincentives to work, negatively affecting long-term economic growth.
- Fiscal deficits might not be financed by the market when debt levels are high.
- There may be a **crowding-out effect** as government borrowing increases interest rates and decreases private sector investments.

And there are arguments against being concerned about the size of a fiscal deficit:

- Debt may be financed by domestic citizens.
- Deficits for capital spending can boost the productive capacity of the economy.
- Fiscal deficits may prompt needed tax reform.
- **Ricardian equivalence** may prevail: private savings rise in anticipation of the need to repay principal on government debt.
- When the economy is operating below full employment, deficits do not crowd out private investment.

Fiscal policy tools include spending tools and revenue tools. Spending tools include transfer payments, current spending (goods and services used by government), and capital spending (investment projects funded by government). Revenue tools include direct and indirect taxation.

An increase in a government budget surplus indicates contractionary fiscal policy; a decrease indicates expansionary fiscal policy. Similarly, an increase in a government budget deficit indicates expansionary fiscal policy, and a decrease indicates contractionary fiscal policy.

An advantage of fiscal policy is that indirect taxes (sales, value-added, and excise taxes) can be used to quickly implement social policies and can be used to quickly raise revenues at a low cost.

Disadvantages of fiscal policy include time lags for implementing changes in direct taxes and time lags for capital spending changes to have an impact. Delays (lags) in realizing the effects of fiscal policy changes limit their usefulness.

Here are a few types of lags:

- **Recognition lag.** Policymakers may not immediately recognize when fiscal policy changes are needed.
- **Action lag.** Governments take time to enact needed fiscal policy changes.
- **Impact lag.** Fiscal policy changes take time to affect economic activity.

Additional macroeconomic issues may hinder the usefulness of fiscal policy:

- *Misreading economic statistics*. If the government relies on expansionary fiscal policy mistakenly when the economy is already at full capacity, it will simply drive inflation higher.
- *Crowding-out effect*. Greater government borrowing tends to increase interest rates, which decreases private investments, reducing the impact of expansionary fiscal policy.

- *Supply shortages.* If economic activity is slow due to resource constraints, expansionary fiscal policy will fail to achieve its objective and will probably increase inflation.
- *Limits to deficits.* If the markets perceive that the deficit is already too high as a proportion of GDP, funding the deficit will be problematic. This could lead to higher interest rates and actually make the situation worse.
- *Multiple targets.* If the economy has high unemployment coupled with high inflation, fiscal policy cannot address both problems simultaneously.

Economists often use the **structural budget deficit** (or **cyclically adjusted budget deficit**) to gauge fiscal policy. This is the deficit that would occur based on current policies if the economy were at full employment.

MONETARY POLICY

Monetary policy deals with determining the quantity of money supplied by the central bank. Central bank roles include the following:

- Supplying currency, acting as banker to the government and to other banks
- Regulating and supervising the payments system
- Acting as a lender of last resort
- Holding the nation's gold and foreign exchange reserves
- Conducting monetary policy

Central banks have the primary objective of controlling inflation. Some central banks have additional goals such as maintaining currency stability, full employment, positive sustainable economic growth, or moderate long-term interest rates.

There are policy tools available to central banks:

- Changing the policy rate
- Changing the reserve requirement
- Open market operations

Decreasing the policy rate, decreasing reserve requirements, and making open market purchases of securities are expansionary monetary policy. Increasing the policy rate, increasing reserve requirements, and making open market sales of securities are contractionary monetary policy.

An increase in the growth rate of the money supply will decrease nominal and (in the short run) real interest rates, which will increase economic growth. Because lower real interest rates will decrease foreign investment and demand for the domestic currency, an increase in the growth rate of the money supply will cause the domestic currency to depreciate relative to those of the country's trading partners. The depreciation of the domestic currency will increase export demand, further increasing economic growth. In the long run, the increase in the money supply will not decrease real interest rates because inflation (and inflation expectations) will increase, offsetting the decrease in

nominal interest rates. A decrease in the growth rate of the money supply will have opposite effects.

Effective central banks exhibit the following:

- *Independence*. The central bank is free from political interference.
- *Credibility*. The central bank follows through on its stated policy intentions.
- *Transparency*. The central bank makes it clear what economic indicators it uses and reports on the state of those indicators.

There are reasons that monetary policy may not work as intended:

- Monetary policy changes may affect inflation expectations to such an extent that long-term interest rates move opposite to short-term interest rates.
- Individuals may be willing to hold greater cash balances without a change in short-term rates so that an expansion of the money supply does not reduce short-term rates (liquidity trap).
- Banks may be unwilling to lend greater amounts, even when they have more excess reserves as a result of an increase in the money supply.
- Short-term rates cannot be reduced below zero.
- Developing economies face unique challenges in using monetary policy due to undeveloped financial markets, rapid financial innovation, and lack of credibility of the monetary authority.

Interaction of Fiscal and Monetary Policy

Monetary and fiscal policy will interact, and when one is expansionary (easy) and the other is contractionary (tight), they will offset to some degree. The following table summarizes the effects for different combinations of fiscal and monetary policy.

Monetary Policy	Fiscal Policy	Interest Rates	Output	Private Sector Spending	Public Sector Spending
Tight	Tight	Higher	Lower	Lower	Lower
Easy	Easy	Lower	Higher	Higher	Higher
Tight	Easy	Higher	Higher	Lower	Higher
Easy	Tight	Lower	Varies	Higher	Lower

INTRODUCTION TO GEOPOLITICS

Geopolitics refers to interactions among nations, including the actions of **state actors** (national governments) and **nonstate actors** (corporations, nongovernment organizations, and individuals). Originally, geopolitics referred to the study of how geography affects interactions among nations.

Countries' actions range from cooperative to noncooperative with regard to diplomatic, military, economic, and cultural matters. Examples of economic cooperation include

freedom of movement for goods, services, and capital; harmonizing tariffs; and standardizing rules.

Globalization refers to worldwide integration of economic activity and cultures. We may contrast globalization with **nationalism**—which, in this context, refers to a nation pursuing its own interests independently of or in competition with other countries. In general, countries that pursue globalization actively import and export goods and services, permit free movement of capital and exchange of currencies, and are open to cultural interaction.

We can define four basic categories for the behavior of state actors:

1. **Autarky** (noncooperation and nationalism) refers to a goal of national self-reliance and is often associated with a state-dominated society in general.
2. **Hegemony** (noncooperation and globalization) refers to countries that are open to globalization but can influence other countries without necessarily cooperating.
3. **Bilateralism** (cooperation and nationalism) refers to cooperation between two countries; a country may have many such relationships but not participate in multicountry arrangements.
4. **Multilateralism** (cooperation and globalization) refers to countries that engage extensively in international trade and other forms of cooperation. Some countries may exhibit **regionalism**, cooperating multilaterally with nearby countries but less so with the world at large.

Countries may use national security, economic, or financial tools to advance their geopolitical interests. **National security tools** may include armed conflict, espionage, or bilateral or multilateral agreements designed to reinforce or prevent armed conflict. **Economic tools** can be cooperative (e.g., free trade areas, common markets, and economic and monetary unions) or noncooperative (e.g., domestic content requirements, voluntary export restraints). **Financial tools** include foreign investment and the exchange of currencies.

IMF, World Bank, and WTO

The **International Monetary Fund (IMF)** facilitates trade by promoting international monetary cooperation and exchange rate stability, assists in setting up international payments systems, and makes resources available to member countries with balance of payments problems.

The **World Bank** provides low-interest loans, interest-free credits, and grants to developing countries for many specific purposes. It also provides resources and knowledge and helps form private and public partnerships with the overall goal of fighting poverty.

The **World Trade Organization (WTO)** has the goal of ensuring that trade flows freely and works smoothly. Its main focus is on instituting, interpreting, and enforcing numerous multilateral trade agreements, which detail global trade policies for a large majority of the world's trading nations.

Geopolitical Risk

Geopolitical risk refers to interruptions of peaceful international relations. **Event risk** refers to events about which we know the timing but not the outcome, such as national elections. **Exogenous risk** refers to unanticipated events, such as outbreaks of war. **Thematic risk** refers to known factors that have effects over long periods, such as human migration patterns. Geopolitical risk affects the risk premium investors require to hold assets in a country or region.

The **likelihood of geopolitical risk** refers to its probability. Countries that are more cooperative and globalized tend to have less likelihood of some geopolitical risks, such as war—but they may have greater likelihood of other risks, such as supply chain disruptions.

The **velocity of geopolitical risk** refers to how quickly investment values reflect its effects.

The **impact of geopolitical risk** refers to the magnitude of its effects on investment outcomes.

INTERNATIONAL TRADE

Historically, economic models of trade have focused on the gains that result when countries with a **comparative advantage** (lower relative cost) in the production of a good specialize in producing that good and export it, importing goods for which other countries have a comparative advantage. This increases the total output of goods and the wealth of both countries. Newer models emphasize benefits from trade that include the following:

- Gains from economies of scale that reduce costs of export goods
- Increased variety of goods produced
- Decreasing costs and improved quality from additional competition
- More efficient allocation of productive resources

International trade imposes costs as well. The most cited costs of free trade are the loss of domestic jobs in an importing industry and increased economic inequality.

Types of Trade Restrictions

- **Tariffs.** These are taxes on imported goods collected by the government.
- **Quotas.** These are limits on the amount of imports allowed over some period.
- **Export subsidies.** These are government payments to firms that export goods.
- **Minimum domestic content.** This is the requirement that some percentage of product content must be from the domestic country.
- **Voluntary export restraint.** A country voluntarily restricts the amount of a good that can be exported, often in the hope of avoiding tariffs or quotas imposed by their trading partners.

In general, all trade restrictions make foreign producers worse off, domestic producers and industry workers better off, and domestic consumers worse off. In Figure 4, note that before the imposition of a quota or tariff, the total quantity demanded domestically is QD_1, and QS_1 is supplied by domestic suppliers at price P_{world}. The imposition of the tariff raises the price on imports to $P_{protection}$, the quantity demanded decreases to QD_2, the quantity supplied by domestic producers increases to QS_2, and the quantity of imports decreases. The result is an increase in the domestic price of the good and a loss of consumer surplus equal to the blue-shaded area. The portion with vertical lines is an increase in domestic producers' surplus, the portion with horizontal lines is the total tariff revenue collected by the government, and the other two areas represent a deadweight loss.

Figure 4: Effects of Tariffs and Quotas
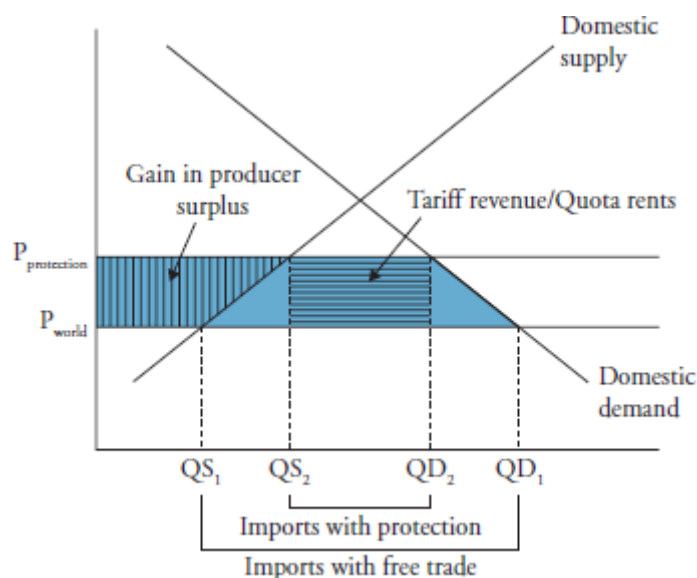
Some countries impose **capital restrictions** on the flow of financial capital across borders. Restrictions include the following:

- Outright prohibition of investment in the domestic country by foreigners
- Prohibition of or taxes on the income earned on foreign investments by domestic citizens
- Prohibition of foreign investment in certain domestic industries
- Restrictions on repatriation of earnings of foreign entities operating in a country

Overall, capital restrictions are thought to decrease economic welfare, but they do protect developing countries from large swings in asset prices as foreign capital moves into and out of a particular country.

Trade Agreements

Trade agreements can be categorized by the degree of economic integration among the participants. Each type of agreement in the following list includes the provisions in

the previous type of agreement, so that monetary union is the most integrated and includes all the provisions listed:

- **Free trade area.** All barriers to import and export of goods and services among member countries are removed.
- **Customs union.** In addition, all member countries adopt a common set of trade restrictions with nonmembers.
- **Common market.** In addition, all barriers to the movement of labor and capital goods among member countries are removed.
- **Economic union.** In addition, member countries establish common institutions and economic policy.
- **Monetary union.** In addition, member countries adopt a single currency.

CAPITAL FLOWS AND THE FX MARKET

The market for foreign exchange is the largest financial market in terms of the value of daily transactions and has various participants, including large multinational banks (the sell side) and corporations, investment fund managers, hedge fund managers, investors, governments, and central banks (the buy side).

Participants in the foreign exchange markets are referred to as *hedgers* if they enter into transactions that decrease an existing foreign exchange risk and as *speculators* if they enter into transactions that increase their foreign exchange risk.

An **exchange rate** is simply the price or cost of units of one currency in terms of another. For the Level I CFA exam, exchange rates are stated in the form 1.416 USD/EUR, to mean that each euro costs USD 1.416. If you read the "/" as *per*, you will have no trouble with the notation. In this quotation, the USD is the **price currency** and the EUR is the **base currency** (easy to remember because it is in the bottom or base of the quote).

An exchange rate expressed as price currency/base currency is referred to as a **direct quote** from the point of view of an investor in the price currency country and an **indirect quote** from the point of view of an investor in the base currency country.

The exchange rate at a point in time is referred to as a **nominal exchange rate**. If this rate (price/base) increases, the cost of a unit of the base currency in terms of the price currency has increased, so that the purchasing power of the price currency has decreased.

The purchasing power of one currency relative to another is also affected by changes in the price levels of the two countries. The **real exchange rate** between two currencies refers to the purchasing power of one currency in terms of the amount of goods priced in another currency, relative to an earlier period:

$$\text{real price/base exchange rate} = \text{nominal price/base exchange rate} \times \left(\frac{\text{CPI base currency}}{\text{CPI price currency}} \right)$$

A **spot exchange rate** is the currency exchange rate for immediate delivery. A **forward exchange rate** is a currency exchange rate for an exchange to be done in the future. Forward rates are quoted for various future dates (e.g., 30 days, 60 days, 90 days, or one year). A forward is actually an agreement to exchange a specific amount of one currency for a specific amount of another on a future date specified in the forward agreement.

Calculating the Percentage Change in an FX Rate

For a change in an exchange rate, we can calculate the **percentage appreciation or depreciation** *of the base currency*. For example, a decrease in the USD/EUR exchange rate from 1.44 to 1.42 represents a depreciation of the EUR relative to the USD of 1.39% (1.42 / 1.44 − 1 = −0.0139) because the USD price of a euro has gone down.

To calculate the appreciation or depreciation of the USD relative to the euro, we first convert the quotes to EUR/USD (making the USD the base currency) and then proceed as before. The initial rate becomes 1/1.44 = 0.6944 EUR/USD, and the later rate becomes 1/1.42 = 0.7042 EUR/USD. The change in the exchange value of the dollar (now the base currency) is 0.7042/0.6944 − 1 = +0.0141, so the USD has appreciated 1.41% relative to the euro over the period.

This could alternatively be calculated as follows:

$$\left(\frac{1}{1-0.0139}\right) - 1 = 1.41\%$$

Notice that the percentage appreciation of the USD is *not* the same as the percentage depreciation of the EUR.

Exchange Rate Regimes

Exchange rate regimes are methods by which countries manage the foreign exchange value of their currencies.

For countries that do not have their own currency, these apply:

- With **formal dollarization**, a country uses the currency of another country.
- In a **monetary union**, several countries use a common currency.

For countries that have their own currency, these apply:

- A **currency board arrangement** is an explicit commitment to exchange domestic currency for a specified foreign currency at a fixed exchange rate.
- In a **conventional fixed peg arrangement**, a country pegs its currency within margins of ±1% versus another currency.
- In a system of pegged exchange rates within a **target zone**, the permitted fluctuations in currency value relative to another currency or basket of currencies are wider (e.g., ±2%).

- With a **crawling peg**, the exchange rate is adjusted periodically, typically to adjust for higher inflation versus the currency used in the peg.
- With management of exchange rates within **crawling bands**, the width of the bands that identify permissible exchange rates is increased over time.
- With a system of **managed floating exchange rates**, the monetary authority attempts to influence the exchange rate in response to specific indicators, such as the balance of payments, inflation rates, or employment without any specific target exchange rate.
- With **independently floating exchange rates**, the exchange rate is market determined.

Changes in exchange rates can affect both imports and exports. The effects on the goods market occur more slowly than the effects on capital flows between countries. This is reflected in a country's **balance of payments**. Essentially, the balance of payments refers to the fact that capital flows must offset any imbalance between the value of a country's exports to and imports from another country. A country that has imports valued more than its exports is said to have a **current account deficit** (trade deficit), which must be offset by a **capital account surplus**. Countries with more exports than imports are said to have a **current account surplus** (trade surplus); therefore, they must have a **capital account deficit**.

Governments sometimes place restrictions on inflows and outflows of investment capital. Commonly cited objectives of capital flow restrictions include the following:

- Reducing the volatility of domestic asset prices
- Maintaining fixed exchange rates
- Keeping domestic interest rates low
- Protecting strategic industries

EXCHANGE RATE CALCULATIONS

Currency Cross Rates

Given two exchange rate quotes for three different currencies, we can calculate a **currency cross rate**. If the MXN/USD quote is 12.1 and the USD/EUR quote is 1.42, we can calculate the MXN/EUR cross rate as 12.1 × 1.42 = 17.18. That is, a euro is priced at 17.18 Mexican pesos.

No-Arbitrage Exchange Rate Relationship

When currencies are freely traded and forward currency contracts exist, the percentage difference between forward and spot exchange rates is approximately equal to the difference between the two countries' interest rates. We call this a *no-arbitrage condition* because if it doesn't hold, there is an opportunity to make a profit without risk. If the no-arbitrage condition holds, "you can't chase yield across borders." In other words, you cannot earn more than your domestic riskless rate of interest by borrowing

your domestic currency, converting it to a foreign currency to invest at the foreign riskless rate, and exchanging back to your domestic currency.

The no-arbitrage relationship can be stated as follows:

$$\frac{\text{forward}_{d/f}}{\text{spot}_{d/f}} = \frac{(1 + r_{\text{domestic}})}{(1 + r_{\text{foreign}})}$$

Forward Points and Percentages

Points in a foreign currency quotation are in units of the last digit of the quotation. For example, a forward quote of +25.3 when the USD/EUR spot exchange rate is 1.4158 means that the forward exchange rate is 1.4158 + 0.00253 = 1.41833 USD/EUR.

For a forward exchange rate quote given as a percentage, the percentage change in the spot rate is calculated as forward / spot – 1. A forward exchange rate quote of +1.787%, when the spot USD/EUR exchange rate is 1.4158, means that the forward exchange rate is 1.4158 (1 + 0.01787) = 1.4411 USD/EUR.

The **forward discount** or **forward premium** *for the base currency* is the percentage difference between the forward price and the spot price.

PORTFOLIO MANAGEMENT (PART ONE)

Weight on Exam	8% to 12%
SchweserNotes™ Reference	Book 2, pages 1–44 and Book 5, pages 69–124

PORTFOLIO RISK AND RETURN: PART I
Risk and Return of Major Asset Classes

Based on U.S. data over the period 1926–2017, Figure 1 indicates that small-capitalization stocks have had the greatest average returns and greatest risk over the period. T-bills had the lowest average returns and the lowest standard deviation of returns.

Figure 1: Risk and Return of Major Asset Classes in the United States (1926–2017)[1]

Assets Class	Average Annual Return (Geometric Mean)	Standard Deviation (Annualized Monthly)
Small-cap stocks	12.1%	31.7%
Large-cap stocks	10.2%	19.8%
Long-term corporate bonds	6.1%	8.3%
Long-term government bonds	5.5%	9.9%
Treasury bills	3.4%	3.1%
Inflation	2.9%	4.0%

Results for other markets around the world are similar: asset classes with the greatest average returns also have the highest standard deviations of returns.

Risk Aversion

An investor who is **risk averse** is simply one who dislikes risk (i.e., prefers less risk to more risk). Given two investments that have equal expected returns, a risk-averse investor will choose the one with less risk (standard deviation, σ).

An investor who is **risk seeking** (risk loving) actually prefers more risk to less and, given equal expected returns, will choose the more risky investment. An investor who is **risk neutral** has no preference regarding risk and would be indifferent between two such investments.

A risk-averse investor may select a very risky portfolio despite being risk averse; a risk-averse investor may hold very risky assets if he feels that the extra return he expects to earn is adequate compensation for the additional risk.

Risk and Return for a Portfolio of Risky Assets

When risky assets are combined into a portfolio, the expected portfolio return is a weighted average of the assets' expected returns, where the weights are the percentages of the total portfolio value invested in each asset.

The standard deviation of returns for a portfolio of risky assets depends on the standard deviations of each asset's return (σ), the proportion of the portfolio in each

asset (w), and—crucially—on the covariance (or correlation) of returns between each asset pair in the portfolio.

Here is the portfolio standard deviation for a two-asset portfolio:

$$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2\,w_1\,w_2\,\sigma_1\,\sigma_2\,\rho_{12}}$$

which is equivalent to:

$$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2\,w_1\,w_2\,Cov_{12}}$$

If two risky asset returns are perfectly positively correlated, $\rho_{12} = +1$, then the square root of portfolio variance (the portfolio standard deviation of returns) is equal to the following:

$$\sigma_{portfolio} = \sqrt{Var_{portfolio}} = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2\,w_1\,w_2\,\sigma_1\,\sigma_2\,(1)}$$
$$= w_1 \sigma_1 + w_2 \sigma_2$$

In this unique case, with $\rho_{12} = +1$, the portfolio standard deviation is simply the weighted average of the standard deviations of the individual asset returns.

Other things equal, the greatest portfolio risk results when the correlation between asset returns is +1. For any value of correlation less than +1, portfolio variance is reduced. Note that for a correlation of zero, the entire third term in the portfolio variance equation is zero. For negative values of correlation ρ_{12}, the third term becomes negative and further reduces portfolio variance and standard deviation.

Efficient Frontier

The Markowitz efficient frontier represents the set of possible portfolios that have the greatest expected return for each level of risk (standard deviation of returns).

Figure 2: Minimum Variance and Efficient Frontiers
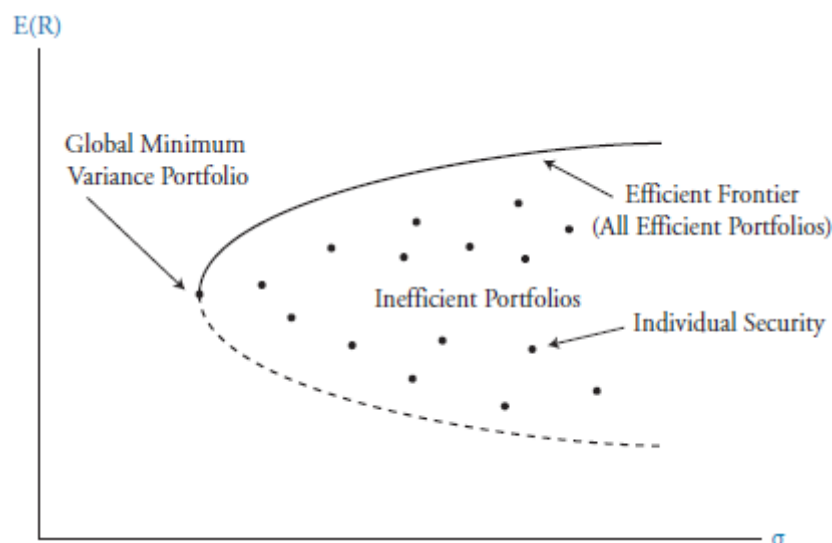
An Investor's Optimal Portfolio

An investor's **expected utility function** depends on his degree of risk aversion. An **indifference curve** plots combinations of risk (standard deviation) and expected return among which an investor is indifferent, as they all have equal expected utility.

Indifference curves slope upward for risk-averse investors because they will only take on more risk if they are compensated with greater expected return. An investor who is relatively more risk averse requires a relatively greater increase in expected return to compensate for taking on greater risk. In other words, a more risk-averse investor will have steeper indifference curves.

In our previous illustration of efficient portfolios available in the market, we included only risky assets. When we add a risk-free asset to the universe of available assets, the efficient frontier is a straight line. Here are the formulas:

$$E(R_{portfolio}) = W_A E(R_A) + W_B E(R_B)$$

$$\sigma_{portfolio} = \sqrt{W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2\,W_A W_B \rho_{AB} \sigma_A \sigma_B}$$

Using these formulas allows Asset B to be the risk-free asset and Asset A to be a risky portfolio of assets.

Because a risk-free asset has zero standard deviation and zero correlation of returns with those of the risky portfolio, this results in the reduced equation:

$$\sigma_{portfolio} = \sqrt{W_A^2 \sigma_A^2} = W_A \sigma_A$$

If we put X% of our portfolio into the risky asset portfolio, the resulting portfolio will have a standard deviation of returns equal to X% of the standard deviation of the risky asset portfolio. The relationship between portfolio risk and return for various portfolio allocations is linear, as illustrated in Figure 3.

Figure 3: Capital Allocation Line and Risky Asset Weights
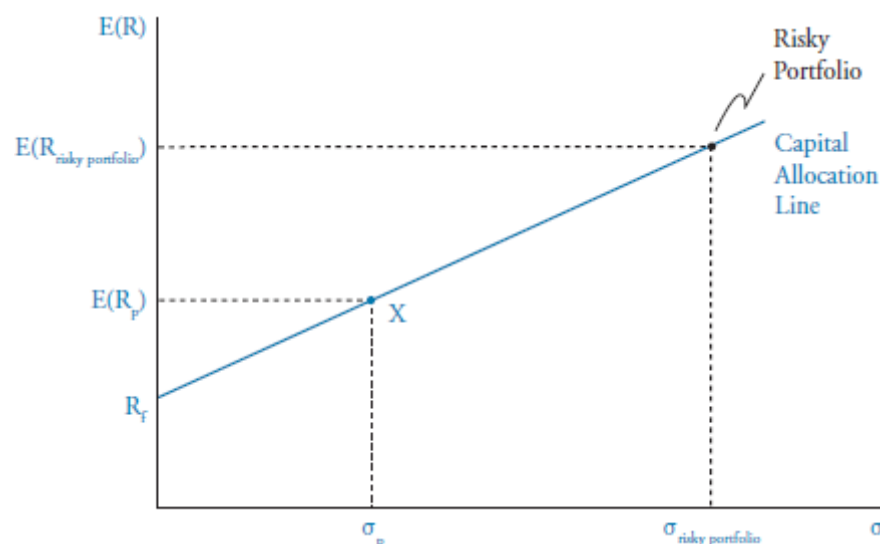
Combining a risky portfolio with a risk-free asset is the process that supports the **two-fund separation theorem**, which states that all investors' optimum portfolios will be made up of some combination of an optimal portfolio of risky assets and the risk-free asset. The line representing these possible combinations of risk-free assets and the optimal risky asset portfolio is referred to as the **capital allocation line (CAL)**.

Point X on the capital allocation line in Figure 3 represents a portfolio that is 40% invested in the risky asset portfolio and 60% invested in the risk-free asset. Its expected return will be $0.40[E(R_{\text{risky asset portfolio}})] + 0.60(R_f)$, and its standard deviation will be $0.40(\sigma_{\text{risky asset portfolio}})$.

We can combine the capital allocation line with indifference curves to illustrate the logic of selecting an optimal portfolio (i.e., one that maximizes the investor's expected utility). In Figure 4, we can see that an investor with preferences represented by indifference curves I_1, I_2, and I_3 can reach the level of expected utility on I_2 by selecting Portfolio X. This is the optimal portfolio for this investor, as any portfolio that lies on I_2 is preferred to all portfolios that lie on I_3 (and, in fact, to any portfolios that lie between I_2 and I_3). Portfolios on I_1 are preferred to those on I_2, but none of the portfolios that lie on I_1 are available in the market.

Figure 4: Risk-Averse Investor's Indifference Curves
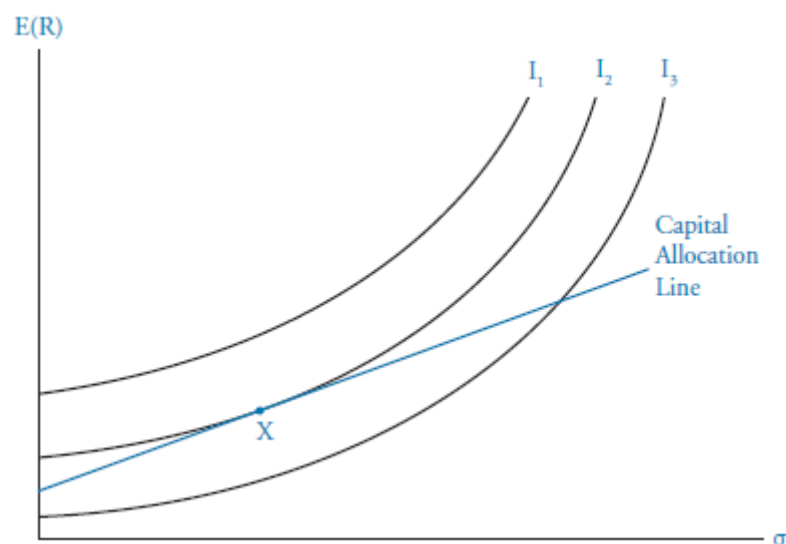
The final result of our analysis here is not surprising: investors who are less risk averse will select portfolios with more risk. As illustrated in Figure 5, the flatter indifference curve for Investor B (I_B) results in an optimal (tangency) portfolio that lies to the right of the one that results from a steeper indifference curve, such as that for Investor A (I_A). An investor who is less risk averse should optimally choose a portfolio with more invested in the risky asset portfolio and less invested in the risk-free asset.
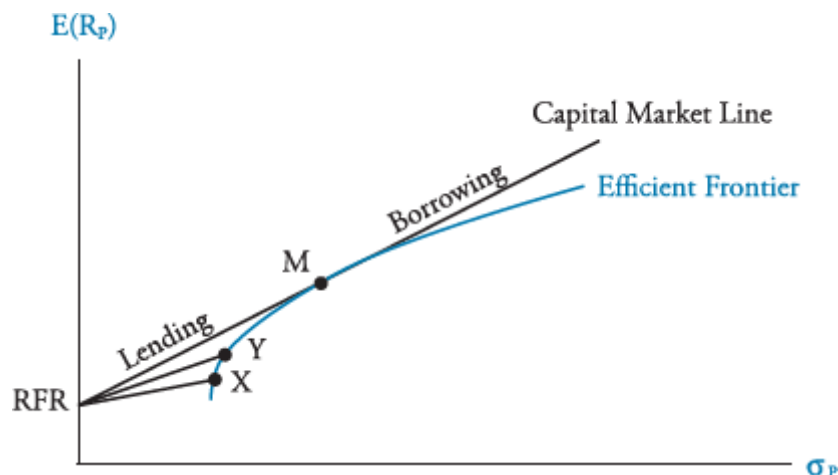
Figure 5: Portfolio Choices Based on Investor's Indifference Curves
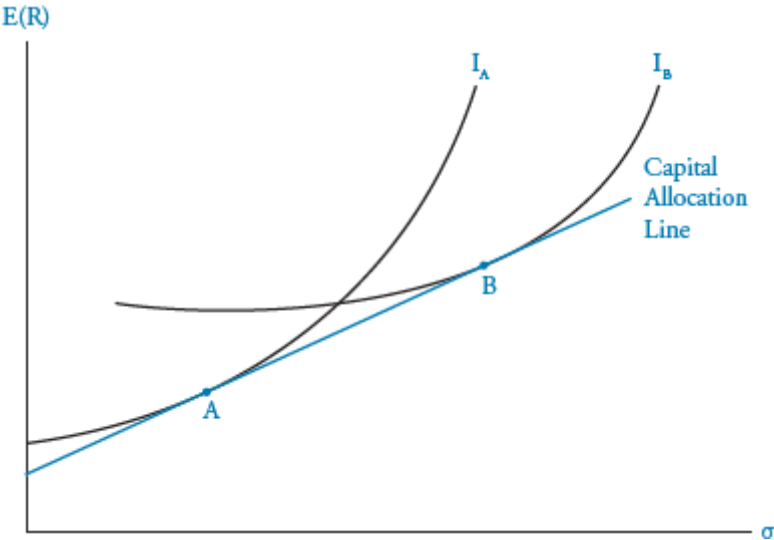
PORTFOLIO RISK AND RETURN: PART II

The following figure illustrates the possible risk-return combinations from combining a risk-free asset with three different (efficient) risky portfolios: X, Y, and M.

Figure 6: Combining a Risk-Free Asset With a Risky Portfolio

This figure also illustrates the point that combining a risk-free asset with risky Portfolio M (the *tangency* portfolio) results in the best available set of risk and return opportunities. Combining the risk-free asset with either Portfolio X or Portfolio Y results in a less preferred set of possible portfolios.

Because all investors who hold any risky assets will choose to hold Portfolio M, it must contain *all* available risky assets, and we can describe it as the "market portfolio."

Investors at Point M have 100% of their funds invested in Portfolio M. Between R_f and M, investors hold both the risk-free asset and Portfolio M. This means that investors are *lending* some of their funds at the risk-free rate and investing the rest in the risky market Portfolio M. To the right of M, investors hold more than 100% of Portfolio M. This means that they are *borrowing* funds to buy more of Portfolio M. The *levered positions* represent a 100% investment in Portfolio M and borrowing to invest even more in Portfolio M.

In short, adding a risk-free asset to the set of risky assets considered in the Markowitz portfolio theory results in a new efficient frontier that is now a straight line, the capital market line (CML).

Security Market Line: Systematic and Unsystematic Risk

Under the assumptions of capital market theory, diversification is costless, and investors will only hold efficient portfolios. The risk that is eliminated by diversification is called *unsystematic risk* (also referred to as unique, diversifiable, or firm-specific risk). Because unsystematic risk is assumed to be eliminated at no cost, investors need not be compensated in equilibrium for bearing unsystematic risk.

The risk that remains in efficient portfolios is termed *systematic risk* (also referred to as nondiversifiable or market risk), which is measured by an asset's or portfolio's beta. This crucial result is the basis for the capital asset pricing model (CAPM). The equilibrium relationship between systematic risk and expected return is illustrated by the security market line (SML), as shown in Figure 7.

Figure 7: Security Market Line
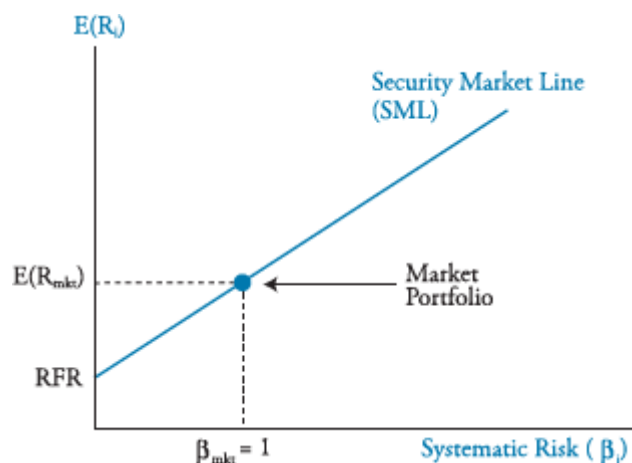
The *total risk* (standard deviation of returns) for any asset or portfolio of assets can be separated into systematic and unsystematic risk.

> total risk = systematic risk + unsystematic risk

Well-diversified (efficient) portfolios have no unsystematic risk, and a risk-free asset has no systematic (market) risk, either. Systematic risk is measured in units of market risk, referred to as the beta of an asset or portfolio, so that the beta of the market portfolio is equal to one. The market portfolio simply has one "unit" of market risk.

> CAPM: $E(R_i) = Rf + \beta_i[E(R_{mkt}) - Rf]$

Note that required return and expected return are the same in equilibrium.

Return-Generating Models

Return-generating models are used to estimate the expected returns on risky securities based on specific factors. For each security, we must estimate the sensitivity of its returns to each factor included in the model. Factors that explain security returns can be classified as macroeconomic, fundamental, and statistical factors.

Multifactor models most commonly use macroeconomic factors such as GDP growth, inflation, or consumer confidence, along with fundamental factors such as earnings, earnings growth, firm size, and research expenditures.

The general form of a multifactor model with *k* risk factors is as follows:

> $E(R_i) - R_f = \beta_{i1} \times E(\text{Factor 1}) + \beta_{i2} \times E(\text{Factor 2}) + \cdots + \beta_{ik}$
> $\times E(\text{Factor k})$

This model states that the expected excess return (above the risk-free rate) for Asset i is the sum of each **factor sensitivity** or **factor loading** (the βs) for Asset i multiplied by the expected value of that factor for the period. The first factor is often the expected excess return on the market, $E(R_m) - R_f$.

One multifactor model that is often used is that of Fama and French. They estimated the sensitivity of security returns to three factors: firm size, firm book value to market value ratio, and the return on the market portfolio minus the risk-free rate (excess return on the market portfolio). Carhart suggests a fourth factor that measures price momentum using prior-period returns. Together, these four factors do a relatively good job of explaining returns differences for U.S. equity securities over the period for which the model has been estimated.

The **market model** is a single-factor (sometimes termed *single-index*) model. The only factor is the expected return on the market portfolio (market index).

The form of the market model is as follows:

$$R_i = \alpha_i + \beta_i R_m + e_i$$

where:

R_i = return on Asset i

R_m = market return

β_i = slope coefficient

α_i = intercept

e_i = abnormal return on Asset i

In the market model, the beta (factor sensitivity) of Asset i is a measure of the sensitivity of the return on Asset i to the return on the market portfolio.

Beta

The sensitivity of an asset's return to the return on the market index in the context of the market model is referred to as its **beta**. Beta is a standardized measure of the covariance of the asset's return with the market return. Beta can be calculated as follows:

$$\beta_i = \frac{\text{covariance of Asset } i\text{'s return with the market return}}{\text{variance of the market return}} = \frac{\text{Cov}_{im}}{\sigma_m^2}$$

We can use the definition of the correlation between the returns on Asset i with the returns on the market index:

$$\rho_{im} = \frac{\text{Cov}_{im}}{\sigma_i \sigma_m}$$

to get $\text{Cov}_{im} = \rho_{im} \sigma_i \sigma_m$.

Substituting for Cov_{im} in the equation for B_i, we can also calculate beta as:

$$\beta_i = \frac{\rho_{im} \sigma_i \sigma_m}{\sigma_m^2} = \rho_{im} \frac{\sigma_i}{\sigma_m}$$

SML and Equilibrium

You should be able to compute an asset's expected return using the SML and determine whether the asset is underpriced or overpriced relative to its equilibrium value. In solving problems, be careful to note whether you are given the expected return on the market, $E(R_M)$, or the market risk premium, $E(R_M) - R_f$.

An analyst may identify assets for which his forecasted returns differ from the expected return based on the asset's beta. Assets for which the forecasted return differs from its equilibrium expected returns will plot either above or below the SML. Consider three stocks—A, B, and C—that are plotted on the SML diagram in Figure 8 based on their forecast returns.

Figure 8: Identifying Mispriced Securities
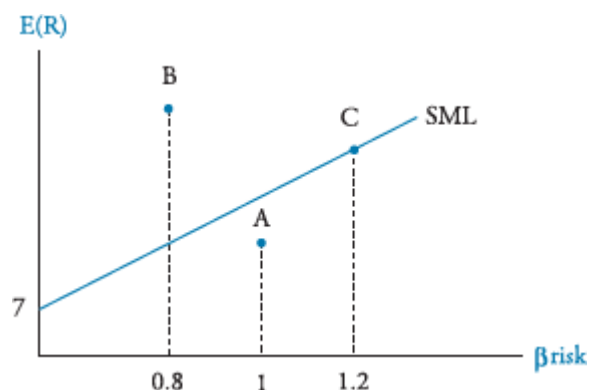
According to the forecasts, Asset B is underpriced, Asset A is overpriced, and Asset C is priced at its equilibrium value.

Performance evaluation of an active manager's portfolio choices refers to the analysis of the risk and return of the portfolio. **Attribution analysis**, an analysis of the sources of returns differences between the active portfolio returns and those of a passive benchmark portfolio, is also part of performance evaluation.

A portfolio with greater risk than the benchmark portfolio (especially beta risk) is expected to produce higher returns over time than the benchmark portfolio. When evaluating the performance of a portfolio with risk that differs from that of a benchmark portfolio, we need to adjust the active portfolio return's risk. Of the alternative ways to measure risk-adjusted returns, the most commonly used is the **Sharpe ratio**, which is its *excess returns per unit of total portfolio risk*. Higher Sharpe ratios indicate better risk-adjusted portfolio performance.

$$\text{Sharpe ratio} = \frac{E\left[R_{portfolio}\right] - R_f}{\sigma_{portfolio}}$$

Because the Sharpe ratio is based on total risk (standard deviation of returns), it can be used to measure the risk-adjusted returns of portfolios that have unsystematic (firm-specific) risk.

In Figure 9, we illustrate that the Sharpe ratio is the slope of the CAL for a portfolio and can be compared to the slope of the CML to evaluate risk-adjusted performance.

Figure 9: Sharpe Ratios as Slopes
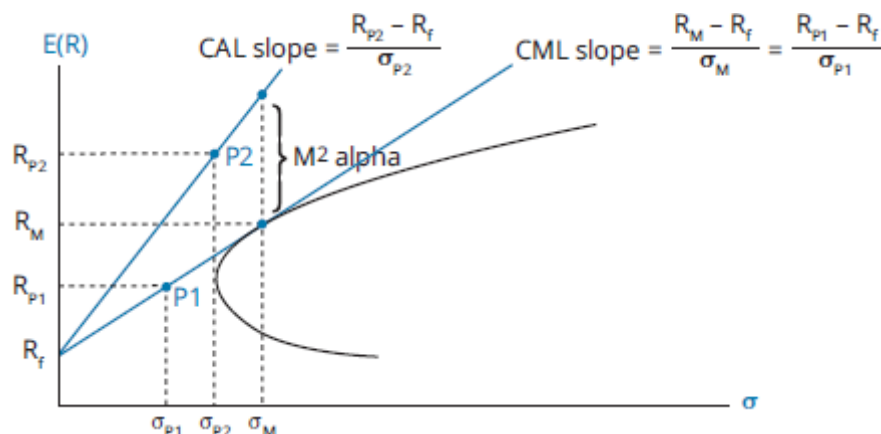
The **M-squared** (M^2) measure produces the same portfolio rankings as the Sharpe ratio, but it is stated in percentage terms (as illustrated in Figure 9). It is calculated for Portfolio 2 as follows:

$$R_f + (R_{P2} - R_f)\frac{\sigma_M}{\sigma_{P2}}$$

The extra return on Portfolio P2 above the return on the market portfolio is referred to as its **M^2 alpha**. The difference between the Sharpe ratio and M^2 measure is that Sharpe is a slope measure, and M^2 is measured in percentage terms.

Two measures of portfolio performance based on systematic (beta) risk rather than total risk are the **Treynor measure** and **Jensen's alpha**. They are analogous to the Sharpe ratio and M^2 measures in that the Treynor measure is a measure of slope, and Jensen's alpha is in percentage returns.

The Treynor measure is calculated as $\dfrac{R_p - R_f}{\beta_p}$, is interpreted as excess returns per unit of systematic risk, and is represented by the slope of a line as illustrated in Figure 10.

Jensen's alpha for Portfolio P is calculated as $\alpha_p = R_p - [R_f + \beta_p(R_M - R_f)]$ and is the percentage portfolio return above that of a portfolio (or security) with the same beta as the portfolio that lies on the SML, as illustrated in Figure 10.

Figure 10: Treynor Measure and Jensen's Alpha
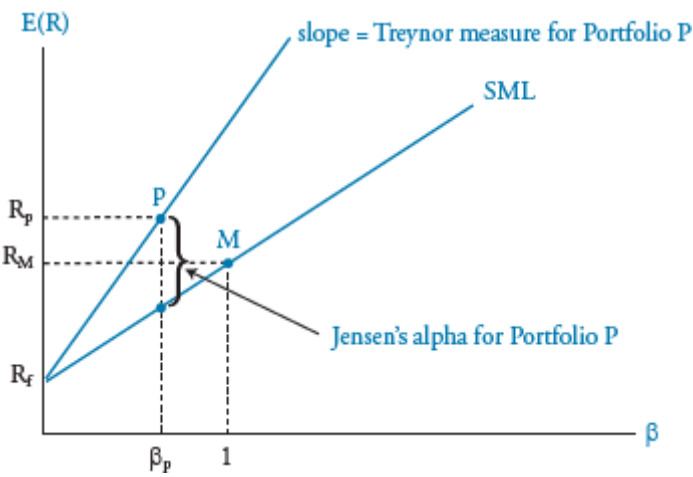
CORPORATE ISSUERS

ORGANIZATIONAL FORMS, CORPORATE ISSUER FEATURES, AND OWNERSHIP

Organizational forms refer to how businesses are set up. Key features of organizational forms include the following:

- Whether the business is a separate legal entity from the owner(s)
- Whether the owners of the business also operate the business, and if not, the nature of the relationship between its owners and operators
- Whether the owners' liability for the actions and debts of the business is limited or unlimited
- The tax treatment of profits or losses from the business
- Access to additional capital to fund expansion and to distribute risk

To understand these features, we can compare them among four commonly used types of business structures:

- **Sole proprietorship.** An individual owns and operates a business. The owner has unlimited liability and the only claim on profits from the business, and is solely responsible for taxes.
- **General partnership.** Two or more individuals own and operate a business. Partners have unlimited liability. A partnership agreement states each partner's responsibilities for business operations and their shares of the partnership's profits or losses. Each partner's share of the profits is taxed as personal income.
- **Limited partnership.** General partners operate a business and have unlimited liability, while limited partners are liable only for the amount they invest. General partners typically receive a larger portion of the profits than limited partners. Profits are taxed as personal income to each partner.
- **Corporation.** This is a legal entity separate from its owners and operators. All owners have limited liability. Owners (shareholders) are separate from operators (managers). Shareholders have **voting rights** that allow them to elect a **board of directors**. The board of directors may distribute a portion of the company's earnings to the shareholders as dividends. A corporation's earnings may be subject to **double taxation** if a country taxes companies on their earnings and shareholders on dividends received.

A **public corporation** (or a **public limited company**) is one that has shares that are sold to the public and trade in an organized market (stock exchange). A **private limited company** is similar to a public company, but it has a limited number of shareholders and restrictions on the transfer of shares.

Most public limited companies are **listed companies**, which means their shares trade on an exchange. The percentage of shares that are actively traded (i.e., not held by insiders, strategic investors, or sponsors) is called the company's **free float**. Public companies are subject to compliance and reporting requirements, such as filing periodic financial reports with a regulatory body.

Private companies have fewer regulatory requirements and typically disclose less information than public companies. Shares in private limited companies do not trade on an exchange. Typically, investors in a private limited company must wait until the company goes public or is sold to exit their investment. Private companies can raise equity capital through **private placements** that are typically restricted to **accredited investors** such as corporate and institutional investors or high-net-worth individuals.

