

PRIVATE REAL ESTATE INVESTMENTS

Study Session 15

EXAM FOCUS

This topic review concentrates on valuation of real estate. The focus is on the three valuation approaches used for appraisal purposes, especially the income approach. Make sure you can calculate the value of a property using the direct capitalization method and the discounted cash flow method. Make certain you understand the relationship between the capitalization rate and the discount rate. Finally, understand the investment characteristics and risks involved with real estate investments.

LOS 43.a: Classify and describe basic forms of real estate investments.

FORMS OF REAL ESTATE

There are four basic forms of real estate investment that can be described in terms of a two-dimensional quadrant. In the first dimension, the investment can be described in terms of public or private markets. In the private market, ownership usually involves a direct investment like purchasing property or lending money to a purchaser. Direct investments can be solely owned or indirectly owned through partnerships or **commingled real estate funds (CREF)**. The public market does not involve direct investment; rather, ownership involves securities that serve as claims on the underlying assets. Public real estate investment includes ownership of a **real estate investment trust (REIT)**, a **real estate operating company (REOC)**, and mortgage-backed securities.

The second dimension describes whether an investment involves debt or equity. An equity investor has an ownership interest in real estate or securities of an entity that owns real estate. Equity investors control decisions such as borrowing money, property management, and the exit strategy.

A debt investor is a lender that owns a mortgage or mortgage securities. Usually, the mortgage is collateralized (secured) by the underlying real estate. In this case, the lender has a superior claim over an equity investor in the event of default. Since the lender must be repaid first, the value of an equity investor's interest is equal to the value of the property less the outstanding debt.

Each of the basic forms has its own risk, expected returns, regulations, legal issues, and market structure.

Private real estate investments are usually larger than public investments because real estate is indivisible and illiquid. Public real estate investments allow the property to

remain undivided while allowing investors divided ownership. As a result, public real estate investments are more liquid and enable investors to diversify by participating in more properties.

Real estate must be actively managed. Private real estate investment requires property management expertise on the part of the owner or a property management company. In the case of a REIT or REOC, the real estate is professionally managed; thus, investors need no property management expertise.

Equity investors usually require a higher rate of return than mortgage lenders because of higher risk. As previously discussed, lenders have a superior claim in the event of default. As financial leverage (use of debt financing) increases, return requirements of both lenders and equity investors increase as a result of higher risk.

Typically, lenders expect to receive returns from promised cash flows and do not participate in the appreciation of the underlying property. Equity investors expect to receive an income stream as a result of renting the property and the appreciation of value over time.

Figure 1 summarizes the basic forms of real estate investment and can be used to identify the investment that best meets an investor's objectives.

Figure 1: Basic Forms of Real Estate Investment

	<i>Debt</i>	<i>Equity</i>
Private	Mortgages	Direct investments such as sole ownership, partnerships, and other forms of commingled funds
Public	Mortgage-backed securities	Shares of REITs and REOCs

LOS 43.b: Describe the characteristics, the classification, and basic segments of real estate.

REAL ESTATE CHARACTERISTICS

Real estate investment differs from other asset classes, like stocks and bonds, and can complicate measurement and performance assessment.

- **Heterogeneity.** Bonds from a particular issue are alike, as are stocks of a specific company. However, no two properties are exactly the same because of location, size, age, construction materials, tenants, and lease terms.
- **High unit value.** Because real estate is indivisible, the unit value is significantly higher than stocks and bonds, which makes it difficult to construct a diversified portfolio.

- **Active management.** Investors in stocks and bonds are not necessarily involved in the day-to-day management of the companies. Private real estate investment requires active property management by the owner or a property management company. Property management involves maintenance, negotiating leases, and collection of rents. In either case, property management costs must be considered.
- **High transaction costs.** Buying and selling real estate is costly because it involves appraisers, lawyers, brokers, and construction personnel.
- **Depreciation and desirability.** Buildings wear out over time. Also, buildings may become less desirable because of location, design, or obsolescence.
- **Cost and availability of debt capital.** Because of the high costs to acquire and develop real estate, property values are impacted by the level of interest rates and availability of debt capital. Real estate values are usually lower when interest rates are high and debt capital is scarce.
- **Lack of liquidity.** Real estate is illiquid. It takes time to market and complete the sale of property.
- **Difficulty in determining price.** Stocks and bonds of public firms usually trade in active markets. However, because of heterogeneity and low transaction volume, appraisals are usually necessary to assess real estate values. Even then, appraised values are often based on similar, not identical, properties. The combination of limited market participants and lack of knowledge of the local markets makes it difficult for an outsider to value property. As a result, the market is less efficient. However, investors with superior information and skill may have an advantage in exploiting the market inefficiencies.

The market for REITs has expanded to overcome many of the problems involved with direct investment. Shares of a REIT are actively traded and are more likely to reflect market value. In addition, investing in a REIT can provide exposure to a diversified real estate portfolio. Finally, investors don't need property management expertise because the REIT manages the properties.

PROPERTY CLASSIFICATIONS

Real estate is commonly classified as residential or non-residential. Residential real estate includes single-family (owner-occupied) homes and multi-family properties, such as apartments. Residential real estate purchased with the intent to produce income is usually considered commercial real estate property.

Non-residential real estate includes commercial properties, other than multi-family properties, and other properties such as farmland and timberland.

Commercial real estate is usually classified by its end use and includes multi-family, office, industrial/warehouse, retail, hospitality, and other types of properties such as parking facilities, restaurants, and recreational properties. A *mixed-use development* is a property that serves more than one end user.

Some commercial properties require more management attention than others. For example, of all the commercial property types, hotels require the most day-to-day attention and are more like operating a business. Because of higher operational risk, investors require higher rates of return on management-intensive properties.

Farmland and timberland are unique categories (separate from commercial real estate classification) because each can produce a saleable commodity as well as have the potential for capital appreciation.

LOS 43.c: Explain the role in a portfolio, economic value determinants, investment characteristics, and principal risks of private real estate.

LOS 43.1: Explain the role in a portfolio, the major economic value determinants, investment characteristics, principal risks, and due diligence of private real estate debt investment.

REASONS TO INVEST IN REAL ESTATE

Current income. Investors may expect to earn income from collecting rents and after paying operating expenses, financing costs, and taxes.

Capital appreciation. Investors usually expect property values to increase over time, which forms part of their total return.

Inflation hedge. During inflation, investors expect both rents and property values to rise.

Diversification. Real estate, especially private equity investment, is less than perfectly correlated with the returns of stocks and bonds. Thus, adding private real estate investment to a portfolio can reduce risk relative to the expected return.

Tax benefits. In some countries, real estate investors receive favorable tax treatment. For example, in the United States, the depreciable life of real estate is usually shorter than the actual life. As a result, depreciation expense is higher, and taxable income is lower resulting in lower income taxes. Also, REITs do not pay taxes in some countries, which allow investors to escape double taxation (e.g., taxation at the corporate level and the individual level).

PRINCIPAL RISKS

Business conditions. Numerous economic factors—such as gross domestic product (GDP), employment, household income, interest rates, and inflation—affect the rental market.

New property lead time. Market conditions can change significantly while approvals are obtained, while the property is completed, and when the property is fully leased. During the lead time, if market conditions weaken, the resultant lower demand affects rents and vacancy resulting in lower returns.

Cost and availability of capital. Real estate must compete with other investments for capital. As previously discussed, demand for real estate is reduced when debt capital

is scarce and interest rates are high. Conversely, demand is higher when debt capital is easily obtained and interest rates are low. Thus, real estate prices can be affected by capital market forces without changes in demand from tenants.

Unexpected inflation. Some leases provide inflation protection by allowing owners to increase rent or pass through expenses because of inflation. Real estate values may not keep up with inflation when markets are weak and vacancy rates are high.

Demographic factors. The demand for real estate is affected by the size and age distribution of the local market population, the distribution of socioeconomic groups, and new household formation rates.

Lack of liquidity. Because of the size and complexity of most real estate transactions, buyers and lenders usually perform due diligence, which takes time and is costly. A quick sale will typically require a significant discount.

Environmental issues. Real estate values can be significantly reduced when a property has been contaminated by a prior owner or adjacent property owner.

Availability of information. A lack of information when performing property analysis increases risk. The availability of data depends on the country, but generally more information is available as real estate investments become more global.

Management expertise. Property managers and asset managers must make important operational decisions—such as negotiating leases, property maintenance, marketing, and renovating the property—when necessary.

Leverage. The use of debt (leverage) to finance a real estate purchase is measured by the loan-to-value (LTV) ratio. Higher LTV results in higher leverage and, thus, higher risk because lenders have a superior claim in the event of default. With leverage, a small decrease in net operating income (NOI) negatively magnifies the amount of cash flow available to equity investors after debt service.

Other factors. Other risk factors, such as unobserved property defects, natural disasters, and acts of terrorism, may be unidentified at the time of purchase.

In some cases, risks that can be identified can be hedged using insurance. In other cases, risk can be shifted to the tenants. For example, a lease agreement could require the tenant to reimburse any unexpected operating expenses.

The Role of Real Estate in a Portfolio

Real estate investment has both bond-like and stock-like characteristics. Leases are contractual agreements that usually call for periodic rental payments, similar to the coupon payments of a bond. When a lease expires, there is uncertainty regarding renewal and future rental rates. This uncertainty is affected by the availability of competing space, tenant profitability, and the state of the overall economy, just as stock prices are affected by the same factors. As a result, the risk/return profile of real estate as an asset class, is usually between the risk/return profiles of stocks and bonds.

Role of Leverage in Real Estate Investment

So far, our discussion of valuation has ignored debt financing. Earlier we determined that the level of interest rates and the availability of debt capital impact real estate prices. However, the percentage of debt and equity used by an investor to finance real estate does not affect the property's value.

Investors use debt financing (leverage) to increase returns. As long as the investment return is greater than the interest paid to lenders, there is positive leverage and returns are magnified. Of course, leverage can also work in reverse. Because of the greater uncertainty involved with debt financing, risk is higher since lenders have a superior claim to cash flow.

LOS 43.d: Describe commercial property types, including their distinctive investment characteristics.

Commercial Property Types

The basic property types used to create a low-risk portfolio include office, industrial/warehouse, retail, and multi-family. Some investors include hospitality properties (hotels and motels) even though the properties are considered riskier since leases are not involved and performance is highly correlated with the business cycle.

It is important to know that with all property types, location is critical in determining value.

Office. Demand is heavily dependent on job growth, especially in industries that are heavy users of office space like finance and insurance. The average length of office leases varies globally.

In a *gross lease*, the owner is responsible for the operating expenses, and in a *net lease*, the tenant is responsible. In a net lease, the tenant bears the risk if the actual operating expenses are greater than expected. As a result, rent under a net lease is lower than a gross lease.

Some leases combine features from both gross and net leases. For example, the owner might pay the operating expenses in the first year of the lease. Thereafter, any increase in the expenses is passed through to the tenant. In a multi-tenant building, the expenses are usually prorated based on square footage.

Understanding how leases are structured is imperative in analyzing real estate investments.

Industrial. Demand is heavily dependent on the overall economy. Demand is also affected by import/export activity of the economy. Net leases are common.

Retail. Demand is heavily dependent on consumer spending. Consumer spending is affected by the overall economy, job growth, population growth, and savings rates. Retail lease terms vary by the quality of the property as well as the size and importance of the tenant. For example, an anchor tenant may receive favorable lease terms to attract them to the property. In turn, the anchor tenant will draw other tenants to the property.

Retail tenants are often required to pay additional rent once sales reach a certain level. This unique feature is known as a *percentage lease* or *percentage rent*. Accordingly, the lease will specify a minimum amount of rent to be paid without regard to sales. The minimum rent also serves as the starting point for calculating the percentage rent.

For example, suppose that a retail lease specifies minimum rent of \$20 per square foot plus 5% of sales over \$400 per square foot. If sales were \$400 per square foot, the minimum rent and percentage rent would be equivalent ($\$400 \text{ sales per square foot} \times 5\% = \$20 \text{ per square foot}$). In this case, \$400 is known as the natural breakpoint. If sales are \$500 per square foot, rent per square foot is equal to \$25 [$\$20 \text{ minimum rent} + \$5 \text{ percentage rent } (\$500 - \$400) \times 5\%$]. Alternatively, rent per square foot is equal to $\$500 \text{ sales per square foot} \times 5\% = \25 because of the natural breakpoint.

Multi-family. Demand depends on population growth, especially in the age demographic that typically rents apartments. The age demographic can vary by country, type of property, and locale. Demand is also affected by the cost of buying versus the cost of renting, which is measured by the ratio of home prices to rents. As home prices rise, there is a shift toward renting. An increase in interest rates will also make buying more expensive.

LOS 43.e: Compare the income, cost, and sales comparison approaches to valuing real estate properties.

REAL ESTATE APPRAISALS

Since commercial real estate transactions are infrequent, appraisals are used to estimate value or assess changes in value over time in order to measure performance. In most cases, the focus of an appraisal is *market value*; that is, the most probable sales price a typical investor is willing to pay. Other definitions of value include *investment value*, the value or worth that considers a particular investor's motivations; *value in use*, the value to a particular user such as a manufacturer that is using the property as a part of its business; and *assessed value* that is used by a taxing authority. For purposes of valuing collateral, lenders sometimes use a more conservative *mortgage lending value*.

Valuation Approaches

Appraisers use three different approaches to value real estate: the cost approach, the sales comparison approach, and the income approach.

The premise of the *cost approach* is that a buyer would not pay more for a property than it would cost to purchase land and construct a comparable building. Consequently, under the cost approach, value is derived by adding the value of the land to the current replacement cost of a new building less adjustments for estimated depreciation and obsolescence. Because of the difficulty in measuring depreciation and obsolescence, the cost approach is most useful when the subject property is relatively new. The cost approach is often used for unusual properties or properties where comparable transactions are limited.

The premise of the *sales comparison approach* is that a buyer would pay no more for a property than others are paying for similar properties. With the sales comparison approach, the sale prices of similar (comparable) properties are adjusted for differences with the subject property. The sales comparison approach is most useful when there are a number of properties similar to the subject that have recently sold, as is usually the case with single-family homes.

The premise of the *income approach* is that value is based on the expected rate of return required by a buyer to invest in the subject property. With the income approach, value is equal to the present value of the subject's future cash flows. The income approach is most useful in commercial real estate transactions.

Highest and Best Use

The concept of highest and best use is important in determining value. The highest and best use of a vacant site is not necessarily the use that results in the highest total value once a project is completed. Rather, the highest and best use of a vacant site is the use that produces the highest implied land value. The implied land value is equal to the value of the property once construction is completed less the cost of constructing the improvements, including profit to the developer to handle construction and lease-out.

Example: Highest and best use

An investor is considering a site to build either an apartment building or a shopping center. Once construction is complete, the apartment building would have an estimated value of €50 million and the shopping center would have an estimated value of €40 million. Construction costs, including developer profit, are estimated at €45 million for the apartment building and €34 million for the shopping center. Calculate the highest and best use of the site.

Answer:

The shopping center is the highest and best use for the site because the €6 million implied land value of the shopping center is higher than the €5 million implied land value of the apartment building as follows:

	<i>Apartment Building</i>	<i>Shopping Center</i>
Value when completed	€50,000,000	€40,000,000
Less: Construction costs	<u>45,000,000</u>	<u>34,000,000</u>
Implied land value	€5,000,000	€6,000,000

Note that the highest and best use is not based on the highest value when the projects are completed but, rather, the highest implied land value.

LOS 43.f: Estimate and interpret the inputs (for example, net operating income, capitalization rate, and discount rate) to the direct capitalization and discounted cash flow valuation methods.

LOS 43.g: Calculate the value of a property using the direct capitalization and discounted cash flow valuation methods.

INCOME APPROACH

The income approach includes two different valuation methods: the direct capitalization method and the discounted cash flow method. With the *direct capitalization method*, value is based on capitalizing the first year NOI of the property using a capitalization rate. With the *discounted cash flow method*, value is based on the present value of the property's future cash flows using an appropriate discount rate.