Private companies can become public companies ("go public") in one of three ways:

1. To issue shares in an **initial public offering (IPO)**, the company must meet exchange-specific requirements. Companies typically engage the services of an investment bank to underwrite the issue.

2. In a **direct listing**, a stock exchange agrees to list a private company's existing shares. This differs from an IPO in that a direct listing does not raise any new capital for the company.

3. A **special purpose acquisition company (SPAC)** is a corporate structure set up to acquire a private company in the future. The SPAC raises capital through an IPO and puts the funds into a trust that it must use to make an acquisition within a specified time.

INVESTORS AND OTHER STAKEHOLDERS

Claims of Lenders and Owners

The interests of a company's lenders, or debtholders, may conflict with the interests of its owners, or equity holders. Lenders have a higher priority of claims than owners to a company's net assets. Lenders have a legal claim to the interest and principal payments the company has promised, while owners have a residual claim to what remains after the company pays its lenders and all other claims (i.e., net assets).

While both lenders and owners can potentially lose their entire investment if a company fails, their upside potential differs. The best result that lenders can get is to receive their promised interest and principal. As long as a company can repay its obligations, its growth does not benefit lenders.

Owners have theoretically unlimited upside if a company succeeds and grows. As a result, owners may favor actions that increase a company's potential growth but also increase its risk. Lenders may oppose such actions because they increase the lenders' default risk but do not increase their upside.

Stakeholder Groups

Under **shareholder theory**, the primary focus of corporate governance is the interests of the firm's shareholders, which are taken to be the maximization of the market value of the firm's common equity. Under **stakeholder theory**, the focus is broader, considering conflicts among groups such as shareholders, employees, suppliers, and customers.

Stakeholders include (but are not limited to) the following groups:

- *Shareholders* have a residual interest in the corporation in that they have claim to the net assets of the corporation after all liabilities have been settled.
- *Lenders* include public debtholders (bondholders) and private debtholders, such as banks. Bondholders rely only on public information and have little influence over an issuer's operations. Private debtholders may have access to nonpublic information from company management. The interests of both types of lenders are protected by covenants in their debt agreements with the firm.
- The *board of directors* is responsible for protecting the interests of shareholders; hiring, firing, and setting the compensation of the firm's senior managers; establishing the strategic direction of the firm; and monitoring the company's financial performance. Board members include **inside directors** (e.g., senior executives, founders) and **independent directors** who have no material relationship with the company. In a **one-tier board structure**, both inside and independent directors serve on a single board. In a **two-tier board structure**, the independent directors serve on a **supervisory board** that oversees a **management board** of inside directors. Typically, board members are elected for a specified term, but in a **staggered board**, only a fraction of the board is elected each year.
- *Senior managers* typically receive compensation that includes a salary, a bonus, and perks. Bonuses are typically tied to some measure of firm performance, giving senior managers a strong interest in the financial success of the firm.
- *Employees* ("human capital") have interests in their rate of pay, opportunities for career advancement, training, and working conditions.
- *Suppliers* have an interest preserving an ongoing relationship with the firm, in the profitability of their trade with the firm, and in the growth and ongoing stability of the firm. As they are typically short-term creditors, they also have an interest in the firm's solvency.
- *Customers* rely on the company to provide a good or service of high quality at a reasonable price, and they may also have an interest in preserving an ongoing relationship to receive support and after-sale service.
- *Governments* rely on corporations for tax revenue, economic growth, social welfare, and employment creation. Regulators have an interest in ensuring compliance with various laws.

Some debt and equity investors are interested in evaluating companies' **environmental, social, and governance (ESG)** factors. Equity investors bear the

brunt of the risk from ESG factors. Debt investors have less exposure unless adverse events result in losses large enough to bring about default. Here are the factors:

- *Environmental factors* include company contributions to problems such as climate change, air and water pollution, deforestation, energy efficiency, waste management, or water scarcity.
- *Social factors* include the protection of customer privacy and information security, customer satisfaction, employee engagement, diversity and inclusion, labor relations, and community relations.
- *Governance factors* include the composition of the board and the internal audit committee, executive compensation, bribery and corruption, political contributions, and lobbying.

CORPORATE GOVERNANCE: CONFLICTS, MECHANISMS, RISKS, AND BENEFITS

The **principal-agent conflict** arises because an agent is hired to act in the interest of the principal, but an agent's interests may not coincide exactly with those of the principal. In the context of a corporation, shareholders are the principals (owners), and firm management and board members (directors) are their agents.

The costs of a principal-agent conflict are called **agency costs**. These can be direct (e.g., hiring employees to monitor the agent) or indirect (e.g., the opportunity cost of lost business).

There is **information asymmetry** between shareholders and managers because managers have more information about the functioning of the firm and its strategic direction than shareholders do. This decreases the ability of shareholders or non-executive directors to monitor and evaluate whether managers are acting in the best interests of shareholders.

Conflicts Between Groups of Shareholders

A single **controlling shareholder** or group of shareholders in a company may hold most of the votes and act against the interests of the minority shareholders. A controlling shareholder with concentrated ownership might want the company to diversify into different businesses to mitigate his own risk. Minority shareholders, by contrast, might already hold diversified portfolios and do not want the company to invest in a less desirable business just to diversify.

Some firms have a **dual-class structure** with different classes of common stock outstanding, some with more voting power than others. A group of shareholders may have effective control of the company, although they have a claim to less than 50% of its earnings and assets.

Conflicts of Interest Between Creditors and Shareholders

Shareholders may prefer more business risk than creditors do because creditors have a limited upside from good results compared to shareholders. Management actions that favor the interests of equity owners over the interests of creditors include issuing new debt that increases the default risk faced by existing debtholders, or increasing dividends at the cost of decreasing company assets as collateral and increasing the risk of default. This potential for conflict is a greater risk for long-term debtholders.

Mechanisms to Manage Stakeholder Relationships

Corporate governance refers to the internal controls and procedures for managing companies. Its objective is to manage and minimize conflicts of interest between stakeholders of the company. **Stakeholder management** is based on having a good understanding of stakeholder interests and maintaining effective communication with stakeholders.

Corporations typically hold an **annual general meeting** after the end of the firm's fiscal year. At the general meeting, company management provides shareholders with the audited financial statements for the year, addresses the company's performance and significant actions over the period, and answers shareholder questions. Typically, anyone owning shares is permitted to attend the meeting, ask questions, and vote their shares. A shareholder who does not attend the annual general meeting can vote her shares by **proxy**.

Ordinary resolutions, such as the approval of an auditor and the election of directors, require a simple majority of the votes cast. Other resolutions are addressed at **extraordinary general meetings**, which can be called anytime a matter requires a shareholder vote.

Activist shareholders pressure companies in which they hold a significant number of shares for changes they believe will increase shareholder value. A shareholder activist group may initiate a **proxy contest**, in which they seek the proxies of shareholders to vote in favor of their alternative proposals, or they may make a **tender offer** for enough shares of a company to gain control.

When a company issues a bond, it specifies the rights of bondholders and the company's obligations in a legal document called a **bond indenture**. An indenture typically includes **covenants** that may require the company to take certain actions or restrict it from taking certain actions. **Creditor committees** may form among bondholders to protect their interests when an issuer experiences financial distress.

The **board of directors** is elected by shareholders to act in their interests. Typical board committees include the following:

- *Audit committee*. This oversees the company's financial reporting and internal controls and recommends its external auditor.

- *Nominating committee* or *governance committee*. This oversees board elections, implements the company's code of ethics, and ensures compliance with laws and regulations.
- *Compensation committee* or *remuneration committee*. This recommends compensation to be paid to directors and senior managers and oversees employee benefit plans.

Labor laws, employment contracts, and the right to form unions are the primary mechanisms for employees to manage relationships with employers. Some countries have laws that require boards of large companies to include employee representatives.

Governments enact and enforce regulations that govern companies' actions. Regulators or stock exchanges may require companies to adopt corporate governance codes.

Risks of Poor Governance

When corporate governance is weak, the control functions of audits and board oversight may be weak as well. The risk is that some stakeholders can gain an advantage, to the disadvantage of other stakeholders. Accounting fraud, or simply poor recordkeeping, will have negative implications for company performance and value.

Without proper monitoring and oversight, management may have incentive compensation that causes it to pursue its own benefit rather than the company's benefit. If management is allowed to engage in related-party transactions that benefit friends or family, this will decrease company value.

Poor compliance procedures with respect to regulation and reporting can easily lead to legal and reputational risks. Violating stakeholder rights can lead to stakeholder lawsuits. A company's reputation can be damaged by a failure to comply with government regulations. Failure to manage creditors' rights can lead to debt default and bankruptcy.

Benefits of Effective Governance

Effective governance implies effective control and monitoring. A strong system of controls and compliance with laws and regulations can avoid many legal and regulatory risks.

Formal policies regarding conflicts of interest and related-party transactions can also lead to better operating results. Alignment of management interests with those of shareholders leads to better financial performance and greater company value.

WORKING CAPITAL AND LIQUIDITY

The **cash conversion cycle** measures the efficiency of a company's cash flow management. It represents the time it takes for a company to convert its investments in inventory and other resources into cash inflows from sales. The cash conversion cycle is adding **days of inventory on hand** (the number of days it takes for a company to sell its inventory) to **days sales outstanding** (the number of days it takes for the company

to collect payment from its customers) and subtracting **days payable outstanding** (the number of days it takes for the company to pay its suppliers).

A lower cash conversion cycle is generally better because it indicates that a company can generate cash quickly and efficiently. A company can decrease its cash conversion cycle by decreasing its inventories and receivables or by extending its payables, but each of these has potential disadvantages:

- Reducing inventories of raw materials may create production bottlenecks due to supply chain disruptions. Reducing inventories of finished foods may make a company unable to meet spikes in demand.

- Reducing or tightening credit to customers may result in lost sales.

- Extending payables is effectively using suppliers as a source of credit. Supplier financing, such as not taking advantage of discounts for prompt payment, is typically more expensive than sources such as bank borrowing.

For a corporate issuer, **primary liquidity sources** include cash and marketable securities on hand, bank borrowings, and cash generated from the business. **Secondary liquidity sources** include suspending dividends, delaying capital investments, selling assets, issuing additional equity, restructuring debt, or filing for bankruptcy. Using secondary liquidity sources sends negative signals to the market, and they are generally more costly than primary liquidity sources.

A **drag on liquidity** occurs when cash inflows lag. This can occur when excess inventory builds up, or when collections are slow or receivables become uncollectible. A **pull on liquidity** occurs when cash outflows accelerate, such as when suppliers reduce credit lines or demand faster payments.

Total working capital is current assets less current liabilities. Analysts often prefer to measure **net working capital**, using only operating current assets and operating current liabilities.

Working capital management seeks to maximize profits while ensuring that enough liquidity is available to maintain the firm's operations and meet its obligations:

- A conservative approach is to hold higher amounts of short-term assets (relative to long-term assets) and finance the working capital using longer-term sources, such as long-term debt and equity. Benefits include using more permanent capital with less need for rolling over; greater flexibility during market disruptions; and a high probability of meeting short-term obligations. Drawbacks are higher costs and lower profitability.

- An aggressive approach is to hold relatively lower levels of short-term assets and finance working capital using short-term debt. The benefit is lower costs, but the risks are failing to meet business obligations and vulnerability to market disruptions.

- A moderate approach is to fund permanent current assets with long-term sources of capital, while funding variable or seasonal current assets with short-term sources.

Firms should maintain various liquidity sources and evaluate the costs of each, while securing sources ahead of time to meet spikes in liquidity needs.

CAPITAL INVESTMENTS AND CAPITAL ALLOCATION

The four types of **capital investments** include going concern projects, regulatory/compliance projects, expansion projects, and other projects:

1. **Going concern projects** may be needed to maintain the business or reduce costs. Projects to maintain the business typically do not require detailed analysis, but projects to improve efficiency may require it.
2. **Regulatory/compliance projects** may be required and often involve safety-related or environmental concerns.
3. **Expansion projects** grow the business and involve complex analysis because they require a forecast of future demand.
4. Other projects, such as new investments outside a company's existing lines of business, also entail a complex decision-making process.

Net Present Value

Net present value (NPV) for a normal project is the present value of all the expected future cash flows minus the initial cost of the project, using the project's cost of capital. A project that has a positive NPV should be accepted because it is expected to increase the value of the firm (shareholder wealth).

The steps in calculating an NPV are as follows:

Step 1: Identify all outflows/inflows associated with the investment.

Step 2: Determine the discount rate appropriate for the investment.

Step 3: Find the PV of the future cash flows. Inflows are positive, and outflows are negative.

Step 4: Compute the sum of all the discounted future cash flows.

Step 5: Subtract the initial cost of the investment or capital project.

$$NPV = CF_0 + \frac{CF_1}{(1 + k)} + \frac{CF_2}{(1 + k)^2} + \cdots + \frac{CF_t}{(1 + k)^t}$$

where:

CF_t = after-tax cash flow at time t (can be positive or negative)

k = the discount rate = opportunity cost of capital = required rate of return for the project

CF_0 = initial investment outlay (a negative cash flow)

With uneven cash flows, use the CF function.

A key advantage of NPV is that it is a direct measure of the expected increase in the value of the firm. In theory, a positive NPV project should cause a proportionate increase in a company's stock price.

Internal Rate of Return

The **internal rate of return (IRR)** is the discount rate that makes the present value of the expected future cash flows equal to the initial cost of the project—that is, the discount rate that makes the NPV = 0. If the IRR is greater than the project's cost of capital, it should be accepted because it is expected to increase firm value. For this reason, the minimum IRR that a firm requires internally for a project to be accepted is often referred to as the **hurdle rate**.

When given a set of equal cash inflows, such as an annuity, calculate IRR by solving for I/Y.

A key advantage of IRR is that it measures profitability as a percentage, showing the return on each dollar invested. The disadvantages of the IRR method are as follows:

- It assumes a project's cash flows are reinvested at the IRR. NPV assumes more realistically that its cash flows are reinvested at the project's required rate of return.
- For multiple sign changes, a project may have multiple IRRs that are difficult to interpret.

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 or differing periods between cash flows. Spreadsheet software is most suitable for calculating NPV and IRR with unconventional cash flows.

Return on Invested Capital

A company's **return on invested capital (ROIC)**, or simply **return on capital**, is defined as its **net operating profit after tax (NOPAT)**, or simply after-tax operating profit over a period, divided by the average book value of its total capital over the period.

$$ROIC = \frac{NOPAT}{average\ book\ value\ of\ total\ capital}$$

Because ROIC measures the after-tax return on the amounts invested by both equity investors and debtholders, we can compare it to the company's weighted average cost of capital (WACC). If a firm's ROIC is greater than its WACC, then the company's management is increasing the value of the firm.

Disadvantages of ROIC include the following:

1. Because accounting treatments differ, ROIC may not be comparable across companies.
2. ROIC is backward-looking and can be volatile from year to year.

3. Because ROIC is for the whole company, it may let profitable projects and good decisions mask unprofitable projects and poor decisions.

Capital Allocation

The **capital allocation process** involves identifying and evaluating projects for which the cash flows to the firm extend over a period longer than one year. The process has four steps:

Step 1: Generate ideas.

Step 2: Analyze project proposals.

Step 3: Create the firm's capital budget.

Step 4: Monitor decisions and conduct a post-audit.

Key principles of capital allocation are as follows:

- *Decisions are based on after-tax cash flows*, not accounting income.
- *Decisions are based on incremental cash flows.* **Sunk costs** (costs that cannot be avoided, even if the project is not undertaken) are not considered. **Externalities** (effects that the acceptance of a project may have on other firm cash flows, including **cannibalization** of sales of the firm's current products) should be included in the analysis.
- *Timing of cash flows is important.* Cash flows received earlier are worth more than cash flows to be received later.

Common mistakes managers make when evaluating capital projects involve cognitive errors and behavioral biases. Cognitive errors include poor forecasting, not considering the cost of internal funds, and incorrectly accounting for inflation. Behavioral biases include pet projects, inertia in setting the capital budget, basing investment decisions on earnings per share or return on equity, and failing to generate alternative investment ideas.

Real Options

Real options are future actions that a firm can take, given that the firm invests in a project today. Real options are similar to financial options in that they give the option holder the right, but not the obligation, to take a future action—and, therefore, cannot have negative values. The value of real options should be included in the calculation of the project's NPV.

Types of real options include the following:

- **Timing options** allow a company to delay making an investment because they expect to have better information in the future.
- **Abandonment options** allow a company to abandon a project.
- **Expansion options** allow a company to make additional investments in future projects.

- **Flexibility options** give managers choices regarding the operational aspects of a project. The two main forms are **price-setting options** and **production flexibility options**.
- **Fundamental options** are projects that are options themselves because the payoffs depend on the price of an underlying asset, such as operating a mine only when prices are high for the ore.

CAPITAL STRUCTURE

An issuer's **weighted average cost of capital (WACC)** is a blended rate that includes its cost of debt and equity:

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

Here, the ws are the proportions of debt and equity capital, the ks are the current costs of debt and equity capital, and t is the firm's marginal tax rate.

The cost of debt is lower than the cost of equity because debt has priority of claims over equity. Because most jurisdictions allow tax deductions for corporate interest expense, we adjust the pretax cost of debt to its after-tax value.

The weights for debt and equity can be target weights or market value weights. Analysts often estimate a company's target weights based on book value of debt and equity. Market value weights are appropriate for estimating the current opportunity cost of capital as they reflect current market conditions.

Capital structures vary considerably among companies. We may view factors that affect capital structures as those that determine a company's capacity to service debt. In general, the more stable, predictable, and recurring are a company's revenues and cash flows, the higher proportion of debt it can have in its capital structure. Thus, other things equal, the following apply:

- Companies in noncyclical industries are better able to support high proportions of debt than companies in cyclical industries.
- Companies with low operating leverage (low fixed operating costs as a proportion of total costs) are better able to support high proportions of debt than companies with high operating leverage.
- Companies with subscription-based revenue models are better able to support high proportions of debt than companies with pay-per-use revenue models.

Debt proportions may vary at different stages of a company's life cycle:

- Start-up companies are financed almost exclusively with equity. In some cases, high-growth companies with rapidly rising stock prices may find it possible to issue convertible debt.
- Growth stage companies with increasing revenue and cash flow and decreasing business risk may find that investors are willing to lend to the company, often with the loans secured by fixed assets or accounts receivable.

- Mature stage companies with lower business risk and high and stable cash flow often find debt financing, including unsecured debt, widely available at a relatively low cost.

Macro factors affect the cost of capital. For example, in business cycle downturns, debt investors demand greater yield spreads to benchmark bonds from corporate borrowers to compensate them for the increased risk of default. This is especially true for companies in cyclical industries.

Modigliani-Miller Propositions

In their seminal work on capital structure theory, Franco Modigliani and Merton Miller (we will refer to them as MM) demonstrate that, under certain assumptions, the value of a firm is unaffected by its capital structure. We refer to this as **MM Proposition I with no taxes (MM I)**. The assumptions are as follows:

- Perfectly competitive capital markets with no taxes, transactions costs, or bankruptcy costs
- Homogeneous expectations with respect to cash flows generated by the firm
- Riskless borrowing and lending at the risk-free rate
- No agency costs or conflicts of interest between managers and shareholders
- Financing decisions do not affect investment decisions or operating income

MM Proposition II (MM II) is framed in terms of a firm's cost of capital, rather than firm value. Based on the same assumptions as MM I, MM II states that the cost of equity increases linearly as a company increases its proportion of debt financing, so the savings from increasing the amount of (lower-cost) debt financing just offset the increased cost of equity capital. Based on this relationship, MM II concludes that a firm's WACC is unchanged by changes in the proportion of debt financing in its capital structure.

Next, we examine the MM propositions when we relax the assumption of no taxes. Under the tax codes of most countries, interest payments are tax deductible, while dividends paid to equity holders are not. This differential tax treatment encourages firms to use debt financing because debt provides a **tax shield** that adds value to the company (the value of taxes avoided). If a firm were 100% financed with debt, the taxes avoided would be at a maximum so that the after-tax cash flows of the firm would be at a maximum as well. Thus, **MM Proposition I with taxes** concludes that the value of the firm is maximized with 100% debt financing.

In practice, companies do not finance their assets with anything close to 100% debt. Current theory suggests that differences in financial leverage result from costs of using debt financing that we have not yet considered, such as the **costs of financial distress**. These include direct costs, such as legal and administrative fees associated with bankruptcy, and indirect costs, such as foregone investment opportunities and the costs that result from losing the trust of customers and other stakeholders. Additionally, financial distress imposes **agency costs of debt** by creating conflicts of interest between managers (who represent equity owners) and debtholders. In general, higher

amounts of financial leverage increase the probability of financial distress. Higher expected costs of financial distress tend to discourage companies from using large proportions of debt in their capital structures.

Static tradeoff theory seeks to balance the costs of financial distress with the tax shield benefits from using debt. It suggests the **optimal capital structure** for a firm—where its WACC is minimized and its value is maximized—is the amount of debt financing at which the increase in the value of the tax shield from additional borrowing is exceeded by the value reduction of higher expected costs of financial distress. Each firm's optimal capital structure depends on its business risk, tax rate, corporate governance, industry influences, and other factors.

Target Capital Structure

To maximize its value, a firm seeks to achieve a target capital structure—on average over time—that reflects management's beliefs about its optimal capital structure. In practice, a firm's actual capital structure tends to fluctuate around the target capital structure because market values of a firm's equity and debt fluctuate, and management may choose to exploit opportunities in a specific financing source.

For analysis, the weights to use when estimating a firm's WACC should be based on its target capital structure, but most firms do not provide one. Alternatives for estimating target capital structure include using a firm's current capital structure based on market values (possibly incorporating any noticeable trends) and using the average capital structure weights for a firm's industry.

Factors Affecting Target Capital Structure

The costs of using less than the optimal amount of debt are relatively small, while the costs of using too much debt may be quite large. A company will base its capital structure decision on its investments and its ability to support debt, given its business risk, the nature of its assets, and its expected operating cash flows.

Market conditions can also influence a firm's financing decisions. Firms may issue equity when they perceive the market price of their stock to be temporarily high, or they may repurchase their stock when management judges it to be too low in the market. When market interest rates fall, or are thought to be temporarily low, firms will likely show a preference for issuing debt. Investors may infer from these financing decisions whether management believes the firm's shares are overvalued or undervalued, or management's expectations for future cash flows. For example, taking on the commitment to make fixed interest payments through debt financing sends a signal that management is confident in the firm's ability to make these payments in the future. By contrast, issuing equity is typically viewed as a negative signal that managers believe a firm's stock is overvalued.

Agency costs of equity are related to conflicts of interest between managers and owners. They include **monitoring costs** associated with supervising management, **bonding costs** of assuring shareholders that managers are working in the shareholders' best interests, and residual losses that may occur even with adequate

monitoring and bonding provisions. According to **agency theory**, greater financial leverage tends to reduce agency costs because the use of debt gives managers less free cash flow to use imprudently.

Pecking order theory suggests that managers prefer to make financing choices that are least likely to send negative signals to investors. Financing choices follow a hierarchy based on visibility to investors. Internally generated capital is most preferred, debt is the next-best choice, and external equity is the least preferred financing option.

BUSINESS MODELS

Understanding business models is crucial for financial analysts. To have an informed opinion about whether a company's managers are doing their jobs well, we must first understand what they are *trying* to do.

A **business model** explains how a firm provides or proposes to provide a product or service, find customers, deliver the product or service, and make a profit. It differs from a **financial plan**, which has detailed projections for revenue and expenses. A business model should identify a firm's potential customers, describe its products or services and explain how it will sell them, describe its key assets and suppliers, and explain its pricing strategy.

Potential customers can be defined in innumerable ways. A business model should identify how the company will acquire customers, the cost of acquiring them, and how the company will monitor and maintain customer satisfaction.

Describing a product or service includes how a company meets a need for its potential customers and what differentiates it from its competitors' products or services. A firm's **value proposition** refers to how customers will value the characteristics of the product or service, given its competing products and their prices. The firm's **value chain** refers to how it executes its value proposition.

How the firm will sell its product or service includes whether it will sell directly to buyers or use intermediaries, as well as how it will deliver its product or service. The answers to these questions comprise a firm's **channel strategy**. A company is a **B2B (business to business)** firm if it sells to other businesses, or a **B2C (business to consumer)** firm if it sells to consumers.

Pricing Strategies

Value-based pricing refers to setting prices based on the value perceived by the buyer.

Price discrimination refers to setting different prices for different customers. This can be driven by different demand from identifiable groups (e.g., discounts for senior citizens) or by different costs of providing goods or services. Other examples are **tiered pricing** based on the volume of purchases, **dynamic pricing** such as peak (surge or congestion) pricing, and **auction pricing**.

Pricing models for multiple products include **bundling** (when multiple products are complementary), **razors-and-blades** (selling a piece of equipment for a low price and profiting by selling a consumable used with the equipment), or **optional products** (add-ons priced with high margins).

Other pricing models include **penetration pricing** (selling at low margins for a time to grow market share), **freemium pricing** (offering basic functionality at no cost, but unlocking more functionality for a fee), or **hidden revenue** (such as offering online content for free but generating revenue through advertising or selling user data).

Pricing models that are alternatives to outright purchase include subscriptions, fractional ownership (e.g., time-share arrangements), licensing, and franchising.

FINANCIAL STATEMENT ANALYSIS

Weight on Exam	11% to 14%
SchweserNotes™ Reference	Book 3, pages 1–248

INTRODUCTION TO FINANCIAL STATEMENT ANALYSIS

Financial reporting refers to the way companies show their financial performance to investors, creditors, and other interested parties by preparing and presenting financial statements. The role of financial statement analysis is to use the information in a company's financial statements, along with other relevant information, to make economic decisions.

The **financial statement analysis framework**[1] consists of six steps:

Step 1: State the objective and context.

Step 2: Gather data.

Step 3: Process the data.

Step 4: Analyze and interpret the data.

Step 5: Report the conclusions or recommendations.

Step 6: Update the analysis.

Standard-setting bodies are professional organizations of accountants and auditors that establish financial reporting standards. **Regulatory authorities** are government agencies that have the legal authority to enforce compliance with financial reporting standards.

The two primary standard-setting bodies are the Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB). In the United States, the FASB sets forth the U.S. Generally Accepted Accounting Principles (U.S. GAAP). Outside the United States, the IASB establishes the International Financial Reporting Standards (IFRS).

Regulatory authorities, such as the Securities and Exchange Commission (SEC) in the United States and the Financial Conduct Authority (FCA) in the United Kingdom, are established by national governments.

Most national authorities belong to the International Organization of Securities Commissions (IOSCO). IOSCO is not a regulatory body, but its members work together to improve cross-border cooperation and make national regulations and enforcement more uniform around the world.

SEC-required filings include Form 8-K, which a company must file to report events, such as acquisitions and disposals of major assets or changes in its management or corporate governance. Companies' annual and quarterly financial statements are also filed with the SEC (Form 10-K and Form 10-Q, respectively).

Financial statement notes (footnotes) include disclosures that provide further details about the information summarized in the financial statements. Footnotes allow users to improve their assessments of the amount, timing, and uncertainty of the estimates reported in the financial statements. Footnotes do the following:

- They provide information about accounting methods, assumptions, and estimates used by management.
- They are audited, whereas other disclosures, such as supplementary schedules, are not audited.
- They provide additional information on such items as business acquisitions or disposals, legal actions, employee benefit plans, contingencies and commitments, significant customers, related-party transactions, position and performance of segments of the firm, and significant post-balance-sheet events.

A **business segment** or **operating segment** is a portion of a larger company that accounts for more than 10% of the company's revenues, assets, or income. Both U.S. GAAP and IFRS require companies to report segment data, but the required disclosure items are only a subset of the required disclosures for the company as a whole. **Geographic segments** are also identified when they both meet the size criterion and have a business environment that is different from that of other segments or the remainder of the company's business.

Management commentary, or **management discussion and analysis (MD&A)**, provides an assessment of the financial performance and condition of a company from the perspective of its management. For publicly held companies in the United States, the MD&A is required to discuss the following:

- Trends, significant events, and uncertainties that affect the firm
- Effects of inflation and changing prices, if material
- Impact of off-balance-sheet and contractual obligations
- Accounting policies that require significant judgment by management
- Forward-looking expenditures and divestitures

Audit Reports

An **audit** is an independent review of an entity's financial statements. Public accountants conduct audits and examine the financial reports and supporting records.

The objective of an audit is to enable the auditor to provide an opinion on the fairness and reliability of the financial reports.

The independent certified public accounting firm employed by the board of directors is responsible for seeing that the financial statements conform to generally accepted accounting principles (GAAP). The auditor examines the company's accounting and internal control systems, confirms assets and liabilities, and generally tries to be confident that there are no material errors in the financial statements and that they conform to applicable reporting standards. The auditor's report is an important source of information.

The **standard auditor's opinion** contains three parts, stating the following:

1. Whereas the financial statements are prepared by management and are its responsibility, the auditor has performed an independent review.
2. Generally accepted auditing standards were followed, thus providing *reasonable assurance* that the financial statements contain no material errors.
3. The auditor is satisfied that the statements were prepared in accordance with accepted accounting principles and that the accounting principles chosen and estimates made are reasonable. The auditor's report must also contain additional explanation when accounting methods have not been used consistently between periods.

An *unqualified opinion* (also known as an unmodified opinion or clean opinion) indicates that the auditor believes the statements are free from material omissions and errors. If the statements make any exceptions to the accounting principles, the auditor may issue a *qualified opinion* and explain these exceptions in the audit report. The auditor can issue an *adverse opinion* if the statements are not presented fairly or are materially nonconforming with accounting standards, or a *disclaimer of opinion* if the auditor is unable to express an opinion. Any opinion other than unqualified is sometimes referred to as a *modified opinion.*

The auditor's opinion will also contain an explanatory paragraph when a material loss is probable but the amount cannot be reasonably estimated. These uncertainties may relate to the *going concern assumption* (the firm will continue to operate for the foreseeable future), to the valuation or realization of assets, or to litigation. This type of disclosure may be a signal of serious problems and call for closer examination by the analyst. An audit report must also include a section called *key audit matters* (international reports) or *critical audit matters* (United States), which highlights accounting choices that are of greatest significance to users of financial statements.

Under U.S. GAAP, the auditor must state an opinion on a publicly traded company's **internal controls**, the processes by which the company ensures that it presents accurate financial statements. Internal controls are the responsibility of the firm's management. Under the Sarbanes-Oxley Act, management is required to provide a report on the company's internal control system.

Other Information Sources

Proxy statements are issued to shareholders when there are matters that require a shareholder vote. These statements, which are also filed with the SEC and available from EDGAR, are a good source of information about the election of (and qualifications of) board members, compensation, management qualifications, and the issuance of stock options.

Corporate reports and press releases are written by management and are often viewed as public relations or sales materials. Not all of the material is independently reviewed by outside auditors. Such information can often be found on the company's website. Management may also provide **earnings guidance** to analysts before releasing the firm's financial statements.

An analyst should review information on economic conditions and the company's industry and compare the company to its competitors. This information can be acquired from sources such as trade journals, statistical reporting services, and government agencies.

Differences Between IFRS and U.S. GAAP

While the IASB and FASB work together to harmonize changes to accounting standards, some significant differences between IFRS and U.S. GAAP still exist. The following table lists some of the most significant differences.

Figure 1: Significant Differences Between IFRS and U.S. GAAP

Basis for Comparison	U.S. GAAP	IFRS
Developed by	FASB	IASB
Based on	Rules	Principles
Inventory valuation	FIFO, LIFO, and weighted average	LIFO prohibited
Product development costs	Expensed	May be capitalized
Interest paid	CFO	CFO or CFF
Reversal of inventory write-downs	Prohibited	Allowed

As financial reporting standards continue to evolve, analysts need to monitor how these developments will affect the financial statements they use. An analyst should be aware of new products and innovations in the financial markets that generate new types of transactions. These might not fall neatly into the existing financial reporting standards.

To keep up to date on the evolving standards, an analyst can monitor professional journals and other sources, such as the IASB and FASB websites. CFA Institute produces position papers on financial reporting issues through the CFA Centre for Financial Market Integrity.

ANALYZING INCOME STATEMENTS

Revenue Recognition

In a sale where the goods are exchanged for cash and returns are not allowed, the recognition of revenue is straightforward: it is recognized at the time of the exchange. The recognition of revenue is not, however, dependent on receiving cash payment. If a sale of goods is made on credit, revenue can be recognized at the time of sale—and an asset, **accounts receivable**, is created on the balance sheet.

If payment for the goods is received before the transfer of the good, a liability, **unearned revenue**, is created when the cash is received (offsetting the increase in the asset *cash*). Revenue is recognized as the goods are transferred to the buyer. As an example, consider a magazine subscription. When the subscription is purchased, an unearned revenue liability is created—and as magazine issues are delivered, revenue is recorded and the liability is decreased.

Converged standards under IFRS and U.S. GAAP take a principles-based approach to revenue recognition issues. The central principle is that a firm should recognize revenue when it has transferred a good or service to a customer.

The converged standards identify a five-step process[2] for recognizing revenue:

Step 1: Identify the contract(s) with a customer.

Step 2: Identify the separate or distinct performance obligations in the contract.

Step 3: Determine the transaction price.

Step 4: Allocate the transaction price to the performance obligations in the contract.

Step 5: Recognize revenue when (or as) the entity satisfies a performance obligation.

A **performance obligation** is a promise to deliver a distinct good or service. A **transaction price** is the amount a firm expects to receive from a customer in exchange for transferring a good or service.

For long-term contracts, revenue is recognized based on a firm's progress toward completing a performance obligation. Progress toward completion can be measured from the input side (e.g., using the percentage of completion costs incurred), or from the output side (e.g., using the percentage of total output delivered to date).

Expense Recognition

Under the accrual method of accounting, expense recognition is based on the **matching principle**, whereby expenses for producing goods and services are recognized in the period in which the revenue for the goods and services is recognized. Expenses that are not tied directly to generating revenue, such as administrative costs, are called **period costs** and are expensed in the period incurred.

The cost of long-lived assets must also be matched with revenues. As a general rule, an expenditure that is expected to provide a future economic benefit over multiple accounting periods is **capitalized**; however, if the future economic benefit is unlikely or

highly uncertain, the expenditure is **expensed** in the period incurred. The allocation of cost over an asset's useful life is known as **depreciation** for tangible assets, **amortization** for intangible assets, or **depletion** for natural resources.

When a firm constructs an asset for its own use (or, in limited circumstances, for resale), the interest that accrues during the construction period is capitalized as a part of the asset's cost. Capitalized interest is not reported in the income statement as interest expense. Once construction interest is capitalized, the interest cost is allocated to the income statement through depreciation expense (if the asset is held for use) or cost of goods sold (if the asset is held for sale). Capitalizing interest results in it being reported in the cash flow statement as an outflow from investing activities. This contrasts with the usual treatment of interest paid, which is reported as an outflow from operating activities under U.S. GAAP and can be an operating or financing outflow under IFRS.

Under IFRS, **research costs**, which are costs aimed at the discovery of new scientific or technical knowledge and understanding, are expensed as incurred. However, **development costs** may be capitalized. Under U.S. GAAP, both research and development costs are generally expensed as incurred. However, the costs of creating software for sale to others are treated in a manner similar to the treatment of research and development costs under IFRS.

If a firm sells goods or services on credit or provides a warranty to the customer, the matching principle requires the firm to estimate bad-debt expense and/or warranty expense.

Because estimates are involved in expense recognition, it is possible for firms to delay or accelerate the recognition of expense. Delayed expense recognition increases net income—and is, therefore, more aggressive.

Nonrecurring Items

A **discontinued operation** is one that management has decided to dispose of, but either has not yet done so, or has disposed of in the current period after the operation had generated income or losses. It must be physically and operationally distinct from the rest of the firm. Income and losses from discontinued operations are reported separately in the income statement, net of tax, after income from continuing operations. Discontinued operations do not affect net income from continuing operations, so analysts should exclude discontinued operations when forecasting future earnings.

Unusual or infrequent items are recorded for events that are either unusual in nature or infrequent in occurrence. Unusual or infrequent items are included in income from continuing operations. Examples include the following:

- Gains or losses from the sale of assets or part of a business (that do not qualify as discontinued operations)
- Impairments, write-offs, write-downs, and restructuring costs

An analyst must review these to determine their effect, if any, on future income.

Accounting Changes

Accounting changes include changes in accounting policies, changes in accounting estimates, and prior-period adjustments. Such changes may require either **retrospective application** or **prospective application**. With retrospective application, any prior-period financial statements presented in a firm's current financial statements must be restated, applying the new policy to those statements as well as future statements. Retrospective application enhances the comparability of the financial statements over time. With prospective application, prior statements are not restated, and the new policies are applied only to future financial statements.

Standard-setting bodies, at times, issue a **change in accounting policy**. Sometimes, a firm may change which accounting policy it applies, such as changing its inventory costing method or capitalizing rather than expensing specific purchases. Unless it is impractical, changes in accounting policies require retrospective application.

In the recent change to revenue recognition standards, firms were given the option of **modified retrospective application**. This application does not require restatement of prior-period statements; however, beginning values of affected accounts are adjusted for the cumulative effects of the change.

Generally, a **change in accounting estimate** is the result of a change in management's judgment, usually due to new information. For example, management may change the estimated useful life of an asset because new information indicates the asset has a longer life than originally expected. Changes in accounting estimates are applied prospectively and do not require the restatement of prior financial statements. Accounting estimate changes typically do not affect cash flow. An analyst should review changes in accounting estimates to determine their impact on future operating results.

Sometimes, a change from an incorrect accounting method to one that is acceptable under GAAP or IFRS is required. A correction of an accounting error is reported as a **prior-period adjustment** and requires retrospective application. Prior-period results are restated. Disclosure of the nature of any significant prior-period adjustment and of its effect on net income is also required. Prior-period adjustments usually involve errors or new accounting standards and typically do not affect cash flow. Analysts should review adjustments carefully because errors may indicate weaknesses in the firm's internal control system.

Earnings Per Share

The following basic definitions are essential:

- **Potentially dilutive securities**. These include stock options, warrants, convertible debt, and convertible preferred stock.
- **Dilutive securities**. These are securities that *would decrease EPS* if exercised or converted to common stock.
- **Antidilutive securities**. These are securities that *would increase EPS* if exercised or converted to common stock.

- **Simple capital structure**. This is a capital structure that contains no potentially dilutive securities.
- **Complex capital structure**. Complex structures contain potentially dilutive securities.
- **Weighted average shares outstanding**. Each share issue is weighted by the portion of the year it was outstanding. Stock splits and stock dividends are applied retroactively to the beginning of the year, so "old" shares are converted to "new" shares for consistency.

The **basic EPS** calculation *does not* consider the effects of any dilutive securities in the computation of EPS. It is the only EPS presented for firms with simple capital structures and is one of the two EPS calculations presented for firms with complex capital structures.

$$\text{basic EPS} = \frac{\text{net income} - \text{preferred dividends}}{\text{weighted average number of common shares outstanding}}$$

If a firm has a complex capital structure (contains potentially dilutive securities), both basic and **diluted EPS** must be reported. To calculate diluted EPS, treat any dilutive securities as if they were converted to common stock from the start of the accounting period (or when issued, if issued during the current year).

Each potentially dilutive security must be considered separately to determine whether or not it is actually dilutive for the current reporting period.

To determine whether a convertible security is dilutive, calculate the following:

$$\frac{\text{convertible pfd. dividends}}{\text{\# shares from conversion of conv. pfd. shares}}$$

or

$$\frac{\text{convertible debt interest} (1 - \text{tax rate})}{\text{\# shares from conversion of conv. debt}}$$

If the calculated amount is less than basic EPS, the security is dilutive.

When considering dilutive securities, the denominator is the basic EPS denominator adjusted for the equivalent number of common shares created by the conversion of all outstanding dilutive securities (convertible bonds, convertible preferred shares, plus options and warrants).

$$\text{diluted EPS} = \frac{\text{adjusted income available for common shares}}{\text{weighted-average common and potential common shares outstanding}}$$

where adjusted income available for common shares is:

earnings available for common shares
+ dividends on dilutive convertible preferred stock
+ after-tax interest on dilutive convertible debt

Therefore, diluted EPS is:

$$\text{diluted EPS} =$$

$$\frac{\left[\text{net income} - \frac{\text{preferred}}{\text{dividends}}\right] + \left(\begin{array}{c}\text{convertible}\\\text{preferred}\\\text{dividends}\end{array}\right) + \left(\begin{array}{c}\text{convertible}\\\text{debt}\\\text{interest}\end{array}\right)(1-t)}{\left(\begin{array}{c}\text{weighted}\\\text{average}\\\text{shares}\end{array}\right) + \left(\begin{array}{c}\text{shares from}\\\text{conversion of}\\\text{conv. pfd. shares}\end{array}\right) + \left(\begin{array}{c}\text{shares from}\\\text{conversion of}\\\text{conv. debt}\end{array}\right) + \left(\begin{array}{c}\text{shares}\\\text{issuable from}\\\text{stock options}\end{array}\right)}$$

With respect to convertible bonds, remember that what you are looking for is a reduction in EPS. The denominator is rising due to the increased number of shares, and the numerator is rising due to the after-tax interest cost savings. When the denominator is rising faster than the numerator, conversion is dilutive.

The **treasury stock method** assumes that the funds received by the company from the exercise of options or warrants would be used hypothetically to purchase shares of the company's common stock in the market, at the average market price over the reporting period.

Options and warrants are dilutive whenever the exercise price is less than the average stock price over the reporting period.

$$\text{new shares (treasury stock method)} = \frac{\text{average market price} - \text{exercise price}}{\text{average market price}} \times \text{\# of shares covered by options/warrants}$$

Financial Ratios Based on the Income Statement

A vertical **common-size income statement** expresses each category of the income statement as a percentage of revenue. This format is useful for time-series and cross-sectional analysis and facilitates the comparison of firms of different sizes.

It is usually more meaningful to present income tax expense as an effective rate, equal to income tax expense divided by pretax income, than as a percentage of revenue.

Margin ratios examine how well management has done at generating profits from sales. The different ratios are designed to isolate specific costs. Generally, higher margin ratios are desirable.

Gross profit margin is the ratio of gross profit (revenue minus cost of goods sold) to revenue:

$$\text{gross profit margin} = \frac{\text{gross profit}}{\text{revenue}}$$

Gross profit margin can be increased by raising sales prices or reducing production costs.

Net profit margin is the ratio of net income to revenue:

$$\text{net profit margin} = \frac{\text{net income}}{\text{revenue}}$$

Any subtotal presented in the income statement can be expressed in terms of a margin ratio (to revenues). For example, **operating profit margin** is equal to operating profit divided by revenue, and **pretax margin** is equal to pretax accounting profit divided by revenue.

ANALYZING BALANCE SHEETS

Intangible Assets

Intangible assets are nonmonetary assets that lack physical substance. The cost of a finite-lived intangible asset is amortized over its useful life. Examples of **identifiable intangible assets** include patents, trademarks, and copyrights. An **unidentifiable intangible asset** cannot be purchased separately and may have an indefinite life.

Intangible assets that are purchased are reported on the balance sheet at historical cost less accumulated amortization. Except for certain legal costs, intangible assets that are created internally, including research and development costs, are expensed as incurred under U.S. GAAP and are not shown on the balance sheet.

Under IFRS, a firm must identify the research stage and the development stage. Accordingly, the firm must expense costs during the research stage but *may* capitalize costs incurred during the development stage.

All of the following should be expensed as incurred, and do not create balance sheet assets:

- Start-up and training costs
- Administrative overhead
- Advertising and promotion costs
- Relocation and reorganization costs
- Termination costs

Some analysts completely eliminate intangible assets for analytical purposes. However, analysts should consider the value to the firm of each intangible asset before making an adjustment.

Goodwill is an unidentifiable intangible asset created when a business is purchased for more than the fair value of its assets, net of liabilities. Goodwill is not amortized, but it must be tested for impairment (a decrease in its fair value) at least annually. Because goodwill is not amortized, firms can manipulate net income upward by allocating more of the acquisition price to goodwill and less to the identifiable assets. The result is less depreciation and amortization expense—and thus, higher net income.

Accounting goodwill should not be confused with **economic goodwill**. Economic goodwill derives from the expected future performance of the firm, while accounting goodwill is the result of past acquisitions.

When computing ratios, analysts should eliminate goodwill from the balance sheet and goodwill impairment charges from the income statement for comparability. Also,

analysts should evaluate future acquisitions in terms of the price paid relative to the earning power of the acquired assets.

Accounting Treatments for Financial Instruments

IFRS has three categories for securities held as assets. These categories reflect how they are valued and how unrealized gains and losses are reported in the financial statements. The IFRS categories are as follows:

- Securities measured at amortized cost
- Securities measured at fair value through other comprehensive income (OCI)
- Securities measured at fair value through profit and loss

U.S. GAAP has three categories that mostly correspond to the IFRS treatments:

- Held-to-maturity securities
- Available-for-sale securities
- Trading securities

Debt securities that a firm intends to hold until maturity, notes receivable, and unlisted securities for which fair value cannot be reliably determined are all measured at (amortized) historical cost.

Debt securities for which a firm intends to collect interest payments but may sell before maturity are measured at fair value through OCI under IFRS and classified as available for sale under U.S. GAAP.

Equity securities, derivatives, and other financial assets that do not fit either of the other two classifications are measured at fair value through profit and loss under IFRS and are classified as trading securities under U.S. GAAP.

Under IFRS, firms may make an irrevocable choice at the time of purchase to account for equity securities as measured at fair value through OCI. Also, IFRS firms can make an irrevocable choice to carry any financial asset at fair value through profit and loss. These choices are not available under U.S. GAAP.

Noncurrent Liabilities

Long-term financial liabilities include bank loans, notes payable, bonds payable, and some derivatives. If the financial liabilities are not issued at face value, they are usually reported on the balance sheet at amortized cost. Any premium or discount is amortized through interest expense over the life of the liability. Amortizing premiums and discounts cause the balance sheet liability to move toward face value at maturity of the liability.

Financial liabilities reported at fair value include held-for-trading liabilities such as a short position in a stock (which may be classified as a short-term liability), derivative liabilities, and nonderivative liabilities with exposures hedged by derivatives.

Common-Size Balance Sheets

A vertical **common-size balance sheet** expresses each item of the balance sheet as a percentage of total assets and allows the analyst to evaluate the balance sheet changes over time (time-series analysis) as well as to compare the balance sheets with other firms, industry, and sector data (cross-sectional analysis).

Liquidity ratios measure the firm's ability to satisfy short-term obligations when due.

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

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

- The **quick ratio** (acid test ratio) is a more conservative measure of liquidity because it excludes inventories and less liquid current assets from the numerator.

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

- The **cash ratio** is the most conservative measure of liquidity.

$$\text{cash ratio} = \frac{\text{cash + marketable securities}}{\text{current liabilities}}$$

The higher its liquidity ratios, the more likely the firm will be able to pay its short-term bills when due. The ratios differ only in the assumed liquidity of the current assets.

Solvency ratios measure a firm's ability to satisfy long-term obligations (its solvency). The higher the ratio, the greater the financial leverage and the greater the financial risk.