Value is based on NOI under both methods. As shown in Figure 2, NOI is the amount of income remaining after subtracting vacancy and collection losses, and operating expenses (e.g., insurance, property taxes, utilities, maintenance, and repairs) from potential gross income. NOI is calculated before subtracting financing costs and income taxes.

Figure 2: Net Operating Income

Rental income if fully occupied
+ Other income
= Potential gross income
– Vacancy and collection loss
= Effective gross income
– Operating expense
= Net operating income

Example: Net operating income

Calculate net operating income (NOI) using the following information:

Property type	Office building
Property size	200,000 square feet
Gross rental income	€25 per square foot
Other income	€75,000
Vacancy and collection loss	5% of potential gross income
Property taxes and insurance	€350,000
Utilities and maintenance	€875,000
Interest expense	€400,000
Income tax rate	40%

Answer:

Gross rental income	€5,000,000 [200,000 SF × €25]
Other income	75,000
Potential gross income	€5,075,000
Vacancy and collection losses	(253,750)[5,075,000 × 5%]
Operating expenses	(1,225,000)[350,000 + 875,000]
Net operating income	€3,596,250

Note that interest expense and income taxes are not considered operating expenses.

The Capitalization Rate

The **capitalization rate**, or cap rate, and the discount rate are not the same rate although they are related. The discount rate is the required rate of return; that is, the risk-free rate plus a risk premium.

The cap rate is applied to first-year NOI, and the discount rate is applied to first-year and future NOI. So, if NOI and value is expected to grow at a constant rate, the cap rate is lower than the discount rate as follows:

$$\text{cap rate} = \text{discount rate} - \text{growth rate}$$

Using the previous formula, we can say the growth rate is implicitly included in the cap rate.

The cap rate can be defined as the current yield on the investment as follows:

$$\text{cap rate} = \frac{\text{NOI}_1}{\text{value}}$$

Since the cap rate is based on first-year NOI, it is sometimes called the *going-in cap rate*.

By rearranging the previous formula, we can now solve for value as follows:

$$\text{value} = V_0 = \frac{\text{NOI}_1}{\text{cap rate}}$$

If the cap rate is unknown, it can be derived from recent comparable transactions as follows:

$$\text{cap rate} = \frac{\text{NOI}_1}{\text{comparable sales price}}$$

It is important to observe several comparable transactions when deriving the cap rate. Implicit in the cap rate derived from comparable transactions are investors' expectations of income growth and risk. In this case, the cap rate is similar to the reciprocal of the price-earnings multiple for equity securities.

Example: Valuation using the direct capitalization method

Suppose that net operating income for an office building is expected to be \$175,000, and an appropriate cap rate is 8%. Estimate the market value of the property using the direct capitalization method.

Answer:

The estimated market value is:

$$V_0 = \frac{\text{NOI}_1}{\text{cap rate}} = \frac{\$175,000}{8\%} = \$2,187,500$$

When tenants are required to pay all expenses, the cap rate can be applied to rent instead of NOI. Dividing rent by comparable sales price gives us the *all risks yield* (ARY). In this case, the ARY is the cap rate and will differ from the discount rate if an investor expects growth in rents and value.

$$\text{value} = V_0 = \frac{\text{rent}_1}{\text{ARY}}$$

If rents are expected to increase at a constant rate each year, the internal rate of return (IRR) can be approximated by summing the cap rate and growth rate.

Stabilized NOI

Recall the cap rate is applied to first-year NOI. If NOI is not representative of the NOI of similar properties because of a temporary issue, the subject property's NOI should be stabilized. For example, suppose a property is temporarily experiencing high vacancy during a major renovation. In this case, the first-year NOI should be stabilized; NOI should be calculated as if the renovation is complete. Once the stabilized NOI is capitalized, the loss in value, as a result of the temporary decline in NOI, is subtracted in arriving at the value of the property.

Example: Valuation during renovation

On January 1 of this year, renovation began on a shopping center. This year, NOI is forecasted at €6 million. Absent renovations, NOI would have been €10 million. After this year, NOI is expected to increase 4% annually. Assuming all renovations are completed by the seller at their expense, estimate the value of the shopping center as of the beginning of this year assuming investors require a 12% rate of return.

Answer:

The value of the shopping center after renovation is:

$$\frac{\text{stabilized NOI}}{\text{cap rate}} = \frac{10,000,000}{(12\% - 4\%)} = €125,000,000$$

Using our financial calculator, the present value of the temporary decline in NOI during renovation is:

$$N = 1; I/Y = 12, \text{PMT} = 0; \text{FV} = 4,000,000; \text{CPT} \rightarrow \text{PV} = €3,571,429$$

(In the previous computation, we are assuming that all rent is received at the end of the year for simplicity).

The total value of the shopping center is:

Value after renovations	€125,000,000
Loss in value during renovations	(3,571,429)
Total value	€121,428,571

The gross income multiplier, another form of direct capitalization, is the ratio of the sales price to the property's expected gross income in the year after purchase. The gross income multiplier can be derived from comparable transactions just like we did earlier with cap rates.

$$\text{gross income multiplier} = \frac{\text{sales price}}{\text{gross income}}$$

Once we obtain the gross income multiplier, value is estimated as a multiple of a subject property's estimated gross income as follows:

$$\text{value} = \text{gross income} \times \text{gross income multiplier}$$

A shortfall of the gross income multiplier is that it ignores vacancy rates and operating expenses. Thus, if the subject property's vacancy rate and operating expenses are higher than those of the comparable transactions, an investor will pay more for the same rent.

Discounted Cash Flow Method

Recall from our earlier discussion, we determined the growth rate is implicitly included in the cap rate as follows:

$$\text{cap rate} = \text{discount rate} - \text{growth rate}$$

Rearranging the above formula we get:

$$\text{discount rate} = \text{cap rate} + \text{growth rate}$$

So, we can say the investor's rate of return includes the return on first-year NOI (measured by the cap rate) and the growth in income and value over time (measured by the growth rate).

$$\text{value} = V_0 = \frac{\text{NOI}_1}{(r - g)} = \frac{\text{NOI}_1}{\text{cap rate}}$$

where:

r = rate required by equity investors for similar properties

g = growth rate of NOI (assumed to be constant)

r - g = cap rate



Professor's Note: This equation should look very familiar to you because it's just a modified version of the constant growth dividend discount model, also known as the Gordon growth model, from the equity valuation portion of the curriculum.

If no growth is expected in NOI, then the cap rate and the discount rate are the same. In this case, value is calculated just like any perpetuity.

Terminal Cap Rate

Using the discounted cash flow (DCF) method, investors usually project NOI for a specific holding period and the property value at the end of the holding period rather than projecting NOI into infinity. Unfortunately, estimating the property value at the end of the holding period, known as the *terminal value* (also known as *reversion* or *resale*), is challenging. However, since the terminal value is just the present value of the NOI received by the next investor, we can use the direct capitalization method to estimate the value of the property when sold. In this case, we need to estimate the future NOI and a future cap rate, known as the *terminal* or *residual cap rate*.

The terminal cap rate is not necessarily the same as the going-in cap rate. The terminal cap rate could be higher if interest rates are expected to increase in the future or if the growth rate is projected to be lower because the property would then be older and might be less competitive. Also, uncertainty about future NOI may result in a higher terminal cap rate. The terminal cap rate could be lower if interest rates are expected to be lower or if rental income growth is projected to be higher. These relationships are easily mastered using the formula presented earlier (cap rate = discount rate - growth rate).

Since the terminal value occurs in the future, it must be discounted to present. Thus, the value of the property is equal to the present value of NOI over the holding period and the present value of the terminal value.

Example: Valuation with terminal value

Because of existing leases, the NOI of a warehouse is expected to be \$1 million per year over the next four years. Beginning in the fifth year, NOI is expected to increase to \$1.2 million and grow at 3% annually thereafter. Assuming investors require a 13% return, calculate the value of the property today assuming the warehouse is sold after four years.

Answer:

Using our financial calculator, the present value of the NOI over the holding period is:

$$N = 4; I/Y = 13, PMT = 1,000,000; FV = 0; CPT \rightarrow PV = \$2,974,471$$

The terminal value after four years is:

$$V_4 = \frac{NOI_5}{\text{cap rate}} = \frac{\$1,200,000}{(13\% - 3\%)} = \$12,000,000$$

The present value of the terminal value is:

$$N = 4; I/Y = 13, PMT = 0; FV = 12,000,000; CPT \rightarrow PV = \$7,359,825$$

The total value of the warehouse today is:

PV of forecast NOI	\$2,974,471
PV of terminal value	7,359,825
Total value	\$10,334,296

Note: We can combine the present value calculations as follows:

$$N = 4; I/Y = 13, PMT = 1,000,000; FV = 12,000,000; CPT \rightarrow PV = \$10,334,296$$

Valuation with Different Lease Structures

Lease structures can vary by country. For example, in the U.K., it is common for tenants to pay all expenses. In this case, the cap rate is known as the ARY as discussed earlier. Adjustments must be made when the contract rent (passing or term rent) and the current market rent (open market rent) differ. Once the lease expires, rent will likely be adjusted to the current market rent. In the U.K. the property is said to have *reversionary potential* when the contract rent expires.

One way of dealing with the problem is known as the *term and reversion approach* whereby the contract (term) rent and the reversion are appraised separately using different cap rates. The reversion cap rate is derived from comparable, fully let,

properties. Because the reversion occurs in the future, it must be discounted to present. The discount rate applied to the contract rent will likely be lower than the reversion rate because the contract rent is less risky (the existing tenants are not likely to default on a below-market lease).

Example: Term and Reversion Valuation Approach

A single-tenant office building was leased six years ago at £200,000 per year. The next rent review occurs in two years. The estimated rental value (ERV) in two years based on current market conditions is £300,000 per year. The all risks yield (cap rate) for comparable fully let properties is 7%. Because of lower risk, the appropriate rate to discount the term rent is 6%. Estimate the value of the office building.

Answer:

Using our financial calculator, the present value of the term rent is:

$$N = 2; I/Y = 6, PMT = 200,000; FV = 0; CPT \rightarrow PV = \text{£}366,679$$

The value of reversion to ERV is:

$$V_2 = \frac{ERV_3}{ERV \text{ cap rate}} = \frac{300,000}{7\%} = \text{£}4,285,714$$

The present value of the reversion to ERV is:

$$N = 2; I/Y = 7, PMT = 0; FV = 4,285,714; CPT \rightarrow PV = \text{£}3,743,309$$

The total value of the office building today is:

PV of term rent	£366,679
PV of reversion to ERV	£3,743,309
Total value	£4,109,988

Except for the differences in terminology and the use of different cap rates for the term rent and reversion to current market rents, the term and reversion approach is similar to the valuation example using a terminal value.

A variation of the term and reversion approach is the *layer method*. With the layer method, one source (layer) of income is the contract (term) rent that is assumed to continue in perpetuity. The second layer is the increase in rent that occurs when the lease expires and the rent is reviewed. A cap rate similar to the ARY is applied to the term rent because the term rent is less risky. A higher cap rate is applied to the incremental income that occurs as a result of the rent review.

Example: Layer method

Let's return to the example that we used to illustrate the term and reversion valuation approach. Suppose the contract (term) rent is discounted at 7%, and the incremental rent is discounted at 8%. Calculate the value of the office building today using the layer method.

Answer:

The value of term rent (bottom layer) into perpetuity is:

$$\frac{\text{term rent}}{\text{term rent cap rate}} = \frac{200,000}{7\%} = \text{£}2,857,143$$

The value of incremental rent into perpetuity (at time $t = 2$) is:

$$\frac{\text{ERV}}{\text{ERV cap rate}} = \frac{(300,000 - 200,000)}{8\%} = \text{£}1,250,000$$

Using our financial calculator, the present value of the incremental rent (top layer) into perpetuity is:

$$N = 2; I/Y = 8, \text{PMT} = 0; \text{FV} = 1,250,000; \text{CPT} \rightarrow \text{PV} = \text{£}1,071,674$$

The total value of the office building today is:

PV of term rent	£2,857,143
PV of incremental rent	<u>1,071,674</u>
Total value	£3,928,817

Using the term and reversion approach and the layer method, different cap rates were applied to the term rent and the current market rent after review. Alternatively, a single discount rate, known as the *equivalent yield*, could have been used. The equivalent yield is an average, although not a simple average, of the two separate cap rates.

Using the discounted cash flow method requires the following estimates and assumptions, especially for properties with many tenants and complicated lease structures:

- *Project income from existing leases.* It is necessary to track the start and end dates and the various components of each lease, such as base rent, index adjustments, and expense reimbursements from tenants.
- *Lease renewal assumptions.* May require estimating the probability of renewal.
- *Operating expense assumptions.* Operating expenses can be classified as fixed, variable, or a hybrid of the two. Variable expenses vary with occupancy, while fixed expenses do not. Fixed expenses can change because of inflation.
- *Capital expenditure assumptions.* Expenditures for capital improvements, such as roof replacement, renovation, and tenant finish-out, are lumpy; that is, they do not occur evenly over time. Consequently, some appraisers average the capital expenditures and deduct a portion each year instead of deducting the entire amount when paid.

- *Vacancy assumptions.* It is necessary to estimate how long before currently vacant space is leased.
- *Estimated resale price.* A holding period that extends beyond the existing leases should be chosen. This will make it easier to estimate the resale price because all leases will reflect current market rents.
- *Appropriate discount rate.* The discount rate is not directly observable, but some analysts use buyer surveys as a guide. The discount rate should be higher than the mortgage rate because of more risk and should reflect the riskiness of the investment relative to other alternatives.

Example: Allocation of operating expenses

Total operating expenses for a multi-tenant office building are 30% fixed and 70% variable. If the 100,000 square foot building was fully occupied, operating expenses would total \$6 per square foot. The building is currently 90% occupied. If the total operating expenses are allocated to the occupied space, calculate the operating expense per occupied square foot.

Answer:

If the building is fully occupied, total operating expenses would be \$600,000 (100,000 SF × \$6 per SF). Fixed and variable operating expenses would be:

Fixed	\$180,000 (600,000 × 30%)
Variable	<u>420,000</u> (600,000 × 70%)
Total	\$600,000

Thus, variable operating expenses are \$4.20 per square foot (\$420,000 / 100,000 SF) if the building is fully occupied. Since the building is 90% occupied, total operating expenses are:

Fixed	\$180,000
Variable	<u>378,000</u> (100,000 SF × 90% × \$4.20 per SF)
Total	\$558,000

So, operating expenses per occupied square foot are \$6.20 (558,000 total operating expenses / 90,000 occupied SF).

LOS 43.h: Compare the direct capitalization and discounted cash flow valuation methods.

Under the direct capitalization method, a cap rate or income multiplier is applied to first-year NOI. Implicit in the cap rate or multiplier are expected increases in growth.

Under the discounted cash flow (DCF) method, the future cash flows, including the capital expenditures and terminal value, are projected over the holding period and discounted to present at the discount rate. Future growth of NOI is explicit in the DCF method.

Because of the inputs required, the DCF method is more complex than the direct capitalization method, as it focuses on NOI over the entire holding period and not just NOI in the first year. DCF does not rely on comparable transactions as long as an appropriate discount rate is chosen. Choosing the appropriate discount rate and terminal cap rate are crucial as small differences in the rates can significantly affect value.

Following are some common errors made using the DCF method:

- The discount rate does not adequately capture risk.
- Income growth exceeds expense growth.
- The terminal cap rate and the going-in cap rate are not consistent.
- The terminal cap rate is applied to NOI that is atypical.
- The cyclical nature of real estate markets is ignored.

LOS 43.i: Calculate the value of a property using the cost and sales comparison approaches.

Cost Approach

The premise behind the cost approach is that a buyer is unlikely to pay more for a property than it would cost to purchase land and build a comparable building. The cost approach involves estimating the market value of the land, estimating the replacement cost of the building, and adjusting for depreciation and obsolescence. The cost approach is often used for unusual properties or properties where comparable transactions are limited.