- The **long-term debt-to-equity ratio** measures long-term financing sources relative to the equity base.

$$\text{long-term debt-to-equity} = \frac{\text{total long-term debt}}{\text{total equity}}$$

- The **debt-to-equity ratio** measures total debt relative to the equity base.

$$\text{debt-to-equity} = \frac{\text{total debt}}{\text{total equity}}$$

- The **total debt ratio** measures the extent to which assets are financed by creditors.

$$\text{total debt ratio} = \frac{\text{total debt}}{\text{total assets}}$$

- The **financial leverage ratio** is a variation of the debt-to-equity ratio that is used as a component of the DuPont model.

$$\text{financial leverage ratio} = \frac{\text{total assets}}{\text{total equity}}$$

ANALYZING STATEMENTS OF CASH FLOWS I

The **cash flow statement** provides information beyond that available from the income statement. The cash flow statement provides information about a firm's liquidity, solvency, and financial flexibility. The cash flow statement reconciles the beginning and ending balances of cash in the balance sheet over an accounting period. The change in cash is a result of the firm's operating, investing, and financing activities as follows:

```
    operating activities
+   investing activities
+   financing activities
=   change in cash balance
+   beginning cash balance
=   ending cash balance
```

Operating Cash Flows: Direct and Indirect Methods

Two different methods of presenting **cash flow from operating activities (CFO)** are permitted under U.S. GAAP and IFRS: the direct method and the indirect method. The use of the direct method is encouraged by both standard setters. The difference in the two methods relates to the presentation of cash flow from operating activities. Total cash flow from operating activities is exactly the same under both methods, and the presentation of cash flow from investing activities and from financing activities is exactly the same under both methods.

The direct method provides more information than the indirect method. The main advantage of the indirect method is that it focuses on the differences between net income and operating cash flow.

The direct method presents operating cash flow by taking each item from the income statement and converting it to its cash equivalent by adding or subtracting the changes in the corresponding balance sheet accounts. The following are examples of operating cash flow components:

- Cash collected from sales is the main component of CFO. Cash collections are calculated by adjusting sales for the changes in accounts receivable and unearned (deferred) revenue.
- Cash used in the production of goods and services (cash inputs) is calculated by adjusting cost of goods sold (COGS) for the changes in inventory and accounts payable.

Using the indirect method, operating cash flow is calculated in four steps:

Step 1: Begin with net income.

Step 2: Add back all noncash charges to income (such as depreciation and amortization) and subtract all noncash components of revenue. Subtract gains or add losses that resulted from financing or investing cash flows (such as gains from the sale of land).

Step 3: Adjust for working capital by adding or subtracting changes to balance sheet operating accounts as follows:

- Subtract increases in operating asset accounts (uses of cash), and add decreases (sources of cash).
- Add increases in operating liability accounts (sources of cash), and subtract decreases (uses of cash).

Most firms present the cash flow statement using the indirect method. For analytical purposes, it may be beneficial to *convert the cash flow statement to the direct method*. The three-step process is as follows:

Step 1: Aggregate all revenues and gains and all expenses and losses.

Step 2: Remove all noncash charges and disaggregate the remaining items.

Step 3: Convert from accruals to cash flows by adjusting for the change in working capital.

Investing and Financing Cash Flows

Cash flow from investing activities (CFI) is calculated by subtracting expenditures on new assets from the proceeds of asset sales.

When calculating the cash from an asset that has been sold, it is necessary to consider any gain or loss from the sale using the following formula:

$$\text{cash from asset sold} = \text{book value of the asset} + \text{gain (or} - \text{loss)} \text{ on sale}$$

Cash flow from financing activities (CFF) consists of the cash inflows and outflows that result from transactions affecting a firm's capital structure, such as borrowing, repaying debt, and issuing or redeeming equity securities. CFF is the sum of the following two measures:

$$\text{net cash flows from creditors} = \text{new borrowings} - \text{principal repaid}$$

$$\text{net cash flows from shareholders} = \text{new equity issued} - \text{share repurchases} - \text{cash dividends}$$

Differences Between U.S. GAAP and IFRS

The following are under IFRS:

- Interest and dividends received may be classified as either CFO or CFI.
- Dividends paid to shareholders and interest paid on debt may be classified as either CFO or CFF.
- Income taxes are reported as operating activities unless the expense can be tied to an investing or financing transaction.

ANALYZING STATEMENTS OF CASH FLOWS II
Analysis of the Cash Flow Statement

1. Operating Cash Flow

The analyst should identify the major determinants of operating cash flow—primarily, the firm's earning-related activities and changes in noncash working capital.

Equality of operating cash flow and net income is an indication of high-quality earnings, but it can be affected by the stage of business cycle and of the firm's life cycle. Earnings that exceed operating cash flow may be an indication of premature recognition of revenues or delayed recognition of expenses.

2. Investing Cash Flow

Increasing capital expenditures, a use of cash, is usually an indication of growth. Conversely, a firm may reduce capital expenditures or even sell capital assets to conserve or generate cash. This may result in higher cash outflows in the future as older assets are replaced or growth resumes.

3. Financing Cash Flow

The financing activities section of the cash flow statement reveals information about whether the firm is generating cash by issuing debt or equity. It also indicates whether the firm is using cash to repay debt, reacquire stock, or pay dividends.

The cash flow statement can be converted to **common-size format** by expressing each line item as a percentage of revenue. Alternatively, each inflow of cash can be expressed as a percentage of total cash inflows, and each outflow of cash can be expressed as a percentage of total cash outflows.

Free cash flow is a measure of cash that is available for discretionary use, after a firm has covered its capital expenditures. **Free cash flow to the firm (FCFF)** is the cash available to all investors, both equity owners and debtholders. FCFF can be calculated using net income or operating cash flow as a starting point.

FCFF is calculated from net income as follows:

$$FCFF = NI + \text{noncash charges} + \left[\text{cash interest paid} \times (1 - \text{tax rate})\right] - \text{fixed capital investment} - \text{working capital investment}$$

FCFF is calculated from operating cash flow as follows:

$$FCFF = CFO + \left[\text{cash interest paid} \times (1 - \text{tax rate})\right] - \text{fixed capital investment}$$

Free cash flow to equity (FCFE) is the cash flow that is available for distribution to the common shareholders; that is, after all obligations have been paid. FCFE can be calculated as follows:

$$FCFE = CFO - \text{fixed capital expenditure} + \text{net borrowing}$$

Cash Flow Ratios That Measure Performance

- The **cash flow-to-revenue ratio** measures the amount of operating cash flow generated for each dollar of revenue.

$$\text{cash flow-to-revenue} = \frac{\text{CFO}}{\text{net revenue}}$$

- The **cash return-on-assets ratio** measures the return of operating cash flow attributed to all providers of capital.

$$\text{cash return-on-assets} = \frac{\text{CFO}}{\text{average total assets}}$$

Cash Flow Ratios That Measure Coverage

- The **debt coverage ratio** measures financial risk and leverage.

$$\text{debt coverage} = \frac{\text{CFO}}{\text{total debt}}$$

- The **interest coverage ratio** measures the firm's ability to meet its interest obligations.

$$\text{interest coverage} = \frac{\text{CFO} + \text{interest paid} + \text{taxes paid}}{\text{interest paid}}$$

ANALYSIS OF INVENTORIES

Inventory Values on the Balance Sheet

Under IFRS, inventory is reported on the balance sheet at the lower of cost or **net realizable value**, which is expected sales price less selling costs and completion costs. If NRV is less than the balance sheet value of inventory, the inventory is "written down" to NRV, and the loss is recognized in the income statement either as a separate line item or by increasing COGS. Inventory "write-up" is allowed, but only to the extent that a previous write-down to net realizable value was recorded.

Under U.S. GAAP, companies that use LIFO or the retail method value inventories at the lower of cost or market. Market is usually equal to replacement cost, but it cannot exceed net realizable value or be less than net realizable value minus a normal profit margin. For companies using cost methods other than LIFO or retail, inventory valuation is similar to IFRS. No subsequent write-up of inventory values that have been written down is allowed under U.S. GAAP.

In certain industries—primarily, producers and dealers of commodities—reporting inventory above historical cost is permitted under IFRS and U.S. GAAP. If an active market exists for the commodity, the quoted market price is used to value the inventory. Otherwise, recent market transactions are used.

LIFO vs. FIFO

In periods of rising prices and stable or increasing inventory quantities, this occurs:

LIFO results in:	FIFO results in:
Higher COGS	Lower COGS
Lower gross profit	Higher gross profit
Lower inventory balances	Higher inventory balances

In periods of falling prices, this occurs:

LIFO results in:	FIFO results in:
Lower COGS	Higher COGS
Higher gross profit	Lower gross profit
Higher inventory balances	Lower inventory balances

For a firm using the (weighted) average cost inventory method, all of these values will be between those for the LIFO and FIFO methods.

Ratios and Inventory Method

Regarding *profitability*, as compared to FIFO, LIFO produces higher COGS in the income statement and will result in lower earnings. Any profitability measure that includes COGS will be lower under LIFO. For example, higher COGS will result in lower gross, operating, and net profit margins as compared to FIFO.

Regarding liquidity, compared to FIFO, LIFO results in a lower inventory value on the balance sheet. Because inventory (a current asset) is lower under LIFO, the current ratio, a popular measure of liquidity, is also lower under LIFO than under FIFO. Working capital is lower under LIFO as well because current assets are lower. The quick ratio is unaffected by the firm's inventory cost flow method because inventory is excluded from its numerator.

Regarding activity, inventory turnover (COGS / average inventory) is higher for firms that use LIFO compared to firms that use FIFO. Under LIFO, COGS is valued at more recent, higher costs (higher numerator), while inventory is valued at older, lower costs (lower denominator). Higher turnover under LIFO will result in lower days of inventory on hand (365 / inventory turnover).

Regarding solvency, LIFO results in lower total assets compared to FIFO because LIFO inventory is lower. Lower total assets under LIFO result in lower stockholders' equity (assets – liabilities). Because total assets and stockholders' equity are lower under LIFO, the debt ratio and the debt-to-equity ratio are higher under LIFO compared to FIFO.

LIFO Liquidation

A **LIFO liquidation** occurs when a LIFO firm's inventory quantities decline. In a rising price environment, COGS are based on older, lower unit costs, which makes COGS artificially low. The reduction in COGS from a LIFO liquidation increases gross and net profits and margins, but these increases are not sustainable. A decrease in the LIFO reserve (disclosed in footnotes for LIFO companies) can alert analysts that a LIFO liquidation may be responsible for an increase in current-period profits and profit margins.

Inventory Disclosures

Required inventory disclosures are similar under U.S. GAAP and IFRS and include the following:

- Cost flow method used
- Carrying value of inventory by classification, if appropriate (raw materials, work in progress, finished goods)
- Carrying value of inventories reported at fair value less selling costs
- Cost of inventory recognized as an expense (COGS) during the period
- Amount of inventory write-downs during the period
- Reversals of inventory write-downs during the period (IFRS only), with discussion of the circumstances
- Carrying value of inventories pledged as collateral

ANALYSIS OF LONG-TERM ASSETS

Intangible Assets

Purchased intangible assets that do not have physical substance but have finite lives (e.g., patents and franchises) are reported on the balance sheet at their fair values, which are reduced over their economic lives by amortization (like depreciation of a physical asset).

Most **internally developed intangible assets** are not reported on the balance sheet. Values of intangible assets that do not have finite lives (e.g., goodwill) and of those that can be renewed at minimal cost (e.g., trademarks) are not amortized, but they must be checked periodically for impairment.

The exception is **research and development**. Firms reporting under IFRS must expense research costs as incurred but may capitalize development costs (costs incurred after technological feasibility and the intent to use or sell the completed asset have been established).

Under U.S. GAAP, costs to develop software are capitalized in some circumstances:

- *Software for sale to others*. Costs are expensed as incurred until the product's technological feasibility has been established, after which the costs of developing a salable product are capitalized.

- *Software for internal use*. Costs must be expensed until it is probable that the firm will complete the project and use the software as intended.

Goodwill results from business combinations. Under the **acquisition method**, the price paid to acquire a firm is allocated to the identifiable assets and liabilities of the acquired firm on the basis of fair value. Any remaining amount of the purchase price is recorded as goodwill. Only goodwill created in a business combination is capitalized on the balance sheet. The costs of any internally generated "goodwill" are expensed in the period incurred.

Impairments

Under IFRS, the firm must annually assess whether events or circumstances indicate that an **impairment** of an asset's value has occurred. For example, there may have been a significant decline in the market value of the asset or a significant change in the asset's physical condition. If so, the asset's value must be tested for impairment.

An asset is impaired when its carrying value (original cost less accumulated depreciation) exceeds the **recoverable amount**. The recoverable amount is the greater of its fair value less any selling costs and its **value in use**. The value in use is the present value of its future cash flow stream from continued use and disposal.

If impaired, the asset's value must be written down on the balance sheet to the recoverable amount. An impairment loss, equal to the excess of carrying value over the recoverable amount, is recognized in the income statement.

Under IFRS, the loss can be reversed if the value of the impaired asset recovers in the future. However, the loss reversal is limited to the original impairment loss.

Under U.S. GAAP, an asset is tested for impairment only when events and circumstances indicate the firm may not be able to recover the carrying value through future use.

Determining an impairment and calculating the loss potentially involves two steps. In the first step, the asset is tested for impairment by applying a **recoverability test**. If the asset is impaired, the second step involves measuring the loss.

Regarding **recoverability,** an asset is considered impaired if the carrying value (original cost less accumulated depreciation) is greater than the asset's future *undiscounted* cash flow stream. Because the recoverability test is based on estimates of future undiscounted cash flows, tests for impairment involve considerable management discretion.

Regarding **loss measurement, if** impaired, the asset's value is written down to fair value on the balance sheet—and a loss, equal to the excess of carrying value over the fair value of the asset (or the *discounted* value of its future cash flows if the fair value is not known), is recognized in the income statement.

Under U.S. GAAP, loss recoveries are not permitted.

Derecognition of Long-Lived Assets

Long-lived assets are *derecognized* and removed from the balance sheet when they are sold, exchanged, or abandoned.

When a long-lived asset is sold, the asset is removed from the balance sheet, and the difference between the sale proceeds and the carrying value of the asset is reported as a gain or loss in the income statement. The carrying value is equal to original cost minus accumulated depreciation and any impairment charges.

The gain or loss is usually reported in the income statement as a part of other gains and losses, or reported separately as an unusual or infrequent item if material. Also, if the firm presents its cash flow statement using the indirect method, the gain or loss is removed from net income to compute cash flow from operations because the proceeds from selling a long-lived asset are an investing cash inflow.

If a long-lived asset is abandoned, the treatment is similar to a sale, except there are no proceeds. In this case, the carrying value of the asset is removed from the balance sheet, and a loss of that amount is recognized in the income statement.

If a long-lived asset is exchanged for another asset, a gain or loss is computed by comparing the carrying value of the old asset with fair value of the old asset (or the fair value of the new asset, if that value is clearly more evident). The carrying value of the old asset is removed from the balance sheet, and the new asset is recorded at its fair value.

Analysis of Long-Lived Asset Disclosures

An analyst can use financial statement disclosures to estimate the **average age** and **useful life** of a firm's long-lived assets. Older, less efficient assets may make a firm less competitive. The average age of assets is useful in estimating the timing of major capital expenditures and a firm's future financing requirements. These estimates are most accurate for a firm that uses straight-line depreciation.

$$\text{average age} = \frac{\text{accumulated depreciation}}{\text{annual depreciation expense}}$$

$$\text{total useful life} = \frac{\text{historical cost (gross cost)}}{\text{annual depreciation expense}}$$

$$\text{remaining useful life} = \frac{\text{ending net PP\&E}}{\text{annual depreciation expense}}$$

TOPICS IN LONG-TERM LIABILITIES AND EQUITY

Leases

With a lease, a firm (the **lessee**) essentially purchases the right to use an asset from another firm (the **lessor**) for a specified period. Advantages of leasing rather than purchasing an asset may include the following:

- *Less initial cash outflow.* Typically, a lease requires only a small down payment, if any.
- *Less costly financing.* The interest rate implicit in a lease contract may be less than the interest rate on a loan to purchase the asset.
- *Less risk of obsolescence.* At the end of a lease, the lessee often returns the leased asset to the lessor—and, therefore, does not bear the risk of an unexpected decline in the asset's end-of-lease value.

To be a lease, a contract must meet the following three requirements:

1. It must refer to a specific asset.
2. It must give the lessee effectively all the asset's economic benefits during the term of the lease.
3. It must give the lessee the right to determine how to use the asset during the term of the lease.

Lessee Financial Reporting

Under IFRS and U.S. GAAP, a **finance lease** is any lease in which both the benefits and risks of ownership are substantially transferred to the lessee. If either the benefits or the risks are not substantially transferred to the lessee, a lease is classified as an **operating lease**. Any given lease will be classified the same way by the lessee and the lessor.

Under IFRS, for both finance and operating leases (except those that are short term or of low value), the lessee records a **right-of-use (ROU) asset** and a **lease liability** on the balance sheet, both equal to the present value of the lease payments. The ROU asset is amortized straight-line over the term of the lease. The amortization amount and the interest portion of each lease payment are reported (separately) as expenses on the income statement. The lease liability is reduced each period by the principal portion of the lease payment. So, while the asset and liability both begin with the same value and reach zero at the end of the lease, their values can differ during the life of the lease, as the amortization of the ROU asset will exceed the principal portion of the lease payment in the early years of a lease.

Under U.S. GAAP, a lessee accounts for finance leases just as under IFRS. With an operating lease, the lessee reports both the interest portion of the lease payment and the amortization of the ROU asset (which is equal to the interest portion of the lease payment, not straight-line as under IFRS) on the income statement as a single expense. Because the amortization of the lease liability and the amortization of the ROU asset are equal each period, the asset and liability will have equal values over the life of the lease.

For all leases under IFRS, the principal portion of the lease payment is a financing cash outflow, while the interest portion may be reported as an operating or financing cash outflow. Under U.S. GAAP, for a finance lease, the interest portion of the lease payment is an operating cash outflow and the principal portion is a financing cash outflow. For

an operating lease under U.S. GAAP, the full lease payment is classified as an operating cash outflow.

Lessor Financial Reporting

For lessors, the financial reporting of both finance and operating leases is the same under IFRS and U.S. GAAP.

Regarding a *finance lease*, at initiation, the lessor removes the leased asset from its balance sheet and adds a **lease receivable** asset, equal to the present value of the expected lease payments. If this value is different from the asset's book value, the lessor recognizes a profit or a loss. Over the term of the lease, the lessor uses the effective interest method (the same as lessees) to amortize the lease receivable and reports the interest portion of the lease payments as income. If leasing is one of the lessor's primary business activities, this interest income is included in revenues for the period. The entire cash inflow (interest and principal) is classified as cash from operations.

Regarding an *operating lease*, the lessor keeps the leased asset on its balance sheet and continues to record depreciation expense. On the income statement, the lessor reports the lease payments as income and reports depreciation and other costs associated with leasing the asset as expenses. As with a finance lease, the entire cash inflow is cash from operations.

Deferred Compensation

A **defined contribution pension plan** is a retirement plan in which the firm contributes a sum each period to the employee's retirement account. The firm makes no promise to the employee regarding the future value of the plan assets. The investment decisions are left to the employee, who assumes all of the investment risk. On the income statement, pension expense is simply equal to the employer's contribution. There is no future liability to report on the balance sheet.

In a **defined benefit pension plan**, the firm promises to make periodic payments to employees after retirement. The benefit is usually based on the employee's years of service and the employee's compensation at, or near, retirement. For example, an employee might earn a retirement benefit of 2% of her final salary for each year of service. Because the employee's future benefit is defined, the employer assumes the investment risk.

Financial reporting for a defined benefit plan is much more complicated than for a defined contribution plan because the employer must estimate the value of the future obligation to its employees. The obligation involves forecasting numerous variables, such as future compensation levels, employee turnover, average retirement age, mortality rates, and an appropriate discount rate.

For defined benefit plans, if the fair value of the plan's assets is greater than the estimated pension obligation, the plan is said to be **overfunded,** and the sponsoring firm records a **net pension asset** on its balance sheet. If the fair value of the plan's assets is less than the estimated pension obligation, the plan is **underfunded,** and the

firm records a **net pension liability** on its balance sheet. A net pension asset or liability is referred to as a plan's **funded status.**

The change in the net pension asset or liability is reported each year. Some components of the change are included in net income, while others are included in OCI.

Under IFRS, the change in funded status has three elements:

1. There is service cost, which includes the present value of additional benefits employees have earned by working an additional year, as well as "past service costs," which are changes to benefits earned in previous periods.
2. There is net interest expense or income, which is interest income on a net pension asset or interest expense on a net pension liability. The amount equals the funded status times the plan's discount rate.
3. There are remeasurements, which include actuarial gains and losses and the difference between actual and expected returns on plan assets.

Under U.S. GAAP, the change in funded status has five components:

1. Service costs for the current period
2. Interest expense or income
3. The expected return on plan assets
4. Past service costs
5. Actuarial gains and losses

Share-based compensation refers to issuing employees company stock or options to buy company stock. While doing so does not require cash outflows from the company, it dilutes the ownership of existing shareholders and reduces earnings per share. IFRS and U.S. GAAP both require the company to estimate the fair value of any stock-based compensation at the **grant date**, and to expense it to the income statement over the **vesting period** or **service period**—the time between the grant date and when the employee receives the stock or can first exercise a stock option.

ANALYSIS OF INCOME TAXES

A company must show the same basic facts to its tax authorities that it shows its owners and lenders: how much revenue it brought in, how much it spent to generate that revenue, and hopefully, a positive difference between the two on which it will pay tax. If the tax laws were the same as the financial reporting standards, this wouldn't raise many issues.

Of course, the tax laws are not the same as the financial reporting standards, so financial reporting needs a special set of rules to account for the differences.

The same transactions that affect the financial statements need to be reported to the tax authorities. The most important differences come from *when* they are recognized in one or the other. In particular, let's focus on expenses. Compared to when expenses are recognized in the income statement, the following occur:

- If a company can recognize an expense *sooner* for tax purposes, it saves on taxes now (by showing less income to the tax authorities) but will have to make them up later. Having to pay more tax later, like any future commitment, is something a company must recognize on its balance sheet. It does so by creating a **deferred tax liability (DTL)**.

- If a company is not allowed until *later* to recognize an expense for tax purposes, it must pay more tax now, but it should be able to pay less tax later. Being able to pay less tax later has value, and a company can recognize that value on its balance sheet. It does so by creating a **deferred tax asset (DTA)**.

In both cases, the differences are expected to reverse in the future. DTLs and DTAs only result from **temporary differences** between tax reporting and financial reporting.

The amount of a DTL or a DTA equals the amount of the timing (temporary) difference times the company's **statutory tax rate**. The values of DTLs and DTAs change over time as the temporary differences reverse, and as new transactions result in additional temporary differences.

For a given period, we can reconcile **income tax expense** (the amount that appears on the income statement) with **taxes payable** (the amount actually owed to the government) using the following equation:

$$\text{income tax expense} = \text{taxes payable} + \Delta\text{DTL} - \Delta\text{DTA}$$

From this equation, we can see the following:

- An increase in a DTL increases income tax expense.
- A decrease in a DTL decreases income tax expense.
- An increase in a DTA decreases income tax expense.
- A decrease in a DTA increases income tax expense.

Besides temporary differences and their reversals, changes in deferred tax items can result from the following:

- If the statutory tax rate changes, existing DTLs and DTAs must be adjusted. An increase in the statutory rate will increase both DTLs and DTAs. A decrease in the statutory rate will decrease both DTLs and DTAs.

- A **tax loss carryforward** is a current or past loss that can be used to reduce taxable income in the future. This can result in a DTA.

- For a DTA to have value, a company must have at least that much future tax to pay, which means it must expect enough future income to owe that much tax. If this becomes doubtful, a company must decrease the value of its DTAs, either directly (under IFRS) or by creating a **valuation allowance** (under U.S. GAAP). Notice from the previous equation that this will increase the company's income tax expense for the period.

Some revenues and expenses are recognized in the financial statements, but never for tax reporting, or vice versa. These **permanent differences** do not result in DTLs or

DTAs. Instead, they change the company's **effective tax rate**, which is income tax expense as a percentage of pretax income.

The footnote disclosure in the financial statements must reconcile the statutory tax rate to the effective tax rate. An analyst should also consider a company's **cash tax rate**, which is cash taxes paid as a percentage of pretax income.

The primary example of temporary differences that create DTLs is using accelerated depreciation for tax reporting and straight-line depreciation for financial reporting. If a company that does so is increasing its investments in physical capital over time, it can have more new depreciable assets coming onto its balance sheet than it has old ones reaching the end of their useful lives. In this case, its DTL will keep increasing and will not reverse until its capital spending stops growing. An analyst who does not expect a company's DTL to reverse in the foreseeable future may choose to treat it as equity, for analytical purposes only, by decreasing the DTL and increasing shareholders' equity by the same amount.

FINANCIAL REPORTING QUALITY

When discussing the quality of a firm's financial statements, we must distinguish between the quality of its financial reporting and the quality of its reported results.

Financial reporting quality refers to the characteristics of a firm's financial statements, primarily with respect to how well they follow generally accepted accounting principles (GAAP). However, given that GAAP provide choices of methods, estimates, and specific treatments, compliance with GAAP by itself does not necessarily produce financial reporting of the highest quality.

High-quality financial reporting must be *decision useful*. Two characteristics of decision-useful financial reporting are (1) relevance and (2) faithful representation. Financial statements are relevant when the information presented is useful in making decisions and likely to affect these decisions. Faithful representation encompasses the qualities of completeness, neutrality, and the absence of errors.

The **quality of earnings** is a separate issue. The quality of reported earnings (not the quality of earnings reports) is high if earnings represent an adequate return on equity and are sustainable; that is, they are expected to recur in future periods. A firm can have high financial reporting quality but low earnings quality (inadequate returns/unsustainable), but if a firm has low-quality financial reporting, we might not be able to determine the quality of its earnings.

Quality of financial reports may be ranked from best to worst, based on the quality of earnings and financial reporting:

1. Reporting is compliant with GAAP and decision useful; earnings are sustainable and adequate.
2. Reporting is compliant with GAAP and decision useful, but earnings are not sustainable or not adequate.
3. Reporting is compliant with GAAP, but earnings quality is low and reporting choices and estimates are biased.

4. Reporting is compliant with GAAP, but the amount of earnings is actively managed to increase, decrease, or smooth reported earnings.
5. Reporting is not compliant with GAAP, although the numbers presented are based on the company's actual economic activities.
6. Reporting is not compliant and includes numbers that are fictitious or fraudulent.

Neutral Accounting vs. Conservative or Aggressive Accounting

Financial statements should be neutral (unbiased) to be most valuable to users. Biased reporting can be conservative or aggressive. Choices made within GAAP are considered **conservative** if they tend to decrease the company's reported earnings and financial position for the current period and considered **aggressive** if they increase reported earnings or improve the financial position for the current period. Aggressive accounting often results in decreased earnings in future periods, while conservative accounting will tend to increase future period earnings.

Both of these types of bias are used by management to **smooth earnings**. During periods of higher-than-expected earnings, management may employ a conservative bias (e.g., by adjusting an accrued liability upward to reduce reported earnings for that period). This effectively defers the recognition of these earnings to a future period. If, in a future period, earnings are less than expected, a more aggressive earnings choice (e.g., decreasing the accrued liability) can increase reported earnings. The initial increase in the accrued liability is sometimes referred to as putting earnings in the "cookie jar" (so that they may be enjoyed later).

Conservatism in financial reporting is not necessarily "good." Either type of bias is a deviation from neutral reporting or faithful representation. Sometimes, GAAP themselves can introduce conservatism by imposing higher standards of verification for revenue and profit than for expenses and accrual of liabilities. While conservative bias is not ideal for users of financial statements, it may be beneficial in reducing the probability of future litigation from users claiming they were misled, in reducing current period tax liability, and in protecting the interests of those who have less complete information than management, such as buyers of the company's debt.

Some examples of conservative versus aggressive financial reporting choices are shown in Figure 2.

Figure 2: Aggressive and Conservative Accounting

Aggressive	Conservative
Capitalize current period costs	Expense current period costs
Longer estimates of the lives of depreciable assets	Shorter estimates of the lives of depreciable assets
Higher estimated salvage values	Lower estimated salvage values
Straight-line depreciation	Accelerated depreciation
Delayed recognition of impairments	Early recognition of impairments
Smaller reserve for bad debt	Greater reserve for bad debt
Smaller valuation allowances on deferred tax assets	Larger valuation allowances on DTAs

Motivations and Conditions for Low-Quality Financial Reporting

Three factors that typically exist in cases where management provides low-quality financial reporting are *motivation*, *opportunity*, and *rationalization* of the behavior:

1. One important motivation for aggressive accounting choices is to meet or exceed benchmark or expected-earnings-per-share growth. The manager's motivation may be to enhance her reputation and improve future career opportunities, or to simply increase incentive compensation. Other possible motivations are to gain credibility with equity market investors or improve the way the company is viewed by its customers and suppliers. For companies that are highly leveraged and unprofitable, aggressive accounting may be motivated by a desire to avoid violating debt covenants.

2. Circumstances that provide opportunity for low-quality, or even fraudulent, financial reporting include weak internal controls, inadequate oversight by the board of directors, the large range of acceptable accounting treatments, or inconsequential penalties in the case of accounting fraud.

3. The third likely factor in low-quality financial reporting is rationalization by management for less-than-ethical actions. Whether the story is "I'll fix it next period" or "I have to do it to get my bonus and pay for my parents' care," the resulting behavior is the same.

Requiring audited financial statements is one mechanism to discipline financial reporting quality. However, an unqualified or "clean" audit opinion does not guarantee that no fraud has occurred; it only offers reasonable assurance that the financial statements (prepared the under the direction of management) have been "fairly reported" with respect to the applicable GAAP. The auditor is selected and paid by the firm being audited.

Non-GAAP Measures

Firms will sometimes report accounting measures that are not defined or required under GAAP. Such measures typically exclude some items to make the firm's

performance look better. Management may exclude items because they are one-time or nonoperating costs that will not affect operating earnings going forward, because the items are noncash charges, or to "improve comparability with companies that use different accounting methods" for depreciation or restructuring charges.

In the United States, companies that report non-GAAP measures in their financial statements are required to do the following:

- Display the most comparable GAAP measure with equal prominence.
- Provide an explanation by management as to why the non-GAAP measure is thought to be useful.
- Reconcile the difference between the non-GAAP measure and the most comparable GAAP measure.
- Disclose other purposes for which the firm uses the non-GAAP measure.
- Include, in any non-GAAP measure, any items that are likely to recur in the future—even those treated as nonrecurring, unusual, or infrequent in the financial statements.

IFRS require that firms using non-IFRS measures in financial reports must do the following:

- Define and explain the relevance of such non-IFRS measures.
- Reconcile the differences between the non-IFRS measure and the most comparable IFRS measure.

Accounting Methods, Choices and Estimates, and Warning Signs

Regarding *revenue recognition*, firms can choose where in the shipping process the customer takes title to the goods: free on board (FOB) at the shipping point or FOB at the destination. Choosing terms of FOB at the shipping point will mean that revenue is recognized earlier compared to FOB at the destination.

Firms can also manage the timing of revenue recognition by accelerating or delaying shipments. If additional revenue is required to meet targets, firms can offer discounts or special financing terms to increase orders in the current period or ship goods to distributors without receiving an order. Overloading a distribution channel with more goods than would normally be sold during a period is referred to as **channel stuffing**. In periods when high earnings are expected, management may wish to delay recognition of revenue to the next period and hold or delay customer shipments to achieve this.

In a **bill-and-hold transaction**, the customer buys the goods and receives an invoice but requests that the firm keep the goods at their location for a period of time. The use of fictitious bill-and-hold transactions can increase earnings in the current period by recognizing revenue for goods that are actually still in inventory. Revenue for future periods will be decreased as real customer orders for these bill-and-hold items are filled but not recognized in revenue, offsetting the previous overstatement of revenue.

Accounting warning signs related to revenue recognition may include the following:

- Changes in revenue recognition methods
- Use of barter transactions
- Use of rebate programs that require estimation of the impact of rebates on net revenue
- Lack of transparency with regard to how the various components of a customer order are recorded as revenue
- Revenue growth out of line with peer companies
- Receivables turnover is decreasing over multiple periods
- Decreases in total asset turnover, especially when a company is growing through acquisition of other companies
- Inclusion of nonoperating items or significant one-time sales in revenue

Regarding *estimates of credit losses*, on the balance sheet, the reserve for uncollectible debt is an offset to accounts receivable. If management determines the probability that accounts receivable will be uncollectible is lower than their current estimate, a decrease in the reserve for uncollectible debt will increase net receivables and increase net income. An increase in the estimate of credit losses would have the opposite effect.

A firm that simply underestimates the percentage of receivables that will be uncollectible will report higher receivables and higher net income as a result. At some point, when actual uncollectible accounts exceed the low estimate, the firm will report an additional expense that will reduce net income and net receivables.

Other reserves, such as a reserve for warranty expense, can also be changed to manage reported earnings. A decrease in the estimated warranty expense as a percentage of sales will increase earnings, while an increase in the reserve for warranty expense will decrease earnings.

Regarding valuation allowance, recall that, under U.S. GAAP, a valuation allowance reduces the carrying value of a DTA based on managers' estimates of the probability it will not be realized. Similar to the effects of an allowance for bad debt, increasing a valuation allowance will decrease the net deferred tax asset on the balance sheet and reduce net income for the period, while a decrease in the valuation allowance will increase the net deferred tax asset and increase net income for the period. The valuation allowance can be understated to show higher asset values, and it can be adjusted over time to smooth earnings. Under IFRS, while no explicit valuation allowance is reported, deferred tax assets (and liabilities) are adjusted to the expected recoverable amount.

Regarding *depreciation methods and estimates*, compared to straight-line depreciation, an accelerated depreciation method increases expenses and decreases net income in the early years of an asset's life. In the later years of an asset's life, this will reverse; expenses will be lower, and net income will be higher.

Estimates of useful life and salvage value can also affect depreciation expense—and, thereby, net income and the carrying value of an asset. An increase in salvage value will

decrease depreciation expense, increase operating income, and result in a greater carrying value for the asset. A smaller salvage value will have the opposite effects. If the salvage value of an asset is set higher than the actual sale price at the end of the asset's life, a loss on the sale of the asset will decrease net income in the period in which the asset is disposed of. Using a longer estimated useful life decreases periodic depreciation expense and increases net income in the early years of an asset's life compared to using a shorter estimated useful life.

Depreciation methods, estimated asset lives, or estimates of salvage values that are out of line with those of peer companies in the industry are an accounting warning sign.

Regarding *amortization and impairment*, management choices and estimates regarding amortization of purchased intangible assets are similar to those for depreciation of tangible assets. The intangible asset goodwill is not amortized, but it is subject to an impairment test. By ignoring or delaying recognition of an impairment charge for goodwill, management can increase earnings in the current period.

Regarding the *inventory method*, during periods of rising prices, cost of goods sold (COGS) under the FIFO method will be less than COGS under the weighted average costing method. Gross profit, gross margin, and earnings will all be greater under the FIFO method than under the weighted average method as a result. Balance sheet inventory value will be greater under FIFO than under the weighted average method. During periods of decreasing prices, the opposite is true.

FIFO results in more accurate balance sheet inventory values because inventory value is closer to current replacement cost than under the weighted average cost. Conversely, COGS are closer to current (replacement) cost under the weighted average cost method so that gross and net margins better reflect economic reality under those methods.

Accounting warning signs related to inventories may include a declining inventory turnover ratio—or, for a firm using LIFO under U.S. GAAP, drawing down inventory levels so that COGS reflects the lower costs of items acquired in past periods (LIFO liquidations), which increases current period earnings.

Regarding *related-party transactions*, if a public firm does business with a supplier that is private and controlled by management, adjusting the price of goods supplied can shift profits either to or from the private company to manage the earnings reported by the public company.

Regarding *capitalizing expenses*, any expense that can be capitalized creates an asset on the balance sheet, and the impact of the expense on net income can be spread over many years. Capitalization also affects cash flow classifications. If an expense is capitalized, the entire amount is classified as an investing cash outflow so that operating cash flow is increased by that amount. Analysts should take notice if a firm capitalizes costs that are not typically capitalized by firms in their industry.

Capitalizing interest expense will decrease cash flow from investing and increase cash flow from operations, along with its effects on the pattern of earnings from depreciating the interest expense over time rather than expensing it all in the current period. The ability under IFRS to classify interest received and dividends received as either

operating or investing cash flows—and interest paid and dividends paid as either operating or financing cash flows—gives management some ability to manage reported operating cash flow.

Regarding *stretching payables*, delaying payments that would normally be made near the end of a reporting period until the beginning of the next accounting period will increase operating cash flow in the current period and reduce it in some subsequent period. There is no effect on reported earnings in the current period from stretching payables.

Other accounting warning signs are as follows:

- The ratio of operating cash flow to net income is persistently less than one or declining over time.
- Fourth-quarter earnings show a pattern (either high or low) compared to the seasonality of earnings in the industry or seasonality of revenue for the firm.
- Certain expenses are classified as nonrecurring but appear regularly in financial reports.
- Gross or operating profit margins are noticeably higher than are typical for the industry and peer companies.
- Management typically provides only minimal financial reporting information and disclosure.
- Management typically emphasizes non-GAAP earnings measures and uses special or nonrecurring designations aggressively for charges.
- Growth by purchasing a large number of businesses can provide many opportunities to manipulate asset values and future depreciation and amortization and make comparisons to prior-period earnings problematic.

FINANCIAL ANALYSIS TECHNIQUES

With respect to analysis of financial statements, you should memorize numerous key ratios, including the following:

- Current, quick, and cash ratios
- All the ratios in the cash conversion cycle (turnover ratios are more important, like receivables, inventory, and payables turnover)
- Turnover ratios use revenue in the numerator, except for payables and inventory turnover ratios, which use COGS (purchases can also be used for payables turnover)
- Gross profit margin, net profit margin, and operating profit margin are readily available from a common-size income statement
- Return on equity (ROE) is critical (definitely know the three- and five-component DuPont ROE decompositions)
- Debt-to-equity, debt-to-capital, debt-to-assets, interest coverage, and fixed-charge coverage ratios (remember to add lease payments to numerator and denominator for this final one)

Usefulness and Limitations of Ratio Analysis

Financial ratios provide useful information to analysts, including the following:

- Insights into the financial relationships that are useful in forecasting future earnings and cash flows
- Information about the financial flexibility of the firm
- A means of evaluating management's performance

Financial ratios have limitations:

- Ratios are not useful when viewed in isolation. Ratios should be interpreted relative to industry averages, economy-wide firm averages, and the company's own historical performance.
- Comparisons with other companies are made more difficult because of different accounting methods, especially when comparing U.S. firms to non-U.S. firms.
- There may be difficulty in locating comparable ratios when analyzing companies that operate in multiple industries.
- Conclusions cannot be made from viewing one set of ratios. Ratios must be viewed relative to one another.
- Judgment is required. Determining the target or comparison value for a ratio is difficult and may require some range of acceptable values.

Regarding *common-size balance sheets and income statements*, these statements normalize balance sheets and income statements and allow the analyst to make easier comparisons of different-sized firms. A vertical common-size balance sheet expresses each balance sheet account as a *percentage of total assets*. A horizontal common-size balance sheet expresses each account as a ratio to the first-year value (e.g., 1.1 indicates an increase of 10% above the first-year value). A vertical common-sized income statement expresses each income statement item as a *percentage of sales*.

Measures of liquidity:

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

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

Measures of operating performance—turnover ratios and the cash conversion cycle:

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

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

$$\text{payables turnover ratio} = \frac{\text{cost of goods sold}}{\text{average trade payables}}$$

$$\text{days of sales outstanding} = \frac{365}{\text{receivables turnover}}$$

$$\text{days of inventory on hand} = \frac{365}{\text{inventory turnover}}$$

$$\text{number of days of payables} = \frac{365}{\text{payables turnover ratio}}$$

$$\text{cash conversion cycle} =$$

$$\left(\begin{array}{c}\text{days of sales}\\\text{outstanding}\end{array}\right) + \left(\begin{array}{c}\text{days of inventory}\\\text{on hand}\end{array}\right) - \left(\begin{array}{c}\text{number of}\\\text{days of}\\\text{payables}\end{array}\right)$$

Measures of operating performance—operating efficiency ratios:

$$\text{total asset turnover} = \frac{\text{revenue}}{\text{average total assets}}$$

$$\text{fixed asset turnover} = \frac{\text{revenue}}{\text{average net fixed assets}}$$

$$\text{working capital turnover} = \frac{\text{revenue}}{\text{average working capital}}$$

Measures of operating performance—operating profitability:

$$\text{gross profit margin} = \frac{\text{gross profit}}{\text{revenue}}$$

$$\text{operating profit margin} = \frac{\text{operating income}}{\text{revenue}} = \frac{\text{EBIT}}{\text{revenue}}$$

$$\text{net profit margin} = \frac{\text{net income}}{\text{revenue}}$$

Return on invested capital (ROIC):

$$\text{return on invested capital} = \frac{\text{EBIT}}{\text{average total capital}}$$

Total capital includes debt capital, so interest is added back to net income.

Return on equity (ROE):

$$\text{return on total equity} = \frac{\text{net income}}{\text{average total equity}}$$

$$\text{return on common equity} = \frac{\text{net income} - \text{preferred dividends}}{\text{average common equity}}$$

Measures of solvency:

$$\text{debt-to-equity ratio} = \frac{\text{total debt}}{\text{total shareholders' equity}}$$

$$\text{debt-to-capital} = \frac{\text{total debt}}{\text{total debt} + \text{total shareholders' equity}}$$

$$\text{debt-to-assets} = \frac{\text{total debt}}{\text{total assets}}$$

$$\text{debt-to-EBITDA} = \frac{\text{total debt}}{\text{EBITDA}}$$

$$\text{financial leverage} = \frac{\text{average total assets}}{\text{average total equity}}$$

Measures of interest coverage:

$$\text{interest coverage} = \frac{\text{EBIT}}{\text{interest payments}}$$

$$\text{fixed-charge coverage} = \frac{\text{EBIT} + \text{lease payments}}{\text{interest payments} + \text{lease payments}}$$

Regarding *DuPont analysis*, the DuPont method decomposes the ROE to better analyze firm performance. An analyst can see the impact of leverage, profit margin, and turnover on ROE. There are two variants of the DuPont system: the traditional approach and the extended system.

Both approaches begin with the following:

$$\text{ROE} = \left(\frac{\text{net income}}{\text{average equity}}\right)$$

This is the traditional DuPont equation:

$$\text{ROE} = \left(\frac{\text{net income}}{\text{revenue}}\right)\left(\frac{\text{revenue}}{\text{average total assets}}\right)$$
$$\left(\frac{\text{average total assets}}{\text{average stockholders' equity}}\right)$$

You may also see it presented as follows:

$$\text{ROE} = \left(\begin{array}{c}\text{net}\\\text{profit}\\\text{margin}\end{array}\right)\left(\begin{array}{c}\text{total}\\\text{asset}\\\text{turnover}\end{array}\right)\left(\begin{array}{c}\text{financial}\\\text{leverage}\\\text{ratio}\end{array}\right)$$

The traditional DuPont equation is arguably the most important equation in ratio analysis because it breaks down a very important ratio—ROE—into three key components. If ROE is low, it must be that at least one of the following is true: the company has a poor profit margin, the company has poor asset turnover, or the firm is underleveraged.

The *extended DuPont equation* takes the net profit margin and breaks it down further. The extended DuPont equation can be written as follows:

$$ROE = \left(\frac{\text{net income}}{\text{EBT}}\right)\left(\frac{\text{EBT}}{\text{EBIT}}\right)\left(\frac{\text{EBIT}}{\text{revenue}}\right)\left(\frac{\text{revenue}}{\text{average total assets}}\right)\left(\frac{\text{average total assets}}{\text{average total equity}}\right)$$

You may also see it presented as follows:

$$ROE = \left(\begin{array}{c}\text{tax}\\\text{burden}\end{array}\right)\left(\begin{array}{c}\text{interest}\\\text{burden}\end{array}\right)\left(\begin{array}{c}\text{EBIT}\\\text{margin}\end{array}\right)\left(\begin{array}{c}\text{total asset}\\\text{turnover}\end{array}\right)\left(\begin{array}{c}\text{financial}\\\text{leverage}\end{array}\right)$$

INTRODUCTION TO FINANCIAL STATEMENT MODELING

A sales-based **pro forma company model** consists of projected future financial statements based on an analyst's estimate of a company's future revenues. Steps in creating such a model are as follows:

Step 1: Estimate revenue based on market growth and market share, a trend growth rate, or growth relative to GDP.

Step 2: Estimate COGS based on a percentage of sales or on a more detailed method.

Step 3: Estimate SG&A as either fixed, growing with revenue, or using another technique.

Step 4: Estimate financing costs.

Step 5: Estimate income tax expense and cash taxes.

Step 6: Model the balance sheet based on working capital accounts.

Step 7: Use depreciation and capital expenditures to estimate capital expenditures and net PP&E.

Step 8: Use the completed pro forma income statement and balance sheet to construct a pro forma cash flow statement.

Forecasts may be affected by analysts' behavioral biases. These include **overconfidence bias** (underestimating forecasting errors and having narrower confidence intervals than warranted); **illusion of control bias** (creating overly complex models); **conservatism bias** or **anchoring** (insufficiently changing forecasts when new information arrives); **representativeness bias** (overreliance on known classifications); and **confirmation bias** (seeking out data that affirms an existing opinion and disregarding information that calls it into question).

Forecasts of financial results should consider the competitive environment in which a firm operates and how successful it is in that environment. A framework that analysts commonly use to evaluate a company's competitive position is **Porter's five forces**: threat of new entrants, threat of substitute products, intensity of industry rivalry,

bargaining power of buyers, and bargaining power of suppliers. We will examine these forces in the Equity Investments section of this book.

Changes in input costs can significantly affect earnings. Companies with commodity inputs can hedge their exposure through fixed-price contracts or derivatives. Companies that are vertically integrated (in effect, their own suppliers) are relatively less exposed to input cost risk. For a company that neither hedges input price exposure nor is vertically integrated, an analyst should determine the extent to which an increase in costs can be passed on to customers, as well as the expected effect of price increases on sales volume and revenue. The effects of raising a product's price depend on its elasticity of demand.

A forecast horizon, especially when analyzing cyclical companies, should be long enough that the effects of the current phase of the economic cycle are not driving above-trend or below-trend earnings effects. **Normalized earnings** are expected midcycle earnings, or expected earnings when the current effects of events or cyclicality are no longer affecting them. For a buy-side analyst, the appropriate forecast horizon may simply be the expected holding period for a stock.

A difficult part of an analyst's job is recognizing **inflection points**, those instances when the future will not be like the past. Examples of inflection points include changes in the economic environment or business cycle stage, government regulations, or technology.

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1   Hennie van Greuning and Sonja Brajovic Bratanovic, *Analyzing and Managing Banking Risk: Framework for Assessing Corporate Governance and Financial Risk*, International Bank for Reconstruction and Development, April 2003, p. 300.