Professor's Note: Depreciation for appraisal purposes is not the same as depreciation used for financial reporting or tax reporting purposes. Financial depreciation and tax depreciation involve the allocation of original cost over time. For appraisal purposes, depreciation represents an actual decline in value.

The steps involved in applying the cost approach are as follows:

- Step 1: Estimate the market value of the land.** The value of the land is estimated separately, often using the sales comparison approach.
- Step 2: Estimate the building's replacement cost.** Replacement cost is based on current construction costs and standards and should include any builder/developer's profit.



Professor's Note: Replacement cost refers to the cost of a building having the same utility but constructed with modern building materials. Reproduction cost refers to the cost of reproducing an exact replica of the building using the same building materials, architectural design, and quality of construction. Replacement cost is usually more relevant for appraisal purposes because reproduction cost may be uneconomical.

Step 3: **Deduct depreciation including physical deterioration, functional obsolescence, locational obsolescence, and economic obsolescence.** *Physical deterioration* is related to the building's age and occurs as a result of normal wear and tear over time. Physical deterioration can be curable or incurable. An item is curable if the benefit of fixing the problem is at least as much as the cost to cure. For example, replacing the roof will likely increase the value of the building by at least as much as the cost of the roof. The cost of fixing curable items is subtracted from replacement cost.

An item is incurable if the problem is not economically feasible to remedy. For example, the cost of fixing a structural problem might exceed the benefit of the repair. Since an incurable defect would not be fixed, depreciation can be estimated based on the **effective age** of the property relative to its total **economic life**. For example, the physical depreciation of a property with an effective age of 30 years and a 50-year total economic life is 60% (30 year effective age / 50 year economic life). To avoid double counting, the age/life ratio is multiplied by and deducted from replacement cost minus the cost of fixing curable items.



Professor's Note: The effective age and the actual age can differ as a result of above-normal or below-normal wear and tear. Incurable items increase the effective age of the property.

Functional obsolescence is the loss in value resulting from defects in design that impairs a building's utility. For example, a building might have a bad floor plan. As a result of functional obsolescence, NOI is usually lower than it otherwise would be because of lower rent or higher operating expenses. Functional obsolescence can be estimated by capitalizing the decline in NOI.

Locational obsolescence occurs when the location is no longer optimal. For example, five years after a luxury apartment complex is completed, a prison is built down the street making the location of the apartment complex less desirable. As a result, lower rental rates will decrease the value of the complex. Care must be taken in deducting the loss in value because part of the loss is likely already reflected in the market value of the land.

Economic obsolescence occurs when new construction is not feasible under current economic conditions. This can occur when rental rates are not sufficient to support the property. Consequently, the replacement cost of the subject property exceeds the value of a new building if it was developed.

Example: The cost approach

Heavenly Towers is a 200,000 square foot high-rise apartment building located in the downtown area.

The building has an effective age of 10 years, while its total economic life is estimated at 40 years. The building has a structural problem that is not feasible to repair. The building also needs a new roof at a cost of €1,000,000. The new roof will increase the value of the building by €1,300,000.

The bedrooms in each apartment are too small and the floor plans are awkward. As a result of the poor design, rents are €400,000 a year lower than competing properties.

When Heavenly Towers was originally built, it was located across the street from a park. Five years ago, the city converted the park to a sewage treatment plant. The negative impact on rents is estimated at €600,000 a year.

Due to recent construction of competing properties, vacancy rates have increased significantly resulting in an estimated loss in value of €1,200,000.

The cost to replace Heavenly Towers is estimated at €400 per square foot plus builder profit of €5,000,000. The market value of the land is estimated at €20,000,000. An appropriate cap rate is 8%. Using the cost approach, estimate the value of Heavenly Towers.

Answer:

Replacement cost including builder profit [(200,000 SF × €400 per SF) + 5,000,000]	85,000,000
Curable physical deterioration – new roof	<u>(1,000,000)</u>
Replacement cost after curable physical deterioration	€84,000,000
Incurable physical deterioration – structural problem [(10-year effective age / 40 year life) × 84,000,000]	(21,000,000)
Incurable functional obsolescence – poor design [400,000 lower rent / 8% cap rate]	(5,000,000)
Locational obsolescence – sewage plant [600,000 lower rent / 8% cap rate]	(7,500,000)
Economic obsolescence – competing properties	(1,200,000)
Market value of land	<u>20,000,000</u>
Estimated value using the cost approach	€69,300,000

Because of the difficulty in measuring depreciation and obsolescence, the cost approach is most useful when the subject property is relatively new.

The cost approach is sometimes considered the upper limit of value since an investor would never pay more than the cost to build a comparable building. However, investors must consider that construction is time consuming and there may not be enough demand for another building of the same type. That said, market values that exceed the implied value of the cost approach are questionable.

Sales Comparison Approach

The premise of the sales comparison approach is that a buyer would pay no more for a property than others are paying for similar properties in the current market. Ideally, the comparable properties would be identical to the subject but, of course, this is impossible since all properties are different. Consequently, the sales prices of similar (comparable) properties are adjusted for differences with the subject property. The differences may relate to size, age, location, property condition, and market conditions at the time of sale. The values of comparable transactions are adjusted upward (downward) for undesirable (desirable) differences with the subject property. We do this to value the comparable as if it was similar to the subject property.

Example: Sales comparison approach

An appraiser has been asked to estimate the value of a warehouse and has collected the following information:

<i>Unit of Comparison</i>	<i>Subject Property</i>	<i>Comparable Transactions</i>		
		<i>1</i>	<i>2</i>	<i>3</i>
Size, in square feet	30,000	40,000	20,000	35,000
Age, in years	5	9	4	5
Physical condition	Average	Good	Average	Poor
Location	Prime	Prime	Secondary	Prime
Sale date, months ago		6	18	12
Sales price		\$9,000,000	\$4,500,000	\$8,000,000

The appraiser's adjustments are based on the following:

- Each adjustment is based on the unadjusted sales price of the comparable.
- Properties depreciate at 2% per annum. Since comparable #1 is four years older than the subject, an upward adjustment of \$720,000 is made [$\$9,000,000 \times 2\% \times 4$ years].
- *Condition adjustment:* Good: +5%, average: none; poor: –5%. Because comparable #1 is in better condition than the subject, a downward adjustment of \$450,000 is made [$\$9,000,000 \times 5\%$]. Similarly, an upward adjustment is made for comparable #3 to the tune of \$400,000 [$\$8,000,000 \times 5\%$].
- *Location adjustment:* Prime – none, secondary – 10%. Because both comparable #1 and the subject are in a prime location, no adjustment is made.
- Over the past 24 months, sales prices have been appreciating 0.5% per month. Because comparable #1 was sold six months ago, an upward adjustment of \$270,000 is made [$\$9,000,000 \times 0.5\% \times 6$ months].

Answer:

Once the adjustments are made for all of the comparable transactions, the adjusted sales price per square foot of the comparable transactions are averaged and applied to the subject property as follows:

<i>Adjustments</i>	<i>Subject Property</i>	<i>Comparable Transactions</i>		
		<i>1</i>	<i>2</i>	<i>3</i>
Sales price		\$9,000,000	\$4,500,000	\$8,000,000
Age		+720,000	-90,000	-
Condition		-450,000	-	+400,000
Location		-	+450,000	-
Sale date		+270,000	+405,000	+480,000
Adjusted sales price		\$9,540,000	5,265,000	\$8,880,000
Size in square feet	30,000	40,000	20,000	35,000
Adjusted sales price per SF		\$238.50	\$263.25	\$253.71
Average sales price per SF	\$251.82			
Estimated value	\$7,554,600			

The sales comparison approach is most useful when there are a number of properties similar to the subject that have been recently sold, as is usually the case with single-family homes. When the market is weak, there tend to be fewer transactions. Even in an active market, there may be limited transactions of specialized property types, such as regional malls and hospitals. The sales comparison approach assumes purchasers are acting rationally; the prices paid are representative of the current market. However, there are times when purchasers become overly exuberant and market bubbles occur.

RECONCILIATION OF VALUE

Because of different assumptions and availability of data, the three valuation approaches are likely to yield different value estimates. An important part of the appraisal process involves determining the final estimate of value by reconciling the differences in the three approaches.

An appraiser may provide more, or less, weight to an approach because of the property type or market conditions. For example, an appraiser might apply a higher weight to the value obtained with the sales comparison approach when the market is active with plenty of comparable properties. Alternatively, if the subject property is old and estimating depreciation is difficult, an appraiser might apply a lower weight to the cost method.

LOS 43.j: Describe due diligence in private equity real estate investment.

Real estate investors, both debt and equity, usually perform *due diligence* to confirm the facts and conditions that might affect the value of the transaction. Due diligence may include the following:

- Lease review and rental history.
- Confirm the operating expenses by examining bills.
- Review cash flow statements.
- Obtain an environmental report to identify the possibility of contamination.
- Perform a physical/engineering inspection to identify structural issues and check the condition of the building systems.
- Inspect the title and other legal documents for deficiencies.
- Have the property surveyed to confirm the boundaries and identify easements.
- Verify compliance with zoning laws, building codes, and environmental regulations.
- Verify payment of taxes, insurance, special assessments, and other expenditures.

Due diligence can be costly, but it lowers the risk of unexpected legal and physical problems.

LOS 43.k: Discuss private equity real estate investment indices, including their construction and potential biases.

A number of real estate indices are used to track the performance of real estate including appraisal-based indices and transaction-based indices. Investors should be aware of how the indices are constructed as well as their limitations.

Appraisal-Based Indices

Because real estate transactions covering a specific property occur infrequently, indices have been developed based on appraised values. Appraisal-based indices combine valuations of individual properties that can be used to measure market movements. A popular index in the United States is the NCREIF Property Index (NPI). Members of NCREIF, mainly investment managers and pension fund sponsors, submit appraisal data quarterly, and NCREIF calculates the return as follows:

$$\text{return} = \frac{\text{NOI} - \text{capital expenditures} + (\text{end market value} - \text{beg market value})}{\text{beginning market value}}$$

The index is then value-weighted based on the returns of the separate properties. The return is known as a holding-period return and is equivalent to a single-period IRR.

Earlier, we found that the cap rate is equal to NOI divided by the beginning market value of the property. This is the current yield or income return of the property and is one component of the index equation. The remaining components of the equation

produce the capital return. To have a positive capital return, the market value must increase by more than the capital expenditures.

The index allows investors to compare performance with other asset classes, and the quarterly returns can be used to measure risk (standard deviation). The index can also be used by investors to benchmark returns.

Appraisal-based indices tend to lag actual transactions because actual transactions occur before appraisals are performed. Thus, a change in price may not be reflected in appraised values until the next quarter or longer if a property is not appraised every quarter. Also, appraisal lag tends to smooth the index; that is, reduce its volatility, much like a moving average reduces volatility. Finally, appraisal lag results in lower correlation with other asset classes. Appraisal lag can be adjusted by unsmoothing the index or by using a transaction-based index.

Transaction-Based Indices

Transaction-based indices can be constructed using a repeat-sales index and a hedonic index.

A *repeat-sales index* relies on repeat sales of the same property. A change in market conditions can be measured once a property is sold twice. Accordingly, a regression is developed to allocate the change in value to each quarter.

A *hedonic index* requires only one sale. A regression is developed to control for differences in property characteristics such as size, age, location, and so forth.

LOS 43.m: Calculate and interpret financial ratios used to analyze and evaluate private real estate investments.

Lenders often use the **debt service coverage ratio (DSCR)** and the **loan-to-value (LTV)** ratio to determine the maximum loan amount on a specific property. The maximum loan amount is based on the measure that results in the lowest debt.

The DSCR is calculated as follows:

$$\text{DSCR} = \frac{\text{first-year NOI}}{\text{debt service}}$$

Debt service (loan payment) includes interest and principal, if required. Principal payments reduce the outstanding balance of the loan. An interest-only loan does not reduce the outstanding balance. The LTV ratio is calculated as follows:

$$\text{LTV} = \frac{\text{loan amount}}{\text{appraisal value}}$$

Example: Maximum loan amount

A real estate lender agreed to make a 10% interest-only loan on a property that was recently appraised at €1,200,000 as long as the debt service coverage ratio is at least 1.5 and the loan-to-value ratio does not exceed 80%. Calculate the maximum loan amount assuming the property's NOI is €135,000.

Answer:

Using the LTV ratio, the property will support a loan amount of €960,000 [1,200,000 value × 80% LTV ratio].

Using the DSCR, the property will support a debt service payment of €90,000 [135,000 NOI / 1.5]. The corresponding loan amount would be €900,000 [90,000 payment / 10% interest rate].

In this case, the maximum loan amount is the €900,000, which is the lower of the two amounts.

At €900,000, the LTV is 75% [900,000 loan amount / 1,200,000 value] and the DSCR is 1.5 [135,000 NOI / 90,000 payment].

When debt is used to finance real estate, equity investors often calculate the **equity dividend rate**, also known as the cash-on-cash return, which measures the cash return on the amount of cash invested.

$$\text{equity dividend rate} = \frac{\text{first year cash flow}}{\text{equity}}$$

The equity dividend rate only covers one period. It is not the same as the IRR that measures the return over the entire holding period.

Example: Equity dividend maximum loan amount

Returning to the previous example, calculate the equity dividend rate (cash-on-cash return) assuming the property is purchased for the appraised value.

Answer:

The €1,200,000 property was financed with €900,000 debt and €300,000 equity. First-year cash flow is €45,000 (135,000 NOI – 90,000 debt service payment). Thus, the equity dividend rate is 15% (45,000 first year cash flow / 300,000 equity).

In order to calculate the IRR with leverage, we need to consider the cash flows over the entire holding period including the change in value of the original investment. Since the property was financed with debt, the cash flows that are received at the end of the holding period (i.e., net sales proceeds) are reduced by the outstanding mortgage balance.

Example: Leveraged IRR

Returning to the last example, calculate the IRR if the property is sold at the end of six years for €1,500,000. Assume that NOI growth is zero.

Answer:

Over the holding period, annual cash flows of €45,000 are received and, at the end of six years, the sale proceeds of €1,500,000 are reduced by the outstanding mortgage balance of €900,000. Recall that the loan was interest only and, hence, the entire original mortgage amount of €900,000 was outstanding at the end of the holding period. Using our financial calculator, the leveraged IRR is 24.1% as follows:

$$N = 6; PV = (300,000), PMT = 45,000; FV = 600,000; CPT \rightarrow I/Y = 24.1\%$$

We can see the effects of leverage by calculating an unleveraged IRR. In this case, the initial cash outflow is higher because no debt is incurred. The annual cash flows are higher because there is no debt service, and the terminal cash flow is higher because no mortgage balance is repaid at the end of the holding period.

Returning to the last example, the unleveraged IRR is 14.2% as follows:

$$N = 6; PV = (1,200,000), PMT = 135,000; FV = 1,500,000; CPT \rightarrow I/Y = 14.2\%$$

Notice the leveraged IRR of 24.1% is higher than the unleveraged IRR of 14.2%. As a result, the equity investor benefits by financing the property with debt because of positive leverage. Remember, however, that leverage will also magnify negative returns.

KEY CONCEPTS

LOS 43.a

There are four basic forms of real estate investment; private equity (direct ownership), publicly traded equity (indirect ownership), private debt (direct mortgage lending), and publicly traded debt (mortgage-backed securities).

LOS 43.b

Real estate investments are heterogeneous, have high unit values, have high transaction costs, depreciate over time, are influenced by the cost and availability of debt capital, are illiquid, and are difficult to value.

Real estate is commonly classified as residential and non-residential. Income-producing properties (including income-producing residential properties) are considered commercial real estate.

LOS 43.c

Reasons to invest in real estate include current income, capital appreciation, inflation hedge, diversification, and tax benefits.

Risks include changing business conditions, long lead times to develop property, cost and availability of capital, unexpected inflation, demographic factors, illiquidity, environmental issues, property management expertise, and the effects of leverage.

Real estate is less than perfectly correlated with the returns of stocks and bonds; thus, adding real estate to a portfolio can reduce risk relative to the expected return.