2   IFRS 15, *Revenue From Contracts With Customers.*

EQUITY INVESTMENTS

MARKET ORGANIZATION AND STRUCTURE

The three main functions of the financial system are to:

1. Allow entities to save and borrow money, raise equity capital, manage risks, trade assets currently or in the future, and trade based on their estimates of asset values.
2. Determine the returns (i.e., interest rates) that equate the total supply of savings with the total demand for borrowing.
3. Allocate capital to its most efficient uses.

Assets and Markets

Financial assets include securities (stocks and bonds), derivative contracts, and currencies. **Real assets** include real estate, equipment, commodities, and other physical assets.

Debt securities are promises to repay borrowed funds. **Equity securities** represent ownership positions.

Public securities are traded on exchanges or through securities dealers and are subject to regulatory oversight. Securities that are not traded in public markets are referred to as **private securities**. Private securities are often illiquid and not subject to regulation.

Derivative contracts have values that are derived from the values of other assets. **Financial derivative contracts** are based on equities, equity indexes, debt, debt indexes, or other financial contracts. **Physical derivative contracts** derive their values from the values of physical assets such as gold, oil, and wheat.

Markets for immediate delivery are referred to as **spot markets**. Contracts for the future delivery of physical and financial assets include forwards, futures, and options.

The **primary market** is the market for newly issued securities. Subsequent sales of securities are said to occur in the **secondary market**.

Money markets refer to markets for debt securities with maturities of one year or less. **Capital markets** refer to markets for longer-term debt securities and equity securities that have no specific maturity date.

Traditional investment markets refer to those for debt and equity. **Alternative markets** refer to those for hedge funds, commodities, real estate, collectibles,

gemstones, leases, and equipment. Alternative assets often are more difficult to value, illiquid, and require investor due diligence.

Types of Securities

Fixed income securities typically refer to debt securities that are promises to repay borrowed money in the future.

Convertible debt is debt that an investor can exchange for a specified number of equity shares of the issuing firm.

Equity securities represent ownership in a firm and include common stock, preferred stock, and warrants.

- **Common stock** is a residual claim on a firm's assets.
- **Preferred stock** is an equity security with scheduled dividends that typically do not change over the security's life and must be paid before any dividends on common stock may be paid.
- **Warrants** are similar to options in that they give the holder the right to buy a firm's equity shares at a fixed exercise price prior to the warrant's expiration.

Pooled investment vehicles include mutual funds, depositories, and hedge funds. The investor's ownership interests are referred to as *shares, units*, *depository receipts*, or *limited partnership interests*.

- **Mutual funds** are pooled investment vehicles in which investors can purchase shares, either from the fund itself (open-end funds) or in the secondary market (closed-end funds).
- **Exchange-traded funds (ETFs)** and **exchange-traded notes (ETNs)** trade like closed-end funds, but have special provisions for in-kind creation and redemption.
- **Asset-backed securities** represent a claim to a portion of the cash flows from a pool of financial assets such as mortgages, car loans, or credit card debt.
- **Hedge funds** are organized as limited partnerships, and purchase is usually restricted to investors of substantial wealth and investment knowledge.

Contracts

Financial contracts are often based on securities, currencies, commodities, or security indexes (portfolios). They include futures, forwards, options, swaps, and insurance contracts.

Forward contracts are agreements to buy or sell an asset in the future at a price specified in the contract at its inception and are not typically traded on exchanges or in dealer markets.

Futures contracts are similar to forward contracts except that they are standardized as to amount, asset characteristics, and delivery time, and are traded on an exchange.

In a **swap contract**, two parties make payments that are equivalent to one asset or portfolio being traded for another. In a simple *interest rate swap*, floating rate interest

payments are exchanged for fixed-rate payments over multiple settlement dates. A *currency swap* involves a loan in one currency for the loan of another currency for a period of time. An *equity swap* involves the exchange of the return on an equity index or portfolio for the interest payment on a debt instrument.

A **call option** gives the option buyer the right (but not the obligation) to buy an asset. A **put option** gives the option buyer the right (but not the obligation) to sell an asset.

An **insurance contract** pays a cash amount if a future event occurs.

Credit default swaps are a form of insurance that makes a payment if an issuer defaults on its bonds.

Currencies, Commodities, and Real Assets

Currencies are issued by a government's central bank. Some are referred to as **reserve currencies**, which are those held by governments and central banks worldwide and include the dollar and euro, and secondarily the British pound, Japanese yen, and Swiss franc.

Commodities trade in spot, forward, and futures markets. They include precious metals, industrial metals, agricultural products, energy products, and credits for carbon reduction.

Examples of **real assets** are real estate, equipment, and machinery. Although they have been traditionally held by firms for their use in production, real assets are increasingly held by institutional investors both directly and indirectly.

Brokers, Dealers, and Exchanges

Brokers help their clients buy and sell securities by finding counterparties to trades in a cost efficient manner.

Block brokers help with the placement of large trades.

Investment banks help corporations sell common stock, preferred stock, and debt securities to investors. They also provide advice to firms, notably about mergers, acquisitions, and raising capital.

Exchanges provide a venue where traders can meet. Exchanges sometimes act as brokers by providing electronic order matching.

Alternative trading systems (ATS), which serve the same trading function as exchanges but have no regulatory function, are also known as **electronic communication networks** or **multilateral trading facilities**. ATS that do not reveal current client orders are known as *dark pools*.

Dealers facilitate trading by buying for or selling from their own inventory.

Some dealers also act as brokers. **Broker-dealers** have an inherent conflict of interest. As brokers, they should seek the best prices for their clients, but as dealers, their goal is

to profit through prices or spreads. As a result, traders typically place limits on how their orders are filled when they transact with broker-dealers.

Dealers that trade with central banks when the banks buy or sell government securities in order to affect the money supply are referred to as **primary dealers**.

Investment Positions

An investor who owns an asset, or has the right or obligation under a contract to purchase an asset, is said to have a **long position**. A **short position** can result from borrowing an asset and selling it, with the obligation to replace the asset in the future (a short sale). The party to a contract who must sell or deliver an asset in the future is also said to have a short position. In general, investors who are long benefit from an increase in the price of an asset and those who are short benefit when the asset price declines.

In 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. Short sellers hope to profit from a fall in the price of the security or asset sold short. The repayment of the borrowed security or other asset is referred to as "covering the short position."

Margin Transactions

Margin purchase transactions involve paying for part of the cost of a security, a loan for the rest from a broker, and leaving the securities on deposit with the broker as collateral. Currently a maximum of 50% of the purchase price can be borrowed. A minimum of 50% of the purchase price must be deposited in cash which is referred to as the *initial margin*.

The *equity* in a margin account for a long position is the market value of the securities minus the loan amount. At any point in time, the *margin percentage* in an account is the equity in the account as a percentage of the market value of the securities held. *Maintenance margin*, or minimum margin, is the minimum percentage of equity permitted; if the margin percentage falls below this minimum, more cash or securities must be deposited in order to maintain the position.

To calculate the rate of return on a margin transaction, divide the gain or loss on the security position by the margin deposit.

The following formula indicates how to calculate the stock price that will trigger a margin call based on the initial price, P_0 (for a long position).

$$\text{trigger price (margin purchases)} = P_0 \left(\frac{1 - \text{initial margin}\%}{1 - \text{maintenance margin}\%} \right)$$

Bid and Ask Prices

Securities dealers provide prices at which they will buy and sell shares. The **bid price** is the price at which a dealer will buy a security. The **ask** or **offer price** is the price at which a dealer will sell a security. The difference between the bid and ask prices is referred to as the **bid-ask spread** and is the source of a dealer's compensation. The bid and ask are quoted for specific trade sizes (**bid size** and **ask size**).

The quotation in the market is the highest dealer bid and lowest dealer ask from among all dealers in a particular security. More liquid securities have market quotations with bid-ask spreads that are lower (as a percentage of share price) and therefore have lower transactions costs for investors. Traders who post bids and offers are said to *make a market*, while those who trade with them at posted prices are said to *take the market*.

Execution Instructions

The most common orders, in terms of execution instructions, are market or limit orders. A **market order** instructs the broker to execute the trade immediately at the best available price. A **limit order** places a *minimum* execution price on sell orders and a *maximum* execution price on buy orders. The disadvantage of a limit order is that it might not be filled.

Validity Instructions

Validity instructions specify *when* an order should be executed. Most orders are **day orders**, meaning they expire if unfilled by the end of the trading day. Good-till-cancelled orders remain open until they are filled. **Immediate or cancel** orders (also known as **fill or kill** orders) are cancelled unless they can be filled immediately. **Good-on-close** orders are only filled at the end of the trading day. If they are market orders, they are referred to as **market-on-close** orders. These are often used by mutual funds because their portfolios are valued using closing prices. There are also **good-on-open** orders.

Stop (stop loss) orders are not executed unless the stop price has been reached. A **stop sell order** is placed at a "stop" price below the current market price, executes if the stock trades at or below the stop price, and can limit the losses on a long position. A **stop buy order** is placed at a "stop" price above the current market price, executes if the stock trades at or above the stop price, and can limit losses on a short position.

Primary and Secondary Markets

Primary capital markets refers to the markets for newly issued securities, either:

- Initial public offerings (IPOs).
- **Seasoned offerings** (secondary issues).

Secondary financial markets refers to markets where previously issued securities trade.

Market Structures

In **call markets**, orders are accumulated and securities trade only at specific times. Call markets are potentially very liquid when in session because all traders are present, but they are obviously illiquid between sessions. In a call market, all trades, bids, and asks are at prices that are set to equate supply and demand.

In **continuous markets**, trades occur at any time the market is open with prices set either by the auction process or by dealer bid-ask quotes.

There are three main categories of securities markets: *quote-driven markets* where investors trade with dealers, *order-driven markets* where rules are used to match buyers and sellers, and *brokered markets* where investors use brokers to locate a counterparty to a trade.

In **quote-driven markets**, traders transact with dealers (market makers) who post bid and ask prices. Dealers maintain an inventory of securities. Quote-driven markets are thus sometimes called **dealer markets**, **price-driven markets**, or **over-the-counter markets**. Most securities other than stocks trade in quote-driven markets. Trading often takes place electronically.

In **order-driven markets**, orders are executed using trading rules, which are necessary because traders are usually anonymous. Exchanges and automated trading systems are examples of order-driven markets.

In **brokered markets**, brokers find the counterparty in order to execute a trade. This service is especially valuable when the trader has a security that is unique or illiquid. Examples are large blocks of stock, real estate, and artwork. Dealers typically do not carry an inventory of these assets and there are too few trades for these assets to trade in order-driven markets.

Characteristics of a Well-Functioning Financial System

A market is said to be **complete** if:

- Investors can save for the future at fair rates of return.
- Creditworthy borrowers can obtain funds.
- Hedgers can manage their risks.
- Traders can obtain the currencies, commodities, and other assets they need.

If a market can perform these functions at low trading costs (including commissions, bid-ask spreads, and price impacts) it is said to be **operationally efficient**. If security prices reflect all public information associated with fundamental value in a timely fashion, then the financial system is **informationally efficient**. A well-functioning financial system has complete markets that are operationally and informationally efficient, with prices that reflect fundamental values. Furthermore, in informationally efficiently markets, capital is allocated to its most productive uses. That is, markets are also **allocationally efficient**.

SECURITY MARKET INDEXES

A **security market index** is used to represent the performance of an asset class, security market, or segment of a market. Individual securities are referred to as the **constituent securities** of an index.

A price index is based on security prices, and the percentage change in a price index is referred to as its **price return**. The price return on an index plus the return from dividends paid on index stocks is referred to as the **total return** of an index.

Index Weighting Methods

A **price-weighted index** is the arithmetic average of the prices of its constituent securities. The divisor of a price-weighted index must be adjusted for stock splits and for changes in the composition of the index so that the index value is unaffected by such changes.

$$\text{price-weighted index} = \frac{\text{sum of stock prices}}{\text{number of stocks in index}}$$

A given percentage price change on a high-priced stock will have a greater impact on index returns than it will on a low-priced stock. Weights based on prices are considered somewhat arbitrary, and the weights of all index stocks must be adjusted when an index stock splits. A portfolio with equal numbers of shares of each index stock will match the performance of a price-weighted index.

An **equal-weighted index** is calculated as the arithmetic average of the returns of index stocks and would be matched by the returns on a portfolio that had equal dollar amounts invested in each index stock. When stock prices change, however, portfolio weights change and the portfolio must be rebalanced periodically to restore equal weights to each index security. Compared to a price-weighted index, an equal-weighted index places more (less) weight on the returns of low-priced (high-priced) stocks. Compared to a market capitalization-weighted index, an equal-weighted index places more (less) weight on returns of stocks with small (large) market capitalizations.

In a **market capitalization-weighted index** (or **value-weighted index**), returns are weights based on the market capitalization of each index stock (current stock price times the number of shares outstanding) as a proportion of the total market capitalization of all the stocks in the index. A market capitalization-weighted index does not need to be adjusted when a stock splits or pays a stock dividend.

$$\text{current index value} = \frac{\text{current total market value of index stocks}}{\text{base year total market value of index stocks}} \times \text{base year index value}$$

A **float-adjusted market capitalization-weighted index** is constructed like a market capitalization-weighted index. The weights, however, are based on the proportionate value of each firm's shares that are available to investors to the total market value of the shares of index stocks that are available to investors. Firms with relatively large

percentages of their shares held by controlling stockholders will have less weight than they have in an unadjusted market-capitalization index.

The advantage of market capitalization-weighted indexes of either type is that index security weights represent proportions of total market value.

An index that uses **fundamental weighting** uses weights based on firm fundamentals, such as earnings, dividends, or cash flow. An advantage of a fundamental-weighted index is that it avoids the bias of market capitalization-weighted indexes toward the performance of the shares of overvalued firms and away from the performance of the shares of undervalued firms.

Rebalancing and Reconstitution

Rebalancing refers to periodically adjusting the weights of securities in an index or portfolio to their target weights, and it is important for equal-weighted indexes as portfolio weights change as prices change.

Index **reconstitution** occurs when the securities that make up an index are changed. Securities are deleted if they no longer meet the index criteria and are replaced by securities that do.

Index Types

Equity indexes can be classified as follows:

- *Broad market index*. Provides a measure of a market's overall performance and usually contains more than 90% of the market's total value.
- *Multi-market index*. Typically constructed from the indexes of markets in several countries and is used to measure the equity returns of a geographic region, markets based on their stage of economic development, or the entire world.
- *Multi-market index with fundamental weighting*. Uses market capitalization-weighting for the country indexes, but then weights the country index returns in the global index by a fundamental factor (e.g., GDP).
- *Sector index*. Measures the returns for an industry sector such as health care, financial, or consumer goods firms.
- *Style index*. Measures the returns to market capitalization and value or growth strategies. Some indexes reflect a combination of the two (e.g., small-cap value fund).

Many different **fixed income indexes** are available to investors. The fixed income security universe is much broader than the universe of stocks. Also, unlike stocks, bonds mature and must be replaced in fixed income indexes. As a result, turnover is high in fixed income indexes.

Because fixed income securities often trade infrequently, index providers must often estimate the value of index securities from recent prices of securities with similar characteristics.

Illiquidity, transactions costs, and high turnover of constituent securities make it both difficult and expensive for fixed income portfolio managers to replicate a fixed income index.

Commodity indexes are based on futures contract prices for commodities such as grains, livestock, metals, and energy. Different indexes have significantly different commodity exposures and risk and return characteristics.

Real estate indexes can be constructed using returns based on appraised values, repeat property sales, or the performance of Real Estate Investment Trusts (REITs).

Most **hedge fund indexes** equally weight the returns of the hedge funds included in the index.

Hedge funds are largely unregulated and are not required to report their performance to index providers. It is often the case that those funds that report are the funds that have been successful, as the poorly performing funds do not choose to report their performance. This results in an upward bias in index returns, with hedge funds appearing to be better investments than they actually are.

MARKET EFFICIENCY

An **informationally efficient capital market** is one in which the current price of a security fully and quickly reflects all available information about that security without bias.

In a perfectly efficient market, investors should use a passive investment strategy (i.e., buying a broad market index of stocks and holding it) because active investment strategies will underperform on average by the amount of transactions costs and management fees. However, to the extent that market prices are inefficient, active investment strategies can generate positive risk-adjusted returns.

Market efficiency increases with:

- Larger numbers of market participants.
- More information available to investors.
- Fewer impediments to trading such as restrictions on short sales.
- Lower transactions costs.

Forms of the Efficient Markets Hypothesis

1. The *weak form* of the hypothesis states that current stock prices fully reflect all price and trading volume (market) information. If weak-form efficiency holds, purely technical analysis has no value.

2. The *semistrong form* of the hypothesis holds that public information cannot be used to beat the market. If stock prices are semistrong-form efficient, neither technical nor fundamental analysis has any value in stock selection.

3. *Strong-form* efficiency states that stock prices fully reflect all information, both public and private. If markets were strong-form efficient, even private (inside)

information would be of no value in selecting securities.

Identified Market Pricing Anomalies

A **market anomaly** is something that would lead us to reject the hypothesis of market efficiency.

- The **January effect** or **turn-of-the-year effect** is the finding that during the first five days of January, stock returns, especially for small firms, are significantly higher than they are the rest of the year.
- The **overreaction effect** refers to the finding that firms with poor stock returns over the previous three or five years (losers) have better subsequent returns than firms that had high stock returns over the prior period.
- **Momentum effects** have also been found where high short-term returns are followed by continued high returns.
- The **size effect** refers to evidence that small-cap stocks outperform large-cap stocks. This effect could not be confirmed in later studies, suggesting that either investors had traded on, and thereby eliminated, this anomaly or that the initial finding was simply a random result for the time period examined.
- The **value effect** refers to the finding that value stocks have outperformed growth stocks. Some researchers attribute the value effect to greater risk of value stocks that is not captured in the risk adjustment procedure used in the studies.

The majority of the evidence suggests that reported anomalies are not violations of market efficiency but are due to the methodologies used in the tests of market efficiency. Furthermore, both underreaction and overreaction have been found in the markets, meaning that prices are efficient on average. Other explanations for the evidence of anomalies are that they are transient relations, too small to profit from, or simply reflect returns to risk that the researchers have failed to account for.

Portfolio management based on previously identified anomalies will likely be unprofitable. Investment management based solely on anomalies has no sound economic basis.

Behavioral Finance

Behavioral finance examines investor behavior, its effect on financial markets, how cognitive biases may result in anomalies, and whether investors are rational.

- **Loss aversion** refers to the tendency for investors to dislike losses more than they like gains of equal amounts.
- **Investor overconfidence.** Securities will be mispriced if investors overestimate their ability to value securities. However, it appears that this mispricing may be hard to predict, may only be temporary, may not be exploitable for abnormal profits, and may only exist for high-growth firms.
- **Representativeness.** Investors assume good companies or good markets are good investments.

- **Mental accounting.** Investors classify different investments into separate mental accounts instead of viewing them as a total portfolio.
- **Conservatism.** Investors react slowly to changes.
- **Narrow framing.** Investors view events in isolation.

Although investor biases may help explain the existence of security mispricing and anomalies, it is not clear that they are predictable enough so that abnormal profits could be earned by exploiting them.

OVERVIEW OF EQUITY SECURITIES
Types of Equity Securities

- **Common shares** represent a residual claim (after the claims of debt holders and preferred stockholders) on firm assets.
- **Preference shares** (or **preferred stock**) have features of both common stock and debt. As with common stock, preferred stock dividends are not a contractual obligation and the shares do not mature. Like debt, preferred shares typically make fixed periodic payments to investors and do not usually have voting rights. Preference shares may be callable, giving the firm the right to repurchase the shares at a specified price. They may also be putable, giving the shareholder the right to sell the preference shares back to the issuer at a specified price.
- **Cumulative preference shares** require that current period dividends and any dividends that were not paid must be made up before common shareholders can receive dividends. The dividends of **non-cumulative preference shares** do not accumulate over time when they are not paid, but dividends for the current period must be paid before common shareholders can receive dividends.
- Investors in **participating preference shares** receive extra dividends if firm profits exceed a predetermined level and may receive a value greater than the par value of the preferred stock if the firm is liquidated. **Non-participating preference shares** have a claim equal to par value in the event of liquidation and do not share in firm profits.
- **Convertible preference shares** can be exchanged for common stock at a conversion ratio determined when the shares are originally issued.

Private Equity

Private equity is usually issued to institutional investors via private placements. Private equity markets are smaller than public markets but are growing rapidly.

Compared to public equity, private equity has the following characteristics:

- Less liquidity because no public market for the shares exists.
- Share price is negotiated between the firm and its investors, not determined in a market.
- More limited firm financial disclosure because there is no government or exchange requirement to do so.

- Lower reporting costs because of less onerous reporting requirements.
- Potentially weaker corporate governance because of reduced reporting requirements and less public scrutiny.
- Greater ability to focus on long-term prospects because there is no public pressure for short-term results.
- Potentially greater return for investors once the firm goes public.

The three main types of private equity investments are venture capital, leveraged buyouts, and private investments in public equity.

Voting Rights

In a **statutory voting** system, each share held is assigned one vote in the election of each member of the board of directors. Under **cumulative voting**, shareholders can allocate their votes to one or more candidates as they choose.

A firm may have different classes of common stock (e.g., "Class A" and "Class B" shares). One class may have greater voting power and seniority if the firm's assets are liquidated. The classes may also be treated differently with respect to dividends, stock splits, and other transactions with shareholders.

Foreign Equity

Direct investing in the securities of foreign companies simply refers to buying a foreign firm's securities in foreign markets. Some obstacles to direct foreign investment are that:

- The investment and return are denominated in a foreign currency.
- The foreign stock exchange may be illiquid.
- The reporting requirements of foreign stock exchanges may be less strict, impeding analysis.
- Investors must be familiar with the regulations and procedures of each market in which they invest.

Methods for Investing in Foreign Companies

Depository receipts (DRs) trade like domestic shares but represent an interest in shares of a foreign firm that are held by a bank in the country in which they trade. When the foreign firm is involved with the issue, they are termed **sponsored DRs**, and investors receive the voting rights for the shares their DRs represent. When the foreign firm is not involved, they are termed **unsponsored DRs**, face less strict reporting requirements, and the depository bank retains the voting rights on the shares.

Global depository receipts (GDRs) are issued outside the U.S. and the issuer's home country, are traded primarily on the London and Luxembourg exchanges, are usually denominated in U.S. dollars, and can be sold to U.S. institutional investors.

American depository receipts (ADRs) are denominated in U.S. dollars and trade in the United States.

Global registered shares (GRS) are traded in different currencies on stock exchanges around the world.

A **basket of listed depository receipts (BLDR)** is an exchange-traded fund (ETF) that is a collection of DRs. ETF shares trade in markets just like common stocks.

Equity Risk and Return Characteristics

The risk of equity securities is most commonly measured as the standard deviation of returns. Preferred shares are less risky than common stock because preferred shares pay a known, fixed dividend. Because they are less risky, preferred shares have lower average returns than common shares.

Cumulative preferred shares have less risk than non-cumulative preferred shares.

For both common and preferred shares, putable shares are less risky and callable shares are more risky compared to shares with neither option.

Callable shares are the most risky because if the market price rises, the firm can call the shares, limiting the upside potential of the shares.

Market and Book Value of Equity

A firm's **book value of equity** is the value of the firm's assets on the balance sheet minus its liabilities.

The **market value of equity** is the total value of a firm's outstanding equity shares based on market prices and reflects the expectations of investors about the firm's future performance.

A key ratio used to determine management efficiency is the **accounting return on equity**, usually referred to simply as the **return on equity (ROE)**:

$$\text{ROE}_t = \frac{\text{NI}_t}{\text{average } BV_t} = \frac{\text{NI}_t}{(BV_t + BV_{t-1})/2}$$

A firm's **cost of equity** is the expected equilibrium total return (including dividends) on its shares in the market.

COMPANY ANALYSIS: PAST AND PRESENT

A **company research report** includes an analyst's valuation and investment recommendations, based on the company's projected earnings, cash flows, and financial position. An initial research report for external distribution ("initiating coverage") is likely to be thorough, followed by subsequent reports that are less thorough. Key items typically included in an initial company research report are as follows:

- Front matter such as the issuer name, buy/hold/sell recommendation, target buy/sell prices, and legal disclosures

- Rationales for the recommendation
- Company description, including its business model
- Industry overview and competitive positioning
- Financial analysis and model, including past and pro forma financial statements
- Valuation
- ESG factors
- Upside and downside risks and their valuation impact

A subsequent company research report typically includes the front matter, recommendation and rationales for any changes, analysis of new information, and changes to the valuation and risk factors.

The **business model** considers a company's products and services, customers, sales channels, pricing and payment terms, and suppliers and other key relationships. Analysts use four general types of information to determine a company's business model:

1. Information directly from the company
2. Publicly available third-party information
3. Proprietary third-party information
4. Proprietary primary research performed or commissioned by the analyst

A company's **revenue drivers** can be analyzed on a bottom-up or top-down basis. In a bottom-up analysis, revenue is broken down into specific drivers such as price and volume, business segments, or geography. In a top-down analysis, macro variables such as market share or GDP growth serve as drivers of revenue. Analysts often use both approaches.

Revenues are limited by a company's **pricing power**, the extent to which it can determine its selling prices without hurting sales. Pricing power depends on the industry structure as well as the company's competitive position.

Highly competitive price-taker markets usually result in returns being close to the cost of capital (zero economic profit) unless a company is a **low-cost producer** that can sustain its cost advantage over time. Such markets typically have an absence of product differentiation, many substitutes, few or no barriers to entry, little or no brand loyalty, and low or no switching costs. **Commoditization** describes an industry that is evolving toward this state.

Less competitive markets (monopoly, oligopoly, monopolistic competition) are characterized by greater product differentiation, few or no substitutes, high barriers to entry, high customer loyalty, and high switching costs. In such markets, companies may have some or considerable pricing power. When prices rise more than costs over time, this demonstrates a company's ability to transfer those costs to its customers without losing sales. This is more likely in a market that exhibits high switching costs or for a product that does not have good substitutes.

A top-down approach considers how external factors affect revenue, including market size and the company's market share. **Market size** refers to the total revenue of all the companies in the market. **Market share** is the ratio of the company's revenue to the market size.

A company's **operating costs** are driven by business model and company size. We can categorize operating costs by their relationship with output (fixed or variable) or by their nature or function (as they are typically shown in financial statements). In terms of fixed and variable costs, we can state the following:

operating profit = [Q × (P − VC)] − FC

where:
Q = number of units sold
P = price per unit
VC = variable costs per unit
FC = fixed costs in total

The term (P − VC) is the **contribution margin** per unit. A company will earn profits when the contribution margin per unit is positive and the number of units sold is large enough that the total contribution margin is greater than fixed costs.

Operating leverage results from fixed operating costs. The larger the proportion of fixed operating costs, the more rapidly operating profits will increase or decrease with a given change in quantity sold. The **degree of operating leverage** is the percent change in operating profit that results from a given percent change in sales.

Common metrics used for operating profitability include gross profit; earnings before interest, taxes, depreciation, and amortization (EBITDA); and earnings before interest and taxes (EBIT). EBIT is often referred to as operating profit.

- Gross profit = revenue − cost of sales
- EBITDA = gross profit − operating expenses
- EBIT = EBITDA − depreciation and amortization

We may divide each of these measures by revenue to produce the ratios gross margin, EBITDA margin, and EBIT margin (or operating margin).

Economies of scale occur when increasing output decreases unit costs. **Economies of scope** occur when adding divisions or product lines results in decreasing unit costs.

Evaluating a company's capital structure involves determining whether its opportunities exceed the risks. To assess capital structure risks, analysts use measures such as leverage ratios, coverage ratios, and the **degree of financial leverage (DFL)**, which is the percent change in net income that results from a given percent change in operating income. DFL increases when a company adds fixed interest expense by borrowing.

INDUSTRY AND COMPETITIVE ANALYSIS

Industry and competitive analysis is a macro approach to analyzing what drives industry size, profits, and market share, and determining a company's position within

its industry.

Whether a company can sustain economic profits over time depends largely on its industry. Competition tends to drive company profitability toward an industry base rate over time. The role of industry and competitive analysis is to determine an industry's base rate of profitability and what factors affect that rate.

Within a given industry, differences in profitability result from business models, company size, and competitive strategy. While industry factors limit companies' profitability, company-specific factors tend to be more to blame when they underperform.

Industry and competitive analysis involves five steps:

1. *Define the industry*, often using third-party classification systems.
2. *Survey the industry* in terms of its size, growth rate, profitability, and market share trends.
3. *Analyze the industry structure* using a framework such as Porter's five forces.
4. *Examine external influences* such as political, economic, social, technological, legal, and environmental (PESTLE).
5. *Analyze companies' competitive strategies* and each company's competitive advantages.

1. Industry Classifications

One way to group companies into an industry is by the products and services they offer. Classification systems that are grouped by products and services usually classify firms by their principal business activity. Commercial industry classifications include the Global Industry Classification Standard (GICS), the Industry Classification Benchmark (ICB), and the Refinitiv Business Classification (TRBC). The top level for all three systems consists of 11 common sectors or industries, as follows:

1. Energy
2. Financials
3. Basic materials
4. Information technology
5. Industrials
6. Telecommunications services
7. Consumer discretionary/cyclicals
8. Utilities
9. Consumer staples/noncyclicals
10. Real estate
11. Health care

To recognize natural business changes over time, classification system providers update their groupings periodically. This can disrupt the continuity of industry-level

statistics, and it may be necessary to revise historical data to be consistent with current grouping systems. Some of the industry groupings may be either too wide or too narrow for an analyst's specific needs. When this occurs, an analyst might choose to use different classification tiers and possibly alter the groupings on a subjective basis.

Other ways to group companies include by geography, by financial measures such as market capitalization, by ESG factors, or by business cycle sensitivity. A **cyclical company** is one whose earnings are highly dependent on the stage of the business cycle. A **defensive company** produces goods and services for which demand is relatively stable over the business cycle.

2. Industry Size and Growth

Industry size is total annual sales of the product, which is not always the same as total annual sales of all the companies in the industry because some of the companies may operate in multiple product lines. If an industry includes significant sales from private companies and unincorporated businesses, industry size is usually approximated using government economic indicators or independent third-party data.

An industry growth rate can be calculated as an annual rate each year or as a compound annual growth rate over several years. Analysts classify industry groups broadly as growth industries or mature industries. **Growth industries** are those with product markets that have considerable growth potential, which is often related to new technology. **Mature industries** have little or no growth potential remaining in their markets, with industry growth rates in line with the general economy or declining.

Industry profitability should be based on return on invested capital (ROIC), which is an after-tax metric independent of capital structure. Because it is often impractical to estimate ROIC for private companies, analysts may use the returns of publicly traded companies and assume they are similar for private companies.

Market share is a company's annual revenues divided by the industry size. The trend in a company's market share over time is crucial for determining whether its products are viewed favorably by customers. Acquiring a competitor increases a company's market share, but closer investigation is needed to determine whether a company is increasing its market share net of acquisitions.

3. Porter's Five Forces

The industry structure analysis framework developed by Michael Porter[1] describes five forces that determine industry competition and long-run profitability. If some or all of them are strong, firms will likely earn zero or close to zero economic profits.

1. *Rivalry among existing competitors* increases when many firms of relatively equal size compete within an industry. Slow growth leads to competition as firms fight for market share. High fixed costs lead to price decreases as firms try to operate at full capacity. Industries with undifferentiated products or barriers to exit tend to have high levels of competition.

2. *Threat of entry* is high when barriers to entry are low. Industries that have significant barriers to entry (e.g., large capital outlays for facilities, economies of scale) will find it easier to maintain premium pricing.

3. *Threat of substitutes* limits the profit potential of an industry. Substitutes increase the elasticity of demand and limit the prices firms can charge. Commodity-like products have high levels of competition and low profit margins. More differentiated products have a lower threat of substitutes and less price competition.

4. *Power of buyers* to bargain for lower prices or higher quality influences industry profitability. The fewer and larger the buyers, the more bargaining power they tend to have.

5. *Power of suppliers* to raise prices or limit supply influences industry profitability. Suppliers are more powerful if there are just a few of them and their products are scarce.

4. PESTLE Analysis

PESTLE analysis considers the external factors that may affect an industry: political, economic, social, technological, legal, and environmental.

- *Political influences* have an important and widespread effect on businesses through various channels, including taxes and regulation.

- *Economic influences* include the business cycle, structural trends (e.g., productivity, labor force growth), interest rates and credit availability, and inflation.

- *Social influences* relate to trends in how people work, play, spend their money, and conduct their lives. These factors are particularly important for industries that sell directly to individuals.

- *Technological influences* can change an industry dramatically if new or improved products make existing products redundant. Technological innovations can be sustaining or disruptive. **Sustaining innovation** refers to improvements in a product over time that do not fundamentally change its nature. **Disruptive innovation** creates a new market or enters an existing market and creates value in a new way.

- *Legal influences* consider changes in laws and regulations that present both business risks and opportunities.

- *Environmental influences* such as concerns about sustainability continue to gain importance as a factor in industry growth and profitability.

5. Competitive Strategies

Porter has identified three types of competitive strategies: cost leadership, product or service differentiation, and focus. According to Porter, a firm must choose one of these to compete effectively.

In a **cost leadership strategy**, the firm seeks to have the lowest costs of production in its industry, offer the lowest prices, and generate enough volume to make a superior

return. The strategy can be used defensively to protect market share, or offensively to gain market share.

In a **differentiation strategy**, the firm's products and services should be distinctive in terms of type, quality, or delivery. For success, the firm's cost of differentiation must be less than the price premium that buyers are willing to pay for it. The price premium should also be sustainable over time.

A **focus strategy** refers to targeting a niche market. Executing a focus strategy can include aspects of both cost leadership and differentiation.

COMPANY ANALYSIS: FORECASTING

The four key **forecast objects** are as follows:

1. *Financial statement lines with clear drivers* are those that can be forecast based on their relationships with other variables.
2. *Financial statement items without clear drivers* can be forecast directly by using estimates from management or by adjusting amounts from prior years.
3. *Summary measures* are those that combine several financial statement line items, for example, earnings per share or free cash flow.
4. *Ad hoc items* are discrete events a company's financial statements do not yet reflect.

The following four forecast approaches can be used individually or combined:

1. Base forecasts on historical results.
2. Assume results will converge to a historical base rate.
3. Use management guidance.
4. Use other methods to make discretionary forecasts.

Using actual past results as the starting point and assuming the results will continue in the future works best for companies and industries that are noncyclical or in the mature stage. The major drawback is that past conditions might not be the same in the future. For companies operating in a cyclical industry, analysts should make multiyear forecasts that account for the full business cycle.

An analyst might assume a forecast object will converge to an industry average or median growth rate. This base rate should be computed over a sufficiently long and representative time period. The approach makes sense for established industries where few structural changes or external disruptions are expected. For industries that are new or rapidly changing, determining a base rate may be difficult and assuming forecast objects will converge to it might not be appropriate.

Because management has internal and industry information that is unavailable to the public, analysts pay close attention to management's guidance. Guidance is rarely presented as a point estimate but rather as a range. It may not be prudent to use the midpoint of the range to gauge management expectations because managements have been known to shade their revenue growth ranges downward and their expense growth ranges upward to give the impression that they have exceeded expectations. Using

management guidance is best when management has a proven history of providing reasonable estimates.

Discretionary forecasts can be derived from surveys, models, or probability distributions. They are most appropriate when the other approaches tend to fall short, such as for companies in cyclical industries, with few or no peers, that do not offer guidance, or are in a significant transition of their operations.

The appropriate forecast horizon depends on factors such as an investor's or portfolio manager's time horizon, whether the industry is cyclical, or factors specific to a company. Changes a company makes to improve its operations may require a long enough forecast horizon to allow the benefits of these changes to be measurable.

Nonrecurring items should not be included in a forecast object, but rather should be analyzed on a stand-alone basis. Nonrecurring items disclosed by management typically focus on one-time events. However, if a company cites "nonrecurring" items regularly, analysts might reasonably expect this trend to continue and incorporate them into their forecasts.

Forecasts should not result in a single point estimate. Instead, an analyst should perform scenario analysis with multiple alternative assumptions to examine the sensitivity of a forecast to changes in its assumptions.

Forecasting Revenue

Top-down revenue analysis starts with expectations about a macro variable, often expected GDP growth or expected growth in the market for a particular good or service. Bottom-up revenue analysis starts with an individual company or its reportable segments. Incorporating elements of both top-down and bottom-up approaches can highlight any inconsistencies in their assumptions.

When forecasting revenues relative to GDP growth, an analyst may model the relationship between nominal GDP and company sales, or use the real GDP growth rate to forecast quantity and an inflation forecast to estimate prices. Alternatively, an analyst may begin with an estimate of industry sales, then estimate company revenue as a percentage of industry sales based on the company's expected market share.

Examples of bottom-up approaches include:

- Forecasting sales volume and price separately, based on available company information, then multiplying them to generate a revenue forecast.
- Forecasting revenue for separate products, business lines, geographic areas, or reporting segments.
- Forecasting revenue for a company's existing locations, and adding a separate forecast for its newly opened locations.
- Forecasting balance sheet items and the return the company will earn on them.

Forecasting Expenses and Working Capital

Because cost of sales is closely related to revenue, analysts typically estimate it as a percentage of expected revenue:

$$\text{Forecast COGS} = (1 - \text{gross margin}) \times \text{estimate of future revenue}$$

Changes in a company's market share can signal changes in its gross margin. If a company is losing market share because cheaper and more attractive substitutes are becoming available, this should put pressure on the company's gross margins. If a company is gaining market share by introducing a new product that does not yet have substitutes available, this should enable it to increase its gross margin. It can be worthwhile to examine the gross margins of a firm's competitors to check the reasonableness of gross margin estimates. In some cases, differences between firms' business models may be the underlying reason for differences in gross margins.

Selling, general, and administrative operating expenses are less sensitive to changes in sales volume compared to the cost of sales. Their fixed cost component might be modeled using a growth rate that accounts for expected inflation. Selling and distribution costs may be more directly related to sales volume.

Three balance sheet items comprise working capital forecasts: accounts receivable, inventories, and accounts payable.

- We can forecast receivables turnover as forecast annual revenues / forecast average receivables, or we can forecast accounts receivable as days' sales outstanding × (forecast revenues / 365).
- We can forecast inventory turnover as forecast COGS / forecast average inventory, or we can forecast inventory as days' inventory on hand × (forecast COGS / 365).
- We can forecast payables turnover as forecast annual purchases / forecast annual payables, or we can forecast accounts payable as days' payables outstanding × (forecast COGS / 365).

Forecasting Capital Investment

Forecasting investments in tangible and intangible assets requires an analyst to use the cash flow statement to determine assets acquired and disposed of, and the income statement to determine depreciation and amortization expense. Capital expenditures should be divided into two categories: maintenance and growth.

- Historical depreciation is usually the starting point to forecast capital spending for maintenance. An analyst should account for the expected inflation rate when estimating maintenance expenditures. Depreciation and amortization can be forecast using net book value of property, plant, and equipment and the estimated useful life of the assets.
- Forecasting capital expenditures for growth requires an analyst to understand management's future business and revenue growth strategies.

Forecasting a firm's capital structure is often based on its leverage ratios. Analysts should note any borrowing requirements caused by expected capital expenditures. Company management may provide information about their target capital structure.

EQUITY VALUATION: CONCEPTS AND BASIC TOOLS

Categories of Equity Valuation Models

In **discounted cash flow models** (or **present value models**), a stock's value is estimated as the present value of cash distributed to shareholders (*dividend discount models*) or the present value of cash available to shareholders after the firm meets its necessary capital expenditures and working capital expenses (*free cash flow to equity models*).

There are two basic types of **multiplier models** (or **market multiple models**) that can be used estimate intrinsic values. In the first type, the ratio of stock price to such fundamentals as earnings, sales, book value, or cash flow per share is used to determine if a stock is fairly valued. For example, the price to earnings (P/E) ratio is frequently used by analysts.

The second type of multiplier model is based on the ratio of **enterprise value** to either earnings before interest, taxes, depreciation, and amortization (EBITDA) or revenue. Enterprise value is the market value of all a firm's outstanding securities minus cash and short-term investments. Common stock value can be estimated by subtracting the value of liabilities and preferred stock from an estimate of enterprise value.

In **asset-based models**, the intrinsic value of common stock is estimated as total asset value minus liabilities and preferred stock. Analysts typically adjust the book values of the firm's assets and liabilities to their fair values when estimating the market value of its equity with an asset-based model.

Dividends

Cash dividends transfer cash from the firm to its shareholders, reducing the company's assets and equity. The following are types of cash dividends.

- **Regular dividend.** This is typically paid on a schedule (e.g., quarterly).
- **Extra (or special) dividend.** This is a one-time cash payment to shareholders.

Dividend Payment Chronology

- **Declaration date.** The board of directors approves the dividend payment.
- **Ex-dividend date.** This happens one or two days before the record date depending on the settlement period for trades. It is the first day that a buyer of shares will not receive the next dividend payment. If other things are equal, the market value of shares will fall by the amount of the dividend on the ex-dividend date, leaving shareholder wealth unchanged.
- **Holder-of-record date.** Those who own shares on this date will receive the upcoming dividend.

- **Payment date.** Dividends are paid by check or electronic transfer.

Stock Dividends, Stock Splits, and Reverse Stock Splits

These actions change the number of shares outstanding, but the share price changes proportionately, so a shareholder's wealth and proportional ownership stake are not affected.

- **Stock dividend.** Shareholders receive additional shares of stock (e.g., with a 10% stock dividend, each shareholder receives 10% more shares).
- **Stock split.** Each "old" share is replaced by more than one "new" share (e.g., with a 2-for-1 stock split, investors receive two new shares to replace each share owned).
- **Reverse stock split.** Replaces "old" shares with a smaller number of "new" shares (e.g., with a 1-for-5 reverse stock split, investors receive one new share to replace each five shares they own).

Share Repurchases

A company can buy back shares of its outstanding common stock, an alternative to distributing cash to equity holders through cash dividends. Taxes aside, neither cash dividends nor share repurchases affect the shareholder's wealth.

Preferred Stock Valuation

The dividend is fixed and the income stream (dividends) theoretically continues forever so we use the formula for the present value of a perpetuity.

$$\text{preferred stock value} = \frac{D_p}{k_p}$$

Dividend Discount Models (DDM)

All of the valuation models here are based on taking the present value of expected future cash flows.

One-year holding period:

For the purposes of this valuation model, we assume that dividends are received annually at the end of the year; so, if you hold the stock one year, you will receive the dividend and the estimated sale price P_1. To calculate the present value of these cash flows one year from now:

$$\text{one-period model: } P_0 = \frac{\left(\begin{array}{c}\text{dividend to}\\\text{be received}\end{array}\right)}{\left(1 + k_e\right)} + \frac{\left(\begin{array}{c}\text{year-}\\\text{end price}\end{array}\right)}{\left(1 + k_e\right)} \quad \text{or}$$

$$P_0 = \frac{D_1 + P_1}{\left(1 + k_e\right)}$$

Be sure to use the *expected* dividend, D_1, in the calculation.

Multiple-year holding periods:

With a multiple-year holding period, estimate all the dividends to be received as well as the expected selling price at the end of the holding period.

n-period model:
$$P_0 = \frac{D_1}{(1 + k_e)^1} + \frac{D_2}{(1 + k_e)^2} + \dots + \frac{D_n}{(1 + k_e)^n} + \frac{P_n}{(1 + k_e)^n}$$

Infinite period model (constant growth model):

We can take the present value of an infinite stream of dividends that grows at a *constant rate* as long as the assumed growth rate, g_c, is less than the appropriate discount rate, k_e.

constant growth model: $P_0 = \frac{D_1}{k_e - g_c}$, note that $D_1 = D_0(1 + g_c)$

Other things held constant, the higher the growth rate and the higher the dividend, the greater the present value.

In practice, however, increasing the dividend will decrease retained earnings and the firm's sustainable growth rate, so we cannot assume that a firm that increases its dividend will increase firm value.

Temporary supernormal growth or multi-stage DDM:

This model assumes that a company's dividends will grow at a high rate for a period of time before declining to a constant growth rate. To calculate the stock price, discount each of the dividends during the high growth period individually and then use the formula for the infinite growth model to find the terminal stock value at the end of the supernormal growth period. Finally, add together the present values of all dividends and of the terminal stock value.

$$\text{value}_{\text{supernormal growth}} = \frac{D_1}{(1 + k_e)} + \frac{D_2}{(1 + k_e)^2} + \dots + \frac{D_n}{(1 + k_e)^n} + \frac{P_n}{(1 + k_e)^n}$$

D_n is the last dividend of the supernormal growth period.

$$P_n = \frac{D_{n+1}}{k_e - g_c}, \text{ where } D_{n+1} \text{ is expected to grow at the constant/}$$
normal rate

Earnings multiplier model (P/E ratio):

Understand how the DDM relates to the fundamental P/E ratio.

Start with the DDM and then divide both sides of the equation by next year's projected earnings, E_1:

$$\text{If constant growth DDM holds: } P_0 = \frac{D_1}{k-g} \text{ then } \frac{P_0}{E_1} = \frac{D_1/E_1}{k-g}$$

Other things held constant, the P/E ratio:

- Increases with D_1/E_1, the dividend payout ratio.
- Increases with g, the growth rate of dividends.
- Decreases with increases in k, the required rate of return.
- Increases with ROE, since g = ROE × retention ratio.

ROE = (net income / sales)(sales / total assets)(total assets / equity)

Problems with using P/E analysis:

- Earnings are historical accounting numbers and may be of differing quality.
- Business cycles may affect P/E ratios. Currently reported earnings may be quite different from expected future earnings (E_1).
- As with the infinite growth model, when k < g, the P/E implied by the DDM is meaningless.

Estimating the Growth Rate in Dividends

To estimate the growth rate in dividends, the analyst can use three methods:

1. Use the historical growth in dividends for the firm.
2. Use the median industry dividend growth rate.
3. Estimate the sustainable growth rate.

The **sustainable growth rate** is the rate at which equity, earnings, and dividends can continue to grow indefinitely assuming that ROE is constant, the dividend payout ratio is constant, and no new equity is issued.

sustainable growth = (1 − dividend payout ratio) × ROE

The quantity (1 – dividend payout ratio) is referred to as the **retention rate**, the proportion of net income that is not paid out as dividends and goes to retained earnings, thus increasing equity.

Some firms do not currently pay dividends but are expected to begin paying dividends at some point in the future. A firm may not currently pay a dividend because it is in financial distress and cannot afford to pay out cash, or because the return the firm can earn by reinvesting cash is greater than what stockholders could expect to earn by investing dividends elsewhere.

For firms that do not currently pay dividends, an analyst must estimate the amount and timing of the first dividend in order to use the Gordon growth model. Because these parameters are highly uncertain, the analyst should compare the estimated value from the Gordon growth model with value estimates from other models.

Using Price Multiples to Value Equity

Because the dividend discount model is very sensitive to its inputs, many investors rely on other methods. In a **price multiple** approach, an analyst compares a stock's price multiple to a benchmark value based on an index, industry group of firms, or a peer group of firms within an industry.

Common price multiples used for valuation include price-to earnings, price-to-cash flow, price-to-sales, and price-to-book value ratios. Many of these ratios have been shown to be useful for predicting stock returns, with low multiples associated with higher future returns.

When we compare a price multiple, such as P/E, for a firm to those of other firms based on market prices, we are using price multiples based on comparables. By contrast, price multiples based on fundamentals tell us what a multiple should be based on some valuation models.

One criticism of price multiples is that they reflect only the past because historical (trailing) data are often used in the denominator. For this reason, many practitioners use forward (leading or prospective) values in the denominator (sales, book value, earnings, etc.) The use of projected values can result in much different ratios. An analyst should be sure to use price multiple calculations consistently across firms.

Trailing P/E uses earnings over the *most recent* 12 months in the denominator. The *leading P/E ratio* (also known as forward or prospective P/E) uses expected earnings for the next four quarters or fiscal year.

$$\text{trailing P/E} = \frac{\text{market price per share}}{\text{EPS over previous 12 months}}$$

$$\text{leading P/E} = \frac{\text{market price per share}}{\text{forecasted EPS over next 12 months}}$$

The *price-to-book (P/B) ratio* is calculated as:

$$\text{P/B ratio} = \frac{\text{market value of equity}}{\text{book value of equity}} = \frac{\text{market price per share}}{\text{book value per share}}$$

A common adjustment is to use *tangible book value*, which is equal to book value of equity less intangible assets (e.g., goodwill, patents).

Furthermore, balance sheets should be adjusted for significant off-balance-sheet assets and liabilities and for differences between the fair and recorded values of assets and liabilities. Finally, book values often need to be adjusted for differences in accounting methods to ensure comparability.

Price-to-sales (P/S) ratios 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:

$$\text{P/S ratio} = \frac{\text{market value of equity}}{\text{total sales}} = \frac{\text{market price per share}}{\text{sales per share}}$$

Given one of the definitions of cash flow, the *price-to-cash-flow (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

Enterprise Value Multiples

Enterprise value (EV) is a measure of total company value and can be viewed as what it would cost to acquire the firm.

EV = market value of common stock + market value of debt −
cash and short-term investments

Cash and short-term investments are subtracted because an acquirer's cost for a firm would be decreased by the amount of the target's liquid assets. Although an acquirer assumes the firm's debt, it receives the firm's cash and short-term investments. Enterprise value is appropriate when an analyst wants to compare the values of firms that have significant *differences in capital structure.*

EBITDA (earnings before interest, taxes, depreciation, and amortization are subtracted) is probably the most frequently used denominator for EV multiples; operating income can also be used. An advantage of using EBITDA instead of net income is that EBITDA is usually positive even when earnings are not. A disadvantage of using EBITDA is that it often includes non-cash revenues and expenses

Asset-Based Valuation Models

Asset-based models are appropriate when equity value is the market or fair value of assets minus the market or fair value of liabilities. Because market values of firm assets are usually difficult to obtain, the analyst typically starts with the balance sheet to determine the values of assets and liabilities. In most cases, market values are not equal to book values. Possible approaches to valuing assets are to value them at their depreciated values, inflation-adjusted depreciated values, or estimated replacement values.

Applying asset-based models is especially problematic for firms that have a large amount of intangible assets, on or off the balance sheet. The effect of the loss of the current owners' talents and customer relationships on forward earnings may be quite difficult to measure. Analysts often consider asset-based model values as floor or minimum values when significant intangibles, such as business reputation, are involved.

Asset-based model valuations are most reliable when the firm has primarily tangible short-term assets, assets with ready market values (e.g., financial or natural resource firms), or when the firm will cease to operate and is being liquidated.

Advantages and Disadvantages of Valuation Models

Advantages of discounted cash flow models:

- They are based on the fundamental concept of discounted present value and are well grounded in finance theory.
- They are widely accepted in the analyst community.

Disadvantages of discounted cash flow models:

- Their inputs must be estimated.
- Value estimates are very sensitive to input values.

Advantages of comparable valuation using price multiples:

- Evidence that some price multiples are useful for predicting stock returns.
- Price multiples are widely used by analysts.
- Price multiples are readily available.
- They can be used in time series and cross-sectional comparisons.
- EV/EBITDA multiples are useful when comparing firm values independent of capital structure or when earnings are negative and the P/E ratio cannot be used.

Disadvantages of comparable valuation using price multiples:

- Lagging price multiples reflect the past.
- Price multiples may not be comparable across firms if the firms have different size, products, and growth.
- Price multiples for cyclical firms may be greatly affected by economic conditions at a given point in time.
- A stock may appear overvalued by the comparable method but undervalued by a fundamental method, or vice versa.
- Different accounting methods can result in price multiples that are not comparable across firms, especially internationally.
- A negative denominator in a price multiple results in a meaningless ratio. The P/E ratio is especially susceptible to this problem.

Advantages of price multiple valuations based on fundamentals:

- They are based on theoretically sound valuation models.
- They correspond to widely accepted value metrics.

Disadvantages of price multiple valuations based on fundamentals:

- Price multiples based on fundamentals will be very sensitive to the inputs (especially the k – g denominator).

Advantages of asset-based models:

- They can provide floor values.

- They are most reliable when the firm has primarily tangible short-term assets, assets with ready market values, or when the firm is being liquidated.
- They are increasingly useful for valuing public firms that report fair values.

Disadvantages of asset-based models:

- Market values are often difficult to obtain.
- Market values are usually different than book values.
- They are inaccurate when a firm has a high proportion of intangible assets or future cash flows not reflected in asset values.
- Assets can be difficult to value during periods of hyperinflation.

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1   Michael Porter, "The Five Competitive Forces That Shape Strategy," *Harvard Business Review*, Volume 86, No. 1: pp. 78–93.

FIXED INCOME

FIXED-INCOME INSTRUMENT FEATURES

Key features that are specified in a fixed-income security include the following:

- Issuer
- Maturity
- Principal (par value or face value)
- Coupon rate and frequency
- Seniority
- Contingency provisions (embedded options)

Given a bond's price and its expected cash flows, we can calculate a bond's **yield—**the expected return from investing in the bond. For a fixed-coupon bond, when prices fall, the bond offers a higher yield, and when prices rise, the bond offers a lower yield. Prices and yields are inversely related.

Bonds of different maturity from the same issuer typically have different yields. A plot of these yields versus maturity is referred to as a **yield curve**. A yield curve normally slopes upward because investors demand higher returns to compensate them for greater risk over longer time frames. A downward-sloping yield curve is less common and is referred to as an **inverted yield curve**. A government bond yield curve is commonly used as a benchmark to assess the extra returns (spreads) offered by more risky issuers, such as corporations.

A **bond indenture** is a legal contract between a bond's issuer and the bondholders. The indenture defines obligations of, and restrictions on, the borrower, including the sources of repayment. The source of the cash flows depends on the nature of the issuer and type of bond issue:

- Sovereign (national government) bonds are repaid from taxes and, in some cases, the creation of new currency.
- Local government bonds are repaid from local government taxes or revenue from operational infrastructure.
- Corporate bonds may be secured or unsecured. An **unsecured bond** is repaid only from the operating cash flow of the issuer. A **secured bond** is also repaid from

operating cash flow, but if that becomes insufficient, the bondholders have a legal claim on specific assets the company has pledged as **collateral**.

- For an asset-backed security (ABS), financial assets held by the special purpose entity that has issued the ABS provide the cash flows promised to the ABS investors.

Legal rules known as **covenants** can be written into a bond indenture. **Affirmative covenants** specify requirements the issuer must fulfill. **Negative covenants** place restrictions on the issuer.

Two examples of affirmative covenants are cross-default and pari passu provisions:

- A **cross-default clause** states that if the issuer defaults on any other debt obligation, the issuer will also be considered in default on this bond.
- A **pari passu clause** states that the bond will have the same priority of claims as the issuer's other senior debt issues.

An example of a negative covenant is a **negative pledge clause**, which prevents issuance of debt that ranks more senior than existing debt.

FIXED-INCOME CASH FLOWS AND TYPES

A typical bond has a **bullet structure**. Periodic coupon interest payments are made over the life of the bond, and the principal value is paid with the final interest payment at maturity.

For a bond with an **amortizing structure**, the periodic payments include both interest and some repayment of principal. If a bond is **fully amortizing**, the principal is fully paid off when the last periodic payment is made. A bond can also be structured to be **partially amortizing**, so it has a **balloon payment** at bond maturity that includes the unamortized principal. Other types of amortization schedules include **sinking fund provisions** that provide for the repayment of principal through a series of payments over the life of a bond, and **waterfall structures** for ABS and mortgage-backed securities. A common waterfall structure is for junior tranches not to receive any principal payment from the collateral pool until all senior tranches have been fully repaid.

A **floating-rate note (FRN)** has a coupon rate that is based on a **market reference rate (MRR)** plus (or possibly minus) a **credit spread**, which is a margin that reflects the issuer's creditworthiness relative to the reference rate. This added margin is typically expressed in **basis points**, which are hundredths of 1%. Most floaters pay quarterly coupons and are based on a 90-day MRR.

An **index-linked bond** has coupon payments or a principal value that is based on a commodity index, an equity index, or some other published index number. The most common type of index-linked bonds is **inflation-linked bonds** (or **linkers**), for which payments are based on the change in an inflation index. These may be interest indexed or capital indexed:

- **Interest-indexed bonds**. The coupon rate is adjusted for inflation, while the principal value remains unchanged.

- **Capital-indexed bonds**. This is the most common structure. An example is U.S. **Treasury Inflation-Protected Securities (TIPS)**. The coupon rate remains constant, and the principal value of the bonds is increased by the rate of inflation (or decreased by deflation). TIPS are principal protected.

Other coupon structures include the following:

- **Step-up coupon bonds**. The coupon rate increases over time according to a predetermined schedule.
- **Leveraged loans** and **credit-linked notes**. The coupon rate increases if the credit quality of the issuer decreases.
- **Payment-in-kind bonds**. The issuer may make coupon payments by increasing the principal amount, essentially paying bond interest with more bonds.
- **Green bonds**. The coupon rate increases if the issuer does not meet certain environmental goals.

Zero-coupon bonds are the simplest form of fixed-income instrument, offering only a single payment of par at maturity. With a **deferred coupon bond**, regular coupon payments do not begin until a specified time after issuance.

A **contingency provision** is an action that may be taken if an event occurs. Contingency provisions in bond indentures are referred to as **embedded options**. Examples include callable bonds, putable bonds, and convertible bonds. Bonds that do not have contingency provisions are referred to as **straight bonds** or **option-free bonds**.

- A **callable bond** gives the *issuer* the right, but not the obligation, to redeem all or part of a bond issue at a predetermined **call price**. The time from issuance until a callable bond's first call date is referred to as the bond's period of **call protection**. Because bondholders face an uncertain redemption date, they have **call risk** for which they will demand a higher yield than an otherwise equivalent straight bond.
- A **putable bond** gives the *bondholder* the right to sell the bond back to the issuing company at a prespecified price, typically par. Because the choice of whether to exercise the option is the bondholder's, a putable bond will offer a lower yield than an otherwise equivalent straight bond.
- A **convertible bond** gives the *bondholder* the right to exchange the bond for a specific number of shares of the issuing corporation's common stock. Because the conversion option is valuable to bondholders, a convertible bond will have a lower yield than an otherwise-identical straight bond. The **conversion price** is the par amount per share at which the bond may be converted to common stock. The conversion ratio is the par value of the bond divided by the conversion price. The **conversion value** is the market value of the shares that would be received on conversion.

Warrants give their holders the right to buy the firm's common shares at a given price until an expiration date. Warrants provide potential gains to bondholders and do not require the bonds to be retired at exercise, as convertible bonds do. Warrants can be detached from a bond and traded on securities exchanges.

Contingent convertible bonds (referred to as "CoCos") are bonds that convert from debt to common equity automatically if a specific event occurs and can increase the equity of financial institutions when it falls below the percentage required by regulators.

Domestic and Foreign Bond Markets

Bonds are subject to different legal and regulatory requirements that depend on where they are issued and traded. Bonds of issuers domiciled in the same country as the market in which the bonds are issued and traded are referred to as **domestic bonds**. Bonds of issuers from countries other than the market in which the bond trades are referred to as **foreign bonds**.

Eurobonds are issued outside the jurisdiction of any one country and are denominated in a currency different from the currency of the countries in which they are sold. **Global bonds** trade in both the eurobond market and a national bond market. Foreign bonds, global bonds, and eurobonds that involve more than one country are referred to collectively as **international bonds**.

Taxation of Bond Income

Most often, the interest income paid to bondholders is taxed as ordinary income. In the United States, interest from municipal bonds is most often exempt from national income tax and often from state income tax in the state of issue.

Capital gains are often taxed at a lower rate than ordinary income. When a bondholder sells a coupon bond before maturity, it may be at a gain or a loss relative to its purchase price.

Zero-coupon bonds and other bonds sold at significant discounts to par when issued are termed **original issue discount bonds**. Because the gains as their price moves toward par value are really interest income, these bonds can generate tax liability, even when the bondholder has received no cash.

FIXED-INCOME ISSUANCE AND TRADING

Global bond markets are primarily segmented by the type of issuer or sector, credit quality, and time to maturity. The following figure summarizes a **credit/maturity spectrum for issuers**.

Figure 1: Issuer Credit/Maturity Spectrum

	< 1y Short-Term	1y–10y Intermediate-Term	> 10y Long-Term
"Default Risk Free"	Treasury bills	Treasury notes	Treasury bonds
Investment Grade	Repo Commercial Paper ABCP	Unsecured Corporate bonds ABS	Unsecured Corporate bonds MBS
High Yield		Secured Corporate bonds Leveraged loans	
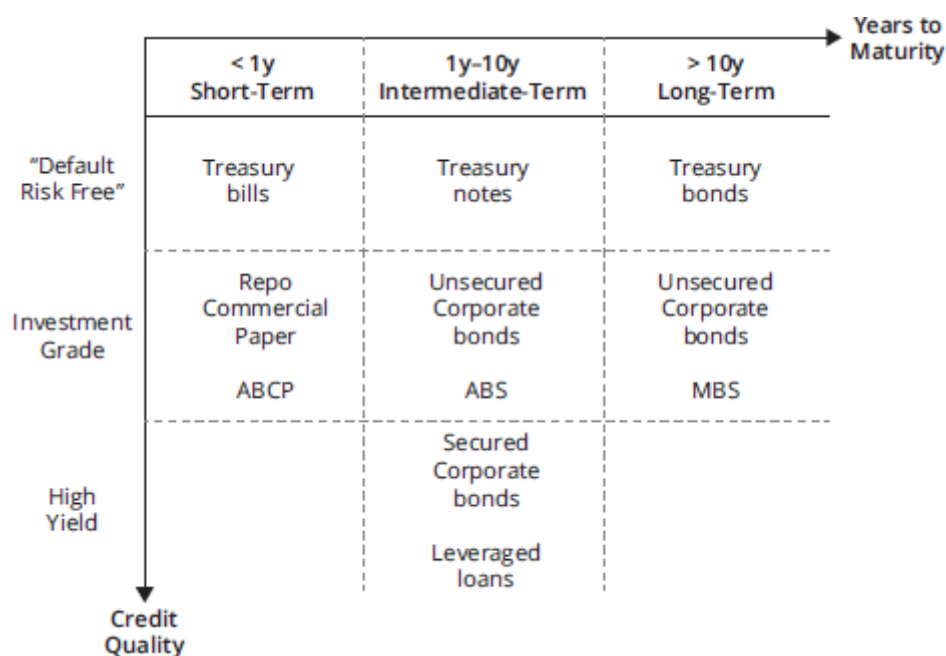
Note: ABCP is asset-backed commercial paper.

Source: Reproduced from Level I CFA Curriculum learning module, "Fixed-Income Issuance and Trading," with permission from CFA Institute.

The type of bond that a corporation chooses to issue is generally driven by its access to capital markets and its intended use of the proceeds. For example, a well-established, investment-grade company might issue commercial paper to fund short-term working capital, intermediate-term debt to fund medium-term investments and permanent working capital, and long-term debt to fund investment in fixed assets.

Investors' positioning in the credit/maturity spectrum depends on their desired exposure to interest rate risk and credit risk, and the maturity of any obligations they need to meet with the cash flows. The following figure summarizes a **credit/maturity spectrum for investors**.

Figure 2: Investor Positioning in Credit/Maturity Spectrum
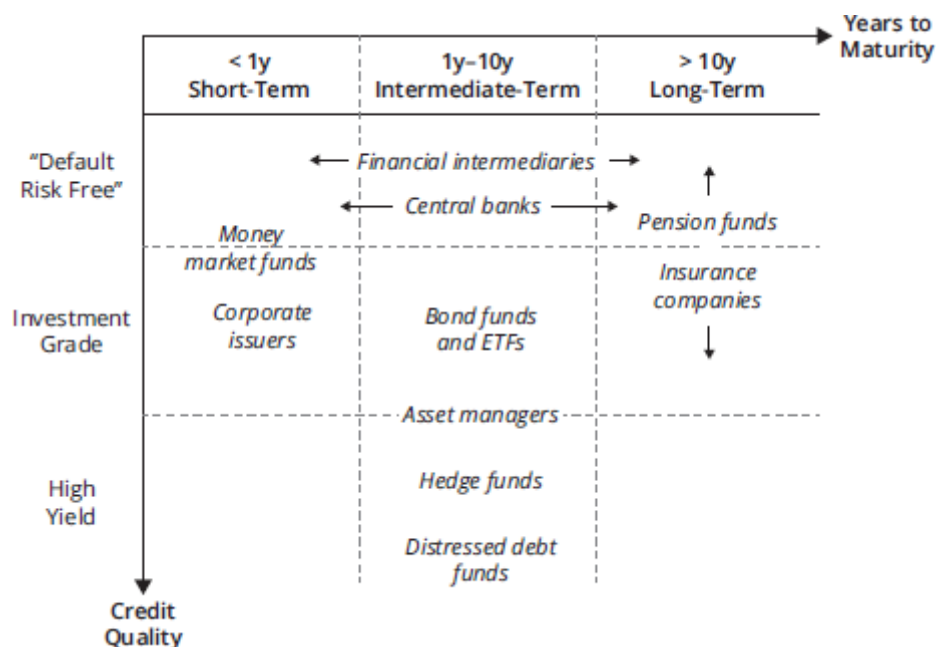
Source: Reproduced from Level I CFA Curriculum learning module, "Fixed-Income Issuance and Trading," with permission from CFA Institute.

Fixed-Income Indices

Fixed-income indices differ from equity indices in the following three ways:

1. Because corporate issuers may have many different bonds outstanding, fixed-income indices have many more constituents than equity indices.

2. Because bonds mature and are reissued, fixed-income indices have higher turnover than equity indices.

3. Changes in debt issuance trends in terms of maturity and credit quality affect the weights of fixed-income indices over time.

Bond indices that contain a broad selection of bonds are called **aggregate indices**, while other bond indices can have a narrower focus on geography, credit quality, sector, maturity, or ESG. An index chosen to act as a benchmark for a bond fund should match the exposure of the fund in terms of sector focus, credit quality, and maturity.

Primary Market for Bonds

Primary market transactions are sales of newly issued bonds. Bonds can be registered with securities regulators for sale in a **public offering** or sold only to qualified investors in a **private placement**. A public offering is typically done with the help of an investment bank, which has expertise in executing a public offering.

In an **underwritten offering**, the investment bank (underwriter) purchases the entire bond issue from the issuing firm and then sells them to dealers and investors. Bonds are priced based on indications of interest from buyers. In a **best-efforts offering**, the investment banks sell the bonds on a commission basis. Unlike an underwritten offering, the investment banks do not commit to purchase the whole issue.

In a **shelf registration**, a bond issue is registered with securities regulators in its aggregate value with a master prospectus. Portions of the registered issue can then be issued over time when the issuer needs to raise funds. Individual offerings under a shelf registration require less disclosure than a separate registration of a bond issue.

An issuer that is offering its first-ever bond is referred to as a **debut issuer**. Debut issues usually require weeks of "roadshows" by underwriters before the issue date to introduce investors to the debut issuer. Subsequent **repeat issues** of fixed-income securities usually take much less time.

Secondary Market for Bonds

Secondary markets refer to the trading of previously issued bonds. While some government bonds and corporate bonds are traded on exchanges, the great majority of bond trading in the secondary market is made in the dealer, or over-the-counter, market. Dealers post bid (purchase) prices and ask or offer (selling) prices for various bond issues. The difference between the bid and ask prices is the dealer's spread. The spread varies across individual bonds according to their liquidity. This ranges from a fraction of a basis point for liquid, recently issued ("on-the-run"), developed market sovereign bonds and high-credit-quality corporate frequent issuers, to 10–20 basis points or more for less liquid, smaller, or older ("seasoned") corporate issues.

Distressed debt is a name given to the bonds of issuers that are in, or expected to file for, bankruptcy. For an otherwise infrequently traded issue, entering a distressed situation may temporarily increase its trading activity because some institutions are prohibited from owning securities with low credit ratings.

FIXED-INCOME MARKETS FOR CORPORATE ISSUERS

Short-term funding for *nonfinancial corporations* may include loans and issuance of securities. Loan financing, or bank lines of credit, refers to agreements between borrowers and banks to draw down funds as required. These primarily consist of three types:

1. **Uncommitted line of credit**. A bank extends a credit line, usually charging a floating MRR plus a fixed credit spread on funds drawn down.
2. **Committed (regular) line of credit**. A bank commits to an offer of credit for a specific time period, providing a more reliable source of funding for borrowers than an uncommitted line of credit. Banks charge a commitment fee, typically about 50 basis points, on either the full or unused amount. The borrower faces **renewal risk** because the bank may withdraw the agreement at maturity.
3. **Revolving (operating) line of credit**. "Revolvers" are typically for a longer term, sometimes years, and are an even more reliable source of short-term financing than a committed line of credit. Fees and rates are similar to a committed line of credit, and banks typically place restrictive covenants on borrowers.

Companies with weaker credit ratings typically have to pledge assets as collateral for bank borrowings. **Secured loans** or **asset-backed loans** are backed by collateral such as fixed assets, receivables, or inventory. **Factoring** refers to the actual transfer of credit granting and collection of receivables to a lender at a discount from their face value.

Large corporations with high credit ratings can reduce their funding costs by issuing short-term unsecured debt securities, referred to as **commercial paper**. With maturity of typically less than three months, commercial paper is issued by firms to fund working capital and as a temporary source of funds before issuing longer-term debt. Debt that is temporary until permanent financing can be secured is referred to as **bridge financing**.

Commercial paper is often reissued, or "rolled over," when it matures. The risk that a company will not be able to sell new commercial paper to replace maturing paper is termed **rollover risk**. To manage this risk, borrowers maintain **backup lines of credit** with banks.

Short-term funding for *financial institutions* consists primarily of deposits, which include checking accounts; operational deposits by larger customers who require cash management, custody, and clearing services; and savings deposits such as **certificates of deposit**, which can be negotiable (able to be resold in the open market) or nonnegotiable. Other sources of short-term financing include **interbank funds** (loans from one bank to another), the **central bank funds market** (borrowing excess reserves from other banks at the central bank funds rate), and issuing commercial paper. Financial institutions often sponsor **asset-backed commercial paper**, a type of short-term ABS.

Repurchase Agreements

In a **repurchase agreement** or **repo**, one party sells a security to a counterparty with a commitment to buy it back later at a specified higher price. The repurchase price is greater than the selling price, and the difference is effectively the interest paid to the buyer. In effect, the buyer is lending funds to the seller with the security as collateral. The interest rate implied by the two prices is called the **repo rate**.

To protect the lender against a potential decrease in the value of the securities posted as collateral, the borrower typically must post extra collateral above the loan amount (the purchase price) by an amount known as the **initial margin**. In practice, this means the loan amount will be a discount to the value of the securities. The loan value increases during its life at the repo rate. Should the market value of the collateral fall below this value times the initial margin, the lender will ask the borrower for more collateral, known as **variation margin**.

A repurchase agreement for one day is called an **overnight repo**, and an agreement covering a longer period is called a **term repo**. The interest cost of a repo is customarily less than the rate on bank loans or other short-term borrowing.

A percentage difference between the market value of the security and the amount loaned is called the **repo margin** or the **haircut**. This margin protects the lender in the event that the value of the security decreases over the term of the repo agreement.

The repo rate is as follows:

- Higher, the longer the repo term
- Lower, the higher the credit quality of the collateral security
- Lower, when the collateral security is in high demand or low supply
- Higher, when the collateral security is not actually delivered to the lender
- Higher, when the interest rates for alternative sources of funds are higher

Like other forms of collateralized borrowing, the major risks in a repurchase agreement include default risk, collateral risk, margining risk, legal risk, and netting and settlement risk. Many of these risks can be mitigated through **tri-party repos**, which employ a custodian bank or clearinghouse as an agent.

The main uses of repurchase agreements are as follows:

- Financial institutions enter repos as security sellers/borrowers to finance positions in securities held in their trading activities.
- Banks and institutional investors enter repos as security buyers/lenders to earn the repo rate on excess short-term funds.
- Central banks may use repos to enact monetary policy, buying securities/lending to increase the money supply and selling securities/borrowing to decrease the money supply.
- Short sellers, such as hedge funds, can use repo agreements to borrow securities that they intend to short sell, speculating that the security value will decrease. When the motivation to enter a repo is to borrow a security in this way, the participant is said to be entering a **reverse repo**.

Long-Term Funding: Investment-Grade Debt vs. High-Yield Debt

In a normal yield curve environment, both investment-grade and high-yield corporate issuers must offer higher yields on longer-maturity bond issues. The difference in yields across maturity is likely to be greater for high-yield issuers because of the higher spreads they must offer. Other major differences between issuances of investment-grade debt versus high-yield debt include the following:

- Default risk, and loss given default, are primary concerns for high-yield investors. For investment-grade investors, the primary credit-related concern is the chance of a ratings downgrade, rather than imminent default.
- Credit spreads are likely to be a smaller proportion of yield for investment-grade issues.
- Investment-grade issuers usually face only a few restrictive covenants. High-yield issuers are likely to face a larger number of restrictive covenants and are likely to

need to provide collateral as security.

- Investment-grade issues are somewhat standardized and typically issued across multiple maturities. Because high-yield issues are likely to have more specific covenants and liens, issues are less standardized. High-yield issuers also typically have less flexibility regarding maturity; their bonds are usually issued with maturity of 10 years or less.
- High-yield issuers are more likely to take leveraged loans with prepayment options or issue callable debt.
- Due to the higher uncertainty in the cash flows used to repay high-yield debt, returns are likely to be more equity-like than the returns of investment-grade debt.

FIXED-INCOME MARKETS FOR GOVERNMENT ISSUERS

Sovereign Debt

National governments issue **sovereign bonds** to raise funds for spending on public goods and services and investment in public infrastructure. These issues are backed by the power to collect taxes; therefore, they typically carry the highest credit rating in their domestic market. Sovereign issuers are usually the largest debt issuers in their domestic market.

Public sector accounting standards are based more on cash transactions and less on accruals compared to those in the private sector. An analyst should consider a sovereign issuer to have an "economic balance sheet" that includes implied assets (e.g., expected future tax revenues) and implied liabilities (e.g., promised future expenditures) in addition to the financial assets and liabilities reported in the public accounts.

A key distinction in sovereign debt markets is the difference between developed market and emerging market issuers. **Developed market sovereign issuers** have stable, diversified economies with consistent and transparent fiscal policy. Their debt is denominated in a **reserve currency** that is held as reserves by central banks across the world and widely used in international trade.

Emerging market sovereign issuers typically have faster growing, less stable, and more concentrated economies. Emerging market debt is often raised to fund investment in economic growth and can be **domestic debt** (issued in the nation's home currency and held by domestic investors) or **external debt** (owed to foreign creditors). External debt may be denominated in the government's home currency or a foreign reserve currency.

A government's **debt management policy** sets out the amount and type of securities it intends to issue. Analysts who wish to forecast a government's debt issuance should focus on its fiscal policy as well as how cyclical and inflation sensitive are its revenues and spending. Analysts should also be aware of debt features such as floating rates or inflation indexing, as well as whether the government guarantees any nonsovereign debt.

Governments typically issue securities across maturities to maintain a stable split between long-term and short-term debt. Relying too heavily on short-term debt creates rollover risk.

Sovereign issuers use regular public auctions to issue government debt securities. Buyers can make competitive bids or noncompetitive bids at government debt auctions. **Competitive bids** are used to set the price of the debt issue, while **noncompetitive bids** are guaranteed to have their allocation met at the price determined by the competitive bids. The yield of the successful competitive bid with the lowest price is referred to as the **cutoff yield**. Under a **single-price auction**, all investors pay the price associated with this cutoff yield, regardless of the yield they actually bid. Under a **multiple-price auction**, successful competitive bidders actually pay the price that they bid. A government issuer that wishes to minimize yield volatility would likely choose to conduct single-price auctions.

Trading is most active for **on-the-run bonds**, which are the most recently issued government securities of a particular maturity. Their yields are typically used to represent default risk–free benchmark yields.

A sovereign issuer typically designates certain financial institutions as **primary dealers** that are required to make competitive bids in auctions, submit bids in auctions on behalf of third parties, and act as counterparty to the central bank when it carries out monetary policy.

Nonsovereign Government Debt

Nonsovereign government bonds are issued by states, provinces, and counties, and by entities created to fund and provide services. Local and regional government authorities may issue **general obligation bonds** backed by local tax-raising powers, or **revenue bonds** to fund a specific project, where the source of repayment is fees from the use of the infrastructure funded by the bond issue.

Agency bonds or **quasi-government bonds** are issued by entities that national governments create for specific purposes, such as financing infrastructure investment or providing mortgage financing. When they are backed by the sovereign entity, agency bonds typically have yields and credit ratings closely aligned with those of the government.

Supranational bonds are issued by international institutions such as the World Bank, the IMF, and the Asian Development Bank. Bonds issued by supranational agencies typically have high credit quality, and some issues are highly liquid.

FIXED-INCOME BOND VALUATION: PRICES AND YIELDS

For an annual-coupon bond with N years to maturity:

$$\text{price} = \frac{\text{coupon}}{(1 + \text{YTM})} + \frac{\text{coupon}}{(1 + \text{YTM})^2} + \cdots + \frac{\text{coupon} + \text{principal}}{(1 + \text{YTM})^N}$$

For a semiannual-coupon bond with N years to maturity:

$$price = \frac{coupon}{\left(1 + \frac{YTM}{2}\right)} + \frac{coupon}{\left(1 + \frac{YTM}{2}\right)^2} + \cdots + \frac{coupon + principal}{\left(1 + \frac{YTM}{2}\right)^{N \times 2}}$$

A bond's price, yield to maturity (YTM), coupon rate, and maturity are related as follows:

- Price and YTM are inversely related. An increase in YTM decreases the price, and a decrease in YTM increases the price.

- If a bond's coupon rate is greater than its YTM, its price will be at a premium to par value. If a bond's coupon rate is less than its YTM, its price will be at a discount to par value.

- For a bond valued at a discount or premium, the price will converge to par value as the bond approaches maturity, assuming the issuer does not default.

- The percentage decrease in value when the YTM increases by a given amount is smaller than the increase in value when the YTM decreases by the same amount (the price-yield relationship is convex).

- Other things equal, the price of a bond with a lower coupon rate is more sensitive to a change in yield than is the price of a bond with a higher coupon rate.

- Other things equal, the price of a bond with a longer maturity is more sensitive to a change in yield than is the price of a bond with a shorter maturity.

The **constant-yield price trajectory** is the change in value as time passes for a discount or premium bond. It shows how the bond's price would change as time passes if its YTM remained constant. If an investor sells a bond before maturity, a capital gain or loss is measured relative to the bond's constant-yield price trajectory.

Bonds can be valued using **spot rates**, which are market discount rates for a single payment to be received in the future. Because the discount rates for zero-coupon bonds are spot rates, we sometimes refer to spot rates as **zero-coupon rates**.

This is the general equation for calculating a bond's value using spot rates (S_i):

$$price = \frac{coupon}{(1 + S_1)} + \frac{coupon}{(1 + S_2)^2} + \cdots + \frac{coupon + principal}{(1 + S_N)^N}$$

This price calculated using spot rates is sometimes called the **no-arbitrage price** of a bond because if a bond is priced differently, there will be a profit opportunity from arbitrage among bonds.

Flat and Full Bond Prices

The **flat price** of a bond does not include interest accrued between coupon dates. The flat price is also known as a bond's **clean price** or **quoted price**. Bond prices are quoted without accrued interest because, holding yield constant, including accrued interest would make a bond's price appear to increase on each day of a coupon period

and drop suddenly on the coupon payment date. The **full price** of a bond includes interest accrued between coupon dates and is also known as the **dirty price** or **invoice price**.

We cannot simply calculate a flat price and add accrued interest to it. Instead, we must calculate the full price and accrued interest, then derive the flat price from them:

flat price = full price − accrued interest

The method for calculating the full price is as follows:

1. Calculate the value of the bond on the last coupon date.
2. Compound this value at the YTM per period, over the number of days since the last coupon payment.

Accrued interest since the last payment date can be calculated as the coupon payment times the portion of the current coupon period that has passed, based on actual calendar days or 30-day months and 360-day years.

Matrix pricing is a method estimating bond YTMs using the YTMs of traded bonds that have credit quality very close to that of the nontraded or infrequently traded bonds of similar maturity and coupon. For example, the YTM for a nontraded six-year bond can be estimated by taking the average of the YTMs of similar seven-year and five-year bonds.

YIELD AND YIELD SPREAD MEASURES FOR FIXED-RATE BONDS

The number of bond coupon payments per year is referred to as the **periodicity** of a bond. A bond with a periodicity of 2 will have its YTM quoted on a **semiannual bond basis**. For a given coupon rate, the greater the periodicity, the more compounding periods, and the greater the annual yield.

In general, the annual (effective) yield for a bond with its YTM stated for a periodicity of n, and n compounding periods per year, is as follows:

$$\text{annual yield} = \left(1 + \frac{\text{YTM}}{n}\right)^n - 1$$

Yields calculated using the stated coupon payment dates are referred to as following **street convention**. When coupon dates fall on weekends and holidays, coupon payments are made the next business day. A yield calculated using these actual coupon payment dates is the **true yield**, which may be slightly lower than a street convention yield.

Current yield (also called **income yield** or **running yield**) is a bond's annual coupon cash flows divided by the bond's flat price. This yield measure does not account for gains or losses as the bond's price moves toward its par value over time.

Simple yield is the sum of the annual coupon payment plus (minus) the straight-line amortization of a discount (premium), divided by the flat price. This yield measure

assumes any discount or premium declines evenly over the remaining years to maturity.

For a callable bond, a **yield to call** can be calculated for each possible call date and price. The lowest of YTM and the various yields to call is termed the **yield to worst**.

The **option-adjusted yield** for a callable bond is calculated by adding the value of the call option to the bond's flat price. The value of a callable bond is equal to the value of the bond if it did not have the call option, minus the value of the call option. The option-adjusted yield will be less than the YTM for a callable bond.

A **yield spread** is the difference between the YTMs of two different bonds. Yield spreads are typically quoted in basis points. A yield spread relative to a benchmark bond is known as a **benchmark spread**. For fixed-coupon bonds, on-the-run government bond yields for the same or nearest maturity are frequently used as benchmarks. A yield spread over a government bond is also known as a **G-spread**.

An alternative to using government bond yields as benchmarks is to use the fixed rates for interest rate swaps in the same currency and with the same tenor as a bond. Yield spreads relative to swap rates are known as **interpolated spreads** or **I-spreads**.

G-spreads and I-spreads are theoretically correct only if the spot yield curve is flat. However, the spot yield curve is not likely to be flat and is typically upward sloping. A **zero-volatility spread** or **Z-spread** is derived by a method that accounts for the shape of the yield curve. The Z-spread is the single spread that, when added to each spot rate, produces a bond value that is equal to the current market value of a bond.

An **option-adjusted spread (OAS)** is used for bonds with embedded options. The OAS is the spread to the spot rate curve that the bond would have if it were option free. For a callable bond, the OAS is less than the Z-spread, and for a putable bond, the OAS is greater than the Z-spread. The OAS is the spread that accounts for differences between the liquidity and credit quality of the subject bond and the benchmark, with the effect on yield of any embedded options removed.

YIELD AND YIELD SPREAD MEASURES FOR FLOATING-RATE INSTRUMENTS

For an FRN, the coupon rate is the reference rate plus or minus a margin based on the credit risk of the bond. Interest is paid in arrears, with the coupon rate for the next period set using the current reference rate.

The margin used to calculate the bond coupon payments is known as the **quoted margin**. The margin required to return the FRN to its par value is the **required margin** or **discount margin**. When the credit quality of an FRN is unchanged, the quoted margin is equal to the required margin, and the FRN returns to its par value at each reset date. If the credit quality of the issuer decreases, the quoted margin will be less than the required margin, and the FRN will sell at a discount. If credit quality has improved, the quoted margin will be greater than the required margin, and the FRN will sell at a premium.

Yields on money market securities can be stated as a discount from face value or as add-on yields, and can be based on a 360-day or 365-day basis. These securities should be compared based on their **bond equivalent yield**, which is an add-on yield based on a 365-day year.

THE TERM STRUCTURE OF INTEREST RATES: SPOT, PAR, AND FORWARD CURVES

A **yield curve** shows yields by maturity. The **term structure** of interest rates refers to the yields at different maturities for like securities or interest rates.

A yield curve for coupon bonds shows the YTMs for coupon bonds at various maturities. A spot rate yield curve or **zero curve** shows the YTMs for zero-coupon bonds at various maturities. A par bond yield curve or **par curve** may be constructed from the spot curve to show the coupon rate that a hypothetical coupon bond at each maturity would need to have to be priced at par.

Forward rates are yields for future periods, such as the rate of interest on a three-year loan that would be made two years from now.

An example of forward rate notation is "2y3y." The "2y" refers to the number of years from today when a loan would begin, and the "3y" refers to the tenor (length) of the loan. Thus, 2y3y is the three-year rate two years from today. Forward rates may also be expressed in months, as "6m3m" is a three-month rate beginning six months from today.

A **forward yield curve** shows the future rates for bonds or money market securities for the same maturities for annual periods in the future.

Forward rates and spot rates are related because borrowing for N years should have the same cost as borrowing for shorter periods that add up to N years. For example, borrowing for two years at the two-year spot rate should have the same cost as borrowing for the first year at the one-year spot rate, and for the second year at the one-year forward rate one year from now. That is, $(1 + S_2)^2 = (1 + S_1)(1 + 1y1y)$. Based on these relationships between spot and forward rates, we can calculate forward rates from spot rates, calculate spot rates from forward rates, or value a bond using forward rates in the same way we valued a bond using spot rates earlier.

> ## EXAMPLE: **Forward rate from spot rates**
>
> The two-year spot rate is 5.5% and the three-year spot rate is 6.0%. Calculate the one-year forward rate two years from now (2y1y).
>
> **Answer:**
>
> $$(1+S_3)^3 = (1 + S_2)^2(1 + 2y1y)$$
>
> $$2y1y = \frac{(1 + S_3)^3}{(1 + S_2)^2} - 1 = \frac{(1.060)^3}{(1.055)^2} - 1 = 7.01\%$$
>
> A quick way to approximate the forward rate is to ignore compounding:

$$3 \times S_3 \approx 2 \times S_2 + 2y1y$$
$$2y1y \approx 3(6.0\%) - 2(5.5\%)$$
$$18\% - 11\% = 7\%$$

EXAMPLE: Spot rate from forward rates

The one-year spot rate is 3.5%. One-year forward rates are: 1y1y = 3.8%, 2y1y = 4.2%, and 3y1y = 4.5%. Calculate the four-year spot rate.

Answer:

The cost of borrowing today for four years should be the same as the cost of a sequence of four one-year loans that begin today and in each of the next three years:

$$(1 + S_4)^4 = (1 + S_1)(1 + 1y1y)(1 + 2y1y)(1 + 3y1y)$$
$$S_4 = [(1.035)(1.038)(1.042)(1.045)]^{1/4} - 1 = 3.9993\%$$

Here, too, we can approximate the result if we ignore compounding:

$$4 \times S_4 \approx S_1 + 1y1y + 2y1y + 3y1y$$
$$S_4 \approx (3.5\% + 3.8\% + 4.2\% + 4.5\%) / 4 = 4.0\%$$

INTEREST RATE RISK AND RETURN

There are three sources of returns from investing in a fixed-rate bond:

1. Coupon and principal payments
2. Interest earned on reinvested coupon payments
3. Capital gain or loss if the bond is sold before maturity

For a bond that does not default, and assuming the rate earned on reinvested coupons is equal to the YTM, there is the following:

- An investor who holds a fixed-rate bond to maturity will earn an annualized rate of return equal to the YTM of the bond when purchased.
- An investor who sells a bond before maturity will earn a rate of return equal to the YTM at purchase if the bond's YTM when sold is equal to the YTM of the bond when purchased.

If the YTM of the bond decreases (increases) shortly after issuance, there is the following:

- An investor who sells the bond in the short term will have an increased (decreased) return due to the increase (decrease) in the sale price of the bond.
- An investor who holds the bond to maturity will have a decreased (increased) return due to the decreased (increased) reinvestment income earned.

These results illustrate the tradeoff between **market price risk**, which is the uncertainty about price due to uncertainty about market YTM, and **reinvestment risk**, which is the uncertainty about the total of coupon payments and reinvestment income due to the uncertainty about future reinvestment rates.

- For an investor with a *short investment horizon*, market price risk is greater than reinvestment risk.
- For an investor with a *long investment horizon*, reinvestment risk is greater than market price risk.

The investment horizon at which these risks just offset is known as a bond's **Macaulay duration**. A bond's annual Macaulay duration is calculated as the weighted average of the number of years until each of the bond's promised cash flows is to be paid, where the weights are the present values of each cash flow as a percentage of the bond's full value. For a semiannual-pay bond, Macaulay duration is calculated as a number of semiannual periods and divided by two to get the annual Macaulay duration.

The difference between a bond's Macaulay duration and the bondholder's investment horizon is referred to as a **duration gap**. A positive duration gap (Macaulay duration greater than the investment horizon) exposes the investor to market price risk from increasing interest rates. A negative duration gap (Macaulay duration less than the investment horizon) exposes the investor to reinvestment risk from decreasing interest rates.

YIELD-BASED BOND DURATION MEASURES AND PROPERTIES

Modified duration is calculated as Macaulay duration divided by one plus the bond's YTM. Modified duration provides an approximate percentage change in a bond's price for a 1% change in YTM. For a given change in YTM, the price change can be calculated as follows:

approximate percentage change in bond price = −modified duration × ΔYTM

We can approximate modified duration directly using bond values for an increase and for a decrease in YTM of the same size:

$$\text{approximate modified duration} = \frac{V_- - V_+}{2 \times V_0 \times \Delta YTM}$$

where:

V_0 = the initial price

V_- = the price of the bond if YTM is decreased by ΔYTM

V_+ = the price of the bond if the YTM is increased by ΔYTM

Modified duration is a linear estimate of the relation between a bond's price and YTM, whereas the actual relation is convex. This means although modified duration provides good estimates of bond prices for small changes in yield, the estimates become increasingly poor for larger changes in yield.

The **money duration** (also called **dollar duration**) of a bond position is expressed in currency units. Multiplying the money duration of a bond times a given change in YTM will provide an estimate of the change in bond value for that change in YTM. Money duration is sometimes expressed as money duration per 100 currency units of bond par value.

The **price value of a basis point (PVBP)** is the money change in the full price of a bond when its YTM changes by one *basis point*, or 0.01%. We can calculate the PVBP directly by calculating the average of the decrease in the full value of a bond when its YTM increases by one basis point, and the increase in the full value when its YTM decreases by one basis point.

Other things equal, a bond's interest rate risk (as measured by duration) is as follows:

- It is usually greater with a longer maturity. We must say *usually* because there are instances where an increase in a discount coupon bond's maturity will decrease its Macaulay duration.
- It is less with a higher coupon rate. When more of a bond's value will be from payments received sooner, the value of the bond is less sensitive to changes in yield.
- It is less with a higher YTM. This is because the price-yield relationship is convex. At lower yields, the price-yield curve has a steeper slope, indicating that price is more sensitive to a given change in yield.

YIELD-BASED BOND CONVEXITY AND PORTFOLIO PROPERTIES

Because modified duration is a linear approximation of the relationship between yield and price, duration-based estimates of a bond's full price become increasingly poor for larger changes in YTM. Estimates of the price impact of a change in yield can be improved by including **convexity**, a measure of the curvature of the price-yield relation. A bond's convexity can be estimated as follows:

$$\text{approximate convexity} = \frac{V_- + V_+ - 2V_0}{(\Delta YTM)^2 \times V_0}$$

This is the estimated price change including the convexity adjustment:

percentage change in full bond price

$= -(\text{annual modified duration})(\Delta YTM) + (1/2)(\text{annual convexity})(\Delta YTM)^2$

Analogous to money duration, the **money convexity** of a bond position is expressed in currency units:

money convexity = annual convexity × full price of bond position

The duration concept may be applied to a bond portfolio. There are two approaches to estimating **portfolio duration**:

1. Calculate the weighted average number of periods until the portfolio's cash flows will be received. This approach is theoretically correct, but it is not often used in practice, and it cannot be used if some portfolio bonds have embedded options.
2. Take a weighted average of the durations of the individual bonds in the portfolio, where the weights are the full price of each bond as a proportion of the total

portfolio value. A limitation of this approach is that it assumes a **parallel shift** in the yield curve (yields at all maturities change at the same time by the same amount).

CURVE-BASED AND EMPIRICAL FIXED-INCOME RISK MEASURES

Modified duration is not appropriate for bonds with embedded options because their future cash flows may change depending on the level and path of interest rates. For these bonds, we use **effective duration**, which uses the change in the benchmark yield curve, rather than the change in YTM, to generate V_- and V_+:

$$\text{effective duration} = \frac{V_- - V_+}{2 \times V_0 \times \Delta_{\text{curve}}}$$

Effective convexity, like effective duration, must be used for bonds with embedded options:

$$\text{effective convexity} = \frac{V_- + V_+ - 2V_0}{(\Delta \text{ curve})^2 \times V_0}$$

This is the estimated price change including the convexity adjustment:

$$\begin{aligned}
&\text{change in full bond price} \\
&= -(\text{effective duration})(\Delta\text{curve}) + (1/2)(\text{effective convexity}) \\
&\quad (\Delta\text{curve})^2
\end{aligned}$$

While the convexity of any option-free bond is positive, a callable bond can exhibit **negative convexity** at low yields. The call price puts an effective limit on increases in bond value because at low yields, the bond is likely to be called. For a bond with negative convexity, the price increase from a decrease in YTM is smaller than the price decrease from an increase in YTM.

A putable bond always has positive convexity. At higher yields, the put becomes more valuable so that the value of the putable bond decreases less than that of an option-free bond as yield increases. This means the duration of a putable bond is less than that of an equivalent option-free bond at high yields.

Duration is an adequate measure of bond price risk only for parallel shifts in the yield curve. The impact of nonparallel shifts can be measured using **key rate duration**. A key rate duration is the sensitivity of the value of a bond or portfolio to changes in the spot rate for a specific maturity, holding other spot rates constant. A bond or portfolio will have a key rate duration for each maturity range on the spot rate curve.

Empirical and Analytical Duration

Duration measures of bond price sensitivity to changes in yields based on mathematical analysis are referred to as **analytical durations**. A different approach is to estimate **empirical durations** using the historical relationship between benchmark yield changes and changes in the yield spread for corporate bonds.