LOS 43.d

Commercial property types, and the demand for each is driven by:

- Office—Job growth
- Industrial—The overall economy
- Retail—Consumer spending
- Multi-family—Population growth

LOS 43.e

Cost approach. Value is derived by adding the value of the land to the replacement cost of a new building less adjustments for estimated depreciation and obsolescence.

Sales comparison approach. The sale prices of similar (comparable) properties are adjusted for differences with the subject property.

Income approach. Value is equal to the present value of the subject's future cash flows over the holding period.

LOS 43.f

NOI is equal to potential gross income (rental income fully leased plus other income) less vacancy and collection losses and operating expenses.

The cap rate, discount rate, and growth rate are linked.

$$\text{cap rate} = \text{discount rate (r)} - \text{growth rate (g)}$$

If the cap rate is unknown, it can be derived from recent comparable transactions as follows:

$$\text{cap rate} = \frac{\text{NOI}_1}{\text{comparable sales price}}$$

The discount rate is the required rate of return of the investor.

$$\text{discount rate} = \text{cap rate} + \text{growth rate}$$

LOS 43.g

Direct capitalization method:

$$\text{value} = V_0 = \frac{\text{NOI}_1}{\text{cap rate}}$$

Discounted cash flow method:

Step 1: Forecast the terminal value at the end of the holding period (use direct capitalization method if NOI growth is constant).

Step 2: Discount the NOI over the holding period and the terminal value to present.

LOS 43.h

Under the direct capitalization method, a cap rate is applied to first-year NOI. Implicit in the cap rate is an expected increase in growth.

Under the DCF method, the future cash flows, including the capital expenditures and terminal value, are projected over the holding period and discounted to present at the discount rate. Future growth of NOI is explicit to the DCF method. Choosing the appropriate discount rate and terminal cap rate are crucial as small differences in the rates can significantly affect value.

LOS 43.i

Steps involved with applying the cost approach.

Step 1: Estimate the market value of the land.

Step 2: Estimate the building's replacement cost.

Step 3: Deduct physical deterioration (estimate incurable using effective age/economic life ratio), functional obsolescence, locational obsolescence, and economic obsolescence.

With the sales comparison approach, the sales prices of similar (comparable) properties are adjusted for differences with the subject property. The differences may relate to size, age, location, property condition, and market conditions at the time of sale. Once the adjustments are made, the adjusted sales price per square foot of the comparable transactions are averaged and applied to the subject property.

LOS 43.j

Investors perform due diligence to confirm the facts and conditions that might affect the value of the transaction. Due diligence can be costly, but it lowers risk of unexpected legal and physical problems. Due diligence involves reviewing leases, confirming expenses, performing inspections, surveying the property, examining legal documents, and verifying compliance.

LOS 43.k

Appraisal-based indices tend to lag transaction-based indices and appear to have lower volatility and lower correlation with other asset classes.

LOS 43.l

Investors use debt financing (leverage) to increase returns. As long as the investment return is greater than the interest paid to lenders, there is positive leverage and returns are magnified. Leverage results in higher risk.

LOS 43.m

Lenders often use the debt service coverage ratio and the loan-to-value ratio to determine the maximum loan amount on a specific property. Investors use ratios such as the equity dividend rate (cash-on-cash return), leveraged IRR, and unleveraged IRR to evaluate performance.

CONCEPT CHECKERS

1. Which form of investment is *most appropriate* for a first-time real estate investor that is concerned about liquidity and diversification?
 - A. Direct ownership of a suburban office building.
 - B. Shares of a real estate investment trust.
 - C. An undivided participation interest in a commercial mortgage.

2. Which of the following real estate properties is *most likely* classified as commercial real estate?
 - A. A residential apartment building.
 - B. Timberland and farmland.
 - C. An owner-occupied, single-family home.

3. A real estate investor is concerned about rising interest rates and decides to pay cash for a property instead of financing the transaction with debt. What is the *most likely* effect of this strategy?
 - A. Inflation risk is eliminated.
 - B. Risk of changing interest rates is eliminated.
 - C. Risk is reduced because of lower leverage.

4. Which of the following *best describes* the primary economic driver of demand for multi-family real estate?
 - A. Growth in savings rates.
 - B. Job growth, especially in the finance and insurance industries.
 - C. Population growth.

5. Which real estate valuation method is likely the *most appropriate* for a 40-year-old, owner-occupied single-family residence?
 - A. Cost approach.
 - B. Sales comparison approach.
 - C. Income approach.

6. The Royal Oaks office building has annual net operating income of \$130,000. A similar office building with net operating income of \$200,000 recently sold for \$2,500,000. Using the direct capitalization method, the market value of Royal Oaks is *closest* to:
 - A. \$1,200,000.
 - B. \$1,625,000.
 - C. \$2,500,000.

7. Using the discounted cash flow method, estimate the property value of a building with the following information:

NOI for next five years	\$600,000
NOI in Year 6	\$700,000
Holding period	5 years
Discount rate	10%
Terminal growth rate	2%

 - A. \$7,707,534.
 - B. \$8,350,729.
 - C. \$9,024,472.

8. Which of the following *most accurately* describes the relationship between a discount rate and a capitalization rate?
- A. The capitalization rate is the appropriate discount rate less NOI growth.
 - B. The appropriate discount rate is the capitalization rate less NOI growth.
 - C. The capitalization rate is the present value of the appropriate discount rate.
9. You are provided the following data for a property:
- | | |
|-----------------------|---------------------|
| Building size | 50,000 square feet |
| Replacement cost | €75 per square foot |
| Actual age | 10 years |
| Effective age | 12 years |
| Total economic life | 20 years |
| Economic obsolescence | €400,000 |
| Land market value | €900,000 |

Using the cost approach, the estimated property value of the building is *closest* to:

- A. €1,100,000.
 - B. €2,000,000.
 - C. €2,375,000.
10. You just entered into a contract to purchase a recently renovated apartment building, and you are concerned that some of the contractors have not been paid. In performing your due diligence, which of the following procedures should be performed to alleviate your concern?
- A. Have the property surveyed.
 - B. Have an environmental study performed.
 - C. Search the public records for outstanding liens.
11. Which of the following statements about real estate indices is *most accurate*?
- A. Transaction-based indices tend to lag appraisal-based indices.
 - B. Appraisal-based indices tend to lag transaction-based indices.
 - C. Transaction-based indices appear to have lower correlation with other asset classes as compared to appraisal-based indices.
12. Which of the following statements about financial leverage is *most accurate*?
- A. Debt financing increases the appraised value of a property because interest expense is tax deductible.
 - B. Increasing financial leverage reduces risk to the equity owner.
 - C. For a property financed with debt, a change in NOI will result in a more than proportionate change in cash flow.
13. A lender will make a 10%, interest-only loan on a property as long as the debt service coverage ratio is at least 1.6 and the loan-to-value ratio does not exceed 80%. The maximum loan amount, assuming the property just appraised for \$1,500,000 and NOI is \$200,000, is *closest* to:
- A. \$1,050,000.
 - B. \$1,200,000.
 - C. \$1,500,000.

ANSWERS – CONCEPT CHECKERS

1. **B** Of the three investment choices, REITs are the most liquid because the shares are actively traded. Also, REITs provide quick and easy diversification across many properties. Neither the direct investment nor the mortgage participation is liquid, and significant capital would be required to diversify the investments.
2. **A** Residential real estate (i.e., an apartment building) purchased with the intent to produce income is usually considered commercial real estate property. Timberland and farmland are unique categories of real estate.
3. **C** An all-cash transaction eliminates financial leverage and lowers risk. Inflation risk is typically lower with a real estate investment, but the risk is not totally eliminated. If interest rates rise, non-leveraged property values are still impacted. Investors require higher returns when rates rise. Resale prices also depend on the cost and availability of debt capital.
4. **C** Demand for multi-family properties depends on population growth, especially in the age demographic that typically rents apartments.
5. **B** The sales comparison approach is likely the best valuation approach because of the number of comparable transactions. The cost approach is not as appropriate because of the difficulty in estimating depreciation and obsolescence of an older property. The income approach is not appropriate because an owner-occupied property does not generate income.
6. **B** The cap rate of the comparable transaction is 8% (200,000 NOI / 2,500,000 sales price). The value of Royal Oaks is \$1,625,000 (130,000 NOI / 8% cap rate).
7. **A** The terminal value at the end of five years is \$8,750,000 [700,000 year 6 payment / (10% discount rate – 2% growth rate)]. The terminal value is discounted to present and added to the present value of the NOI during the holding period. You can combine both steps using the following keystrokes:

$$N = 5; I/Y = 10; PMT = 600,000; FV = 8,750,000; CPT \rightarrow PV = \$7,707,534$$
8. **A** The capitalization rate is the discount rate (required rate of return on equity, r) less the constant growth rate in net operating income, g (i.e., cap rate = $r - g$).
9. **B**

Replacement cost	€3,750,000 [50,000 SF × €75 per SF]
Physical deterioration	(2,250,000)[3,750,000 × (12 eff age / 20 life)]
Economic obsolescence	(400,000)
Land value	<u>900,000</u>
Total value	€2,000,000
10. **C** The public records should be searched for outstanding liens filed by contractors involved in the renovation. An existing lien can result in legal problems for the purchaser and the lender. A survey will not identify outstanding liens. A survey confirms the property boundaries and identifies any easements.
11. **B** Appraisal-based indices tend to lag transaction-based indices because actual transactions occur before appraisals are performed (appraisals are based on transaction data). Appraisal-based indices, not transaction-based indices, appear to have lower correlations with other asset classes.

12. **C** Financial leverage magnifies the effect of changing NOI on cash flow because the interest expense owed to lenders is a fixed cost. The use of debt financing does not affect the value of property. Leverage increases (not decreases) risk.
13. **B** Using the DSCR, the property will support a debt service payment of \$125,000 ($200,000 \text{ NOI} / 1.6$); thus, the loan amount would be \$1,250,000 ($\$125,000 \text{ payment} / 10\% \text{ interest rate}$). However, using the LTV ratio, the property will only support a loan amount of \$1,200,000 ($1,500,000 \text{ value} \times 80\% \text{ LTV}$). Thus, the maximum loan amount is \$1,200,000, which is the lower of the two amounts.

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PUBLICLY TRADED REAL ESTATE SECURITIES

Study Session 15

EXAM FOCUS

For the exam, be able to describe the different types of publicly traded real estate securities, and understand the advantages and disadvantages of investing in real estate through publicly traded securities. Be able to explain the types of REITs, as well as their economic value determinants, investment characteristics, principal risks, and due diligence considerations. Understand the various approaches to REIT valuation, and be able to calculate the value of a REIT share.

LOS 44.a: Describe types of publicly traded real estate securities.

Publicly traded real estate securities can take several forms: real estate investment trusts (REITs), real estate operating companies (REOCs), and residential or commercial mortgage-backed securities (MBS).

We can categorize publicly traded real estate securities into two broad groups, debt and equity.

EQUITY

Publicly traded real estate equity securities represent ownership stakes in properties. Equity REITs and REOCs fall into this category.

Equity REITs (Real estate investment trusts): REITs are tax-advantaged companies (trusts) that are for the most part exempt from corporate income tax. Equity REITs are actively managed, own income-producing real estate, and seek to profit by growing cash flows, improving existing properties, and purchasing additional properties. REITs often specialize in a particular kind of property, while still diversifying holdings by geography and other factors.

REOCs (Real estate operating companies): REOCs are not tax-advantaged; rather, they are ordinary (i.e., taxable) corporations that own real estate. A business will form as a REOC if it is ineligible to organize as REIT. For example, the firm may intend to develop and sell real estate rather than generating cash from rental payments, or the firm may be based in a country that does not allow tax-advantaged REITs.

DEBT

MBS (mortgage-backed securities) and mortgage REITs fall into this category.

Residential or commercial mortgage-backed securities (MBS): Residential or commercial mortgage-backed securities are publicly traded asset-backed securitized debt obligations that receive cash flows from an underlying pool of mortgage loans. These loans may be for commercial properties (in the case of CMBS) or on residential properties (in the case of RMBS). Real estate debt securities represent a far larger aggregate market value than do publicly traded real estate equity securities.

Mortgage REITs: Mortgage REITs invest primarily in mortgages, mortgage securities, or loans that are secured by real estate.

LOS 44.b: Explain advantages and disadvantages of investing in real estate through publicly traded securities.

ADVANTAGES

Investments in REITs and REOCs offer a number of advantages compared to direct investments in physical real estate:

- **Superior liquidity.** Investors in publicly traded real estate securities enjoy far greater liquidity than do investors in physical real estate, because REIT and REOC shares trade daily on a stock exchange. The low liquidity of a direct real estate investment stems from the relatively high value of an individual real estate property and the unique nature of each property.
- **Lower minimum investment.** While a direct investment in a real estate property may require a multi-million dollar commitment, REIT or REOC shares trade for much smaller dollar amounts.
- **Limited liability.** The financial liability of a REIT investor is limited to the amount invested. Other types of investment in real estate, such as a general partnership interest, have potential liabilities greater than the investor's initial investment.
- **Access to premium properties.** Some prestigious properties, such as high-profile shopping malls or other prominent or landmark buildings, are difficult to invest in directly. Shares in REITs that have invested in these properties represent one way to take an ownership stake in these assets.
- **Active professional management.** While a direct investment in properties requires a degree of real estate investment expertise and property management skill, REIT and REOC investments do not. REITs and REOCs employ professional management to control expenses, maximize rents and occupancy rates, and sometimes to acquire additional properties.
- **Protections accorded to publicly traded securities.** REITs and REOCs must meet the same requirements applicable to other publicly traded companies, including rules related to financial reporting, disclosure, and governance. Investors benefit from these securities regulations and from having a board overseeing the management on behalf of investors. Additionally, having public investors monitor the actions of management and the board of directors leads to financial and operating efficiency.

- **Greater potential for diversification.** Because of the high cost of a single property, it is difficult to achieve adequate diversification through direct investments in real estate. Through REITs, however, an investor can diversify across property type and geographical location.

REIT-Specific Advantages

The following advantages apply to REITs, but not to REOCs:

- **Exemption from taxation.** As long as certain requirements are met, REITs enjoy favorable taxation, because a major part of REIT distributions are treated as a return of capital and are thus not taxable.
- **Predictable earnings.** The earnings of REITs tend to be relatively consistent over time, because REITs' rental income is fixed by contracts, unlike the income of companies in other industries.
- **High yield.** To maintain their tax-advantaged status, REITs are obligated to pay out most of their taxable income as dividends. Because of this high income payout ratio, the yields of REITs are higher than the yields on most other publicly traded equities.

DISADVANTAGES

Disadvantages of investing in real estate through publicly traded securities may include:

- **Taxes versus direct ownership.** Depending on local laws, investors that make direct investments in properties may be able to deduct losses on real estate from taxable income or replace one property for a similar property ("like-kind exchange" in the U.S.) without taxation on the gains. For investors in REITs or REOCs, these specific tax benefits are not available.
- **Lack of control.** REIT investors have comparatively little input into investment decisions compared to investors that make direct investments in real estate.
- **Costs of a publicly traded corporate structure.** There are clear benefits from maintaining a publicly traded REIT structure. However, there are also related costs, which may not be worthwhile for smaller REITs.
- **Price is determined by the stock market.** While the appraisal-based value of a REIT may be relatively stable, the market-determined price of a REIT share is likely to be much more volatile. While this relationship suggests a direct real estate investment is less risky, in reality much of this effect results from the underestimation of volatility that is associated with appraised values; appraisals tend to be infrequent and backward-looking, while the stock market is continuous and reflects forward-looking values.
- **Structural conflicts of interest.** When a REIT is structured as an UPREIT or a DOWNREIT there is the potential for conflict of interest. When the opportunity arises to sell properties or take on additional borrowing, a particular action may have different tax implications for REIT shareholders and for the general partners, which may tempt the general partners to act in their own interest, rather than in the interest of all stakeholders.



Professor's Note: An UPREIT is an "umbrella partnership" REIT structure, where the REIT is the general partner and holds a controlling interest in a partnership that owns and operates the properties. UPREITs are the most common REIT structure in the United States. In a DOWNREIT, the REIT has an ownership interest in more than one partnership and can own properties both at the partnership level and at the REIT level.

The following disadvantage applies to REITs, but not to REOCs:

- **Limited potential for income growth.** REITs' high rates of income payout limit REITs' ability to generate future growth through reinvestment. This limits future income growth and may dampen the share price of REITs.
- **Forced equity issuance.** In order to maintain financial leverage, REITs frequently participate in bond markets to refinance maturing debt. When credit is difficult to obtain (e.g., during the 2008 credit crisis), a REIT may be forced to issue equity at a disadvantageous price.
- **Lack of flexibility.** The rules that qualify REITs for favorable taxation also have a downside: REITs are prevented from making certain kinds of investments and from retaining most of their income. These limits may prevent REITs from being as profitable as they might otherwise be. REOCs, on the other hand, do not need to meet these requirements, and thus are free to retain income and devote those funds to property development when the REOC managers see attractive opportunities. REOCs are also not restricted in their use of leverage.

LOS 44.c: Explain economic value determinants, investment characteristics, principal risks, and due diligence considerations for real estate investment trust (REIT) shares.

ECONOMIC VALUE DETERMINANTS OF REITs

National GDP growth is the largest driver of economic value for all REIT types. Overall growth in the economy means more jobs, more need for office space, more disposable income, more growth in shopping centers, more demand for hotel rooms from business and leisure travellers, and so on.

In addition to national GDP growth, there are four major economic factors that impact REITs, as shown in Figure 1.

Figure 1: Rank of Most Important Factors Affecting Economic Value for REIT Property Types

REIT Type	<i>Relative Importance of Factors Affecting REIT Economic Value</i>			
	<i>Population Growth</i>	<i>Job Creation</i>	<i>New Space Supply vs. Demand</i>	<i>Retail Sales Growth</i>
Shopping/Retail	3	2	3	1
Office	3	1	2	4
Residential	1	1	3	4
Healthcare	1	3	2	4
Industrial	2	4	3	1
Hotel	3	1	2	4
Storage	1	2	3	4

Note: 1 = most important, 4 = least important

Adapted from: Exhibit 6, Level II 2016 Volume 5, Alternative Asset Valuation and Fixed Income. John Wiley & Sons (P&T), pp. 94–95.

INVESTMENT CHARACTERISTICS OF REITs

- **Exemption from corporate-level income taxes:** As mentioned earlier, the defining characteristic of REITs is that they are exempt from corporate taxation. However, in order to gain this status, REITs are required to distribute almost all of the REITs' otherwise-taxable income, and a sufficient portion of assets and income must relate to rental income-producing real estate.
- **High dividend yield:** To maintain their tax-exempt status, REITs' dividend yields are generally higher than yields on bonds or other equities.
- **Low income volatility:** REITs' revenue streams tend to be relatively stable. This characteristic is due to REITs' dependence on interest and rent as income sources.
- **Secondary equity offerings:** Since REITs distribute most earnings, they are likely to finance additional real estate acquisitions by selling additional shares. For this reason, REITs issue equity more frequently than do non-real estate companies.

PRINCIPAL RISKS OF REITs

The most risky REITs are those that invest in property sectors where significant mismatches between supply and demand are likely (particularly health care, hotel, and office REITs), as well as those sectors where the occupancy rates are most likely to fluctuate within a short period of time (especially hotels). Other items to consider in assessing the riskiness of a REIT relate to the properties' financing, the leases that are in place, and the properties' locations and quality.

DUE DILIGENCE CONSIDERATIONS OF REITs

- **Remaining lease terms:** An analyst should evaluate the length of remaining lease terms in conjunction with the overall state of the economy—short remaining lease terms provide an opportunity to raise rents in an expansionary economy, while long remaining lease terms are advantageous in a declining economy or softening rental market. Initial lease terms vary with the type of property—industrial and office buildings and shopping centers generally have long lease terms, while hotels and multi-family residential real estate have short lease terms.

- **Inflation protection:** The level of contractual hedging against rising general price levels should be evaluated—some amount of inflation protection will be enjoyed if leases have rent increases scheduled throughout the term of the lease or if rents are indexed to the rate of inflation.
- **In-place rents versus market rents:** An analyst should compare the rents that a REIT's tenants are currently paying (in-place rents) with current rents in the market. If in-place rents are high, the potential exists for cash flows to fall going forward.
- **Costs to re-lease space:** When a lease expires, expenses typically incurred include lost rent, any new lease incentives offered, the costs of tenant-demanded improvements, and broker commissions.
- **Tenant concentration in the portfolio:** Risk increases with tenant concentration; a REIT analyst should pay special attention to any tenants that make up a high percentage of space rented or rent paid.
- **Tenants' financial health:** Since the possibility of a major tenant's business failing poses a significant risk to a REIT, it is important to evaluate the financial position of the REIT's largest renters.
- **New competition:** An analyst should evaluate the amount of new space that is planned or under construction. New competition could impact the profitability of existing REIT properties.
- **Balance sheet analysis:** Due diligence should include an in-depth analysis of the REIT's balance sheet, with special focus on the amount of leverage, the cost of debt, and the debt's maturity.
- **Quality of management:** Senior management's performance record, qualifications, and tenure with the REIT should be considered.

LOS 44.d: Describe types of REITs.

SUBTYPES OF EQUITY REITs

The following paragraphs provide more details on several subtypes of equity REITs.

1. **Retail or Shopping Center REITs.** REITs in this category invest in shopping centers of various sizes and sometimes in individual buildings in prime shopping neighborhoods. Regional shopping malls are large enclosed centers where anchor tenants have very long fixed-rate leases, while smaller tenants often pay a "percentage lease," which consists of a fixed rental price (the "minimum lease"), plus a percentage of sales over a certain level. Community shopping centers, such as "big-box centers," consist of stores that surround parking lots. These stores commonly pay pre-determined rents that increase on a schedule. Lease rates and sales per square foot are important factors for analysts to consider when examining a shopping center REIT.

2. **Office REITs.** Office REITs own office properties that typically lease space to multiple business tenants. Leases are long (generally 5 to 25 years) and rents increase over time. In addition to rent, tenants pay a share of property taxes, operating expenses, and other common costs proportional to the size of their unit (i.e., they are net leases). Because of the length of time that it takes to build this type of property, there is often a supply-demand mismatch, resulting in variations in occupancy rates and rents over the economic cycle. In analyzing office REITs, analysts must consider properties' location, convenience and access to transportation, and the quality of the space including the condition of the building.
3. **Residential (Multi-Family) REITs.** This category of REITs invests in rental apartments. Demand for rental apartments tends to be stable; however, lease periods are short (usually one year), so rental income fluctuates over time as competing properties are constructed. Variables that will affect rental income include the overall strength of the local economy and any move-in inducements offered. Factors to consider when analysing a residential REIT include local demographic trends, availability of alternatives (i.e., home ownership), any rent controls imposed by the local government, and factors related to the portfolio properties themselves, such as the age of the properties and how appealing they are to renters in the local market compared to other competing properties. Additionally, because rents are typically based on a gross lease, the impact of rising costs must be considered (under a gross lease, operating costs are paid by the landlord). Examples include rising fuel or energy costs, taxes, and maintenance costs.
4. **Health Care REITs.** Health care REITs invest in hospitals, nursing homes, retirement homes, rehab centers, and medical office buildings. REITs in many countries are barred from operating this kind of business themselves. In order to participate in this property sector while maintaining their tax-free status, REITs rent properties to health care providers. Leases in this sector are usually net leases. Health care REITs are relatively unaffected by the overall economy. However, other factors are important, such as government funding of health care, demographic shifts, new construction versus demand, increases in the cost of insurance, and the potential for lawsuits by residents.
5. **Industrial REITs.** Industrial REITs own properties used in activities such as manufacturing, warehousing, and distribution. The value of industrial properties is relatively stable and less cyclical compared to the value of other types of properties, due to long leases (5 to 25 years) which smoothes rental income. In analysing industrial REITs, an analyst needs to closely examine the local market for industrial properties; new properties coming on to the market and the demand for such space by tenants will affect the value of existing properties. Location and availability of transportation links (airports, roads, and ports) are also important considerations for industrial REITs.

6. **Hotel REITs.** A hotel REIT (like a health care REIT) usually leases properties to management companies, so the REIT receives only passive rental income. Hotels are exposed to revenue volatility driven by changes in business and leisure travel, and the sector's cyclical nature is intensified by a lack of long-term leases. In analysing hotel REITs, analysts compare a number of statistics against industry averages (operating profit margins, occupancy rates, and average room rates). One key metric that is closely followed is RevPAR, the revenue per available room, which is calculated by multiplying the average occupancy rate by the average room rate. Other closely-watched variables are the level of margins, forward bookings, and food and beverage sales. Expenses related to maintaining the properties are also closely monitored. Because of the time lag associated with bringing new hotel properties on-line (up to three years), the cyclical nature of demand needs to be considered. Because of the uncertainty in income, the use of high amounts of leverage in financing hotel properties is risky.
7. **Storage REITs.** Properties owned by storage REITs rent self-storage lockers (also known as mini-warehouses) to individuals and small businesses. Space is rented to users on a monthly basis and under a gross lease. In analysing storage REITs, it is important to look at the local factors that drive demand for storage, such as housing sales, new business start-ups, demographic trends in the surrounding area, as well as any other competing facilities that are under construction. Seasonal demand should also be considered.
8. **Diversified REITs.** Diversified REITs own more than one category of REIT. While they are uncommon in North America, some investors in Europe and Asia are drawn to the broad nature of these REITs. Because diversified REITs hold a range of property types, when analysing this class of REIT it is especially important to evaluate management's background in the kinds of real estate invested in.

Figure 2: Characteristics of REIT property subtypes

		<i>Characteristic</i>		
<i>REIT Type</i>	<i>Economic Value Determinant</i>	<i>Investment Characteristics</i>	<i>Principal Risks</i>	<i>Due Diligence Considerations</i>
Retail	<ul style="list-style-type: none"> • Retail sales growth • Job creation 	<ul style="list-style-type: none"> • Stable revenue stream over the short term 	<ul style="list-style-type: none"> • Depends on consumer spending 	<ul style="list-style-type: none"> • Per-square-foot sales and rental rates
Office	<ul style="list-style-type: none"> • Job creation • New space supply vs. demand 	<ul style="list-style-type: none"> • Long (5-25 yrs) lease terms • Stable year-to-year income 	<ul style="list-style-type: none"> • Changes in office vacancy and rental rates 	<ul style="list-style-type: none"> • New space under construction • Quality of office space (location, condition of building, and so on)
Residential	<ul style="list-style-type: none"> • Population growth • Job creation 	<ul style="list-style-type: none"> • One-year leases • Stable demand 	<ul style="list-style-type: none"> • Competition • Inducements • Regional economy • Inflation in operating costs 	<ul style="list-style-type: none"> • Demographics and income trends • Age and competitive appeal • Cost of home ownership • Rent controls
Health care	<ul style="list-style-type: none"> • Population growth • New space supply vs. demand 	<ul style="list-style-type: none"> • REITs lease facilities to health care providers. • Leases are usually net leases. 	<ul style="list-style-type: none"> • Demographics • Government funding • Construction cycles • Financial condition of operators • Tenant litigation 	<ul style="list-style-type: none"> • Operating trends • Government funding trends • Litigation settlements • Insurance costs • Competitors' new facilities vs demand
Industrial	<ul style="list-style-type: none"> • Retail sales growth • Population growth 	<ul style="list-style-type: none"> • Less cyclical than some other REIT types • 5-25 year net leases • Change in income and values are slow 	<ul style="list-style-type: none"> • Shifts in the composition of local and national industrial bases and trade 	<ul style="list-style-type: none"> • Trends in tenants' requirements • Obsolescence of existing space • Need for new types of space • Proximity to transportation • Trends in local supply and demand
Hotel	<ul style="list-style-type: none"> • Job creation • New space supply vs. demand 	<ul style="list-style-type: none"> • Variable income • Sector is cyclical because it is not protected by long-term leases 	<ul style="list-style-type: none"> • Exposed to business-cycle • Changes in business and leisure travel • Exposure to travel disruptions 	<ul style="list-style-type: none"> • Occupancy, room rates, and operating profit margins vs. industry averages • Revenue per available room (RevPAR) • Trends in forward bookings • Maintenance expenditures • New construction in local markets • Financial leverage
Storage	<ul style="list-style-type: none"> • Population growth • Job creation 	<ul style="list-style-type: none"> • Space is rented under gross leases and on a monthly basis 	<ul style="list-style-type: none"> • Ease of entry can lead to overbuilding. 	<ul style="list-style-type: none"> • Construction of new competitive facilities • Trends in housing sales • Demographic trends • New business start-up activity • Seasonal trends in demand for storage facilities that can be significant in some markets

LOS 44.e: Justify the use of net asset value per share (NAVPS) in REIT valuation and estimate NAVPS based on forecasted cash net operating income.

NAVPS is the (per-share) amount by which assets exceed liabilities, using current market values rather than accounting book values. NAVPS is generally considered the most appropriate measure of the fundamental value of REITs (and REOCs). If the market price of a REIT varies from NAVPS, this is seen as a sign of over- or undervaluation.

Estimating NAVPS Based on Forecasted Cash Net Operating Income

In the absence of a reliable appraisal, analysts will estimate the value of operating real estate by capitalizing the net operating income. This process first requires the calculation of a market required rate of return, known as the **capitalization rate** (“cap rate”), based on the prices of comparable recent transactions that have taken place in the market.

$$\text{capitalization rate} = \frac{\text{net operating income}}{\text{property value}}$$

Note that the net operating income (NOI) refers to the *expected income in the coming year*. Once a cap rate for the market has been determined, this cap rate can be used to capitalize the NOI:

$$\text{property value} = \frac{\text{net operating income}}{\text{capitalization rate}}$$

In the example below, we show how NAVPS is calculated by capitalizing a rental stream. First, estimated first-year NOI is capitalized using a market cap rate. Next, we add the value of other tangible assets and subtract the value of liabilities to find total net asset value. Net asset value divided by the number of outstanding shares gives us NAVPS.

Note that in calculating cash NOI, we subtract non-cash rent. Non-cash rent is the difference between the average rent over the term of a lease contract (i.e. straight-line rent) versus the amount of cash rent actually received in a period.

Example: Computing NAVPS

Vinny Cestone, CFA, is undertaking a valuation of the Anyco Shopping Center REIT, Inc. Given the following financial data for Anyco, estimate NAVPS based on forecasted cash net operating income.

Select Anyco Shopping Center REIT, Inc. Financial Information (in millions)

Last 12-months NOI	\$80
Cash and equivalents	\$20
Accounts receivable	\$15
Total debt	\$250
Other liabilities	\$50
Non-cash rents	\$2
Full-year adjustment for acquisitions	\$1
Land held for future development	\$10
Prepaid/Other assets (excluding intangibles)	\$5
Estimate of next 12 months growth in NOI	1.25%
Cap rate based on recent comparable transactions	8.0%
Shares outstanding	15

Answer:

Last 12-months NOI	\$80
- Non-cash rents ¹	\$2
+ Full-year adjustment for acquisitions ²	<u>\$1</u>
= Pro forma cash NOI for last 12 months	\$79
+ Next 12 months growth in NOI (@1.25%/yr) ³	<u>\$ 1</u>
= Estimated next 12 months cash NOI	\$80
÷ Cap rate ⁴	<u>8.0%</u>
= Estimated value of operating real estate ⁵	\$1,000
+ Cash and equivalents ⁶	\$20
+ Land held for future development	\$10
+ Accounts receivable	\$15
+ Prepaid/other assets (excluding intangibles)	<u>\$5</u>
= Estimated gross asset value	\$1,050
- Total debt ⁷	\$250
- Other liabilities	<u>\$50</u>
= Net asset value	\$750
÷ Shares outstanding	<u>15</u>
= Net asset value per share ⁸	\$50.00

Notes:

- (1) Non-cash rent (difference between average contractual rent and cash rent paid) is removed.
- (2) NOI is increased to represent full-year rent for properties acquired during the year.
- (3) Cash NOI is expected to increase by 1.25% over the next year.
- (4) Cap rate is based on recent transactions for comparable properties.
- (5) Operating real estate value = expected next 12-month cash NOI / 8% capitalization rate.
- (6) Add the book value of other assets: cash, accounts receivable, land for future development, prepaid expenses, and so on. Certain intangibles, such as goodwill, deferred financing expenses, and deferred tax assets, if given, are ignored.
- (7) Debt and other liabilities are subtracted to get to net asset value.
- (8) NAVPS = NAV / number of outstanding shares

LOS 44.f: Describe the use of funds from operations (FFO) and adjusted funds from operations (AFFO) in REIT valuation.