Corporate bond durations based on a shift in the government yield curve implicitly assume that the credit spread for the corporate bond remains unchanged. When this assumption is not justified, estimates of empirical duration based on the actual relationship between changes in the benchmark yield curve and changes in yield spreads may be more appropriate.

An example of such a situation is a "flight to quality," when yields on government bonds decrease, but credit spreads increase at the same time. As a result, government bond prices increase, but corporate bond prices increase by less or possibly not at all. For a corporate bond portfolio, an estimate of empirical duration that accounts for this effect would be lower (i.e., less price response to a decrease in benchmark yields) than an estimate of analytical duration would indicate.

CREDIT RISK

The key drivers of **credit risk** are either specific to the borrower (bottom up) or relate to general economic conditions (top down). These are often referred to as the "Cs" of credit analysis.

Bottom-up credit analysis factors are as follows:

- *Capacity*. The borrower's ability to make their debt payments on time.
- *Capital*. Other resources available to the borrower that reduce reliance on debt.
- *Collateral*. The value of assets pledged to provide the lender with security in the event of default.
- *Covenants*. The legal terms and conditions the borrowers and lenders agree to as part of a bond issue.
- *Character*. The borrower's integrity (e.g., management for a corporate bond) and their commitment to make payments under their debt obligations.

Top-down credit analysis factors are as follows:

- *Conditions*. The general economic environment that affects all borrowers' ability to make payments on their debt.
- *Country*. The geopolitical environment, legal system, and political system that apply to the debt.
- *Currency*. Foreign exchange fluctuations and their impact on a borrower's ability to service foreign-denominated debt.

Credit analysts should distinguish between an issuer being illiquid, or unable to raise cash to service debt, and being insolvent, where the assets of an issuer fall below the value of its debt. An illiquid issuer may not necessarily be insolvent, but could still default. When default occurs, clauses written into a bond indenture are important. A **cross-default clause** means that a default on one bond issue causes a default on all issues. A **pari passu clause** means that all bonds of a certain type rank equally in the default process.

A debt investor's **expected exposure** or **exposure at default** is the difference between the amount the investor is owed and the value of the collateral available. A

bond's expected **recovery rate** is the proportion of a claim an investor will recover if the issuer defaults. The proportion an investor will not recover, or one minus the recovery rate, is known as **loss severity**.

Loss given default is the loss that an investor will suffer if the issuer defaults. This can be stated as a monetary amount or as a percentage. Stated as a percentage, loss given default is the product of the expected exposure and the loss severity. Estimates of loss given default depend on whether the bond is secured or unsecured, and on its level of seniority.

Probability of default is the probability that a borrower fails to pay interest or repay principal when due. The probability is typically expressed on an annualized basis. Probability of default can be assessed through quantitative metrics relating to capacity to repay, such as leverage and coverage ratios.

Credit risk is measured by assessing the **expected loss** from a debt investment in the event of default:

expected loss = probability of default × loss given default (as a money amount)

We can estimate the credit spread over a risk-free benchmark that an investor should demand as follows:

credit spread ≈ probability of default × loss given default (as a percentage)

If the actual credit spread of the issue is greater than this estimated credit spread, the investor is more than fairly compensated for credit risk. If the actual credit spread is less than this estimated credit spread, investors are not adequately compensated for credit risk and should avoid investing.

Investment-grade issuers have a lower probability of default than high-yield issuers. However, because high-yield issuers often issue secured debt with a secondary source of repayment, high-yield debt can have lower losses given default than unsecured investment-grade debt.

Credit Ratings

Credit rating agencies assign forward-looking ratings to both the issuers of bonds and their debt issues, based on qualitative and quantitative credit risk factors.

Figure 3 shows ratings scales used by Standard & Poor's, Moody's, and Fitch. Bonds with ratings of Baa3/BBB– or higher are considered **investment grade**. Bonds rated Ba1/BB+ or lower are considered **non-investment grade** and are often called **high-yield bonds** or **junk bonds**.

Figure 3: Credit Rating Categories

(a) Investment-Grade Ratings		(b) Non-Investment-Grade Ratings	
Moody's	*Standard & Poor's, Fitch*	*Moody's*	*Standard & Poor's, Fitch*
Aaa	AAA	Ba1	BB+
Aa1	AA+	Ba2	BB
Aa2	AA	Ba3	BB–
Aa3	AA–	B1	B+
A1	A+	B2	B
A2	A	B3	B–
A3	A–	Caa1	CCC+
Baa1	BBB+	Caa2	CCC
Baa2	BBB	Caa3	CCC–
Baa3	BBB–	Ca	CC
		C	C
		C	D

Relying on ratings from credit rating agencies has risks:

- Market prices and credit spreads can change much faster than credit ratings.
- Event risks specific to a company or industry (e.g., natural disasters, acquisitions, and equity buybacks using debt) are difficult to anticipate and therefore not easily captured in credit ratings.
- Credit ratings change over time, and ratings mistakes happen.

Credit Spreads

We can use duration and convexity to estimate the price impact of a change in a bond's credit spread simply by replacing the yield change (ΔYTM) with the spread change (Δspread):

change in full bond price

= –(annual modified duration)(Δspread) + (1/2)(annual convexity)(Δspread)^2

Credit spread risk is the risk that yield spreads widen due to deteriorating conditions, causing credit-risky bond prices to decrease. Credit spread risk arises from macroeconomic, issuer-specific, and market factors:

- Credit risk changes largely in line with the economic cycle. In times of strong growth and high profits, the probability of default decreases, causing spreads to contract; at times of recession, the probability of default increases, causing spreads to widen.
- The financial performance of the issuer will have a significant impact on its yield spread and volatility. To assess issuer-specific concerns, investors often compare an issuer's yield spread to the average of bonds of a similar credit rating.

- Market liquidity risk can be assessed through bid-offer spreads. A wider bid-offer spread implies higher costs of trading to investors and indicates higher market liquidity risk. Market liquidity risk is higher for less actively traded bonds, for issuers with lower credit quality, and for issuers with less debt outstanding.

Credit spreads for high-yield issuers may behave differently than credit spreads for investment-grade issuers over a business cycle. Yield spreads usually increase with maturity because the probability of default increases over longer time frames, giving rise to upward-sloping credit spread curves. During economic contractions, high-yield and investment-grade credit curves rise and flatten as the probability of a near-term default increases. The high-yield credit curve may even invert. During economic expansions, high-yield and investment-grade credit curves fall and steepen as the probability of a near-term default decreases. Credit curves are lowest and steepest at the peak of a cycle.

High-yield spreads tend to fluctuate more than investment-grade spreads as economic conditions change. High-yield spreads can widen dramatically in times of crisis as investors sell riskier assets and buy safer ones in a **flight to quality**. Because high-yield issues tend to be less liquid, bid-offer spreads for high-yield debt may widen more than for investment-grade debt in times of crisis.

CREDIT ANALYSIS FOR GOVERNMENT ISSUERS
Sovereign Government Debt

Factors that affect the credit risk of sovereign issuers can be split into five qualitative factors and three quantitative factors.

Qualitative Factors	Quantitative Factors
1. Institutions and policy	1. Fiscal strength
2. Fiscal flexibility	2. Economic growth and stability
3. Monetary effectiveness	3. External stability
4. Economic flexibility	
5. External status	

Institutions and policy factors address whether a government encourages political stability (a stable political system and peaceful coexistence with neighboring countries) and economic stability (property rights, a culture of debt repayment, transparency and consistency in data reporting, and policies that encourage business activity).

Fiscal flexibility factors relate to the government's ability to increase tax collection or decrease public spending to ensure debt service payments are made.

Monetary effectiveness factors relate to the independence of the central bank and its ability to vary the money supply and interest rates in a credible manner.

Economic flexibility factors relate to growth trends, income per capita, and diversity of sources for economic growth.

External status factors relate to the standing of a country's currency in international markets, as well as geopolitical risks.

Fiscal strength is measured by low debt amounts and interest obligations relative to GDP and revenue.

Economic growth and stability is measured by high real GDP growth, large real economy size, high per-capita GDP, and low volatility of real GDP growth.

External stability is measured by high foreign exchange reserves, low long-term external debt, low near-term external debt (all relative to GDP), and high foreign exchange reserves relative to external debt.

Nonsovereign Government Debt

Quasi-government agencies and government-sector banks or financing institutions are established to carry out a particular government-sponsored role. Backed by law, and with implicit government support, credit ratings for agency debt issues are usually similar to the relevant sovereign debt rating. For supranational issuers, credit ratings depend on the implicit support of the governments and global development institutions that sponsor them.

Regional governments include provinces, states, and local governments. State and local government bonds in the United States are referred to as **municipal bonds**. Most regional government bonds can be classified as general obligation bonds or revenue bonds:

- **General obligation bonds** are unsecured bonds backed by the taxing power of the issuing nonsovereign government entity. Municipal governments' ability to service their general obligation debt depends ultimately on the strength of the local economy.
- **Revenue bonds** are issued to finance specific projects, such as airports, toll bridges, hospitals, and power generation facilities. Revenue bonds often have more credit risk than general obligation bonds because the project is the sole source of funds to service the debt. Analyzing revenue bonds is similar to analyzing corporate bonds, with a focus on the cash flows generated by the project and the issuer's ability to service their debt as measured by the debt service coverage ratio.

CREDIT ANALYSIS FOR CORPORATE ISSUERS

When evaluating the likelihood and impact of a corporate default, an analyst will assess both qualitative and quantitative factors.

Qualitative factors include an issuer's business model, the degree of competition in its industry, its business risk, and the quality of its corporate governance:

- *Business model*. A corporate issuer with high credit quality will have a business model with stable and predictable cash flows. For longer-term debt issues, a credit analyst should consider any long-term changes to its business model that the issuer will need to make to remain competitive.

- *Industry competition.* Less intensive competition is favorable for an issuer's credit quality. Analysts need to consider any long-term changes in the competitive landscape.
- *Business risk.* High-credit-quality issuers have low risk of unexpected deviations from expected revenues and margins. These can originate from issuer-specific, industry-specific, or external sources.
- *Corporate governance.* An issuer with high credit quality should have sufficient processes in place to ensure fair treatment of debtholders. Analysts must assess the potential for management to issue additional debt that would dilute the claims of existing debtholders and assess past actions of management for evidence of preferential treatment of equity investors over debt investors. Analysts must also watch for aggressive accounting policies and other warning signs about the character of management.

Quantitative analysis can be performed on a top-down or bottom-up basis, or both. Top-down inputs relate to the economic cycle, the size of the industry and the company's market share, and event risk related to potential external shocks. Bottom-up inputs relate to issuer-specific factors driving revenue, costs, balance sheet assets and liabilities, and future cash flows. Modeling the future performance of corporate issuers involves estimating future financial statements and cash flows to identify the key factors that drive the company's probability of default and loss given default, and forecasting how these are likely to change over the economic cycle.

All else equal, companies are deemed to be of higher credit quality if the issuer has strong operating profits and recurring revenues, low leverage, high coverage of debt service payments with periodic income, and high liquidity to meet short-term debt payments. Credit analysts calculate ratios to assess creditworthiness, find trends over time, and compare companies to industry averages and peers. The following figure summarizes commonly used credit ratios.

Figure 4: Financial Ratios for Corporate Credit Analysis

Ratio Type	Ratio Name	Calculation	Indication of Higher Credit Quality
Profitability	EBIT margin	EBIT / revenue	Higher ratio
Coverage	EBIT to interest expense	EBIT / interest expense	Higher ratio
Leverage	Debt to EBITDA	Debt / EBITDA	Lower ratio
Leverage	RCF to net debt	RCF / (debt – cash and marketable securities)	Higher ratio

Earnings before interest, taxes, depreciation, and amortization (EBITDA) is operating income plus depreciation and amortization. A drawback to using this measure for credit analysis is that it does not adjust for capital expenditures and

changes in working capital, even though cash needed for these uses is not available to debtholders.

Funds from operations (FFO) is net income from continuing operations plus depreciation, amortization, deferred taxes, and noncash items. FFO is similar to CFO, except that FFO excludes changes in working capital.

Retained cash flow (RCF) is operating cash flow minus dividends. Analysts may define operating cash as CFO, FFO, or another preferred measure.

Debt Seniority Rankings

Recovery rates are the highest for debt with the highest **priority of claims** and decrease with each lower rank of seniority. The lower the **seniority ranking** of a bond, the higher its credit risk. The general seniority rankings, or priority of claims for debt repayment, are the following:

1. First lien/mortgage
2. Senior secured (second lien)
3. Junior secured
4. Senior unsecured
5. Senior subordinated
6. Subordinated
7. Junior subordinated

Secured debt has a higher priority of claims than unsecured debt. Secured debt is backed by collateral, which can be sold to recover funds for bond investors in the event of default by the issuer. Secured debt can be further distinguished as **first lien** (where a specific asset is pledged) or **first mortgage** (where a specific property is pledged); senior secured (**second lien**); or junior secured debt.

Unsecured debt represents a general claim to the issuer's assets and cash flows. Unsecured debt is further divided into senior, junior, and subordinated rankings.

All debt within the same category is said to rank as pari passu. All senior secured debtholders, for example, are treated alike in a corporate bankruptcy.

Credit rating agencies assign ratings to corporate issuers based on the creditworthiness of their senior unsecured debt ratings, referred to as **corporate family ratings**, and to individual debt securities, referred to as **corporate credit ratings**. Higher ratings indicate a lower expected default rate. **Notching** is the practice of assigning different ratings to bonds of the same issuer.

In a holding company structure, a subsidiary's debt covenants may prohibit the transfer of cash or assets to the parent until after the subsidiary's debt is serviced. The parent company's bonds are, thus, effectively subordinated to the subsidiary's bonds. This is referred to as **structural subordination** and is considered by rating agencies when notching an issue credit rating.

FIXED-INCOME SECURITIZATION

Securitization refers to a process by which financial assets (e.g., mortgages, accounts receivable, or automobile loans) are purchased by an entity that then issues **asset-backed securities (ABS)** for which the promised payments come from the cash flows from those financial assets. Securitization involves the following steps:

1. The **originator** (a bank making loans or a corporation extending credit to customers) creates a pool of debt-based assets.
2. The collateral (pool of assets) is sold to a **special purpose entity (SPE)**, which is a legal entity separate from the originator.
3. The SPE issues ABS supported by the cash flows from the collateral.

Originators benefit from securitization through increased business activity (proceeds from securitizing can be used to make new loans); improved profits (originators can charge fees); improved liquidity (removing otherwise-illiquid loans from the balance sheet); and for banks, decreasing their required amount of capital reserves.

Investors benefit because ABS can be tailored to their risk and return needs; by gaining access to the collateral pool they would not otherwise have; and by creating a liquid market for the collateral that allows them to react quickly to changes in market conditions. Economies and financial markets benefit because securitization decreases liquidity risk and improves market efficiency.

The risks to investors in ABS are that the cash flows from the collateral are uncertain and can vary in timing and size, and that the credit risk of the collateral is passed through to investors in the ABS. Systemic buildup of credit risk in ABS can create risks for the financial system.

Parties to a Securitization Transaction and Their Functions

- The originator (seller or depositor) sells a portfolio of loans to the SPE.
- The **issuer/trust** is the SPE that buys the loans from the seller and issues ABS to investors.
- The **servicer** collects the payments from the underlying loans. The servicer may or may not be the issuer.

The following figure illustrates a securitization of auto loans.

Figure 5: Structure of Fred Motor Company Asset Securitization
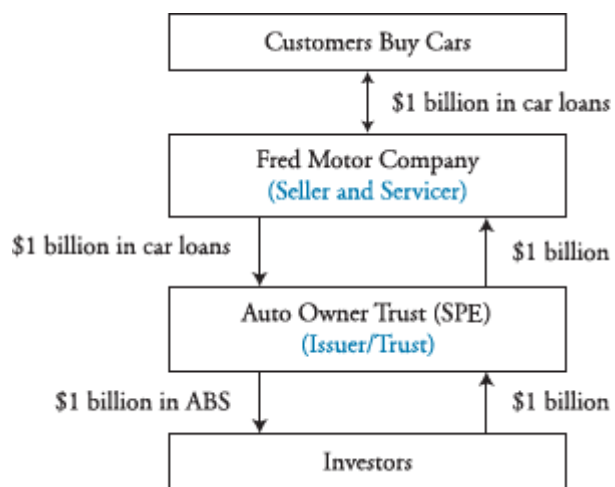
A **disinterested trustee** is appointed to oversee the safekeeping of collateral and cash flows due to the ABS investors and provide information to ABS holders. Principal and interest payments on the loans are allocated to pay principal and interest payments to the owners of the ABS, as well as fees to the servicer.

The SPE is **bankruptcy remote** from the originator. Because the SPE is a separate legal entity, a decline in the originator's financial position does not affect the value of the claims of ABS owners. This also means that the buyers of the ABS have no claim on the originator's other assets.

ABS INSTRUMENT AND MARKET FEATURES

Covered Bonds vs. ABS

Covered bonds are issued primarily by European, Asian, and Australian banks. These are similar to ABS, except that no SPE is created; the underlying assets, while segregated from other assets of the issuer, remain on its balance sheet. If the issuer defaults, covered bond investors have **dual recourse** of claims on both the underlying assets and the issuer's other assets that have not been pledged as collateral for other debt. Unlike an ABS, in which the pool of assets is fixed at issuance, a covered bond requires the issuer to replace or augment nonperforming or prepaid loans.

Covered bonds may have different provisions in case their issuer defaults:

- A **hard-bullet covered bond** is in default if the issuer fails to make a scheduled payment, leading to the acceleration of payments to covered bondholders.
- A **soft-bullet covered bond** may postpone the originally scheduled maturity date by as much as a year, should a payment on the covered bond be missed.
- A **conditional pass-through covered bond** converts to a pass-through bond on the maturity date if any payments remain due.

Credit Enhancement Structures

Internal **credit enhancements** of ABS are features designed to mitigate the credit risk from defaults in the collateral pool. They take three main forms:

- **Overcollateralization**. The value of the collateral exceeds the face value of the ABS.
- **Excess spread**: Income on the collateral that exceeds the coupon promised to ABS investors is used as a reserve to absorb credit losses in the collateral.
- **Credit tranching** or **subordination**. The ABS is structured with multiple classes of securities (tranches), each with a different priority of claims to the cash flows of the collateral. Subordinated tranches absorb credit losses first. This is also called a **waterfall structure** because in liquidation, each subordinated tranche would receive only the "overflow" from the more senior tranches if they are repaid in full.

ABS Examples

Credit card ABS are backed by credit card receivables, which typically are nonamortizing loans on which borrowers can choose to repay principal at their discretion. Credit card ABS typically have an initial **lockout period** or **revolving period** during which only interest is paid to investors, and all principal payments on the receivables are used to purchase additional receivables. Once the lockout period ends, the **amortization period** of the ABS begins, and principal payments made on the underlying collateral are passed through to security holders.

Solar ABS are backed by loans to homeowners wishing to finance the installation of solar energy systems to reduce their energy bills. Solar ABS are attractive to investors focused on ESG factors because they provide funds for homeowners to switch to a renewable energy source. Internal credit enhancement methods such as overcollateralization, excess spread, or subordination are common in these structures. Many solar ABS have a **pre-funding period** that allows the trust to invest in solar-related loans for a fixed period after issuing the ABS.

Collateralized Debt Obligations

Collateralized debt obligations (CDOs) are structured securities backed by a pool of debt obligations. CDOs include **collateralized bond obligations (CBOs)** backed by corporate and emerging market debt, and **collateralized loan obligations (CLOs)** backed by leveraged bank loans. What sets CDOs apart from regular ABS is that CDOs have a **collateral manager** who dynamically buys and sells securities in the collateral pool to generate the cash to make the promised payments to investors.

CDOs issue subordinated tranches in a similar fashion to ABS. In creating a CDO, the structure must be able to offer an attractive return on the lowest-ranked equity tranche, after accounting for the required yields on the more senior CDO debt tranches. Before the 2007–2009 financial crisis, CDOs were based on a wide variety of underlying collateral. Since the crisis, CDO structures have become less complex. Most CDOs today are CLOs.

Three major types of CLOs are as follows:

1. *Cash flow CLOs.* Payments to CLO investors are generated through cash flows on the underlying collateral.
2. *Market value CLOs.* Payments to CLO investors are generated through trading the market value of the underlying collateral.
3. *Synthetic CLOs.* The collateral pool exposure is generated through credit derivative contracts. In this type of CLO, the trust does not take ownership of the collateral.

To protect CLO investors from default, the collateral is subject to a series of tests that include coverage of payment obligations to the CLO investors by cash flows from the collateral; overcollateralization levels for each tranche; diversification in the collateral pool; and limitations on the amount of CCC rated debt in the collateral pool.

MORTGAGE-BACKED SECURITY INSTRUMENT AND MARKET FEATURES

A **residential mortgage loan** is a loan for which the collateral that underlies the loan is residential real estate. Mortgage loans may include prepayment penalties (common in Europe, but rare in the United States) and may be **recourse loans** (the lender also has a claim against other assets of the borrower) or **nonrecourse loans** (only the specified property is collateral). In Europe, most residential mortgages are recourse loans. In the United States, the nature of the loans varies by state, but most loans are nonrecourse.

A key measure of default risk for a mortgage loan is its loan-to-value ratio. The lower the loan-to-value ratio, the higher the borrower's equity in the property. Another key measure is the borrower's debt-to-income ratio. A borrower with a lower debt-to-income ratio is deemed of lower risk to default.

In the United States, **prime loans** are mortgages made to borrowers with good credit, low loan-to-value ratio, and low debt-to-income ratio. Mortgages to borrowers of lower credit quality or that have a lower-priority claim to the collateral in event of default are termed **subprime loans**.

Residential mortgage-backed securities (RMBS) are ABS for which the underlying loans are residential mortgages. In the United States, **agency RMBS** are either guaranteed by the government or guaranteed by a government-sponsored enterprise. Mortgages need to meet minimum underwriting standards to qualify as collateral for an agency RMBS. **Non-agency RMBS** are issued by private entities and have no government or agency guarantee. Issuance of non-agency RMBSs effectively ceased after the 2007–2009 credit crisis due to changes in regulation.

Prepayment Risk

The mortgages underlying RMBS have no prepayment penalties and are subject to **prepayment risk**. In a pool of mortgages, some of the borrowers are likely to prepay, typically because they sell their homes or refinance their mortgages. RMBS valuation is based on an assumed prepayment rate for the underlying mortgages. Prepayment risk is

the risk that prepayment speeds turn out to be *different to the expectations* of RMBS investors:

- **Extension risk** refers to a prepayment rate that is slower than expected, so that principal is returned later. When interest rates increase, borrowers' prepayment speeds will be slower than expected because refinancing activity will slow, leading to extension in the average life of an RMBS. Extension is bad for RMBS investors because cash flows will be discounted by more periods at a higher discount rate.
- **Contraction risk** refers to a prepayment rate that is faster than expected, so that principal is returned earlier. When interest rates decrease, borrowers often refinance their mortgages at lower rates, repaying the original higher-rate mortgages early. This increases prepayment speeds and causes contraction in the average life of an RMBS. Contraction is bad for RMBS investors because they receive cash flows sooner than expected in a low-rate environment and face lower reinvestment returns.

Pass-Through Securities and Collateralized Mortgage Obligations

A **mortgage pass-through security** represents a claim on the cash flows from a pool of mortgages. Investors in mortgage pass-through securities receive the monthly cash flows generated by the underlying pool of mortgages, less any servicing and insurance fees.

The mortgages in the pool typically have different maturities and different mortgage rates:

- The **weighted average maturity** of the pool is equal to the weighted average of the final maturities of the mortgages, weighted by each mortgage's outstanding principal.
- The **weighted average coupon** of the pool is the weighted average of the interest rates of all the mortgages in the pool, weighted by each mortgage's outstanding principal.

The **pass-through rate**, or the coupon rate on the MBS, is less than the weighted average coupon because of servicing and insurance fees.

Collateralized mortgage obligations (CMOs) are securities that are collateralized by pass-through MBS and pools of mortgages. Each CMO has multiple tranches, each with a different risk exposure.

One way to reapportion prepayment risk is to use **time tranching** with different bond classes having different maturities. A **sequential-pay CMO** uses time tranching. Principal payments for the collateral flow to tranches in a prespecified order. Once the first tranche has been fully paid, principal from the underlying collateral flows to the next tranche. The tranches that mature first provide more protection against extension risk. Tranches with longer maturities provide more protection against contraction risk.

A different CMO structure can have a **planned amortization class (PAC) tranche** with reduced prepayment risk because **support tranches** take on more prepayment risk. If

prepayment speeds increase, the additional payments go to the support tranches; if prepayment speeds decrease, principal payments to the support tranches are reduced. In this way, both contraction and extension risk are reduced for PAC tranche investors, to the extent that prepayment speeds remain within the range under which the support tranche can operate.

Other CMO structures may include a **Z-tranche** that receives no interest payments during a specified accrual period (but rather accrues extra principal); interest-only or principal-only securities; floating-rate tranches; or **residual tranches** that are subordinated to all other tranches, similar to the equity tranche of an ABS.

Commercial Mortgage-Backed Securities

Commercial mortgage-backed securities (CMBS) are backed by income-producing real estate (e.g., apartments [multi-family], warehouses [industrial use property], shopping centers, office buildings, health care facilities, senior housing, or hotel/resort property).

Unlike residential mortgages, which are typically repaid by the property owner, commercial mortgages are repaid by real estate investors—who, in turn, rely on tenants (usually businesses) and their customers to provide the cash flow to repay the mortgage. For this reason, the credit rating for CMBS is often focused on the credit risk of the property and not the credit risk of the borrower. Analysts focus on the property's loan-to-value ratio and debt service coverage ratio:

$$\text{loan-to-value ratio} = \frac{\text{current mortgage amount}}{\text{current appraised value}}$$

$$\text{debt-to-service coverage ratio} = \frac{\text{net operating income}}{\text{debt service}}$$

Either a lower loan-to-value ratio or a higher debt service coverage ratio can increase the credit rating for a CMBS.

Call protection (prepayment protection) can be provided for CMBS, either at the individual mortgage level or for the CMBS as a whole. CMBS-level call protection is sometimes provided by sequential-pay tranching similar to that used for CMOs. Loan-level call protection can be provided by the following:

- **Prepayment lockout period**. This is a period during which the loan cannot be prepaid.
- **Defeasance**. Any prepayments are used to purchase Treasury securities that will generate cash flows to make future loan payments.
- **Prepayment penalty**. This is a percentage of the principal amount that must be paid if the loan is paid off early.

Commercial mortgages are typically not fully amortized. At the end of the loan term, a **balloon payment** needs to be paid. The possibility that the borrower cannot arrange refinancing to make this payment is called **balloon risk**. In this case, the lender might

extend the term of the loan during a "workout period" under modified terms. This creates extension risk for CMBS investors.

Weight on Exam	5% to 8%
SchweserNotes™ Reference	Book 4, pages 187–267

DERIVATIVE INSTRUMENT AND DERIVATIVE MARKET FEATURES

A **derivative** obtains its value from the value of another security, interest rate, index value, or another variable at a specific future date. We call that security or variable the **underlying** of a derivative.

One example of a derivative is a **forward contract**, in which one party agrees to buy (and the counterparty agrees to sell) the underlying for a specified price (the **forward price**) on a specified future date (the **settlement date** or **expiration date**).

We can view a derivative contract as a way to transfer risk. For example, selling a forward contract on shares of stock effectively locks in a future price and transfers price risk to the forward buyer. We say the seller has **hedged** (reduced or offset) their stock price risk. If the buyer has no existing price risk before entering the forward contract, we say they are **speculating** as opposed to hedging.

If the risk offset by a derivative exactly matches an existing risk, we say the derivative creates a **full hedge** of the existing risk. If a derivative reduces an existing risk but does not eliminate it, we say it creates a **partial hedge**.

A derivative may be a **deliverable contract**, in which the parties actually exchange the underlying at settlement, or a **cash-settled contract**, in which the parties exchange only the gains and losses at settlement. Ignoring transactions costs, we say that delivery and cash settlement are economically equivalent.

Derivatives have potential advantages over cash market transactions:

- Investors can gain exposure to a risk at low cost through derivatives.
- Transaction costs may be significantly lower for a derivatives position than for a cash market transaction.
- If a cash market transaction would have a significant impact on the underlying price, taking a derivatives position may be a lower-cost alternative.

Forwards, most swaps, and some options are **over-the-counter derivatives**, which are custom instruments created and traded by dealers in a market with no central location. Over-the-counter markets are largely unregulated and less transparent than exchange markets. In over-the-counter markets with no central clearinghouse, each side of a

trade faces **counterparty credit risk**, which is the risk that the other party to the trade does not fulfill its obligations.

Exchange-traded derivatives are standardized and backed by a central clearinghouse, which effectively takes the opposite position to each side of a trade (called **novation**) and guarantees the payments promised under the contract. This effectively eliminates counterparty credit risk for both parties to a contract.

After the financial crisis of 2008, regulators worldwide instituted a **central clearing mandate** for many swap trades, requiring that a central counterparty take on the counterparty credit risk of both sides of a trade, similar to the role of a central clearinghouse.

FORWARD COMMITMENT AND CONTINGENT CLAIM FEATURES AND INSTRUMENTS

A **forward commitment** is a legally binding promise to perform some action in the future. Derivatives that are forward commitments include forward contracts, futures contracts, and most swaps. By contrast, a **contingent claim** to a payoff depends on a future event. Derivatives that are contingent claims include options and credit default swaps.

Forward Contracts

In a forward contract between two parties, one party commits to buy and another party commits to sell an underlying at a specific price on a specific date in the future. The forward price is typically set such that the contract has zero value to either party at inception.

The buyer of the forward gains when the price of the underlying increases; the buyer loses when it decreases (similar to a long position in the underlying). We say the forward buyer has **long exposure** to the underlying, and the forward seller has **short exposure** to the underlying.

Futures Contracts

A futures contract is quite similar to a forward contract, but it is standardized and exchange traded. Futures differ from most forwards in that they trade in liquid markets, are regulated more strictly, and offer greater transparency.

On a futures exchange, both the buyer and seller must deposit **margin**, which protects the clearinghouse from counterparty risk. Based on the settlement price of the futures at the end of each trading day, the clearinghouse adjusts the margin accounts of both buyers and sellers for gains and losses. This is known as **marking to market**.

Initial margin is the amount of cash or collateral that a party must deposit before entering a futures position. **Maintenance margin** is the minimum amount the party must have in the margin account to keep a futures position. If the balance in the account falls below the maintenance margin, the party must bring the margin balance

back up to the *initial* margin amount or close out the futures position. (Note the difference from equity trading, where a margin call only requires bringing the account back up to the *maintenance* level.)

Each day's **settlement price** for a futures contract is the average price of trades over a period at the end of the trading session. Many futures exchanges impose **price limits** on how much each day's settlement price can differ from the previous day's price. Some exchanges have **circuit breakers** that suspend trading for short periods when a futures price changes by a specific amount.

Swap Contracts

Swaps are agreements to exchange a series of payments on multiple settlement dates over a specified period, such as quarterly payments for two years.

In a simple **fixed-for-floating interest rate swap**, the contract specifies a **notional principal** amount, a fixed interest rate (the **swap rate**) that determines the payments of the **fixed-rate payer**, and a **market reference rate (MRR)** that determines the payments of the **floating-rate payer**. Typically, the two payments are netted so that the party owing the greater payment pays the difference to the counterparty.

The swap rate is set so that the swap has zero value to each party at its inception. As expectations of future values of the MRR change over time, the value of the swap will become positive for one party and negative (in an equal amount) for the other party.

A company with a floating-rate note outstanding can effectively convert it to a fixed-rate liability by entering a swap as the fixed-rate payer (floating-rate receiver). The payments from the floating-rate payer essentially cover the interest owed on the company's floating-rate note, and the company makes fixed interest payments.

In a **credit default swap (CDS)**, one party makes fixed periodic payments in exchange for a payment to be made if there is a **credit event**, such as a default, on an underlying reference security. If a credit event occurs, the protection seller must pay an amount that offsets the loss in value of the reference security. This is similar to insuring a bond against default.

The holder of a risky bond can hedge its default risk by entering a CDS as the protection buyer. The protection seller receives the default risk premium, or credit spread, and takes on the risk of default, resulting in risk exposure similar to that of holding the reference bond. The protection buyer essentially pays the credit spread on the reference security for insurance against default.

Options

An **option** contract gives its owner the right, but not the obligation, to either buy or sell an underlying asset at a given price (the **exercise price** or **strike price**). The option buyer can choose whether to exercise an option, whereas the seller is obligated to perform if the buyer exercises the option. There are four possible options positions:

1. *Long call*. The buyer of a call option—has the right to buy an underlying asset.

2. *Short call.* The writer (seller) of a call option—has the obligation to sell the underlying asset.

3. *Long put.* The buyer of a put option—has the right to sell the underlying asset.

4. *Short put.* The writer (seller) of a put option—has the obligation to buy the underlying asset.

The price of an option is also referred to as the **option premium**.

American options may be exercised at any time up to and including the contract's expiration date.

European options can be exercised only on the contract's expiration date.

Call Option Payoff Diagrams

The following graph illustrates the payoff at expiration for a call option as a function of the stock price, for both buyers and writers. Note that this differs from the *profit diagram* that follows in that the profit diagram reflects the initial cost of the option (the *premium*). Remember that the option buyer pays the premium to the option seller, and if the option finishes out of the money, the writer keeps the premium and the buyer loses the premium. Options are considered a *zero-sum game* because whatever amount the buyer gains, the seller loses, and vice versa.

> intrinsic value of a call option = max[0, S − X]
> intrinsic value of a put option = max[0, X − S]

Figure 1: Call Option Payoff Diagram
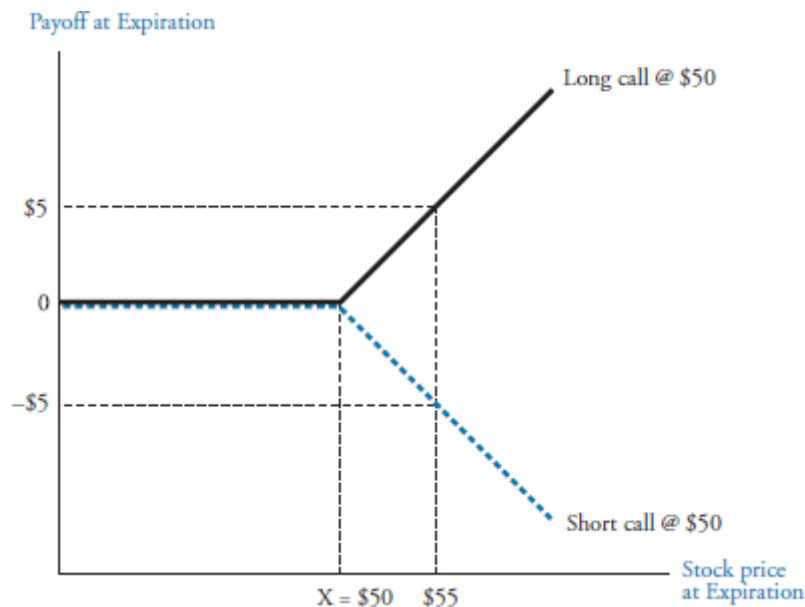
Figure 2: Profit/Loss Diagram for a Call Option

Profit

Option price = $5

Long call

$5
0
−$5

← Breakeven (X + Premium) = $55

Short call

Stock price
at Expiration

X = $50 $55
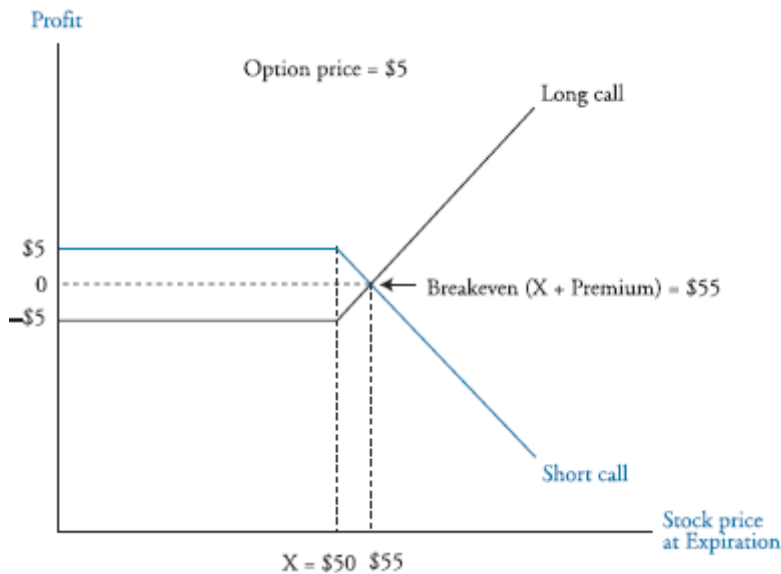
	Call Option	
	Maximum Loss	**Maximum Gain**
Buyer (long)	Premium	Unlimited
Seller (short)	Unlimited	Premium
Breakeven	X + premium	

Put Option Diagrams

The following graph illustrates the payoff at expiration for a put option as a function of stock price, for both buyers and writers.

Figure 3: Put Option Payoff Diagram

Payoff at Expiration

$50   Long put @ $50

$10

0

−$10

−$50   Short put @ $50

$40   X = $50

Stock price
at Expiration
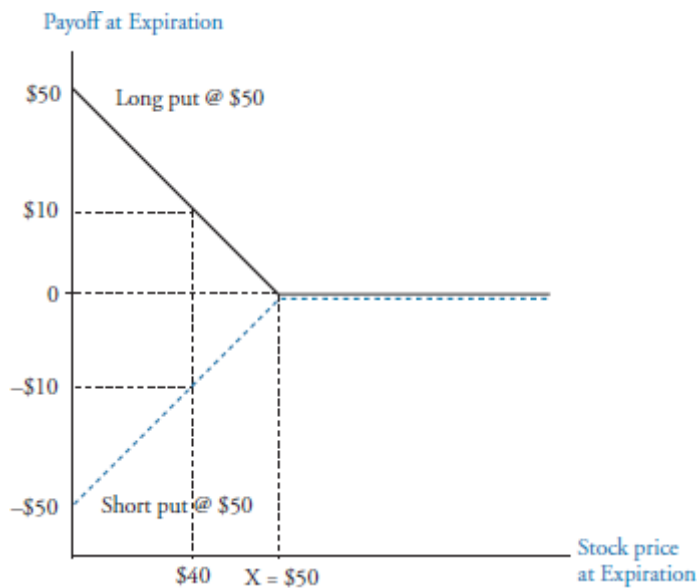
Note that in the *profit diagram* that follows, the cost of the option (the *premium*) is included.

Figure 4: Profit/Loss Diagram for a Put Option
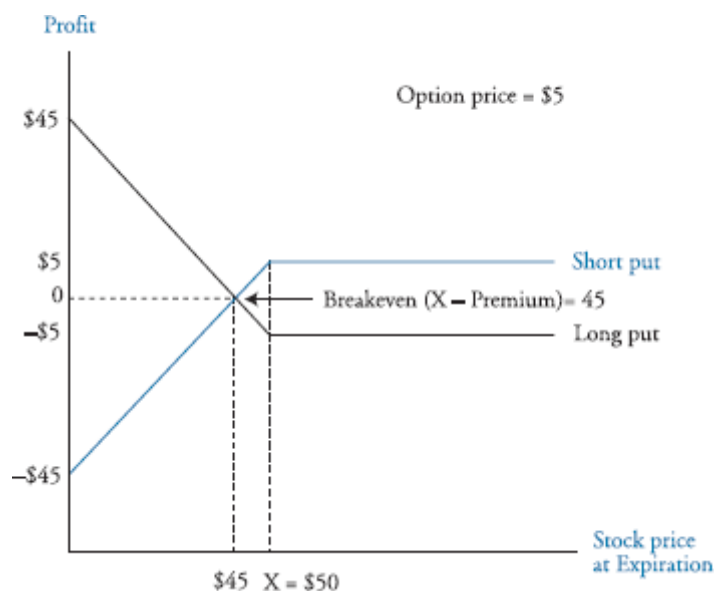
	Put Option	
	Maximum Loss	**Maximum Gain**
Buyer (long)	Premium	X – premium
Seller (short)	X – premium	Premium
Breakeven	X – premium	

DERIVATIVE BENEFITS, RISKS, AND ISSUER AND INVESTOR USES

Benefits of derivatives, compared to cash market transactions, include the following:

- Managing risks, transferring risks, and changing risk allocations
- Creating risk exposures that are not available in cash markets, such as one-sided exposures with options
- Information discovery, such as expected future prices, interest rates, or volatility
- Operational advantages, such as easier short sales, lower transaction costs, greater leverage, and lower cash requirements
- Improved market efficiency, by making it easier to exploit mispriced securities

Risks of derivatives, compared to cash market transactions, include the following:

- Greater implicit leverage
- Less transparency
- **Basis risk** when the derivative does not perfectly match the risk being hedged
- Liquidity risk, such as margin calls to maintain a futures hedge
- Counterparty credit risk for derivatives that do not involve central clearing parties
- Systemic risk to financial markets and institutions

Issuer uses of derivatives include hedging balance sheet risk from changes in asset and liability values and hedging the risk of earnings volatility from changes in interest rates or securities prices. For example, a company with sales in foreign markets might use foreign currency derivatives to manage its exchange rate risk. **Hedge accounting** permits companies to recognize gains and losses on some derivative hedges at the same time as changes in the values of assets or liabilities being hedged. This includes three types of hedge:

1. **Cash flow hedge.** This includes currency forwards used to hedge the domestic currency value of foreign currency revenues, or interest rate swaps used to convert a floating-rate liability to fixed rate.
2. **Fair value hedge.** This is for assets or liabilities the company recognizes at fair value. For example, if a company uses fair value accounting for a bond liability, using an interest rate swap to convert the liability to floating rate is a fair value hedge.
3. **Net investment hedge.** This is to decrease volatility in the balance sheet value of a foreign subsidiary in the parent's domestic currency.

Investor uses of derivatives, as we have seen, are to hedge, modify, or increase their exposure to the risk of an underlying asset or interest rate.

ARBITRAGE, REPLICATION, AND THE COST OF CARRY IN PRICING DERIVATIVES

Derivatives prices are based on a **no-arbitrage condition**. If we can create a portfolio with cash market transactions that has the same payoffs as a derivative for all possible future values of the underlying (we call this **replication**), the derivative must have the same value as that portfolio, or there will be an arbitrage opportunity that market participants will exploit rapidly.

We can replicate a long position in an asset that has no costs or benefits of holding it by buying a forward priced at $F_0(T)$ and buying a bond that pays the forward price, $F_0(T)$, at settlement. The proceeds of the bond will pay the forward price for the asset at settlement time = T, and we will own the asset with a value of S_T at time = T.

To prevent arbitrage, the asset price at t = 0, S_0, must equal the present value of the bond, $F_0(T) / (1 + R_f)^T$:

$$S_0 = F_0(T) / (1 + R_f)^T$$

We can solve for the no-arbitrage price of the forward at t = 0 as:

$$F_0(T) = S_0(1 + R_f)^T$$

Costs and Benefits of Holding an Underlying Asset

Some underlying assets, such as physical commodities, involve costs such as storage and insurance to hold them. On the other hand, holding commodities may have

nonmonetary benefits, such as the opportunity to sell them if their price is temporarily high (we refer to such benefits as **convenience yield**). Underlying assets such as financial securities may have cash benefits of holding them, such as interest or dividend payments.

The no-arbitrage forward price must account for any costs or benefits of holding the underlying. Denoting the present value of any costs of holding the asset from Time 0 to settlement as PV_0(costs), and the present value of any benefits over the forward's life as PV_0(benefits), the no-arbitrage forward price is:

$$F_0(T) = [S_0 + PV_0(\text{costs}) - PV_0(\text{benefits})](1 + R_f)^T$$

Note the signs on the costs and benefits. Costs of holding an asset *increase* its no-arbitrage forward price, while benefits from holding an asset *decrease* its no-arbitrage forward price.

The **net cost of carry** (or **cost of carry**, or simply **carry**) is the benefits minus the costs, where costs include the risk-free return. For an underlying with a positive net cost of carry (benefits > costs including R_f), the forward price will be less than the spot price.

We can also describe the relationship between spot and forward prices using continuously compounded rates of return:

- With no costs or benefits of holding the underlying asset, the no-arbitrage price of a forward that settles at Time T is $F_0(T) = S_0 e^{rT}$, where *r* is the stated annual risk-free rate with continuous compounding.
- With costs expressed as a continuously compounded annual rate of *c*, and benefits expressed as a continuously compounded annual rate of *b*, the no-arbitrage price of a forward that settles at Time T is $F_0(T) = S_0 e^{(r + c - b)T}$.

PRICING AND VALUATION OF FORWARD CONTRACTS AND FOR AN UNDERLYING WITH VARYING MATURITIES

Restating the relationship we have just seen, we can say the *value at initiation* of a forward contract equals zero:

$$V_0(T) = S_0 - F_0(T)(1 + R_f)^{-T} = 0$$

Note that $F_0(T)(1 + R_f)^{-T} = F_0(T) / (1 + R_f)^T$, the present value of the forward contract price.

The value to the buyer of a forward contract *during its life* is the current spot price of the asset minus the present value of the forward contract price:

$$V_t(T) = S_t - F_0(T)(1 + R_f)^{-(T-t)}$$

Including the carrying costs and benefits, the value to the buyer of a forward contract during its life is as follows:

$$V_t(T) = [S_t + PV_t(costs) - PV_t(benefits)] - F_0(T)(1 + R_f)^{-(T-t)}$$

where PV_t(costs) and PV_t(benefits) are the values at time = t of the costs and benefits remaining.

The value to the buyer of a forward contract *at settlement* is the difference between the spot price at expiration and the forward price:

$$V_T(T) = S_T - F_0(T)$$

At all times, the value to the seller is the opposite of the value to the buyer. If the forward buyer has a gain, the forward seller has an equal loss, and vice versa.

Forward Rate Agreements

Recall from Fixed Income that forward rates are yields for future periods, and that we can determine implied forward rates from spot rates. A **forward rate agreement (FRA)** is a derivative contract that has an interest rate as its underlying. In an FRA, the fixed-rate payer will pay the forward rate on a notional amount of principal at a future date, and the floating-rate payer will pay a future reference rate times the notional principal. In practice, the parties only exchange the net amount owed.

Financial institutions use FRAs to manage the volatility of their interest-sensitive assets and liabilities. FRAs are also the building blocks of interest rate swaps over multiple periods. An FRA is equivalent to a single-period swap.

PRICING AND VALUATION OF FUTURES CONTRACTS

With a forward contract (assuming no mark to market), the price $F_0(T)$ remains the same throughout its life, while the contract's value to each party fluctuates with changes in the value of the underlying. With futures contracts, because of marking to market, the *price* changes and the *value* returns to zero daily.

Futures contracts are marked to market during their lives, while forward contracts typically are not. This can lead to differences between futures prices and forward prices for otherwise-identical contracts. If the price of the underlying asset is positively correlated with interest rates, long futures positions will generate cash when rates are higher and require funds when rates are lower. This makes futures more desirable than forwards.

When futures prices are negatively correlated with interest rates, forwards will be more desirable than futures. The more desirable derivative will have a higher contract price. If rates are uncorrelated with futures prices, which includes the case where rates are constant, forwards and futures are equally desirable.