Analysts calculate and use two measures, FFO and AFFO.

1. **Funds from operations:** FFO adjusts reported earnings and is a popular measure of the continuing operating income of a REIT or REOC. FFO is calculated as follows:

$$\begin{array}{r}
 \text{Accounting net earnings} \\
 + \text{ Depreciation expense} \\
 + \text{ Deferred tax expenses (i.e., deferred tax liabilities)} \\
 - \text{ Gains from sales of property and debt restructuring} \\
 + \text{ Losses from sales of property and debt restructuring} \\
 \hline
 = \text{ Funds from operations}
 \end{array}$$

Depreciation is added back under the premise that accounting depreciation often exceeds economic depreciation for real estate. Deferred tax liabilities and associated periodic charges are also excluded, under the idea that this liability will probably not be paid for many years, if ever. Gains from sales of property and debt restructuring are excluded because these are not considered to be part of continuing income.

2. **Adjusted funds from operations:** AFFO is an extension of FFO that is intended to be a more useful representation of current economic income. AFFO is also known as *cash available for distribution* (CAD) or *funds available for distribution* (FAD). The calculation of AFFO generally involves beginning with FFO and then subtracting non-cash rent and maintenance-type capital expenditures and leasing costs (such as improvement allowances to tenants or capital expenditures for maintenance).

$$\begin{array}{r}
 \text{FFO (funds from operations)} \\
 - \text{ Non-cash (straight-line) rent adjustment} \\
 - \text{ Recurring maintenance-type capital expenditures and leasing commissions} \\
 \hline
 = \text{ AFFO (adjusted funds from operations)}
 \end{array}$$

Straight-line rent refers not to the cash rent paid during the lease but rather to the average contractual rent over a lease period—the two figures differ by non-cash rent, which reflects contractually-increasing rental rates. Capital expenditures related to maintenance, as well expenses related to leasing the space in properties, are subtracted from FFO because they represent costs that must be expended in order to maintain the value of the properties.

AFFO is considered a better measure of economic income than FFO because AFFO considers the capital expenditures that are required to sustain the property's economic income. However, FFO is more frequently cited in practice, because AFFO relies more on estimates and is considered more subjective.

LOS 44.g: Compare the net asset value, relative value (price-to-FFO and price-to-AFFO), and discounted cash flow approaches to REIT valuation.

REITs and REOCs are valued using several different approaches.

Net asset value per share: The net asset value method of valuation can be used either to generate an absolute valuation or as part of a relative valuation approach. Note, however, that net asset value is an indication of a REIT's assets to a buyer in the private market, which can be quite different from the value public market investors would attach to the REIT. For this reason, there have historically been significant differences (i.e., premiums or discounts) between NAV estimates and the prices at which REITs actually trade.



Professor's Note: Relative valuation using NAVPS is essentially comparing NAVPS to the market price of a REIT (or REOC) share. If, in general, the market is trading at a premium to NAVPS, a value investor would select the investments with the lowest premium (everything else held constant).

Relative value (price-to-FFO and price-to-AFFO): There are three key factors that impact that price-to-FFO and price-to-AFFO of REITs and REOCs:

1. Expectations for growth of FFO or AFFO.
2. The level of risks inherent in the underlying real estate.
3. Risk related to the firm's leverage and access to capital.

Discounted cash flow approach: Dividend discount and discounted cash flow models of valuation are appropriate for use with REITs and REOCs, because these two investment structures typically pay dividends and thereby return a high proportion of their income to investors. DDM and DCF are used in private real estate in the same way that they are used to value stocks in general. For dividend discount models, an analyst will typically develop near-term, medium-term, and long-term growth forecasts and then use these values as the basis for two- or three-stage dividend discount models. To build a discounted cash flow model, analysts will generally create intermediate-term cash flow projections plus a terminal value that is developed using historical cash flow multiples.



Professor's Note: We discuss dividend discount models extensively in the study session on equity valuation. Similar to price multiples in equity valuation, price multiples here depend on growth rate and risk. The first factor (above) focuses on growth rate, while the second and third factors above focus on risk.

LOS 44.h: Calculate the value of a REIT share using net asset value, price-to-FFO and price-to-AFFO, and discounted cash flow approaches.

We will demonstrate the calculation of the value of a REIT share using net asset value, price-to-FFO and price-to-AFFO, and discounted cash flow approaches with an example.

Example: Calculating the value of a REIT share

Lucinda Crabtree, CFA, is an asset manager that is interested in diversifying the portfolio she manages through an investment in an office building REIT.

Crabtree wants to value the potential investment using four different approaches as of the end of 2013, as follows:

- Approach 1: Net asset value
- Approach 2: Price-to-FFO
- Approach 3: Price-to-AFFO
- Approach 4: Discounted cash flow

Selected REIT Financial Information

	<i>All amounts in \$million</i>
Estimated 12 months cash net operating income (NOI)	\$80
Last year's actual funds from operations (FFO)	\$70
Cash and equivalents	\$65
Accounts receivable	\$35
Debt and other liabilities	\$400
Non-cash rents	\$5
Recurring maintenance-type capital expenditures	\$15
Shares outstanding	10 million shares
Expected annual dividend next year (2014)	\$5.00
Dividend growth rate in 2015 and 2016	2%
Dividend growth rate (from 2017 into perpetuity)	1%
Assumed cap rate	8%
Office subsector average P/FFO multiple	10×
Office subsector average P/AFFO multiple	14×
Crabtree's applicable cost of equity capital	9%
Risk-free rate	2%

Approach 1: Value of a REIT share using net asset value approach

The value per share for this REIT using net asset value valuation is computed as follows:

Estimated cash NOI	80
Assumed cap rate	<u>8%</u>
Estimated value of operating real estate (80 / .08)	1,000
Plus: cash + accounts receivable	100
Less: debt and other liabilities	<u>400</u>
Net asset value	700
Shares outstanding	10
NAV / share	\$70.00

The REIT share value using the net asset value approach is thus \$70. Note that no adjustment for non-cash rents was required in this case because we began with an estimate of cash NOI.

Approach 2: Value of a REIT share using price-to-FFO approach

The value per share for this REIT using price-to-FFO valuation is computed as follows:

Funds from operations (FFO)	\$70
Shares outstanding (millions)	10
FFO / share = \$70 million / 10 million shares	\$7.00

Applying the office subsector average P/FFO multiple of 10× yields a value per share of:

$$\$7.00 \times 10 = \$70.00$$

The REIT share value using the price-to-FFO approach is thus \$70.

Approach 3: Value of REIT share using price-to-AFFO approach

Funds from operations (FFO)	\$70
Subtract: non-cash rents	\$5
Subtract: recurring maintenance-type capital expenditures	<u>\$15</u>
Equals: AFFO	\$50
Shares outstanding (million)	10
AFFO / share = \$50 million / 10 million shares	\$5
Property subsector average P/AFFO multiple	14×

Applying the office subsector average P/AFFO multiple of 14× yields a value per share of $\$5 \times 14 = \70 .

The REIT share value using the price-to-AFFO approach is thus \$70.

Approach 4: Value of REIT share using discounted cash flow approach

	2014	2015	2016	2017
Dividends per share	\$5.00	\$5.10	\$5.20	\$5.25

Present value in 2016 of dividend stream beginning in 2017 = $\$5.25 / (0.09 - 0.01) = \65.63

These dividends are discounted at a rate of 9%.

value of a REIT share

= PV(dividends for years 1 through n) + PV(terminal value at the end of year n)

= PV_{2014 dividend} + PV_{2015 dividend} + PV_{2016 dividend} + PV_{2017 and later dividends (terminal value)}

= $\$5.00 / (1.09)$ + $\$5.10 / (1.09)^2$ + $\$5.20 / (1.09)^3$ + $\$65.63 / (1.09)^3$

= \$63.61

The REIT share value using the discounted cash flow approach is thus \$63.61.

Note that the calculated value of a REIT share is likely to vary, sometimes greatly, depending on which of these approaches is used.

KEY CONCEPTS

LOS 44.a

The main types of publicly traded real estate securities are:

- Real estate investment trusts (REITs) which are tax-advantaged companies that own income-producing real estate.
- Real estate operating companies (REOCs) which are non-tax-advantaged companies that own real estate.
- Mortgage-backed securities (MBS) which are investments in residential or commercial mortgages that are backed by real estate.

The main types of REITs are:

- Equity REITs which take ownership stakes in income-producing property.
- Mortgage REITs which invest primarily in mortgages, mortgage securities, or loans that use real estate as collateral.

LOS 44.b

Advantages of publicly traded real estate securities include:

- Superior liquidity.
- Lower minimum investment.
- Limited liability.
- Access to premium properties.
- Active professional management.
- Protections accorded to publicly traded securities.
- Greater potential for diversification.
- Exemption from taxation.
- Earnings predictability.
- High yield.

Disadvantages of publicly traded real estate securities include:

- Taxes versus direct ownership.
- Lack of control.
- Costs of a publicly traded corporate structure.
- Price is determined by the stock market.
- Structural conflicts of interest.
- Limited potential for income growth.
- Forced equity issuance.
- Lack of flexibility.

LOS 44.c:

Investment characteristics of REITs include:

- Exemption from corporate-level income taxes.
- High dividend yield.
- Low income volatility.
- Frequent secondary equity offerings.

The most risky types of REIT property sectors are those in which significant mismatches between supply and demand are likely to happen (particularly health care, hotel, and office REITs), as well as those sectors where the occupancy rates are most likely to vary over a short period of time (especially hotels).

REIT due diligence considerations:

- Remaining lease terms.
- Inflation protection.
- Occupancy rates and leasing activity.
- In-place rents versus market rents.
- Costs to re-lease space.
- Tenant concentration in the portfolio.
- Tenants' financial health.
- New supply versus demand.
- Balance sheet analysis.
- Quality of management.

LOS 44.d

Types of REITs include:

- Retail REITs, which own properties used as shopping centers.
- Office REITs, which provide space to multiple business tenants.
- Residential (“multi-family”) REITs, which invest in rental apartments.
- Health care REITs, which lease properties to hospitals and nursing homes.
- Industrial REITs, which own properties used in manufacturing, warehousing, and distribution.
- Hotel REITs, which receive passive rental income from hotel management companies.
- Storage REITs, which rent self-storage lockers to individuals and small businesses.
- Diversified REITs, which own multiple types of real estate.

LOS 44.e

Net asset value per share (NAVPS) is the (per-share) amount by which a REIT's assets exceed its liabilities, using current market value rather than accounting or book values. The REIT or REOC portfolio of operating real estate investments can be valued by capitalizing net operating income:

$$\text{property value} = \frac{\text{net operating income}}{\text{capitalization rate}}$$

Estimated cash NOI	
÷ Assumed cap rate	
= Estimated value of operating real estate	
+ Cash and accounts receivable	
- Debt and other liabilities	
= Net asset value	
÷ Shares outstanding	
= NAV / share	

LOS 44.f

Accounting net earnings	
+ Depreciation expense	
+ Deferred tax expenses	
- Gains (losses) from sales of property and debt restructuring	
= Funds from operations	

FFO (funds from operations)	
- Non-cash (straight-line) rent adjustment	
- Recurring maintenance-type capital expenditures and leasing commissions	
= AFFO (adjusted funds from operations)	

LOS 44.g

Approaches to REIT valuation:

- Net asset value per share: NAVPS is based on market values and is considered to be the fundamental measure of value for REITs and REOCs.
- Relative value: Market-based-multiple approaches including price-to-FFO and price-to-AFFO can be used to value REITs and REOCs.
- Discounted cash flow: Dividend discount models typically include two or three stages, based on near- and long-term growth forecasts. Discounted cash flow models use intermediate-term cash flow projections, plus a terminal value based on historical cash flow multiples.

LOS 44.h

Price-to-FFO approach:

$$\begin{aligned}
 & \text{Funds from operations (FFO)} \\
 & \div \text{ Shares outstanding} \\
 \hline
 & = \text{FFO / share} \\
 & \times \text{ Sector average P/FFO multiple} \\
 \hline
 & = \text{NAV / share}
 \end{aligned}$$

Price-to-AFFO approach:

$$\begin{aligned}
 & \text{Funds from operations (FFO)} \\
 & - \text{ Non-cash rents} \\
 & - \text{ Recurring maintenance-type capital expenditures} \\
 \hline
 & = \text{AFFO} \\
 & \div \text{ Shares outstanding} \\
 \hline
 & = \text{AFFO / share} \\
 & \times \text{ Property subsector average P/AFFO multiple} \\
 \hline
 & = \text{NAV / share}
 \end{aligned}$$

Discounted cash flow approach:

$$\begin{aligned}
 & \text{Value of a REIT share} \\
 & = \text{PV}(\text{dividends for years 1 through } n) + \text{PV}(\text{terminal value at the end of year } n)
 \end{aligned}$$

CONCEPT CHECKERS

- Which of the following *least accurately* identifies one of the principal types of publicly traded real estate securities?
 - Commingled real estate fund (CREF).
 - Shares of real estate operating companies (REOC).
 - Residential and commercial mortgage-backed securities (MBS).
- Which of the following statements *most accurately* describes one of the advantages of investing in REITs? REITs:
 - can pass on tax losses to their investors as deductions from their taxable income.
 - have lower price and return volatility than a comparable direct investment in properties.
 - limit investor liability to only the amount of the investor's original capital investment.
- From the choices given, choose the *most accurate* to complete the following sentence. After overall growth in the economy, the *most* important economic factor affecting a(n):
 - hotel REIT is job creation.
 - storage REIT is retail sales growth.
 - office REIT is population growth.
- Compared with other publicly traded shares, REITs are *most likely* to offer relatively low:
 - yields.
 - stability of income and returns.
 - growth from reinvested operating cash flows.
- Which of the following statements *least accurately* describes a feature of the DOWNREIT structure? A DOWNREIT:
 - is the most common REIT structure in the United States.
 - may own properties at both the REIT level and the partnership level.
 - can form partnerships for each property acquisition it undertakes.
- Which of the following statements about the use of net asset value per share (NAVPS) in REIT valuation is *most accurate*? NAVPS is:
 - the difference between the accounting book values of a real estate company's assets and its liabilities, divided by shares outstanding.
 - considered to be a superior measure of the net worth of a REIT's shares, compared with book value per share.
 - exactly equal to the intrinsic value of REIT shares.
- In the process of calculating adjusted funds from operations (AFFO) from funds from operations (FFO), an analyst is *most likely* to:
 - add depreciation and amortization.
 - subtract non-cash rent.
 - add recurring maintenance-type capital expenditures and leasing commissions.

8. Which statement regarding approaches to REIT valuation is *least accurate*?
- AFFO includes a number of adjustments to FFO that result in AFFO approximating continuing cash earnings.
 - P/AFFO is the most frequently used multiple in analyzing the REIT sector.
 - Dividend discount models are appropriate for valuing REITs because REITs return most of their income to investors.

Use the following information for Questions 9 through 12.

Anna Ginzburg, CFA, is using the following information to analyze a potential investment in an industrial building.

Selected REIT Financial Information

	<i>All amounts in \$million</i>
Estimated 12 months cash net operating income (NOI)	\$40
Funds from operations (FFO)	\$30
Cash and equivalents	\$30
Accounts receivable	\$20
Debt and other liabilities	\$250
Non-cash rents	\$5
Recurring maintenance-type capital expenditures	\$10
Shares outstanding	10 million shares
Expected annual dividend next year (2014)	\$3.00
Dividend growth rate in 2015 and 2016	4%
Dividend growth rate (from 2017 into perpetuity)	3%
Assumed cap rate	8%
Office subsector average P/FFO multiple	12×
Office subsector average P/AFFO multiple	20×
Ginzburg's cost of equity capital	11%
Risk-free rate	2%

9. The value of Ginzburg's potential investment using a net asset value (NAV) approach is *closest* to:
- \$30.
 - \$35.
 - \$40.
10. The value of Ginzburg's potential investment using a price-to-FFO approach is *closest* to:
- \$30.
 - \$35.
 - \$40.

11. The value of Ginzburg's potential investment using a price-to-AFFO approach is *closest* to:
 - A. \$30.
 - B. \$35.
 - C. \$40.

12. The value of Ginzburg's potential investment using a discounted cash flow approach is *closest* to:
 - A. \$30.
 - B. \$35.
 - C. \$40.

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ANSWERS – CONCEPT CHECKERS

1. **A** A commingled real estate fund (CREF) is an example of a private real estate investment, not a publicly traded security. The three principal types of publicly traded real estate securities available globally are real estate investment trusts (REITs), real estate operating companies (REOCs), and residential and commercial mortgage-backed securities (MBS).
2. **C** REIT investors have no liability for the REITs in which they invest beyond the original amount invested. REITs and REOCs usually cannot pass on tax losses to their investors as deductions from taxable income. Because REIT prices and returns are determined by the stock market, the value of a REIT is more volatile than its appraised net asset value.
3. **A** After growth in the GDP, the most important factor driving demand for hotel rooms is job creation, because business and leisure travel are closely tied to the size of the workforce. More important to the value of a storage REIT than retail sales growth is population growth. More important to the value of an office REIT than population growth is job creation.
4. **C** When we compare REITs to other kinds of publicly traded shares, REITs offer above-average yields and stable income and returns. Due to their high income-to-payout ratios, REITs have relatively low potential to grow by reinvesting operating cash flows.
5. **A** Most REITs in the United States are structured as UPREITs, not DOWNREITs. The other two statements are true: a DOWNREIT may own properties at both the REIT level and at the partnership level, and may form partnerships for each property acquisition it undertakes.
6. **B** NAVPS is the difference between a REIT's assets and its liabilities, using current market values instead of accounting book values and dividing by the number of shares outstanding. NAVPS is a superior measure of the net worth of a REIT, compared to book value per share which is based on historical cost values. NAV is the largest component of the intrinsic value of a REIT; however, other factors, such as the value of non-asset-based income streams, the value added by management, and the value of any contingent liabilities, also contribute to intrinsic value.
7. **B** To calculate AFFO, we begin with FFO and then deduct non-cash rent, maintenance-type capital expenditures, and leasing commissions.
8. **B** FFO has some shortcomings, but because it is the most standardized method of measuring a REIT's earnings, P/FFO is the most commonly used multiple in analyzing REITs. AFFO is used as a convenient proxy for a "cash flow" multiple because AFFO is an approximation of cash earnings. Dividend discount models are appropriate methods for valuing REITs because REITs return a significant portion of their income to their investors and tend to be high-dividend payers.

9. A The value per share for this REIT using net asset value valuation is computed as follows:

Estimated cash NOI	40
Assumed cap rate	<u>8%</u>
Estimated value of operating real estate (40 / .08)	500
Plus: cash + accounts receivable	50
Less: debt and other liabilities	<u>250</u>
Net asset value	300
Shares outstanding	10
NAV / share	\$30.00

The REIT share value using the net asset value approach is \$30.

10. B The value per share for this REIT using price-to-FFO valuation is computed as follows:

Funds from operations (FFO)	\$30
Shares outstanding (millions)	10
FFO / share = \$30 million / 10 million shares	\$3.00

Applying the office subsector average P/FFO multiple of 12× yields a value per share of:

$$\$3.00 \times 12 = \$36.00$$

The REIT share value using the price-to-FFO approach is \$36.

11. A The value per share for this REIT using a price-to-AFFO valuation is computed as follows:

Funds from operations (FFO)	\$30
Subtract: non-cash rents	\$5
Subtract: recurring maintenance-type capital expenditures	<u>\$10</u>
Equals: AFFO	\$15
Shares outstanding	10 million
AFFO / share = \$15 million / 10 million shares	\$1.50
Property subsector average P/AFFO multiple	20×

Applying the office subsector average P/AFFO multiple of 20× yields a value per share of
 $\$1.50 \times 20 = \30 .

The REIT share value using the price-to-AFFO approach is \$30.

12. C The value per share for this REIT using a discounted cash flow valuation is computed as follows:

	2014	2015	2016	2017
Dividends per share:	\$3.00	\$3.12	\$3.24	\$3.34

Present value in 2016 of dividends stream beginning in 2017 = $\$3.34 / (0.11 - 0.03) = \41.78

Present value of all dividends, when discounted at a rate of 11%

$$\begin{aligned}
 &= PV_{2014 \text{ dividend}} + PV_{2015 \text{ dividend}} + PV_{2016 \text{ dividend}} + PV_{(\text{terminal value})} \\
 &= \$3.00/(1.11) + \$3.12/(1.11)^2 + \$3.24/(1.11)^3 + \$41.78/(1.11)^3 \\
 &= \$38.15
 \end{aligned}$$

The REIT share value using the discounted cash flow approach is \$38.15.

PRIVATE EQUITY VALUATION

Study Session 15

EXAM FOCUS

This topic has a great deal of testable material, both conceptual and quantitative. For the exam, know the three sources of value creation in private equity. Know that, relative to buyouts, venture capital concerns companies that are immature and generally more risky. Understand that the drivers of return for buyouts are earnings growth, the increase in multiple upon exit, and the reduction in the debt; whereas for venture capital, it is the pre-money valuation, the investment, and potential subsequent equity dilution.

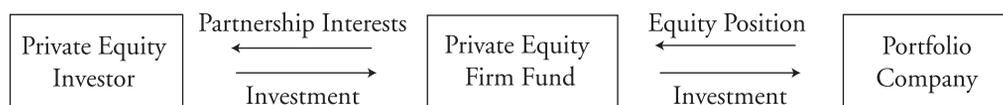
Be familiar with risks, costs, structure, and terms that are unique to private equity funds. Know how to calculate management fees, carried interest, NAV, DPI, RVPI, and TVPI of a private equity fund. Using both the NPV and IRR venture capital methods, be able to calculate ownership fraction, number of new shares issued, and the price per share for the new investment.

BACKGROUND: PRIVATE EQUITY

Private equity is of increasing importance in the global economy. Private equity firms make investments ranging from investments in early stage companies (called a venture capital investment) to investments in mature companies (generally in a buyout transaction).

The following diagram may help you understand the private equity investment process.

Figure 1: The Typical Private Equity Investment Transaction



We will use the term *portfolio company* to denote the companies that private equity firms invest in. Portfolio companies are sometimes referred to as investee companies.

We will use the term *private equity firm* (PE firm) to denote the intermediary in the illustrated transaction.

We will use the term *private equity investor* to denote the outside investor who makes an investment in a fund offered by the PE firm.

In this review, we examine the perspective of both private equity firms evaluating investments in portfolio companies and the perspective of an outside investor who is evaluating an investment in a private equity firm.

LOS 45.a: Explain sources of value creation in private equity.

It is commonly believed that PE firms have the ability to add greater value to their portfolio companies than do publicly governed firms. The sources of this increased value are thought to come from the following:

1. The ability to re-engineer the portfolio company and operate it more efficiently.
2. The ability to obtain debt financing on more advantageous terms.
3. Superior alignment of interests between management and private equity ownership.

Re-engineering the Portfolio Company

In order to re-engineer their portfolio companies, many private equity firms have an in-house staff of experienced industry CEOs, CFOs, and other former senior executives. These executives can share their expertise and contacts with portfolio company management.

Obtaining Favorable Debt Financing

A second source of added value is from more favorable terms on debt financing. During 2006 and the first half of 2007, the availability of cheap credit with few covenants led many private equity firms to use debt for buyout transactions. In PE firms, debt is more heavily utilized and is quoted as a multiple of EBITDA (earnings before interest, taxes, depreciation, and amortization) as opposed to a multiple of equity, as for public firms.

The central proposition of the Modigliani-Miller theorems is that the use of debt versus equity is inconsequential for firm value. However, once the assumption of no taxes is removed from their model, the tax savings from the use of debt (i.e., the interest tax shield) increases firm value. The use of greater amounts of financial leverage may increase firm value in the case of private equity firms. Because these firms have a reputation for efficient management and timely payment of debt interest, this helps to allay concerns over their highly leveraged positions and helps maintain their access to the debt markets.



Professor's Note: The Modigliani-Miller theorems are discussed in detail in the corporate finance portion of the curriculum. In that corporate finance material, they are referred to as propositions.

The use of debt is thought to make private equity portfolio companies more efficient. According to this view, the requirement to make interest payments forces the portfolio companies to use free cash flow more efficiently because interest payments must be made on the debt.

Much of the debt financing for private equity firms comes from the syndicated loan market, but the debt is often repackaged and sold as collateralized loan obligations (CLOs). Private equity firms may also issue high-yield bonds which are repackaged

as collateralized debt obligations (CDOs). These transactions have resulted in a large transfer of risk. However, the markets slowed beginning in 2007, creating less availability of financing for large buyouts.

A third source of value added for PE firms is the alignment of interests between private equity owners and the managers of the portfolio companies they own, as discussed in the next LOS.

LOS 45.b: Explain how private equity firms align their interests with those of the managers of portfolio companies.

In many private equity transactions, ownership and control are concentrated in the same hands. In buyout transactions, management often has a substantial stake in the company's equity. In many venture capital investments, the private equity firm offers advice and management expertise. The private equity firm can also gain increased control if the venture capital investee company does not meet specified targets.

In private equity firms, managers are able to focus more on long-term performance because, unlike public companies, private companies do not face the scrutiny of analysts, shareholders, and the broader market. This also allows the private equity firms to hire managers that are capable of substantial restructuring efforts.

Control Mechanisms

Private equity firms use a variety of mechanisms to align the interests of the managers of portfolio companies with the private equity firm's interests. The following contract terms are contained in the **term sheet** that specifies the terms of the private equity firm's investment.

Compensation: Managers of the portfolio companies receive compensation that is closely linked to the company's performance, and the compensation contract contains clauses that promote the achievement of the firm's goals.

Tag-along, drag-along clauses: Anytime an acquirer acquires control of the company, they must extend the acquisition offer to all shareholders, including firm management.

Board representation: The private equity firm is ensured control through board representation if the portfolio company experiences a major event such as a takeover, restructuring, initial public offering (IPO), bankruptcy, or liquidation.

Noncompete clauses: Company founders must agree to clauses that prevent them from competing against the firm within a prespecified period of time.

Priority in claims: Private equity firms receive their distributions before other owners, often in the form of preferred dividends and sometimes specified as a multiple of their original investment. They also have priority on the company's assets if the portfolio company is liquidated.

Required approvals: Changes of strategic importance (e.g., acquisitions, divestitures, and changes in the business plan) must be approved by the private equity firm.

Earn-outs: These are used predominantly in venture capital investments. Earn-outs tie the acquisition price paid by the private equity firm to the portfolio company's future performance over a specified time period.

By specifying the appropriate control mechanisms in the investment contract, private equity firms can make investments in companies of considerable risk.

LOS 45.c: Distinguish between the characteristics of buyout and venture capital investments.

Valuation Characteristics of Venture Capital vs. Buyout Investments

Venture capital and buyout are the two main forms of private equity investments. As previously noted, companies financed with venture capital are usually less mature than buyout targets. Venture capital firms usually have a specific industry focus, such as biotechnology, and emphasize revenue growth. When private equity firms make buyout purchases, the emphasis is on EBIT or EBITDA growth, and typically a portfolio of companies with stable earnings growth is purchased.

The following chart summarizes the key differences between venture capital and buyout investments.

Figure 2: Key Differences Between Venture Capital and Buyout Investments

<i>Characteristic</i>	<i>Venture Capital Investments</i>	<i>Buyout Investments</i>
Cash Flows	Low predictability with potentially unrealistic projections	Stable and predictable cash flows
Product Market	New product market with uncertain future	Strong market position with a possible niche position
Products	Product is based on new technology with uncertain prospects	Established products
Asset Base	Weak	Substantial base that can serve as collateral
Management Team	New team although individual members typically have a strong entrepreneurial record	Strong and experienced
Financial Leverage	Low debt use with a majority of equity financing	High amounts of debt with a large percentage of senior debt and substantial amounts of junior and mezzanine debt
Risk Assessment	Risk is difficult to estimate due to new technologies, markets, and company history	Risk can be estimated due to industry and company maturity
Exit	Exit via IPO or company sale is difficult to forecast	Exit is predictable
Operations	High cash burn rate required due to company and product immaturity	Potential exists for reduction in inefficiencies
Working Capital Required	Increasing requirements due to growth	Low requirements
Due Diligence Performed by Private Equity Firms	Private equity firms investigate technological and commercial prospects; investigation of financials is limited due to short history	Private equity firms perform extensive due diligence
Goal Setting	Goals are milestones set in business plan and growth strategy	Goals reference cash flows, strategic plan, and business plan
Private Equity Investment Returns	High returns come from a few highly successful investments with writeoffs from less successful investments	Low variability in the success of investments with failures being rare
Capital Market Presence	Generally not active in capital markets	Active in capital markets
Sales Transactions	Most companies are sold as a result of the relationship between venture capital firm and entrepreneurs	Companies are typically sold in an auction-type process
Ability to Grow Through Subsequent Funding	Companies are less scalable as subsequent funding is typically smaller	Strong performers can increase subsequent funding amounts
Source of General Partner's Variable Revenue	Carried interest is most common, transaction and monitoring fees are less common	Carried interest, transaction fees, and monitoring fees

Terms related to private equity, such as carried interest, and revenue of private equity general partners are discussed in greater detail in an upcoming LOS.



Professor's Note: Many of these characteristics can be more easily remembered if you keep in mind that, relative to companies acquired through buyout, venture capital portfolio companies are immature companies with risky prospects and cash flows. They require a great deal of funding but may have limited access to financing, especially debt. The returns on venture capital come from a small number of highly successful investments.

GENERAL VALUATION ISSUES FOR PRIVATE EQUITY

Public companies are bought and sold on regulated exchanges daily. Private companies, however, are bought by buyers with specific interests at specific points in time, with each potential buyer possibly having a different valuation for the company. Furthermore, valuing a private company is more difficult than valuing public companies because, as discussed previously, PE firms often transform and reengineer the portfolio company such that future cash flow estimates are difficult to obtain.

Private Equity Valuation Methodologies

There are six methodologies used to value private equity portfolio companies.

- **Discounted cash flow (DCF) analysis** is most appropriate for companies with a significant operating history because it requires an estimate of cash flows.
- A **relative value** or **market approach** applies a price multiple, such as the price-earnings ratio, against the company's earnings to get an estimate of the company's valuation. This approach requires predictable cash flows and a significant history.
- A third approach uses **real option analysis** and is applicable for immature companies with flexibility in their future strategies.



Professor's Note: Real options are covered in more detail in the topic review on capital budgeting in Corporate Finance.

- The fourth approach uses the **replacement cost** of the business. It is generally not applicable to mature companies whose historical value added would be hard to estimate.
- The last two approaches, the **venture capital method** and the **leveraged buyout method**, are discussed at the end of this review.

Other Considerations

Other considerations for valuing private equity portfolio companies are control premiums, country risk, and marketability and illiquidity discounts. In buyouts, the private equity investors typically have complete control. In venture capital investments, however, these investors usually have a minority position, and their control of the companies depends on the alignment of their interests with that of controlling shareholders. When valuing companies in emerging markets, country risk premiums may be added, thereby increasing the discount rate applied to the company's cash flows. Illiquidity and marketability discounts refer to the ability and right to sell the company's shares, respectively.