Interest Rate Futures and Forward Prices

Interest rate futures on MRRs are quoted on a price basis. For a market reference rate from Time A to Time B, an interest rate futures price is stated as follows:

$$\text{futures price} = 100 - (100 \times \text{MRR}_{A,\,B-A})$$

For example, if the futures price for a 6-month rate six months from now is 97, then $\text{MRR}_{6m,\,6m} = 3\%$.

The **basis point value (BPV)** of an interest rate futures contract is defined as follows:

$$\text{BPV} = \text{notional principal} \times \text{period} \times 0.01\%$$

A one-basis-point change in either direction will change the futures contract value by its BPV. This contrasts with interest rate forward contracts, which exhibit **convexity bias** in that an increase in the reference rate decreases a forward's value by less than a decrease in the reference rate increases its value. Just as we see with bonds, the convexity effect increases for longer periods. As a result, forward and futures prices can be significantly different for contracts on longer-term interest rates. In practice, the convexity effect for forwards and futures on short-term interest rates is very small, and we don't observe differences in their prices.

PRICING AND VALUATION OF INTEREST RATES AND OTHER SWAPS

We can describe a fixed-for-floating interest rate swap as being equivalent to a series of forward rate agreements, each with a fixed rate equal to the **par swap rate**. These FRAs are not necessarily market FRAs that have initial values of zero. The *sum* of the values of the FRAs that comprise a swap will be equal to zero at the initiation of a swap, but individually, these FRAs may have positive or negative values.

As with FRAs, the *price* of a swap is the fixed rate specified in the contract (the swap rate), and the *value* depends on how expected future short-term rates change over time. The value of a swap (to the fixed-rate payer) is the present value of the expected floating-rate payments minus the present value of the fixed-rate payments. An increase in expected future short-term rates will increase the value of the fixed-rate payer position in a swap, while a decrease in expected rates will decrease the value of the swap to the fixed-rate payer.

PRICING AND VALUATION OF OPTIONS
Options: Moneyness, Intrinsic Value, Time Value

An option that would provide a positive payoff if exercised is said to be **in the money**. The **intrinsic value** of an option is the amount that it is in the money or zero if the option is at the money or out of the money. The difference between the price of an option (called its premium) and its intrinsic value is termed its **time value**. Hence:

> option premium = intrinsic value + time value

The following table summarizes the moneyness of options based on the stock's current price, S, and the option's exercise price, X.

Moneyness	Call Option	Put Option
In the money	$S > X$	$S < X$
At the money	$S = X$	$S = X$
Out of the money	$S < X$	$S > X$

Factors Determining Option Values

Price of the Underlying Asset

An increase in the price of the underlying asset will increase the value of a call option. A decrease in the price of the underlying asset will decrease the value of a call option.

An increase in the price of the underlying asset will decrease the value of a put option. A decrease in the price of the underlying asset will increase the value of a put option.

The Exercise Price

A higher exercise price decreases the values of call options. A lower exercise price increases the values of call options.

A higher exercise price increases the values of put options. A lower exercise price decreases the values of put options.

The Risk-Free Rate of Interest

For options on assets other than bonds, an increase in the risk-free rate will increase call values. A decrease in the risk-free rate will decrease call values.

An increase in the risk-free rate will decrease put option values. A decrease in the risk-free rate will increase put option values.

Volatility of the Underlying

An increase in the volatility of the price of the underlying asset increases the values of both put and call options; a decrease in volatility of the price of the underlying decreases both put values and call values.

Time to Expiration

Longer time to expiration increases expected volatility of the asset price over the option's life and increases the value of call options. Less time to expiration decreases the value of call options.

For most put options, longer time to expiration will increase option values because expected volatility is greater with longer time to expiration. For some European put options, however, extending the time to expiration can decrease the value of the put

because the intrinsic value will be paid in the future and its present value decreases with longer time to expiration.

In general, the deeper a put option is in the money, the higher the risk-free rate; the longer the current time to expiration, the more likely that extending a put option's time to expiration will decrease its value.

Costs and Benefits of Holding the Asset

If there are benefits of holding the underlying asset (dividend or interest payments on securities or a convenience yield on commodities), call values are decreased and put values are increased.

An increase in storage costs for an asset has the opposite effect: increasing call values and decreasing put values. Call values increase because owning a call option becomes relatively more attractive than holding the asset itself when storage costs increase. Put values fall because buying and holding the asset for future delivery at the put price becomes more expensive.

OPTION REPLICATION USING PUT-CALL PARITY

Put-Call Parity for European Options

Put-call parity is based on the no-arbitrage principle that portfolios with identical payoffs must sell for the same price. A **fiduciary call** (composed of a European call option and a risk-free bond that will pay X at expiration) and a **protective put** (composed of a share of stock and a long put) both have identical payoffs at maturity, regardless of the value of the underlying asset at expiration. Based on this fact and the law of one price, we can state the following for European options:

$$c + X(1 + R_f)^{-T} = S + p$$

That is, the value of a call at X and the present value of the exercise price must equal the current asset price plus the value of a put or there would be an opportunity for profitable arbitrage. Using just a bit of algebra, we can also state the following:

$$S = c - p + X(1 + R_f)^{-T}$$
$$p = c - S + X(1 + R_f)^{-T}$$
$$c = S + p - X(1 + R_f)^{-T}$$
$$X(1 + R_f)^{-T} = S + p - c$$

The single securities on the left-hand side of the equations all have exactly the same payoffs at expiration as the portfolios on the right-hand side. The portfolios on the right-hand side are the "synthetic" equivalents of the securities on the left. Note that the options must be European-style, and the puts and calls must have the same exercise price, X, for these relations to hold.

If these equalities do not hold, buying the "cheap" side of the equation and selling the other "expensive" side will produce an immediate riskless arbitrage profit.

Remember that $X(1 + R_f)^{-T}$ is equivalent to $X / (1 + R_f)^T$.

Put-Call Forward Parity for European Options

Put-call forward parity is derived with a forward contract rather than the underlying asset itself. A forward contract on an asset at Time T has zero value at initiation; therefore, a long forward at a price of $F_0(T)$, combined with a bond that pays the forward price, $F_0(T)$, at the settlement date is equivalent to owning the asset at settlement. The cost of this position is simply the present value of $F_0(T)$, or $F_0(T)(1 + R_f)^{-T}$. Because this is a way to own the asset at expiration, we can substitute this value for the current price of the asset in put-call parity for European options and get the following:

$$F_0(T)(1 + R_f)^{-T} + p_0 = c_0 + X(1 + R_f)^{-T}$$

This is put-call forward parity at Time 0, the initiation of the forward contract, based on the principle of no arbitrage. By rearranging the terms, put-call forward parity can also be expressed as follows:

$$p_0 - c_0 = [X - F_0(T)](1 + R_f)^{-T}$$

VALUING A DERIVATIVE USING A ONE-PERIOD BINOMIAL MODEL

In a **one-period binomial model**, the price of the underlying will change to one of two possible values at the end of the period—either an up-move (increase in price) or a down-move (decrease in price).

For our first model, we need the following inputs:

- The risk-free rate
- A value for the underlying at the beginning of the period
- An exercise price for an option that expires one period from now
- Returns that will result from an up-move and a down-move in the underlying value

In such a model, we can find a combination (portfolio) of an option and some fraction of the underlying that will have the same value at the end of the period after either an up-move or a down-move in the underlying. The fraction of the underlying in such a portfolio is referred to as the **hedge ratio** (shares per derivative unit). Because the value of the portfolio is certain at the end of the period, regardless of the change in asset price, we discount this end-of-period value by the risk-free rate to get its present value. Using the current value of the underlying asset and the portfolio value, we can solve for the current value of the option.

An alternative approach is to first calculate the value of the payoff on the option at the end of the period using the **risk-neutral probabilities** (not actual probabilities) of an

up-move and a down-move in the price of the underlying. Note that the probability of a down-move $(\pi_D) = 1 -$ probability of an up-move (π_U) in either case.

The risk-neutral probability of an up-move is calculated as follows:

$$\pi_U = \frac{1 + R_f - R^d}{R^u - R^d}$$

where R^u = up-move price/current price and R^d = down-move price/current price for the underlying asset (1 + the percentage return in each case).

This is the (risk-neutral) expected payoff on the option:

$$(\pi_U \times \text{up-move option value}) + (\pi_D \times \text{down-move option value})$$

Because we used risk-neutral probabilities, we can discount the expected option payoff at the risk-free rate to get the current value of the option. This method is equivalent to the hedge portfolio valuation method just described and will produce the same option value.

ALTERNATIVE INVESTMENTS

Weight on Exam	7% to 10%
SchweserNotes™ Reference	Book 5, pages 1–67

ALTERNATIVE INVESTMENT FEATURES, METHODS, AND STRUCTURES

We may classify alternative investments into three broad categories of private capital, real assets, and hedge funds.

- **Private capital** includes private equity and private debt. Private equity funds invest in companies that are not publicly traded, or in publicly traded firms they intend to take private. Leveraged buyout (LBO) funds and venture capital funds are examples of private equity funds. Private debt funds may make loans directly to companies. Examples include venture debt funds and distressed debt funds.

- **Real assets** include real estate, infrastructure, natural resources, and digital assets such as cryptocurrencies. Real estate investments include residential or commercial properties, as well as real estate–backed debt. Natural resources include commodities, farmland, and timberland. Infrastructure refers to long-lived assets that provide public services.

- **Hedge funds** are investment companies typically open only to qualified investors. Hedge funds use many different strategies and do not necessarily hedge risk.

Investment methods for alternative investments include fund investing, co-investing, and direct investing.

- **Fund investing** refers to investing in a pool of assets alongside other investors, using a fund manager who selects and manages a pool of investments. The manager typically receives a percentage of the investable funds (management fee) as well as a percentage of the investment gains (incentive fee). A fund's **term sheet** describes its investment policy, fee structure, and requirements for investors to participate.

- With **co-investing**, an investor contributes to a pool of investment funds (as with fund investing) but also has the right to invest directly in some of the assets in which the manager invests. Co-investing can reduce overall fees while benefiting from the manager's expertise, while providing an opportunity to gain the skills and experience to pursue direct investing.

- **Direct investing** refers to an investor that purchases assets itself, rather than pooling its funds with others or using a specialized outside manager. Direct investing has the advantages of no fees to outside managers and more control over investment

choices. Disadvantages include less diversification, higher minimum investment amounts, and greater investor expertise required.

Alternative investments are often structured as limited partnerships in which the **general partner (GP)** is the fund manager and makes all the investment decisions. The **limited partners (LPs)** are the investors. The LPs typically have no say in how the fund is managed and no liability beyond their investment in the partnership. LP shares are typically only available to **accredited investors** with sufficient wealth to bear significant risk and enough investment sophistication to understand the risks.

The rules and operational details that govern a partnership are contained in the **limited partnership agreement**. Special terms that apply to one limited partner but not to others can be stated in **side letters**.

While most alternative investment limited partnership holdings are illiquid, a fund may be structured as a **master limited partnership (MLP)** that can be publicly traded. MLPs are most common in funds that specialize in natural resources or real estate.

Fee Structures

Fees paid by investors in alternative investment funds often consist of a **management fee**, typically between 1% and 2% of the fund's assets, and a **performance fee** or **incentive fee** (sometimes referred to as *carried interest*).

The fund manager earns the management fee, regardless of investment performance.

- For hedge funds, the management fees are calculated as a percentage of assets under management (AUM), typically the net asset value of the fund's investments.

- For private equity funds, the management fee is calculated as a percentage of committed capital, not invested capital. Committed capital is typically not all invested immediately; rather, it is "drawn down" over three to five years, at the discretion of the fund manager. The reason for basing management fees on committed capital is that otherwise, the fund manager would have an incentive to invest capital quickly instead of selectively. Committed capital that has not yet been drawn down is referred to as **dry powder**.

Performance fees are a portion of profits on fund investments. Typically, performance fees are paid at the end of each year based on the increase in the value of fund investments, after management fees and other charges such as consulting and monitoring fees.

Most often, a **hurdle rate** must be met or exceeded before any performance fees are paid. Hurdle rates can be "hard" or "soft." If a **soft hurdle rate** is met, performance fees are a percentage of the total increase in the value of each partner's investment. With a **hard hurdle rate**, performance fees are based only on gains above the hurdle rate.

A **catch-up clause** is similar in its effect to a soft hurdle rate. Consider a fund with returns of 14%, a hurdle rate of 8%, and a 20% performance fee. A catch-up clause would result in the first 8% of gains going to the LPs and the next 2% going to the GP, allowing the GP to "catch up" to receiving 20% of the first 10% of gains.

A **high-water mark** means no performance fee is paid on gains that only offset prior losses. This ensures that investors will not be charged performance fees twice on the same gains in their portfolio values. Because investors invest in a fund at different times, each may have a different high-water mark value.

A partnership's **waterfall** states how payments are allocated to the GP and the LPs as profits and losses are realized on deals. With a **whole-of-fund waterfall** (or *European waterfall*), the LPs receive all distributions until they have received 100% of their initial investment plus the hurdle rate, typically after all fund investments have been sold. With a **deal-by-deal waterfall** (or *American waterfall*), profits are distributed as each fund investment is sold. This favors the GP because performance fees are paid before 100% of the LPs' original investment plus the hurdle rate has been returned to them.

With a deal-by-deal waterfall, successful deals might be exited initially, while losses are realized later. A **clawback provision** allows the LPs to recover these performance fees to the extent that subsequent losses negate prior gains on which performance fees had been paid.

ALTERNATIVE INVESTMENT PERFORMANCE AND RETURNS

Although it may be difficult in practice, ideally the returns on alternative investments should be adjusted for the additional risks to which they are exposed, compared to traditional investments. These additional risks arise from the following:

- Timing of cash flows over an investment's life cycle
- Use of leverage by fund managers
- Valuation of investments that may or may not have observable market prices
- Complexity of fees, taxes, and accounting

Timing of Cash Flows

Alternative investments often have a life cycle that exhibits three phases:

1. *Capital commitment:* Managers identify investments and make capital calls from partners. Returns tend to be negative during the capital commitment phase.
2. *Capital deployment:* Managers fund, and often involve themselves directly in, the firms or projects in which they invest. Returns typically remain negative in this phase, especially if the investments are in start-up companies or troubled firms.
3. *Capital distribution:* If the fund's investments succeed and begin to generate income and cash flows, returns turn positive and accelerate. Returns may reach a plateau toward the end of a fund's life as the managers exit any remaining investments.

The norm of negative returns in the capital commitment phase, followed by increasing returns in the capital deployment phase and maximum returns in the capital distribution phase, is referred to as a **J-curve effect**.

Because management decisions affect the timing and magnitude of cash flows, an IRR over the life of a fund is the most appropriate measure of investment performance. A drawback to using IRRs is that they rest on assumptions about the cost of capital for cash outflows and the reinvestment rate for cash inflows. Multiple of invested capital is sometimes used, but this measure can be considered somewhat naïve because it does not consider the timing of cash inflows and outflows.

Use of Leverage

Some alternative investments use leverage, particularly hedge funds. One of the reasons that funds use leverage is that some strategies attempt to exploit relatively small pricing anomalies that might not produce meaningful results without leverage.

A leveraged rate of return may be stated as:

$$\frac{r(V_0 + V_B) - r_B V_B}{V_0}$$

where r is the rate of return on the fund's investments, V_0 is the unleveraged portfolio value, V_B is the amount borrowed, and r_B is the interest rate on borrowed funds.

A risk from using leverage is that a lender may issue margin calls if a fund's equity position decreases below a certain level. These can result in a fund having to realize losses by closing positions or liquidating investments at unfavorable prices. Lenders may also limit their access to additional borrowing.

Valuation

Fair value of a fund's investments might rest on assumptions. A **fair value hierarchy** groups these assumptions into the following three levels:

- *Level 1:* The assets trade in active markets and have quoted prices readily available, such as exchange-traded securities.
- *Level 2:* The assets do not have readily available quoted prices, but they can be valued based on directly or indirectly observable inputs, such as many derivatives that can be priced using models.
- *Level 3:* The assets require unobservable inputs to establish a fair value, such as real estate or private equity investments, for which there have been few or no market transactions.

Absence of market activity can result in valuations that remain near their initial cost and might not reflect actual exit costs. Lack of change in fair values can make reported returns for alternative investments appear higher, less risky, and less correlated with traditional investments than they really are.

Fees, Taxes, and Accounting

Fee specifications such as high-water marks, hard or soft hurdle rates, and waterfall structures can be negotiated and may depend on how early an investor commits capital. Thus, different investors in the same fund might realize significantly different returns.

Investor **redemptions**, like margin calls, may require a leveraged fund to exit investments at unfavorable prices and unintended times. Alternative investment funds typically take measures to restrict early redemptions.

- A **lockup period** is the time after initial investment over which limited partners either cannot request redemptions or incur significant fees for redemptions.
- A **notice period** (typically between 30 and 90 days) is the amount of time a fund has to fulfill a redemption request. Notice periods allow time for managers to reduce positions in an orderly manner.
- **Redemption fees** can offset the significant transactions costs fund managers often incur when they redeem shares.
- Managers may implement a **gate** that restricts redemptions for a temporary period.

Although "2 and 20" (2% management fee, 20% performance fee) and "1 and 10" (for funds-of-funds) were, at one time, fairly standard, these fee structures continue to be under competitive pressure. Investors making larger commitments can negotiate lower fees. Early investors in a fund may receive **founders class shares** with lower fees or shorter lockups and notice periods. Annual investor fees can also be **either-or fees**, the maximum of the management fee or the incentive fee.

Return Calculations and Biases

Before-fee returns on alternative investments are calculated the same way we calculate returns on any investment. Calculating after-fee returns simply requires adjustment of the cash flows or values for the various fees involved, typically management and performance fees.

For a simple case in which management fees are a fixed percentage of end-of-period assets and performance fees are a fixed percentage of total return with no hurdle rate, we can state the general partner's total fees in money terms as follows:

$$\text{total fees} = mV_1 + \max [0, p(V_1 - V_0)]$$

where m is the management fee, p is the performance fee, V_0 is beginning-of-period assets, and V_1 is end of-period assets.

Provisions such as hurdle rates and high-water marks make calculating total fees more complex. Other provisions may state whether the performance fee is net of the management fee or independent of it, or whether the management fee is based on beginning-of-period assets or end-of-period assets.

Because each fund's structure is unique, and the funds that exist at any given time can be in widely different phases of their life cycles, alternative investment indexes may not provide much meaningful information on the asset class. Comparing funds that originated in the same **vintage year** is one way to make historical returns data more meaningful.

The effect of **survivorship bias** is greater for a hedge fund database than for other asset classes because by some estimates, more than 25% of hedge funds fail in their first three years. An index that does not include failed funds will overstate the returns and understate the risk of hedge funds. These effects may be magnified by **backfill bias**, which occurs when managers only select their successful funds for inclusion in indexes.

INVESTMENTS IN PRIVATE CAPITAL: EQUITY AND DEBT

Private equity is equity capital raised from sources other than the public markets. Private equity funds usually invest in private companies or public companies that they plan to take private (leveraged buyout funds) or early in companies' lives (venture capital funds). The companies in which a private equity fund invests are called its **portfolio companies**.

A **leveraged buyout (LBO)** fund acquires public companies with a large percentage of the purchase price financed by debt. LBOs are a way for a company to "go private." The LBO fund seeks to add value by improving or restructuring the portfolio company's operations, then uses its increased cash flows to service and pay down the debt taken to fund the acquisition. Two of the various types of LBOs are **management buyouts (MBOs)**, in which the portfolio company's existing management team participates in the purchase, and **management buy-ins (MBIs)**, in which the private equity manager replaces the portfolio company's current management team with a new team.

Venture capital funds provide financing to companies in the early stages of their development. Venture capital investment involves a high level of risk, but the returns can be substantial. Investors are actively involved in developing their portfolio companies. We can classify venture capital investments by the portfolio company's stage of development:

- The **formative stage** refers to investments made during a firm's earliest period and comprises three different phases:
    1. **Pre-seed capital** or **angel investing** is the capital provided at the idea stage, usually by individuals rather than venture capital funds.
    2. **Seed-stage financing** or **seed capital** is the first stage at which venture capital funds usually invest, supporting product development, marketing, and market research.
    3. **Early-stage financing** or **start-up stage financing** funds operations in the lead-up to production and sales.
- **Later-stage financing** or **expansion venture capital** comes after production and sales have begun. Investment funds provided at this stage are used to support initial

growth, expansion, product improvement, or marketing.

- **Mezzanine-stage financing** refers to capital provided to prepare the firm for an initial public offering.

Minority equity investing refers to a private equity fund taking a less-than-controlling interest in public companies that are looking for capital with which to expand. One way it can make such investments is through a **private investment in public equity (PIPE)**.

Funds have several methods of exiting an investment in a portfolio company:

- *Trade sale* to a strategic buyer via direct sale or auction.
- *Public listing* on a stock exchange through an IPO, a direct listing, or a special purpose acquisition company.
- *Recapitalization* by issuing debt to fund a dividend distribution to equity holders. (This is not an exit because the fund still controls the company.)
- *Secondary sale* to another private equity firm or a group of investors.
- *Write-off or liquidation* of an unsuccessful investment.

Each private equity fund has a **vintage year** when the fund made its first investment. Investors in private capital should diversify across vintage years. Funds that begin investing during a business cycle expansion are likely to earn higher rates of return if they specialize in early-stage companies. Funds that begin investing during business cycle contractions are likely to earn higher rates of return if they specialize in distressed companies.

Private debt refers to various forms of debt provided by investors directly to private entities. Private debt investments typically provide a higher rate of return than traditional bonds to compensate investors for higher risk and illiquidity. Investors may also benefit from increased diversification because private debt returns have relatively low correlations with traditional investments. Private debt investing requires specialized knowledge about the structure of the debt, the borrower's life cycle phase, and the features of the underlying assets for secured lending.

Categories of private debt include the following:

- *Direct lending:* Loans made directly to a private company without an intermediary. The debt is typically senior and secured, with covenants to protect the lender. If loan is made by a private debt fund using money borrowed from other sources, it is referred to as a **leveraged loan**.
- *Venture debt:* Loans backing start-up or early-stage firms that are not yet profitable. Venture debt is often convertible to stock or combined with warrants.
- *Mezzanine debt:* Private debt that is subordinated to senior secured debt and may have special features such as conversion rights or warrants.
- *Distressed debt:* Debt of mature companies in financial trouble such as bankruptcy or default.

- *Unitranche debt:* Combining secured and unsecured classes of debt into a single loan with an interest rate that reflects the blend of debt classes.

Risk and return profiles vary among categories of private capital. Private equity has the highest risk and return, followed by mezzanine debt, unitranche debt, senior direct lending, senior real estate debt, and infrastructure debt.

REAL ESTATE AND INFRASTRUCTURE

Real Estate

Real estate can provide income in the form of rent, as well as the potential for price appreciation. The types of real estate we will discuss here include single-family residential and commercial, the latter of which includes office buildings, shopping, industrial/warehouse/distribution, and rental residential.

Real estate investment can be described in terms of a quadrant, with dimensions that distinguish between public and private real estate markets and between debt and equity investments.

- In the private market, ownership usually involves direct investment. Direct investments can be solely owned or indirectly owned through partnerships. Private real estate investments are usually larger than public investments because real estate is indivisible and illiquid, and they require the owner to have property management expertise.
- The public market involves securities that serve as claims on the underlying assets. Examples include real estate investment trust (REIT) shares, equity in a real estate company, exchange-traded funds (ETFs), residential mortgage-backed securities (MBSs), commercial mortgage-backed securities (CMBSs), mortgage REITs, and mortgage ETFs.
- An equity investor has an ownership interest in real estate or securities of an entity that owns real estate.
- A debt investor is a lender that owns a mortgage or mortgage-backed securities.

Benefits of direct investment include control of the property, diversification with traditional investments, and tax advantages. Drawbacks include illiquidity, the complexity of managing property, the need for specialized knowledge, high investment amounts, and concentration risk if a portfolio has one or few properties.

Indirect investments in real estate can be through limited partnerships, joint ventures, or publicly traded securities. REITs are a popular form of investment because they are exchange traded, exempt from double taxation, and have managers with specialized knowledge. REITs that pursue **core real estate strategies** invest in high-quality commercial and residential properties that deliver stable returns. These REITs typically have open-end structures with indefinite lives. REITs with riskier investment strategies are most often structured as closed-end funds with finite lives. These strategies include *core-plus* (undertaking modest development and redevelopment), *value-add* (development and redevelopment on a somewhat larger scale than core-

plus), and *opportunistic* (large-scale redevelopment and repurposing, distressed properties, or speculating on upturns in real estate markets).

Infrastructure

Infrastructure investments include:

- Transportation assets (e.g., roads, airports, ports, railways).
- Utility assets (e.g., gas distribution facilities, electric generation and distribution facilities, and waste disposal and treatment facilities).
- Information and communication technology (e.g., telecom towers and cable systems).
- Social infrastructure (e.g., prisons, schools, and health care facilities).

Infrastructure assets typically have a long life and are quite large in cost and scale, so direct investment in them has low liquidity. More liquid investments backed by infrastructure assets, such as ETFs, mutual funds, private equity funds, or master limited partnerships (MLPs), are a small part of the overall universe of infrastructure investments. Infrastructure investments tend to be most suitable for long-term institutional investors.

Cash flows generated from infrastructure investments include **availability payments** for making the infrastructure available, **usage-based payments** such as highway tolls, and **take-or-pay arrangements** that require the buyer to pay minimum purchase price for an agreed-upon volume.

Investments in infrastructure assets that are already constructed are referred to as **brownfield investments**. Brownfield investments in fully operational facilities are called **secondary-stage investments**. Brownfield investments provide stable cash flows and relatively high current yields but offer little growth potential. Secondary-stage investments are the least risky and offer the lowest return.

Investments in infrastructure assets that are to be constructed are referred to as **greenfield investments**. Greenfield investments are subject to more uncertainty and may provide relatively lower yields in the near term, but offer greater growth potential. Greenfield investments in developing economies, while risky, have generated attractive returns over the long term as they benefit from increasing per-capita incomes and wealth.

NATURAL RESOURCES

Natural resources comprise raw land, land used for growing crops or timber, and commodities.

Raw land, farmland, and timberland are all illiquid investments, and their value is primarily driven by location. All can generate lease income and price appreciation. Farmland and timberland also generate income from their output. Farmland is primarily held by individuals, while institutions are more likely to invest in raw land and timberland. Timberland investors who lack specialized expertise can invest

through **timberland investment management organizations (TIMOs)**. Farmland and timberland are attractive to investors with an ESG focus on climate change because trees and crops consume carbon.

Commodity sectors include:

1. Metals
2. Agricultural products
3. Energy products

Because commodities are physical goods, they have costs for storage and transportation. For this reason, derivatives such as futures are more commonly used to gain exposure to commodities.

An equation that relates spot prices to futures prices is:

futures price ≈ spot price × (1 + risk-free rate) + storage costs − convenience yield

Convenience yield is the nonmonetary value of having a physical commodity for use over the period of a futures contract. If there is little or no convenience yield, the net cost of carry will be positive, and futures prices will be higher than spot prices, a situation termed **contango**. When the convenience yield is high, the net cost of carry will be negative, and futures prices will be less than spot prices, a situation termed **backwardation**.

Other methods to invest in commodities include:

- Exchange-traded funds (ETFs) or exchange-traded notes (ETNs)
- Managed futures funds, such as commodity trading advisers (CTAs)
- Specialized funds in specific commodity sectors

Demand for commodities is affected by their value to end users and by global economic conditions. Supply is affected by production, storage costs, and existing inventories. For many commodities, supply is inelastic in the short run because of long lead times to alter production levels. As a result, commodity prices can be volatile when demand changes significantly or in response to supply shocks.

In recent decades, returns and the volatility of returns have been higher for commodities than for global stocks or bonds. Timberland and farmland also have higher average returns, but with lower volatility than global stocks and similar volatility to global bonds.

Historically, correlations of commodity returns with the returns of global equities and global bonds have been low. As a result, adding commodities to a portfolio of traditional assets can provide diversification benefits. Because commodity prices tend to move with inflation rates, holding commodities can act as a hedge of inflation risk.

HEDGE FUNDS

Hedge funds are typically structured as limited partnerships or limited liability corporations. They can be structured as commingled funds or as a **separately**

managed account (SMA) for a single large investor. Commingled funds often have a **master-feeder structure** with two feeder funds (offshore in a tax haven and onshore) that flow into a master fund, which makes the investments. This structure bypasses regional regulatory requirements.

A **fund-of-funds** is an investment company that invests in hedge funds. Fund-of-funds investing can give investors diversification among hedge fund strategies, offer a manager's expertise in selecting individual hedge funds, and provide smaller investors with access to hedge funds in which they may not be able to invest directly. Fund-of-funds managers charge an additional layer of fees beyond the fees charged by the individual hedge funds in the portfolio.

We can classify hedge funds by the strategies they pursue:

- **Equity hedge fund strategies** seek to profit from long or short positions in publicly traded equities and derivatives with equities as their underlying assets. Subcategories include the following:
  - *Fundamental long/short:* Take long positions in undervalued securities while having a short position in a portfolio of stocks or an index. Most managers have net long exposure.
  - *Fundamental growth:* Buy equities of high-growth companies and short equities of companies expected to have low or no revenue growth. Typically, these funds have a net long bias.
  - *Fundamental value:* Buy equity shares that are believed to be undervalued and short equities believed to be overvalued.
  - *Market neutral:* Select undervalued equities to be held long and overvalued equities to be sold short, in approximately equal amounts to eliminate exposure to market risk.
  - *Short bias:* Take predominantly short positions in overvalued equities, possibly with smaller long positions but with negative market exposure overall.
- **Event-driven strategies** are typically based on a restructuring or acquisition that creates profit opportunities for long or short positions in a company's equities or bonds. Subcategories are as follows:
  - *Merger arbitrage:* Buy shares of a firm being acquired and sell short the firm making the acquisition.
  - *Distressed/restructuring:* Buy securities of firms in financial distress if their value can be increased by a successful restructuring.
  - *Activist shareholder:* Buy enough equity shares to influence a company's policies.
  - *Special situations:* Invest in the securities of firms that are issuing or repurchasing securities, spinning off divisions, selling assets, or distributing capital.
- **Relative value strategies** involve buying a security and selling short a related security. Subcategories include the following:
  - *Convertible arbitrage fixed income:* Exploit pricing discrepancies among convertible bonds, common stock of the issuing companies, and options on the

common shares.

- – *Specific fixed income* (ABS/MBS/high yield): Exploit pricing and quality discrepancies.
- – *General fixed income:* Exploit pricing discrepancies among fixed-income securities.
- – *Multistrategy:* Exploit pricing discrepancies among securities within and across asset classes and markets.

- **Opportunistic strategies** focus on macro events and commodity trading. Subcategories include the following:

  - – *Macro strategies:* Take long or short positions in equities, fixed income, currencies, or commodities based on global economic trends and events.
  - – *Managed futures:* Focus on trading commodity futures or financial futures.

Hedge fund returns come from three sources:

1. *Market beta:* The return attributable to the broad market index.
2. *Strategy beta:* The return attributable to specific sectors to which a fund has exposure.
3. *Alpha:* The additional return delivered by the manager through security selection.

Hedge fund performance as measured by indexes is often overstated. Because index reporting is voluntary, poor-performing funds are less likely to report. Index returns may exhibit **survivorship bias** because funds might not be included until they have existed for a minimum time or reached a minimum size. **Selection bias** may result from index providers assigning funds to categories inconsistently or having different requirements for including a fund. Adding a fund's historical returns to index returns when a fund is added to an index can result in **backfill bias**, which tends to overstate performance because funds with better historical returns are more likely to be added.

INTRODUCTION TO DIGITAL ASSETS

Digital assets are those that can be created, stored, and transferred electronically. Examples include cryptocurrencies, tokens, and digital collectibles.

A digital asset is secured and validated using **distributed ledger technology (DLT)**, also known as **blockchain** technology. A distributed ledger is a database shared among market participants that maintains a record of all transactions. A DLT network consists of a digital ledger, a consensus mechanism, and a network of participants.

Consensus protocols determine how blocks are chained together.

- In a **proof of work (PoW) protocol**, when a transaction takes place, **miners** use computers to solve a cryptographic problem, which then verifies the transaction.

- In a **proof of stake (PoS) protocol**, certain network participants known as **validators** pledge collateral (known as **staking**) to guarantee the validity of a block. Validators use their stake to signal to the network that a transaction is ready to be added to the blockchain.

The two forms of DLT networks are permissionless and permissioned.

- In **permissionless networks**, transactions are visible to all users within the network, and any user can execute a transaction. An advantage is that transactions are confirmed or denied through consensus mechanisms rather than by a centralized authority, and thus transacting parties do not have to trust each other. Bitcoin and many other cryptocurrencies use permissionless networks.

- In **permissioned networks**, users may be restricted from some network activities. Because permissioned blockchains have stronger restrictions, they are more cost effective than open and decentralized permissionless networks.

The main types of digital assets currently available are cryptocurrencies and tokens. A **cryptocurrency** is a digital currency issued privately with no backing from a central bank. Bitcoin, the most widely traded cryptocurrency, has influenced the development of many other types of digital assets. Alternate cryptocurrencies known as **altcoins** are based on the technology used by Bitcoin. Although cryptocurrencies commonly limit how many currency units can be issued, many cryptocurrencies still experience extreme price volatility.

Stablecoins are linked to the value of another asset, such as the U.S. dollar, and secured by a basket of assets. The value of stablecoins is protected from price volatility through this reserve basket. A **central bank digital currency (CBDC)** is essentially a digital version of a banknote or coin issued by a central bank.

Tokenization uses DLT to streamline ownership verification for physical assets by digitally tracking the historical record of ownership. A **nonfungible token (NFT)** is an example of tokenization in which a digital asset is linked to a certificate of authenticity. The key difference between NFTs and "fungible" tokens is that each NFT represents a distinct object.

A **security token** digitally tracks ownership rights in publicly traded securities. A blockchain can facilitate the custody, settlement, recordkeeping, and post-trade processing of security tokens. An example of a security token is an **initial coin offering (ICO)**, in which companies offer crypto tokens in exchange for money or other cryptocurrency. ICOs are potentially less expensive and take less time to raise capital compared to IPOs. Most ICOs do not have attached voting rights.

Utility tokens provide network services, such as service payments and network fees. **Governance tokens** are offered on permissionless networks and act as voting rights to determine how networks should operate.

Investment Features of Digital Assets

Due to high expected returns and diversification benefits, institutional investors are taking more interest in digital assets as an asset class. Financial service providers have strengthened their infrastructures to support future institutional investment.

Key investment differences between digital assets and other asset classes are as follows:

- Most digital assets are not backed by underlying assets or the cash flows they generate, such as interest or dividends. Because digital assets lack expected earnings, they have no fundamental value. Asset prices are determined by projected asset growth, which is based on scarcity and the ability to transfer value in the future.

- While traditional financial instruments are typically recorded on private ledgers maintained by central intermediaries, digital assets are recorded on decentralized digital ledgers.

- Financial systems rely on these fiat currencies as a medium of exchange. Digital assets are used as an alternative to fiat currencies and are mainly used for online transactions. Because cryptocurrencies are not legal tender in many jurisdictions and are heavily restricted in several countries, the mainstream financial system is hesitant to accept cryptocurrencies as a medium of exchange.

- Unlike traditional financial assets, digital assets lack well-developed regulatory standards. Exchanges used to trade digital currencies are typically unregulated, and participants are not specifically prohibited from engaging in behaviors like market manipulation.

Direct ownership of cryptocurrencies requires the use of a **cryptocurrency wallet**, which contains digital encryption keys for accessing and trading assets. The two categories of exchanges for trading cryptocurrencies are centralized and decentralized exchanges.

- Centralized exchanges are privately held and offer trading platforms for price transparency and volume information. Traders on these exchanges trade directly on private servers, which may introduce security vulnerabilities. In some jurisdictions these exchanges are regulated as financial exchanges.

- A decentralized exchange operates on a distributed framework. Multiple computers are used to service this type of exchange, so if one computer is attacked, the exchange will remain in operation. This makes attacks on decentralized exchanges substantially more difficult, but also makes regulations difficult to enforce.

Lack of regulatory oversight makes fraud and market manipulation on either type of exchange more likely to occur, such as **pump-and-dump schemes** involving questionable promotion of cryptocurrencies on social media; scam ICOs; market manipulation; theft; and attempts to gain access to wallet credentials. Also, many small cryptocurrencies are held primarily by a few large entities known as **whales** that may hold enough of their supply to manipulate their prices.

Because cryptocurrencies are normally held in secure wallets that require unique passkeys to access, losing those passkeys makes the cryptocurrency in a wallet worthless. It is estimated that 20% of Bitcoin is in lost or abandoned wallets.

Indirect exposure to cryptocurrencies can be achieved through coin trusts, futures contracts, exchange-traded products, stocks, and hedge funds.

- **Cryptocurrency coin trusts** trade over the counter and are similar to closed-end mutual funds. Coin trusts increase transparency and eliminate the need for digital wallets and encryption keys, but may charge substantial fees.

- **Cryptocurrency futures contracts** are typically cash settled and tend to be more volatile and less liquid than traditional futures markets.
- **Cryptocurrency exchange-traded products** such as ETFs attempt to mimic the returns of digital assets using cash or cryptocurrency derivatives.
- **Cryptocurrency stocks,** such as payment providers that support cryptocurrencies or companies that provide products or services for operating blockchain networks, offer indirect exposure through their business connection to digital assets.
- **Cryptocurrency hedge funds** employ strategies to invest indirectly in cryptocurrencies and may conduct Bitcoin mining activities to generate additional returns.

Asset-backed tokens represent digital ownership of physical or financial assets. These are collateralized by an underlying asset such as oil, gold, or equities. Asset-backed tokens can potentially increase liquidity of high-priced assets such as real estate by allowing for fractional ownership. Regulators generally classify asset-backed tokens as securities.

Decentralized finance (DeFi) seeks to develop sophisticated financial products and services using open-source financial applications.

Cryptocurrency returns have demonstrated low correlations with traditional asset class returns, and therefore have the potential to provide portfolio diversification benefits. However, correlations may increase during periods of market stress. Cryptocurrency prices are influenced by the unique aspects of this asset class, including market adoption, risk appetite, technological innovation, network impacts, speculation, and regulation.

PORTFOLIO MANAGEMENT (PART TWO)

Weight on Exam	8% to 12%
SchweserNotes™ Reference	Book 2, pages 1–44 and Book 5, pages 69–124

PORTFOLIO MANAGEMENT: AN OVERVIEW

The Portfolio Perspective

The **portfolio perspective** refers to evaluating individual investments by their contribution to the risk and return of an investor's overall portfolio. The alternative is to examine the risk and return of each security in isolation. An investor who holds all his wealth in a single stock because he believes it to be the best stock available is not taking the portfolio perspective—his portfolio is very risky compared to a diversified portfolio.

Modern portfolio theory concludes that the extra risk from holding only a single security is not rewarded with higher expected investment returns. Conversely, diversification allows an investor to reduce portfolio risk without necessarily reducing the portfolio's expected return.

The **diversification ratio** is calculated as the ratio of the risk of an equal-weighted portfolio of *n* securities (measured by its standard deviation of returns) to the risk of a single security selected at random from the portfolio. If the average standard deviation of returns of the *n* stocks is 25%, and the standard deviation of returns of an equal-weighted portfolio of the *n* stocks is 18%, the diversification ratio is 18 / 25 = 0.72. Note that a *lower* diversification ratio indicates a *greater* risk reduction benefit from diversification:

- Portfolio diversification works best when financial markets are operating normally.
- Diversification provides less reduction of risk during market turmoil.
- During periods of financial crisis, correlations tend to increase, which reduces the benefits of diversification.

Steps in the Portfolio Management Process

Planning begins with an analysis of the investor's risk tolerance, return objectives, time horizon, tax exposure, liquidity needs, income needs, and any unique circumstances or investor preferences.

This analysis results in an investment policy statement that does the following:

- Details the investor's investment objectives and constraints
- Specifies an objective benchmark (such as an index return)
- Should be updated at least every few years and anytime the investor's objectives or constraints change significantly

The **execution** step requires an analysis of the risk and return characteristics of various asset classes to determine the asset allocation. In *top-down* analysis, a portfolio manager examines current macroeconomic conditions to identify the asset classes that are most attractive. In *bottom-up* analysis, portfolio managers seek to identify individual securities that are undervalued.

Feedback is the final step. Over time, investor circumstances will change, risk and return characteristics of asset classes will change, and the actual weights of the assets in the portfolio will change with asset prices. The portfolio manager must monitor changes, **rebalance** the portfolio periodically, and evaluate performance relative to the benchmark portfolio identified in the IPS.

Investment Management Clients

Individual investors save and invest for various reasons, including purchasing a house or educating their children. In many countries, special accounts allow citizens to invest for retirement and to defer any taxes on investment income and gains until the funds are withdrawn. Defined contribution pension plans are popular vehicles for these investments.

Many types of **institutions** have large investment portfolios. **Defined benefit pension plans** are funded by company contributions and have an obligation to provide specific benefits to retirees, such as a lifetime income based on employee earnings.

An **endowment** is a fund that is dedicated to providing financial support on an ongoing basis for a specific purpose. A **foundation** is a fund established for charitable purposes to support specific types of activities, or to fund research related to a particular disease.

The investment objective of a **bank** is to earn more on the bank's loans and investments than the bank pays for deposits of various types. Banks seek to keep risk low and need adequate liquidity to meet investor withdrawals as they occur.

Insurance companies invest customer premiums with the objective of funding customer claims as they occur.

Investment companies manage the pooled funds of many investors. **Mutual funds** manage these pooled funds in particular styles (e.g., index investing, growth investing, bond investing) and restrict their investments to particular subcategories of investments (e.g., large-firm stocks, energy stocks, speculative bonds) or particular regions (emerging-market stocks, international bonds, Asian firm stocks).

Sovereign wealth funds refer to pools of assets owned by a government.

Figure 1 provides a summary of the risk tolerance, investment horizon, liquidity needs, and income objectives for these different types of investors.

Figure 1: Characteristics of Different Types of Investors

Investor	Risk Tolerance	Investment Horizon	Liquidity Needs	Income Needs
Individuals	Depends on individual	Depends on individual	Depends on individual	Depends on individual
Banks	Low	Short	High	Pay interest
Endowments	High	Long	Low	Spending level
Insurance	Low	Long—life Short—P&C	High	Low
Mutual funds	Depends on fund	Depends on fund	High	Depends on fund
DB pensions	High	Long	Low	Depends on age

The Asset Management Industry

The asset management industry comprises firms that manage investments for clients. They are referred to as **buy-side firms**, in contrast with **sell-side firms** such as broker-dealers and investment banks.

Full-service asset managers are those who offer various investment styles and asset classes.

Specialist asset managers may focus on a particular investment style or a particular asset class.

A **multi-boutique firm** is a holding company that includes numerous different specialist asset managers.

A key distinction is between firms that use active or passive management. **Active management** attempts to outperform a chosen benchmark through manager skill (e.g., by using fundamental or technical analysis). **Passive management** attempts to replicate the performance of a chosen benchmark index. This may include traditional broad market index tracking or a **smart beta** approach that focuses on exposure to a particular market risk factor.

Asset management firms may also be classified as traditional or alternative asset managers. Traditional asset managers focus on equities and fixed-income securities. Alternative asset managers focus on asset classes such as private equity, hedge funds, real estate, or commodities.

Robo-advisors are a technology that offers investors portfolio allocation advice and recommendations based on their investment requirements and constraints, using a computer algorithm.

BASICS OF PORTFOLIO PLANNING AND CONSTRUCTION

Importance of the Investment Policy Statement

An **investment policy statement (IPS)** states the investor's return requirements and objectively and realistically articulates the risks and costs of investing. The IPS imposes investment discipline on, and provides guidance for, both the client and the portfolio manager.

The major components of an IPS typically address the following:

- *Description of Client* circumstances, situation, and investment objectives
- *Statement of the Purpose* of the IPS
- *Statement of Duties and Responsibilities* of investment manager, custodian of assets, and the client
- *Procedures* to update the IPS and to respond to various possible situations
- *Investment Objectives* derived from communications with the client
- *Investment Constraints* that must be considered in the plan
- *Investment Guidelines* such as how the policy will be executed, asset types permitted, and leverage to be used
- *Evaluation of Performance*, the benchmark portfolio for evaluating investment performance, and other information on evaluation of investment results
- *Appendices* containing information on strategic (baseline) asset allocation and permitted deviations from policy portfolio allocations, as well as how and when the portfolio allocations should be rebalanced

Risk and Return Objectives

Absolute risk objectives can be stated in terms of the probability of specific portfolio results, either percentage losses or dollar losses, or in terms of strict limits on portfolio results. An absolute return objective may be stated in nominal terms, such as "an overall return of at least 6% per annum," or in real returns, such as "a return of 3% more than the annual inflation rate each year."

Relative risk objectives relate to a specific benchmark and can also be strict, such as, "Returns will not be less than the yield on 1-year government debt over any 12-month period," or stated in terms of probability, such as, "No greater than a 5% probability of returns more than 4% below the return on the MSCI World Index over any 12-month period."

The account manager must make sure that the stated risk and **return objectives** are compatible, given the reality of expected investment results and uncertainty over time.

Risk Tolerance

An investor's **ability to bear risk** depends on financial circumstances. Longer investment horizons (20 years rather than 2 years), greater assets versus liabilities (more wealth), more insurance against unexpected occurrences, and a secure job all suggest a greater ability to bear investment risk.

An investor's **willingness to bear risk** is based primarily on the investor's attitudes and beliefs about investments (various asset types).

If the investor's willingness to take on investment risk is high but the investor's ability to take on risk is low, the low ability to take on investment risk will prevail in the advisor's assessment.

In situations where ability is high but willingness is low, the advisor may attempt to educate the investor about investment risk and correct any misconceptions.

Investment Objectives and Constraints

The IPS should include the following:

Investment objectives:

- Return objectives
- Risk tolerance

Constraints:

- Liquidity needs
- Time horizon
- Tax concerns
- Legal and regulatory factors
- Unique needs and preferences

Asset Allocation

After having determined the investor objectives and constraints, a **strategic asset allocation** is developed that specifies the percentage allocations to the included asset classes. In choosing asset classes for an account, the correlations of returns *within* an asset class should be relatively high, and the correlations of returns *between* asset classes should be relatively low in comparison.

Once the portfolio manager has identified the investable asset classes for the portfolio, an *efficient frontier* can be constructed, and the manager can identify that portfolio (the strategic asset allocation) which best meets the risk and return requirements of the investor.

A manager who varies from strategic asset allocation weights to take advantage of perceived short-term opportunities is adding **tactical asset allocation** to the portfolio

strategy. **Security selection** refers to deviations from index weights on individual securities within an asset class.

ESG Considerations in Portfolio Planning and Construction

If a portfolio's investment universe is constrained by **negative screening**, measuring its performance against a broad market index is unlikely to be appropriate. Indices are available that exclude companies or industries that investors with ESG concerns commonly avoid.

Investors using a **positive screening** or **best-in-class** approach invest in companies that have positive ESG practices. Which companies to invest in, and which ESG practices to focus on, differ among investors. Thus, portfolios and performance benchmarks must be customized under these approaches. Similarly, **thematic investing** may require an investment manager who specializes in this style of investing.

For investment managers with clients who wish to engage in **active ownership**, it is important to clarify whether the clients intend to vote their shares themselves or direct the managers to vote the shares according to specified ESG factors.

Imposing constraints based on ESG factors will likely affect portfolio performance. Limiting the universe of investment choices and incurring the costs involved in considering ESG factors may decrease returns. On the other hand, investing in companies with good corporate governance practices and avoiding those that face ESG-related risks may increase portfolio returns.

THE BEHAVIORAL BIASES OF INDIVIDUALS
Cognitive Errors vs. Emotional Biases

Behavioral finance asserts that certain biases are widespread—and, therefore, predictable. These can be classified as cognitive errors and emotional biases.

Cognitive errors may arise from not understanding statistical analysis, information processing errors, illogical reasoning, or memory errors. The two major categories of cognitive errors are *belief perseverance* and *processing biases*. Cognitive errors can be addressed with increased awareness, better training, or more information.

Emotional biases are not related to conscious thought. Rather, they stem from feelings, impulses, or intuition. As such, they are difficult to overcome and may have to be accommodated.

A behavioral bias may have elements of both cognition and emotion. When trying to mitigate biases that are both emotional and cognitive, success is more likely by focusing on the cognitive aspect.

Cognitive Errors: Belief Perseverance Biases

When an individual holds conflicting beliefs or receives information that challenges a current belief, **cognitive dissonance** causes stress that individuals seek to reduce. They may do so by letting go of prior beliefs or by discounting the conflicting information. Because doing the latter is often easier, individuals tend to exhibit **belief perseverance**—bias in favor of their currently held beliefs.

Types of belief perseverance biases include the following:

- **Conservatism bias.** Market participants rationally form an initial view, but they then fail to change that view as new information becomes available.
- **Confirmation bias.** Market participants seek out information that supports their prior beliefs, but they avoid or discount the importance of conflicting information.
- **Representativeness bias.** Market participants use certain characteristics to put an investment in a category and conclude that it will have the characteristics of investments in that category. Examples include **base-rate neglect** (analyzing an individual member of a population without adequately considering the probability of a characteristic in that population) and **sample-size neglect** (making a classification based on a small and potentially unrealistic sample).
- **Illusion of control bias.** Market participants believe they can control or affect outcomes when they cannot.
- **Hindsight bias.** Market participants have selective memories, resulting in a tendency to see things as more predictable than they really are (i.e., the "I knew it all along" phenomenon).

Cognitive Errors: Information Processing Biases

These are related more to the processing of information and less to the decision-making process. Types of information processing biases include the following:

1. **Anchoring and adjustment bias.** Market participants base expectations on a prior number and overweight its importance, making adjustments in relation to that number as new information arrives.
2. **Mental accounting bias.** Market participants view money in different accounts or from different sources differently when making investment decisions, as opposed to viewing them in a portfolio context.
3. **Framing bias.** The ways in which questions are phrased or data are presented can influence how market participants respond to them.
4. **Availability bias.** Market participants judge the probability of an event by the ease with which examples come to mind.

Emotional Biases

These six biases generally arise from emotions and feelings rather than through conscious thought:

1. **Loss-aversion bias** arises from feeling more pain from a loss than pleasure from an equal gain.
2. **Overconfidence bias** occurs when market participants overestimate their own investing ability. Examples include the following:
   - **Illusion of knowledge.** Market participants think they do a better job of predicting than they actually do.
   - **Self-attribution.** Market participants give themselves personal credit when things go right, but they blame others or circumstances when things go wrong.
   - **Prediction overconfidence.** Market participants underestimate uncertainty and the standard deviation of their predictions.
   - **Certainty overconfidence.** Market participants overestimate the probability they will be right.
3. **Self-control bias** occurs when individuals lack self-discipline and favor short-term satisfaction over long-term goals. They may exhibit **hyperbolic discounting**, favoring small payoffs now at the expense of larger payoffs in the future.
4. **Status quo bias** occurs when comfort with an existing situation causes an individual to be resistant to change. For example, a choice is more likely if it will happen unless the individual opts out than if the individual must choose to opt in.
5. **Endowment bias** occurs when an asset is felt to be more valuable simply because it is already owned.
6. **Regret aversion bias** occurs when market participants fail to take an investment action out of excessive fear that actions could be wrong. **Herding behavior** is a form of regret aversion where participants go with the consensus or popular opinion, telling themselves they are not to blame if others are wrong, too.

Behavioral Biases and Market Anomalies

Behavioral biases may contribute to market anomalies such as asset price bubbles and subsequent crashes. Overconfidence may lead to overtrading, underestimation of risk, and lack of diversification. Persistently good results combined with self-attribution bias can fuel overconfidence, as can hindsight bias as investors give themselves credit for choosing profitable stocks in a bull market. Confirmation bias may lead investors to ignore or misinterpret new information, suggesting that valuations will not continue to rise or to misinterpret initial decreases in asset values as simply another buying opportunity. Anchoring may cause investors to believe recent highs are rational prices, even after prices begin their eventual decline. Regret aversion may keep even very skeptical investors in the market.

Another anomaly that may result from behavioral factors is the seeming outperformance of value stocks versus growth stocks. The **halo effect** is a version of representativeness in which fast growth and a rising stock price lead market participants to conclude that a stock is a good one to own, leading growth stocks to be overvalued.

Home bias refers to market participants' tendency to invest heavily in firms in their domestic country or more heavily in firms operating in their region. This may result from a belief that they have better access to information or simply an emotional desire to invest in companies "closer to home."

INTRODUCTION TO RISK MANAGEMENT

Risk (uncertainty) is not something to be avoided by an organization or in an investment portfolio; returns above the risk-free rate are earned only by accepting risk. The risk management process seeks to (1) identify the risk tolerance of the organization, (2) identify and measure the risks the organization faces, and (3) modify and monitor these risks. Through these choices, a firm aligns the risks it takes with its risk tolerance after considering which risks the organization is best able to bear.

An overall risk management framework encompasses several activities, including the following:

- Establishing processes and policies for risk governance
- Determining the organization's risk tolerance
- Identifying and measuring existing risks
- Managing and mitigating risks to achieve the optimal bundle of risks
- Monitoring risk exposures over time
- Communicating across the organization
- Performing strategic risk analysis

Risk governance provides organization-wide guidance on which risks should be pursued in an efficient manner, which should be subject to limits, and which should be reduced or avoided. A risk management committee can provide a way for various parts of the organization to bring up issues of risk measurement, integration of risks, and the best ways to mitigate undesirable risks.

Determining an organization's **risk tolerance** involves setting the overall risk exposure the organization will take by identifying the risks the firm can effectively take and the risks that the organization should reduce or avoid. Some of the factors that determine an organization's risk tolerance are its expertise in its lines of business, its skill at responding to negative outside events, its regulatory environment, and its financial strength and ability to withstand losses.

Risk budgeting is the process of allocating firm resources to assets or investments by considering their risk characteristics and how they combine to meet the organization's risk tolerance. The goal is to allocate the overall amount of acceptable risk to the mix of assets or investments that have the greatest expected returns over time. The risk budget may be a single metric, such as portfolio beta, value at risk, portfolio duration, or returns variance.

Financial risks are those that arise from exposure to financial markets. Here are a few examples:

- *Credit risk*. This is the uncertainty about whether the counterparty to a transaction will fulfill its contractual obligations.
- *Liquidity risk*. This is the risk of loss when selling an asset at a time when market conditions make the sales price less than the underlying fair value of the asset.
- *Market risk*. This is the uncertainty about market prices of assets (stocks, commodities, and currencies) and interest rates.

Nonfinancial risks arise from the operations of the organization and from sources external to the organization. Here are a few examples:

- *Operational risk*. This is the risk that human error, faulty organizational processes, inadequate security, or business interruptions will result in losses.
- *Solvency risk*. This is the risk that the organization will be unable to continue to operate because it has run out of cash.
- *Regulatory risk*. This is the risk that the regulatory environment will change, imposing costs on the firm or restricting its activities.
- *Government or political risk* (including *tax risk*). This is the risk that political actions outside a specific regulatory framework, such as increases in tax rates, will impose significant costs on an organization.
- *Legal risk*. This is the uncertainty about the organization's exposure to future legal action.
- *Model risk*. This is the risk that asset valuations based on the organization's analytical models are incorrect.
- *Tail risk*. This is the risk that extreme events (those in the tails of the distribution of outcomes) are more likely than the organization's analysis indicates, especially from incorrectly concluding that the distribution of outcomes is normal.
- *Accounting risk*. This is the risk that the organization's accounting policies and estimates are judged to be incorrect.

The various risks that an organization faces interact in many ways. Interactions among risks can be especially important during periods of stress in financial markets.

Measures of risk for specific asset types include standard deviation, beta, and duration:

- *Standard deviation* is a measure of the volatility of asset prices and interest rates. Standard deviation may not be the appropriate measure of risk for nonnormal probability distributions, especially those with negative skew or positive excess kurtosis (fat tails).
- *Beta* measures the market risk of equity securities and portfolios of equity securities. This measure considers the risk reduction benefits of diversification and is appropriate for securities held in a well-diversified portfolio, whereas standard deviation is a measure of risk on a stand-alone basis.
- *Duration* is a measure of the price sensitivity of debt securities to changes in interest rates.

Derivatives risks (sometimes referred to as "the Greeks") include the following:

- *Delta*. This is the sensitivity of derivatives values to the price of the underlying asset.
- *Gamma*. This is the sensitivity of delta to changes in the price of the underlying asset.
- *Vega*. This is the sensitivity of derivatives values to the volatility of the price of the underlying asset.
- *Rho*. This is the sensitivity of derivatives values to changes in the risk-free rate.

Tail risk or **downside risk** is the uncertainty about the probability of extreme negative outcomes. Commonly used measures of tail risk include **value at risk (VaR)**, which is the minimum loss over a period that will occur with a specific probability, and conditional VaR (CVaR), which is the expected value of a loss, given that the loss exceeds a given amount.

Two methods of risk assessment that are used to supplement measures such as VaR and CVaR are stress testing and scenario analysis. **Stress testing** examines the effects of a specific (usually extreme) change in a key variable. **Scenario analysis** refers to a similar what-if analysis of expected loss, but it incorporates specific changes in multiple inputs.

Once the risk management team has estimated various risks, management may decide to *avoid* a risk, *prevent* a risk, *accept* a risk, *transfer* a risk, or *shift* a risk:

- One way to *avoid* a risk is to not engage in the activity with the uncertain outcome.
- Some risks can be *prevented* by increasing the level of security and adopting stronger processes.
- For risks that management has decided to *accept*, the organization will seek to bear them efficiently, often through diversification. The term **self-insurance** of a risk refers to a risk that an organization has decided to bear.
- With a risk *transfer*, a risk is transferred to another party. Insurance is a type of risk transfer. With a **surety bond**, an insurance company agrees to make a payment if a third party fails to perform under the terms of a contract. A **fidelity bond** pays for losses resulting from employee theft or misconduct.
- Risk *shifting* is a way to change the distribution of possible outcomes and is accomplished primarily with derivative contracts.

ETHICAL AND PROFESSIONAL STANDARDS

Weight on Exam	15% to 20%
SchweserNotes™ Reference	Book 5, pages 125–190

Ethics is 15%–20% of the Level I examination and is extremely important to your overall success (remember, you can fail a topic area and still pass the exam, but we wouldn't recommend failing Ethics). Ethics can be tricky, and small details can be important on some ethics questions. Be prepared.

In addition to starting early, study the ethics material more than once. Ethics is one of the keys to passing the exam.

ETHICS AND TRUST IN THE INVESTMENT PROFESSION

Ethics can be described as a set of shared beliefs about what behavior is good or acceptable.

Ethical conduct has been described as behavior that follows moral principles and is consistent with society's ethical expectations, and as conduct that improves outcomes for stakeholders—those who are directly or indirectly affected by the conduct.

A **code of ethics** is a written set of moral principles that can guide behavior:

- Having a code of ethics is a way to communicate an organization's values, principles, and expectations.
- Some codes of ethics include a set of rules or standards that require some minimum level of ethical behavior.

A **profession** refers to a group of people with specialized skills and knowledge who serve others and agree to behave in accordance with a code of ethics. A profession may have the following characteristics:

- A code and standards for professional behavior
- A regulatory body to enforce rules concerning professional behavior and monitor the ethical behavior of members
- A focus on the needs of their clients (e.g., students, patients)
- A focus on service to society
- A requirement to put client interests first
- A focus on or requirement for continuing education

Ways that professions establish trust include the following:

- Requiring high standards of expertise, knowledge, and skill
- Establishing standards of ethical behavior
- Monitoring professional conduct
- Encouraging continuing education to maintain and increase competence
- Being focused on clients' needs
- Mentoring and inspiring others in the profession

One challenge to ethical behavior is that individuals tend to overrate the ethical quality of their behavior and overemphasize the importance of their personal traits in determining the ethical quality of their behavior.

It is claimed that external or situational influences, such as social pressure from others or the prospect of acquiring more money or greater prestige, have a greater effect on the ethical quality of behavior than personal traits.

Some financial professionals are held to a **suitability standard**, while others are held to a **fiduciary standard**. Suitability refers to the match between client return requirements and risk tolerances and the characteristics of the securities recommended. A fiduciary standard is stronger, requiring professionals to use their knowledge and expertise to act in the best interests of the client.

Investment professionals have a special responsibility because they are entrusted with their clients' wealth. Because investment advice and management are intangible products (making quality and value received more difficult to evaluate than for tangible products), trust in investment professionals takes on an even greater importance. Failure to act in a highly ethical manner can damage not only client wealth but also impede the success of investment firms and investment professionals because potential investors will be less likely to use their services.

Unethical behavior by financial services professionals can have negative effects for society as a whole. A lack of trust in financial advisors will reduce the funds entrusted to them and increase the cost of raising capital for business investment and growth. Unethical behavior, such as providing incomplete, misleading, or false information to investors, can affect the allocation of the capital that is raised.

Ethical vs. Legal Standards

Not all unethical actions are illegal, and not all illegal actions are unethical. Acts of "whistleblowing" or civil disobedience that may be illegal in some places are considered by many to be ethical behavior. On the other hand, recommending investment in a relative's firm without disclosure may not be illegal, but it would be considered unethical by many. Ethical principles often set a higher standard of behavior than laws and regulations. In general, ethical decisions require more judgment and consideration of the impact of behavior on many stakeholders compared to legal decisions.

Framework for Ethical Decision-Making

Ethical decisions will be improved when ethics are integrated into a firm's decision-making process. The following ethical decision-making framework is presented in the Level I CFA curriculum:[1]

- Identify: Relevant facts, stakeholders and duties owed, ethical principles, and conflicts of interest.
- Consider: Situational influences, additional guidance, and alternative actions.
- Decide and act.
- Reflect: Was the outcome as anticipated? Why or why not?

CODE OF ETHICS AND STANDARDS OF PROFESSIONAL CONDUCT

We recommend you read the original *Standards of Practice Handbook*. Although we are very proud of our reviews of the ethics material, there are *two* reasons we recommend you read the original *Standards of Practice Handbook* (11th Ed., updated March 2018). First, you are a CFA candidate. As such, you have pledged to abide by the CFA Institute Standards. Second, most of the ethics questions will likely come directly from the text and examples in the *Standards of Practice Handbook*. You will be much better off if you read both our summaries of the standards and the original handbook and all the examples presented in it.

The CFA Institute Professional Conduct Program is covered by the CFA Institute Bylaws and the Rules of Procedure for Proceedings Related to Professional Conduct. The Disciplinary Review Committee of the CFA Institute Board of Governors has overall responsibility for the Professional Conduct Program and enforcement of the Code and Standards.

CFA Institute, through the Professional Conduct staff, conducts inquiries related to professional conduct. Several circumstances can prompt such an inquiry:

- Self-disclosure by members or candidates on their annual Professional Conduct Statements of involvement in civil litigation or a criminal investigation, or that the member or candidate is the subject of a written complaint
- Written complaints about a member or candidate's professional conduct that are received by the Professional Conduct staff
- Evidence of misconduct by a member or candidate that the Professional Conduct staff received through public sources, such as a media article or broadcast
- A report by a CFA exam proctor of a possible violation during the examination
- Analysis of exam scores and materials and monitoring of websites and social media by CFA Institute

Once an inquiry is begun, the Professional Conduct staff may request (in writing) an explanation from the subject member or candidate, and may:

- Interview the subject member or candidate.

- Interview the complainant or other third parties.
- Collect documents and records relevant to the investigation.

The Professional Conduct staff may decide:

- That no disciplinary sanctions are appropriate.
- To issue a cautionary letter.
- To discipline the member or candidate.

In a case where the Professional Conduct staff finds a violation has occurred and proposes a disciplinary sanction, the member or candidate may accept or reject the sanction. If the member or candidate chooses to reject the sanction, the matter will be referred to a panel of CFA Institute members for a hearing. Sanctions imposed may include condemnation by the member's peers or suspension of the candidate's continued participation in the CFA Program.

Code and Standards

Questions about the Code and Standards will most likely be application questions. You will be given a situation and be asked to identify whether or not a violation occurs, what the violation is, or what the appropriate course of action should be. You are not required to know the standards by number, just by name.

The Code of Ethics states that members of CFA Institute (including CFA charterholders) and candidates for the CFA designation (Members and Candidates) must do the following:

- Act with integrity, competence, diligence, and respect and in an ethical manner with the public, clients, prospective clients, employers, employees, colleagues in the investment profession, and other participants in the global capital markets.
- Place the integrity of the investment profession and the interests of clients above their own personal interests.
- Use reasonable care and exercise independent, professional judgment when conducting investment analysis, making investment recommendations, taking investment actions, and engaging in other professional activities.
- Practice and encourage others to practice in a professional and ethical manner that will reflect credit on themselves and the profession.
- Promote the integrity and viability of the global capital markets for the ultimate benefit of society.
- Maintain and improve their professional competence and strive to maintain and improve the competence of other investment professionals.

GUIDANCE FOR STANDARDS I–VII

The following is a list of the Standards of Professional Conduct. Candidates should focus on the purpose of the standard, applications of the standard, and proper procedures of compliance for each standard.

The following is intended to offer a useful summary of the current standards, but it certainly does not take the place of careful reading of the standards themselves, the guidance for implementing the standards, and the examples in the handbook.

1. Know the law relevant to your position:
   - Comply with the most strict law or standard that applies to you.
   - Don't solicit gifts.
   - Don't compromise your objectivity or independence.
   - Use reasonable care.
   - Don't lie, cheat, or steal.
   - Don't continue association with others who are breaking laws, rules, or regulations.
   - Don't use others' work or ideas without attribution.
   - Don't guarantee investment results or say that past results will be certainly repeated.
   - Don't do things outside of work that reflect poorly on your integrity or professional competence.

2. Do not act or cause others to act on material nonpublic information:
   - Do not manipulate market prices or trading volume with the intent to mislead others.

3. Act solely for the benefit of your client and know to whom a fiduciary duty is owed with regard to trust accounts and retirement accounts:
   - Treat clients fairly by attempting simultaneous dissemination of investment recommendations and changes.
   - Do not personally take shares in oversubscribed IPOs.

   When in an advisory relationship, do the following:
   - Know your client.
   - Make suitable recommendations/take suitable investment action (in a total portfolio context).
   - Preserve confidential client information unless it concerns illegal activity.
   - Do not try to mislead with performance presentation.
   - Vote nontrivial proxies in clients' best interests.

4. Act for the benefit of your employer:
   - Do not harm your employer.
   - Obtain written permission to compete with your employer or to accept additional compensation from clients contingent on future performance.
   - Disclose (to employer) any gifts from clients.
   - Don't take material with you when you leave employment (you can take what is in your brain).
   - Supervisors must take action to both prevent and detect violations.

- Don't take supervisory responsibility if you believe procedures are inadequate.

5. Thoroughly analyze investments:
   - Have reasonable basis.
   - Keep records.
   - Tell clients about the investment process, including its risks and limitations.
   - Distinguish between facts and opinions.
   - Review the quality of third-party research and the services of external advisers.
   - In quantitative models, consider what happens when their inputs are outside the normal range.

6. Disclose potential conflicts of interest (let others judge the effects of any conflict for themselves):
   - Disclose referral arrangements.
   - Client transactions come before employer transactions, which come before personal transactions.
   - Treat clients who are family members just like any client.

7. Don't cheat on *any* exams (or help others to).
   - Don't reveal CFA exam questions or disclose what topics were tested or not tested.
   - Don't use your Society position or any CFA Institute position or responsibility to *improperly* further your personal or professional goals.
   - Don't use the CFA designation improperly.
   - Don't put "CFA" in bold or in bigger font than your name.
   - Don't put "CFA" in a pseudonym that conceals your identity, such as a social media account name.
   - Don't imply or say that holders of the CFA charter produce better investment results.
   - Don't claim that passing all exams on the first try makes you a better investment manager than others.
   - Don't claim CFA candidacy unless registered for the next exam or awaiting results.
   - There is no such thing as a CFA Level I (or II, or III).

   My goodness! What *can* you do?
   - You can use information from recognized statistical sources without attribution.
   - You can be wrong (as long as you had a reasonable basis at the time).
   - You can use several pieces of nonmaterial, nonpublic information to construct your investment recommendations (mosaic theory).
   - You can do large trades that may affect market prices, as long as the intent of the trade is not to mislead market participants.
   - You can say that Treasury securities are without default risk.

- You can always seek the guidance of your supervisor, compliance officer, or outside counsel.
- You can get rid of records after seven years.
- You can accept gifts from clients and referral fees as long as properly disclosed.
- You can call your biggest clients first (after fair distribution of investment recommendation or change).
- You can accept compensation from a company to write a research report if you disclose the relationship and nature of compensation.
- You can get drunk when not at work and commit misdemeanors that do not involve fraud, theft, or deceit.
- You can protest laws or policies you believe are unjust, even if you get arrested for doing so (civil disobedience).
- You can disclose otherwise-confidential information to authorities to expose wrongdoing or protect the integrity of financial markets (whistleblowing).
- You can say you have passed the Level I, II, or III CFA exam (if you really have).
- You can accurately describe the nature of the examination process and the requirements to earn the right to use the CFA designation.

INTRODUCTION TO THE GLOBAL INVESTMENT PERFORMANCE STANDARDS (GIPS®)

Why GIPS Were Created

When firms choose their own methodologies for reporting investment performance, they tend to choose those that make their own performance look good. Examples include choosing a top-performing portfolio or an unusually good time period and claiming that it represents the firm's overall results, as well as excluding accounts that clients terminated for poor performance.

CFA Institute created GIPS as a way to present a standardized methodology for performance reporting. Widespread usage of GIPS can make performance comparisons across firms meaningful, avoid misrepresentations of performance, and give oversight bodies a clearer understanding of the returns achieved and the risks taken by the firms they supervise.

Who GIPS Apply To

GIPS only apply to firms that actually manage assets. Presenting performance information compliant with GIPS is voluntary for such firms, but they may only claim compliance with GIPS if they comply fully and on a firm-wide basis. Other firms related to the asset management business, such as software developers, may state that they endorse GIPS but may not claim compliance with GIPS.

GIPS Standards for Firms

The GIPS standards for firms consist of eight sections:

Composites

A **composite** is a grouping of portfolios that a firm manages using a similar investment strategy, objective, or mandate. Reporting the performance of composites gives clients and prospects information about the firm's success in managing various types of securities and investment styles.

To comply with GIPS, a composite must include *all fee-paying, discretionary portfolios* (current and past) that the firm has managed with a particular strategy. All fee-paying discretionary accounts managed by the firm must be included in at least one composite. The firm must assign each portfolio to its composite before the portfolio's performance is known. This prevents firms from choosing portfolios selectively to create composites with artificially superior returns.

Definition of the Firm

For GIPS compliance, the *firm* is defined as the corporation, subsidiary, or division that is held out to clients as a business entity. The definition of the firm includes all of its geographic locations and their clients.

Definition of Discretion

Discretion means the firm is managing the assets in a portfolio, and therefore, the portfolio should be included in a composite. If a client restricts a portfolio such that the manager cannot carry out the intended strategy, the firm may classify that portfolio as nondiscretionary—and, therefore, not include it in a composite.

Verification of GIPS Compliance

Firms are encouraged, but not required, to pursue verification of their compliance with GIPS. Verification applies to the entire firm's performance measurement practices and methods, not a selected composite.

If a firm chooses verification, it must appoint an independent third party to perform it. This third party must attest that the firm has complied with all GIPS requirements on a firm-wide basis and has processes in place to present performance in accordance with GIPS.

ETHICS APPLICATION

This learning module presents additional examples for each of the Standards of Practice. As with the Code and Standards themselves, we recommend that candidates study this material multiple times from the assigned curriculum. We believe the examples given are a good indicator of the depth at which Level I exam questions will test the Code and Standards.

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1   Bidhan L. Parmar, PhD, Dorothy C. Kelly, CFA, and David B. Stevens, CFA, "Ethics and Trust in the Investment Profession," CFA Program 2024 Level I Curriculum, Volume 1 (CFA Institute, 2023).

ESSENTIAL EXAM STRATEGIES

The level of review contained in this section is different from our other CFA review materials. As always, our objective is to enhance your chances of passing the CFA exam. Unlike the previous part of this book, which covers *what* you need to know to pass the Level I CFA exam, this section provides you important guidance on *how* to pass the exam. By this time, you have likely studied the entire Level I curriculum and have a solid grasp on the content, so we won't spend any time here reviewing or quizzing you on material you already know. Instead, we provide insights about how to successfully apply your hard-earned knowledge on exam day.

First, we provide some proven approaches to mastering the Level I CFA curriculum. Next, we present a structured plan for the last week before the exam. Following this plan assures that you will be sharp on exam day, and your performance will not be adversely affected by your nerves. We will also spend some time discussing general exam-taking strategies and how to approach individual questions.

A Formidable Task

Over the past few months, you have studied an enormous amount of material. CFA Institute's assigned learning modules for the Level I curriculum include nearly 3,000 pages (not counting the prerequisite materials), and there are more than 350 learning outcome statements. This is a huge amount of material. Realistically speaking, it is virtually impossible to remember every detail within the curriculum. The good news is that you don't have to know every detail. From this guide, you will learn how to get the most benefit from the short time remaining until the exam.

As you prepare for the CFA exam, try to focus on the exam itself. Don't add to your stress level by worrying about whether you'll pass or what might happen if you don't. If you must, you can worry about all of that after the exam. If you worry about it before the exam, or especially during the exam, your performance will likely suffer. There is ample stress in remembering the material, let alone worrying whether you'll pass. Many of the tips we provide are proven stress reducers on exam day. Your grasp of the content, combined with the tips we provide, will have you well prepared for the exam experience.

All of the faculty at Kaplan Schweser have earned CFA charters and have extensive experience in teaching the topics covered in the CFA curriculum. As such, we know what you are going through from our own personal experiences, and we have helped tens of thousands of candidates earn the right to use the CFA designation. We've been there and done that! We know the agony and anxiety you are experiencing. Now, we want to share with you the time-honored strategies that we have personally seen lead to success on the Level I CFA exam.

Let's start with some overall thoughts. There are two basic strategies you should follow in learning the CFA curriculum: (1) focus on the big picture, and (2) know the main concepts.

Focus on the Big Picture

Focusing on the big picture means you should know at least a little about every concept. When we took the exam, some of us were not overly comfortable with debt securities. We just didn't deal with bonds on a regular basis. Still, we knew that we had to learn some of the basics for the exam. For example, even if you don't know the formula for effective duration, at least know that effective duration is a measure of interest rate risk. By remembering some basic information on exam day, you will be able to narrow your answer choices. You probably won't answer many questions correctly with only a basic grasp of the concept, but you can improve your odds on a multiple-choice question from 33% to 50%. You also will be able to better distinguish between the relevant and irrelevant information in a question. Continuing with our duration theme, you would know that bond rating information provided in a duration question is not relevant because bond ratings reflect credit risk, not interest rate risk.

Even if you don't currently work with, for example, futures, and you know you never will, try to at least get a basic grasp of the important concepts within the topic. It is simply a poor exam strategy to completely blow off significant pieces of the curriculum. We have known people in the CFA Program who thought that as long as they knew a few of the assigned topics really well, they could bluff their way through the rest of the exam. These were smart individuals, but they had poor exam strategies. So far, none of them have passed the Level I exam that way.

Know the Main Concepts

It is important to identify those concepts that can be considered core knowledge for a financial analyst. In any given year, some concepts might be emphasized more than others, but if you can answer most of the questions concerning the main concepts, you will dramatically increase your chance of passing. Generally, the idea is to be correct on most of the questions dealing with the core concepts, and then rely on your big-picture knowledge to get points on the remaining material.

Topic Weighting

In preparing for the exam, you must pay attention to the weights assigned to each topic within the curriculum. The Level I topic weights are as follows:

Topic	Exam Weight	Number of LOS	Questions per LOS
Quantitative Methods	6%–9%	38	0.28 to 0.43
Economics	6%–9%	30	0.36 to 0.54
Corporate Issuers	6%–9%	22	0.49 to 0.74
Financial Statement Analysis	11%–14%	53	0.37 to 0.48
Equity Investments	11%–14%	66	0.30 to 0.38
Fixed Income	11%–14%	51	0.39 to 0.49
Derivatives	5%–8%	22	0.41 to 0.65
Alternative Investments	7%–10%	22	0.57 to 0.82
Portfolio Management	8%–12%	40	0.36 to 0.54
Ethical and Professional Standards	15%–20%	21	1.29 to 1.71
Totals	100%	365	0.49

Notice how the LOS counts are not consistent with the exam weights. In fact, some topic areas with a relatively low number of LOS have a relatively high weight on the exam. Allocating your preparation time based on the number of LOS will most likely lead to being underprepared in some key areas, especially Ethical and Professional Standards.

Formulas

You may be surprised to know that the Level I CFA examination is quite conceptual and is not heavily weighted toward computations based on memorized formulas. It is nothing like what undergraduate students used to refer to as "plug and chug" problems. Certainly, some formulas are required, but you will find that you need to use your calculator much less often than you might imagine after reading the required material. Examples of the types of formulas that you need to commit to memory are (1) the constant growth dividend discount model, (2) the security market line, (3) the variance of a two-asset portfolio, and (4) both the traditional and expanded DuPont formulas for decomposing ROE.

Many times, you will be given questions where the answer can be obtained by using a formula and a fairly lengthy calculation—but where you can also identify the correct answer without calculation, if you truly understand the concept or relationship being tested. With any formula you encounter in the required readings, you should try to gain a clear understanding of what it is telling you (when it is appropriate to use it) and of the relationship among the various input variables.

One example of this sort of understanding is the holding period return or holding period yield. It is simply the percentage increase in the value of an investment over the holding period. If you buy a stock for $100, receive a $5 dividend, and sell it for $103 at the end of the period, the value increased from $100 to $108—an increase of 8% (which is the holding period return or yield). If you understand that the harmonic mean is used to get the average price per share when the same amount is invested over multiple periods, you can easily calculate the harmonic mean of $1, $2, and $3. If you invested a total of $6 at each of these three prices, you would buy 6 / 1 + 6 / 2 + 6 / 3 = 11 shares and spend a total of $6 × 3 = $18. The average price per share (and the harmonic mean) is 18 / 11 = $1.636.

Think of the formula as just a shorthand way of expressing a relation or concept you need to understand. For example, the formula tells you that the population variance is the average squared deviation from the mean. Approaching formulas in this way will reduce your chances of missing a problem because your memory fails you under the stress of the exam. I can never remember the formula for an updated probability using Bayes' theorem, but ever since I understood it as presented in a tree diagram, I can calculate updated probabilities without a problem, and without worrying whether I "remembered" the precise formula correctly.

"Characteristic" Lists

Another common source of specific questions is identifying the characteristics of various securities, models, and valuation methods. A typical question format would be, "Which of the following most accurately describes … ?" Here, the big-picture approach can help you weed out wrong answers. Also, some candidates use mnemonics to help them remember lists of characteristics or lists of pros and cons.

Acronyms

Exam questions may include common abbreviations and acronyms that appear in the Level I curriculum. You should be able to recognize all the abbreviations in the following list.

Abbreviation	Full name
CAPM	Capital asset pricing model
D/E	Debt-to-equity ratio
EBIT	Earnings before interest and taxes
EBITDA	Earnings before interest, taxes, depreciation, and amortization
EPS	Earnings per share
ETF	Exchange-traded fund
FIFO	First-in, first-out
IFRS	International Financial Reporting Standards
IPO	Initial public offering
IRR	Internal rate of return
LIFO	Last-in, first-out
NAV	Net asset value
NPV	Net present value
P/B	Price-to-book ratio
P/CF	Price-to-cash-flow ratio
P/E	Price-to-earnings ratio
PPE or PP&E	Property, plant, and equipment
ROA	Return on assets
ROE	Return on equity
U.S. GAAP	U.S. Generally Accepted Accounting Principles
WACC	Weighted average cost of capital

Know Your Strengths

We each have our own style of learning. Some of us can sit and study for hours at a time, while some of us learn better in small doses each day. Be aware of your study habits, and do not place unrealistic burdens on yourself. Be especially aware of problems with certain topics. For example, if you have always struggled with accounting, look at ways to improve your grasp of the accounting material—spend more time with it, attend a review course, or join a study group. *Do not* expect that you can ignore a topic and make up for the lost points by excelling in another area. Similarly, do not skip an area because you think you already know it. There are CPAs who fail the financial statement analysis section and PhDs in Economics who fail the economics section. You need to review the specific material in the assigned CFA curriculum to pass the CFA exam.

The Rules

At some point in your studies, it would be a good idea to review the Policies and Procedures section of the CFA Institute website. Believe it or not, you will probably find this to be a nice break from accounting or derivatives! Be sure that you have a passport that will not expire before exam day. Select an approved calculator and learn how to use it proficiently. You should also read the CFA Program errata that are issued in the months before the exam.

Be aware of items you can and cannot take to the exam. CFA Institute strictly prohibits taking any of the following into the testing room:

- Food or non-water beverages
- Wallets or purses
- Watches or timers
- Jewelry other than wedding or engagement rings
- Backpacks, briefcases, luggage of any kind
- *Any* study materials
- Scratch paper, pens and pencils, calculator manuals
- Cell phones, any personal electronics

You will be provided with scratch paper for use during the exam.

Do not expect that these policies do not apply to you. Every year, numerous candidates have problems on exam day because they assumed their cases would be legitimate exceptions. There is no such thing. We have stories of people sprinting back to their cars to put stuff away to get back in time to start the exam. If you read the rules and follow them, you reduce the potential for unexpected stress on your exam day. That's a good thing!

Final Preparation—The Week Before Your Exam

Have a well-defined strategy for the last week before your exam. If at all possible, it is best to take at least some leave from your job. You should save at least one mock exam for the last week. To simulate the real exam, you should avoid looking at this exam or studying questions from it until you are ready to sit down and take it for the first time. Take this exam early in the final week. Take the first half of the exam in a 2-hour-and-15-minute period, take a 30-minute break, then take the other half in a second 2-hour-and-15-minute period. Time yourself so you can get a feel for the time constraints and pressure of exam day. Remember, you have an average of 90 seconds per question. When you have completed the entire exam, use these results to identify areas where you need to focus your study efforts over the last few days. You should devote most of your time to areas where you performed poorly, but you should also spend enough time keeping your stronger topics fresh in your mind.

At some point during the week before your exam, it is a good idea to visit the actual exam center. Figure out how long it will take to get to your test center and where you

can park, if needed. Taking a light snack can make your break more relaxing. If your exam appointment is on a Saturday or Sunday and you are relying on public transportation, make sure to confirm the weekend schedule. The fewer surprises and distractions on exam day, the better.

On the day before your exam, we recommend rereading Ethical and Professional Standards, including all the examples, from the curriculum volume.

Exam Windows and Computer-Based Testing

CFA Institute offers the Level I exam four times per year: in February, May, August, and November. Each exam is available over a period of up to one week. Registration deadlines are set such that a candidate who needs to retake the Level I exam must wait at least six months between attempts. That is, a candidate may attempt the Level I exam a maximum of two times in a calendar year.

The Level I exam is computer based and given at Prometric exam centers. You are responsible for scheduling an appointment to take your exam at one of these centers.

We recommend that you use the Prometric exam software tutorial to get comfortable with the user interface you will encounter when you sit for the exam. A link to the tutorial can be found at www.prometric.com/test-takers/search/cfa.

No scratch paper is allowed to be brought into the exam, but each candidate will be provided with scratch paper once in the exam room to use during the exam.

An exam appointment is up to 5½ hours. In the first half hour, you will read and electronically sign the candidate pledge and may review the software tutorial. You will then have 2 hours and 15 minutes to complete the first half of the exam (90 questions, 90 seconds per question, on average). You may take a 30-minute break before you start the second half of the exam, which is also 90 questions in 2 hours and 15 minutes.

Different Topic Areas in Each Session

The first 2-hour-and-15-minute session begins with a section on the topic areas of Ethical and Professional Standards, Quantitative Methods, Economics, Corporate Issuers, and Financial Statement Analysis. Within this section, questions will not be grouped by topic area; you might see individual questions from these five topic areas appear in any order.

The exam software does not require you to answer the questions in sequence from 1 to 90. If you find that Ethics questions take you longer to answer than the rest, you can bank some time by starting with the other topics and then coming back to Ethics. Note, however, that you must complete the first session before the break and cannot come back to it during the second session.

The second 2-hour-and-15-minute session tests the topic areas of Equity Investments, Fixed Income, Derivatives, Alternative Investments, and Portfolio Management. The questions will, again, be mixed by topic area.

Exam Day

Answering Level I Multiple-Choice Questions

Read the full question carefully! Watch for double negatives like "Which of the following is least likely a disadvantage…" It is very important not to miss words, or parts of words, by reading too quickly (e.g., reading "most likely" instead of "least likely," or "advantages" instead of "disadvantages").

For non-numerical questions, read *all* answer choices. Don't just stop when you get to one that sounds right. There may be a better choice.

For long questions, dissect the bits of information that are provided. What information is relevant? What is most specifically related to the question? Often a wrong answer looks good because it is consistent with information in the question that is actually irrelevant.

After you read the question, determine what you think the question is asking. This can help you filter out extraneous information and focus quickly on appropriate answer choices.

Similarly, after you read the question, it is a good idea to formulate your own answer before reading the answer choices. Develop an expectation of what the answer should be. This may make the correct answer sound better to you when you read it.

On calculation problems, after you have selected an answer choice, pause for a moment and think about whether the answer makes sense. Is the sign of the result correct, or does the direction of change make sense?

Do not look for patterns in answers. Just because the last three questions all had "C" for an answer, do not expect the next answer not to be "C." There is no reason to expect that CFA Institute has a preference for how many questions are answered with the same letter.

Trust your first impressions. You will find that you are often correct. It is okay to change an answer, but only do so if you have a *good* reason. Over the years, we have heard many stories of how candidates talk themselves out of the correct answer. We have all done this. If you come back to a question, be sure you can justify any change before you make it.

Finally, and probably most importantly, *do not lose confidence*. As far as we know, no one has ever received a perfect score on a CFA exam. It just does not happen. You can miss a significant number of questions and still pass. Even if you have struggled on a few questions, maybe even five or six in a row, do not lose confidence. The worst thing you can do is second-guess yourself—you will take longer on every question and start changing correct answers.

What To Do With a Difficult Question

There will undoubtedly be questions that give you trouble. You might not understand the question, may think that none of the answers make sense, or simply may not know

the concept being tested. The following tips will likely prove to be useful if you find yourself facing a difficult question.

- If the question does not make sense or if none of the answers look remotely correct, reread the question to see if you missed something. If you are still unsure, select an answer choice and move on. Don't agonize over it and waste precious time that can be allocated to questions you can nail.

- Guess if you must. A randomly marked answer has a one-in-three chance of being correct, and if you can eliminate one bad answer, this increases to one-in-two. You are not penalized for wrong answers. If you are unable to determine the "best" answer, you still should be able to help your odds.

- Take some comfort in the fact that the CFA exams are graded on a curve. If a question gave you trouble, it might have given many other candidates just as much trouble.

Time Management

Candidates who fail to pass CFA exams cite time management as their biggest downfall. Do not let poor time management determine your exam results. The following are some tips to help you manage your time wisely.

Take at least one mock exam where you time yourself. This will give you some indication of whether you will have problems on exam day. However, do not let your positive results on mock exams lull you into overconfidence. The stress of exam day, plus possible distractions like noise or a cold exam room, can make a big difference in how fast you work.

Monitor your progress. Keep an eye on the time as you work through the exam. There will be 90 questions in each 2-hour-and-15-minute exam session, which means 40 questions per hour or 10 questions every 15 minutes. You may deviate some as you work through easier or more difficult questions, but be careful not to let yourself fall too far behind.

Never panic! Even if you fall behind, panicking will only make things worse. You won't think clearly and you'll miss easy questions. If you need a short break, take a few deep breaths. The 30 seconds or so that this takes may very well help you think clearly enough to answer several additional questions correctly.

Catch your breath at the break. If you eat something, eat light; avoid heavy foods that can make you feel drowsy during the second session.

If you talk to other candidates during your break, do not let their comments influence you. They may say the exam is easier or more difficult than they expected, but they might not be correct about how well they are doing. If you want, you can review a little at the break. That's fine. But if you need to relax for a few minutes, that may do you just as much good as an additional 30-minute cram session. Do what you are most comfortable with.

Question Formats at Level I

Here are some guidelines that CFA Institute adheres to in constructing questions for the Level I exam:

- Each question draws on one or more learning outcome statements.
- Terminology and symbols will be consistent with those used in the readings (and, therefore, the SchweserNotes).
- Candidates do not need to know the numbers for specific Standards of Practice.
- Empirical results cited in the readings are not tested.
- The exam does not reuse old questions. All questions are new.
- Distractors (the incorrect choices) are written to capture the most common mistakes a candidate is likely to make on a question.
- Each question has three answer choices.
- *None of the above*, *all of the above*, and *not enough information* are not used.
- The words *true*, *false*, and *except* do not appear in the question stems. Instead, the questions use phrases like *most accurate*, *least likely*, or *closest to*.
- Every question has its own stem and answer choices. The Level I exam does not have any multiple-part questions.
- Written answer choices are arranged from shortest to longest.
- Numeric answer choices are arranged from lowest to highest.

As to the format of Level I questions, you can expect two main varieties.

1. There are sentence completion questions with three choices, such as the following:

   When yields increase, bond prices:

      A. fall.

      B. rise.

      C. are unaffected.

2. There are complete questions with three answer choices, such as the following:

   If a central bank decreases its policy rate by 1% and nominal long-term interest rates increase, which of the following is the *most likely* reason?

      A. The central bank also increased its target for long-term rates.

      B. Changes in long-term rates always are opposite to changes in the policy rate.

      C. The expansionary monetary policy action caused an increase in expected future inflation.

Specific Types of Questions You Should Expect

It is difficult to generalize Level I questions. Some are straightforward, some look straightforward but are testing deeper understanding, and some are just confusing. CFA Institute's objective is to evaluate your grasp of the Level I Candidate Body of

Knowledge. They do not set out to confuse or frustrate you, although that *is* a common result.

The following are some general types of questions and answers to expect.

Cause and Effect Problems

Part of the reason Level I CFA questions seem so difficult is because they ask you to apply your knowledge in ways you may not expect. Many questions combine more than one LOS or ask you to reason out the results and implications of a given series of events. These questions require some thought and will definitely be more difficult if you are not well rested, or if you are stressed out.

Long Questions

Look out for these. They are major time burners. The worst areas for these are Ethics and Financial Statement Analysis. In both areas, you might get a lot of irrelevant information, so try to weed out the confusion factors and focus on what's important.

It often helps to *read the end of the question first.* This can let you know what information is relevant as you read the body of the question.

Tempting but Unnecessary Calculations

CFA Institute is interested in testing your grasp of the Level I curriculum. They are not particularly interested in whether or not you can use your calculator. CFA Institute has always emphasized the qualitative grasp of a concept over the quantitative "number crunching" type question. Even so, you might see questions that appear to call for long, complex calculations. Before you start wearing down your calculator battery, spend a moment to see if there is a shortcut. Here is a question on debt securities to emphasize this point.

1. Given the spot rates in the table, the 1-year forward rate two years from now is:

Time (years)	Annual Spot Rate
1	15.0%
2	12.5%
3	10.0%
4	7.5%

  A. −3.21%

  B. 5.17%

  C. 10.00%

This is an example of a calculation question where you can look at the answer choices and reason out a correct answer without doing any calculations. Think about this question for a moment. The spot yield curve is declining. The one-year rate two years from now will have to be a rate such that after earning 12.5% for two years, you will end up with an average return over three years of 10%. The answer has to be less than 10%, right? A spot rate between two positive spot rates is very unlikely

to be negative, and Choice B is the only one less than 10%. If you want to do the calculation, here it is:

$$\frac{(1 + S_3)^3}{(1 + S_2)^2} - 1 = 2y1y; \quad \frac{(1 + 0.10)^3}{(1 + 0.125)^2} - 1 = 2y1y; \quad 2y1y = 5.17\%$$

This question is an example of how taking a few seconds and applying some big-picture understanding can actually save you some time. Also, if you did the calculation, you could use the preceding logic to check yourself.

2. An annual-pay three-year note with an 8% coupon has a yield to maturity of 8%. An analyst's pricing model forecasts that if the benchmark yield curve shifts up by 50 basis points, the bond's price will decrease to 98.75, and if the benchmark curve shifts down by 50 basis points, the bond's price will increase to 100.25. The bond's effective convexity is *closest* to:

   A. –400.

   B. 30.

   C. 240.

At first glance, this looks like a calculation that requires the formula for effective convexity. However, step back for a moment and look at the information given. With an 8% coupon and an 8% yield to maturity, the bond's price equals par value. For equal-sized changes in the benchmark curve, the estimated price increase is less than the estimated price decrease. This is opposite to what we would expect for a bond that has positive convexity. This bond must have negative convexity, and Choice A is the only answer that is negative.

If you prefer, you can do the calculation:

$$\text{effective convexity} = \frac{V_- + V_+ - 2V_0}{(\Delta_{curve})^2 V_0} = \frac{100.25 + 98.75 - 2(100)}{(0.005)^2(100)} = -400$$

Indirect or Confusing Wording

Despite what you might hear from other candidates, we honestly don't think CFA Institute purposely writes confusing questions. It is more likely that a particular question is trying to approach a concept from an unusual perspective. That is a good way to test your grasp of a concept, but sometimes, the wording makes it difficult to figure out what is being tested. If you get confused by a question, think it through, but don't waste too much time on it. Remember, you are probably not the only one scratching your head.

"Distractor" Answers That Are True but Not Correct

These are answer choices that seem like good answers for any of several reasons:

- They might be true, but are not appropriate answers (or at least not the best answer).
- They might be consistent with irrelevant information provided in the question.
- They might include buzzwords or common misconceptions about a concept.

Be very careful with these types of distractors because they may make sense, even though they are wrong. They may also make you think you could defend them as an answer choice. You might think, "Well, they want me to answer 'A,' but I think 'B' is okay and I can argue the point with anyone." Think again—you will never get to argue the point. Instead, select the *best* answer that is true all of the time and applies in every case, not the one you think *could* work.

Read the Full Question

Always read all three answer choices before making your selection. This will help you avoid selecting a "true but not correct" choice when a better answer is available.

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