Price Multiples

To value private equity portfolio companies, many investors use market data from similar publicly traded companies, most commonly the price multiples from comparable public companies. However, it is often difficult to find public companies at the same stage of development, same line of business, same capital structure, and same risk. A decision must also be made as to whether trailing or future earnings are used. For these reasons, a relative value or market approach should be used carefully.

Discounted Cash Flow Analysis

Market data is also used with discounted cash flow (DCF) analysis, with beta and the cost of capital estimated from public companies while adjusting for differences in operating and financial leverage between the private and public comparables. In DCF analysis, an assumption must be made regarding the company's future value. Typically a terminal value (i.e., an exit value) is calculated using a price multiple of the company's EBITDA.



Professor's Note: Adjusting beta for differences in operating and financial leverage between comparables is covered in more detail in the topic review on return concepts in the equity section of the curriculum.

Given the uncertainty associated with private companies, a variety of valuation techniques is typically applied to a range of different potential scenarios.

BUYOUT VALUATION ISSUES

Types of Buyouts

In a buyout transaction, the buyer acquires a controlling equity position in a target company. Buyouts include takeovers, management buyouts (MBOs), and leveraged buyouts (LBOs). This review focuses on LBOs, in which a high amount of debt is used to finance a substantial portion of the acquisition. The financing of a LBO typically involves senior debt, junk bonds, equity, and mezzanine finance. Mezzanine finance is a hybrid between debt and equity and can be structured to suit each particular transaction.

Leveraged Buyout (LBO)

The view of an LBO transaction, referred to as the LBO model, is not a form of valuation but rather a method of factoring in the company's capital structure and other parameters to determine the return the private equity firm should expect from the transaction. The objective is not to value the company but to determine the maximum price in negotiation that the private equity firm should pay for its stake.

LBO Model

The LBO model has three main inputs:

1. The target company's forecasted cash flows.
2. The expected returns to the providers of the financing.
3. The total amount of financing.

The cash flow forecasts are provided by the target's management but scrutinized by the private equity firm. The exit date (when the target company is sold) is evaluated at different dates to determine its influence on the projected returns. The value of the company at that time is forecast using a relative value or market approach.

LOS 45.d: Describe valuation issues in buyout and venture capital transactions.

Exit Value

The exit value can be viewed as:

$$\text{investment cost} + \text{earnings growth} + \text{increase in price multiple} + \text{reduction in debt} = \text{exit value}$$

As previously mentioned, private equity firms are known for their reengineering and improved corporate governance of target companies, which should result in operational efficiencies and higher earnings growth. As a result, the target company should see an increase in price multiples and increased ability to pay down its debt. Each of the three variables should be examined using scenario analysis to determine the plausibility of their forecasted values and the forecasted exit value. One purpose for calculating the exit value is to determine the investment's internal rate of return sensitivity in the exit year.

Example: Calculating payoff multiples and IRRs for equity investors

Suppose an LBO transaction is valued at \$1,000 million and has the following characteristics (amounts are in millions of dollars):

- Exit occurs in five years at a projected multiple of 1.80 of the company's initial cost.
- It is financed with 60% debt and 40% equity.
- The \$400 equity investment is composed of:
 - ◆ \$310 in preference shares held by the private equity firm.
 - ◆ \$80 in equity held by the private equity firm.
 - ◆ \$10 in equity held by management equity participation (MEP).
- Preference shares are guaranteed a 14% compound annual return payable at exit.
- The equity of the private equity firm is promised 90% of the company's residual value at exit after creditors and preference shares are paid.
- Management equity receives the other 10% residual value.
- By exit, the company will have paid off \$350 of the initial \$600 in debt using operating cash flow.

Calculate the payoff for the company's claimants and the internal rate of return (IRR) and payoff multiple for the equity claimants.

Answer:

First calculate the exit value as: $\$1,000 \times 1.8 = \$1,800$.

Next calculate the claimants' payoffs:

- *Debt:* The claim of debtholders is their initial investment minus the amount that has been paid down: $\$600 - \$350 = \$250$.
- *Preference shares:* Earn a return of 14% so their claim is:
 $\$310 \times (1.14)^5 = \596.88 .
- *Private equity firm:* Receives 90% of the residual exit value:
 $0.90(\$1,800 - \$250 - \$596.88) = \857.81 .
- *Management:* Receives 10% of the residual exit value:
 $0.10(\$1,800 - \$250 - \$596.88) = \95.31 .

The total investment by the private equity firm is $\$310 + \$80 = \$390$.

The total payoff is $\$596.88 + \$857.81 = \$1454.69$.

The payoff multiple for the private equity firm is: $1454.69 / 390 = 3.7$.

Using your TI BA II Plus, the IRR is calculated as:

$PV = -\$390$; $FV = \$1454.69$; $N = 5$; $CPT I/Y \Rightarrow 30.1\%$.

For the management equity, the IRR is:

$PV = -\$10$; $FV = \$95.31$; $N = 5$; $CPT I/Y \Rightarrow 57.0\%$.

The payoff multiple for the management equity program (MEP) is: $95.31 / 10 = 9.5$.

In the example, the equity held by the private equity firm and management experiences a significant increase in value. The IRR for each is attractive at 30.1% and 57.0%, respectively.

The components of the return are:

- The return on the preference shares for the private equity firm.
- The increased multiple upon exit.
- The reduction in the debt claim.

In most LBOs, most of the debt is senior debt that will amortize over time. In the preceding example, the debtholders' claim on assets was reduced from \$600 to \$250. The use of debt in this example is advantageous and magnifies the returns to the equityholders. However, the use of debt also increases risk to the equityholders. Use of debt becomes disadvantageous if a company experiences difficulties and cannot make the payments on the debt. In this case, the equityholders could lose control of the company if it is forced into bankruptcy.

VALUATION ISSUES IN VENTURE CAPITAL INVESTMENTS

Pre- and Post-Money Valuation

The two fundamental concepts in venture capital investments are pre-money (PRE) valuation and post-money (POST) valuation. A private equity firm makes an investment (INV) in an early-stage start-up company.

The post-money valuation of the investee company is:

$$\text{PRE} + \text{INV} = \text{POST}$$

The ownership proportion of the venture capital (VC) investor is:

$$= \text{INV} / \text{POST}$$

Example: Calculating post-money valuation and proportional ownership

A company is valued at \$3,000,000 prior to a capital infusion of \$1,000,000 by a VC investor.

Calculate the post-money valuation and the VC investor's proportional ownership.

Answer:

The post-money valuation is:

$$\$3,000,000 + \$1,000,000 = \$4,000,000$$

The ownership proportion of the VC investor is:

$$= \$1,000,000 / \$4,000,000 = 25\%$$

Appropriate Methods for Venture Capital Valuation

The pre-money valuation and investment will be negotiated between the investee company and the VC investor. Additionally, the VC investor should keep in mind that his ownership could be diluted in the future due to future financing, conversion of convertible debt into equity, and the issuance of stock options to management.

As discussed previously, it is difficult to forecast the cash flows for a VC portfolio company. Therefore, discounted cash flow analysis (the income approach) is not usually used as the primary valuation method for VC companies. It is also difficult to use a relative value or market approach. This is because a VC company is often unique, and there may be no comparable companies to estimate a benchmark price multiple from. A replacement cost approach may also be difficult to apply. Alternative methodologies include real option analysis and the venture capital method, which will be addressed later in this review.

To estimate the pre-money valuation, the VC investor typically examines the company's intellectual property and capital, the potential for the company's products, and its intangible assets. Sometimes a cap (e.g., \$3,000,000) is placed on the pre-money valuation due to its uncertain value.

VALUATION ISSUES: BUYOUT VS. VENTURE CAPITAL

The following table highlights the different issues when valuing buyouts versus venture capital.

Figure 3: Valuation Issues for Buyouts vs. Venture Capital Investments

<i>Valuation Issue</i>	<i>Buyout</i>	<i>Venture Capital</i>
Applicability of DCF Method	Frequently used to estimate value of equity	Less frequently used as cash flows are uncertain
Applicability of Relative Value Approach	Used to check the value from DCF analysis	Difficult to use because there may be no truly comparable companies
Use of Debt	High	Low as equity is dominant form of financing
Key Drivers of Equity Return	Earnings growth, increase in multiple upon exit, and reduction in the debt	Pre-money valuation, investment, and subsequent dilution



Professor's Note: Valuation methodologies for buyouts need to factor in the level and pattern of leverage over the investment term. Initially, debt levels are high but are expected to decrease to "normal" levels by the time of exit. We address this issue near the end of this topic review.

LOS 45.e: Explain alternative exit routes in private equity and their impact on value.

Types of Exit Routes

The exit value is a critical element in the return for the private equity firm and is considered carefully before the investment is undertaken. The means and timing of the exit strongly influence the exit value. There are four exit routes that private equity firms typically use: (1) an initial public offering (IPO), (2) secondary market sale, (3) management buyout (MBO), and (4) liquidation.

Initial Public Offering (IPO)

In an IPO, a company's equity is offered for public sale. An IPO usually results in the highest exit value due to increased liquidity, greater access to capital, and the potential to hire better quality managers. However, an IPO is less flexible, more costly, and a more cumbersome process than the other alternatives.

IPOs are most appropriate for companies with strong growth prospects and a significant operating history and size. The timing of an IPO is key. After the bursting of the U.S. tech bubble in 2000, the IPO market withered and venture capital firms had to find other means of exit.

Secondary Market Sale

In a secondary market sale, the company is sold to another investor or to another company interested in the purchase for strategic reasons (e.g., a company in the same industry wishes to expand its market share). Secondary market sales from one investor to another are quite frequent, especially in the case of buyouts. VC portfolio companies are sometimes exited via a buyout to another firm, but VC companies are usually too immature to support a large amount of debt. Secondary market sales result in the second highest company valuations after IPOs.

Management Buyout (MBO)

In an MBO, the company is sold to management, who utilize a large amount of leverage. Although management will have a strong interest in the subsequent success of the company, the resulting high leverage may limit management's flexibility.

Liquidation

Liquidation, the outright sale of the company's assets, is pursued when the company is deemed no longer viable and usually results in a low value. There is potential for negative publicity as a result of displaced employees and from the obvious implications of the company's failure to reach its objectives.

Exit Timing

The timing of the exit is also very important for company value, and the private equity firm should be flexible in this regard. For example, if a portfolio company cannot be sold due to weak capital markets, the private equity firm may want to consider buying another portfolio company at depressed prices, merging the two companies, and waiting until capital market conditions improve to sell both portfolio companies as one.

When an exit is anticipated in the next year or two, the exit valuation multiple can be forecasted without too much error. Beyond this time horizon, however, exit multiples become much more uncertain and stress testing should be performed on a wide range of possible values.



Professor's Note: Don't lose sight of the purpose of valuation: (1) to assess the ability of the portfolio company to generate cash flow and (2) to represent a benchmark for negotiations.

LOS 45.f: Explain private equity fund structures, terms, valuation, and due diligence in the context of an analysis of private equity fund returns.

Limited Partnership

The most common form of ownership structure for private equity funds is the limited partnership. In a limited partnership, the limited partners (LPs) provide funding and do not have an active role in the management of the investments. Their liability is limited to what they have invested (i.e., they cannot be held liable for any amount beyond their investment in the fund). The general partner (GP) in a limited partnership is liable for all the firm's debts and, thus, has unlimited liability. The GP is the manager of the fund.

Another form of private equity fund structure is the company limited by shares. It offers better legal protection to the partners, depending on the jurisdiction. Most fund structures are closed end, meaning that investors can only redeem the investment at specified time periods.

Private equity firms must both raise funds and manage the investment of those funds. The private equity firm usually spends a year or two raising funds. Funds are then drawn down for investment, after which returns are realized. Most private equity funds last 10 to 12 years but can have their life extended another 2 to 3 years.

Private Equity Fund Terms

As mentioned previously, private equity investments are often only available to qualified investors, the definition of which depends on the jurisdiction. In the United States, the individual must have at least \$1 million in assets.

The terms in a fund prospectus are a result of negotiation between the GP and the LPs. If the fund is oversubscribed (i.e., has more prospective investors than needed), the GP has greater negotiating power.

The terms of the fund should be focused towards aligning the interests of the GP and LPs and specifying the compensation of the GP. The most important terms can be categorized into economic and corporate governance terms.

Economic Terms of a Private Equity Fund

Management fees: These are fees paid to the GP on an annual basis as a percent of committed capital and are commonly 2%. Management fees could instead be based on NAV or paid-in capital.

Transaction fees: These are paid by third parties to the GP in their advisory capacity (e.g., for investment banking services, such as arranging a merger). These fees are usually split evenly with the LPs and, when received, are deducted from management fees.

Carried interest/performance fees: This is the GP's share of the fund profits and is usually 20% of profits (after management fees).

Ratchet: This specifies the allocation of equity between stockholders and management of the portfolio company and allows management to increase their allocation, depending on company performance.

Hurdle rate: This is the IRR that the fund must meet before the GP can receive carried interest. It usually varies from 7% to 10% and incentivizes the GP.

Target fund size: The stated total maximum size of the PE fund, specified as an absolute figure. It signals the GP's ability to manage and raise capital for a fund. It is a negative signal if actual funds ultimately raised are significantly lower than targeted.

Vintage: This is the year the fund was started and facilitates performance comparisons with other funds.

Term of the fund: As discussed previously, this is the life of the firm and is usually ten years.



Professor's Note: There are several "capital" terms used throughout this reading. Committed capital is the amount of funds promised by investors to private equity funds. Paid-in capital is the amount of funds actually received from investors (also referred to as invested capital in this reading).

Example: Calculating carried interest with a hurdle rate

Suppose a fund has committed capital of \$100 million, carried interest of 20%, and a hurdle rate of 9%. The firm called 80% of its commitments in the beginning of Year 1. Of this, \$50 million was invested in Company A and \$30 million in Company B.

At the end of Year 2, a \$7 million profit is realized on the exit from Company A. The investment in Company B is unchanged. The carried interest is calculated on a deal-by-deal basis (i.e., the IRR for determining carried interest is calculated for each deal upon exit).

Determine the theoretical carried interest and the actual carried interest.

Answer:

The theoretical carried interest is: $20\% \times \$7,000,000 = \$1,400,000$.

The IRR for Company A is: $PV = -\$50$; $FV = \$57$; $N = 2$; $CPT I/Y \Rightarrow 6.8\%$.

Because the 6.8% IRR is less than the hurdle rate of 9%, no carried interest is actually paid.

Corporate Governance Terms of a Private Equity Fund

The corporate governance terms in the prospectus provide the legal arrangements for the control of the fund and include the following:

Key man clause: If a key named executive leaves the fund or does not spend a sufficient amount of time at the fund, the GP may be prohibited from making additional investments until another key executive is selected.

Performance disclosure and confidentiality: This specifies the fund performance information that can be disclosed. Note that the performance information for underlying portfolio companies is typically not disclosed.

Clawback: If a fund is profitable early in its life, the GP receives compensation from the GP's contractually defined share of profits. Under a clawback provision, if the fund subsequently underperforms, the GP is required to pay back a portion of the early profits to the LPs. The clawback provision is usually settled at termination of the fund but can also be settled annually (also known as true-up).

Distribution waterfall: This provision specifies the method in which profits will flow to the LPs and when the GP receives carried interest. Two methods are commonly used. In a deal-by-deal method, carried interest can be distributed after each individual deal. The disadvantage of this method from the LPs' perspective is that one deal could earn \$10 million and another could lose \$10 million, but the GP will receive carried interest on the first deal, even though the LPs have not earned an overall positive return.

In the total return method, carried interest is calculated on the entire portfolio. There are two variants of the total return method: (1) carried interest can be paid only after the entire *committed* capital is returned to LPs; or (2) carried interest can be paid when the value of the portfolio exceeds *invested* capital by some minimum amount (typically 20%). Notice that the former uses committed capital whereas the latter uses only the capital actually invested.

Tag-along, drag-along clauses: Anytime an acquirer acquires control of the company, they must extend the acquisition offer to all shareholders, including firm management.

No-fault divorce: This clause allows a GP to be fired if a supermajority (usually 75% or more) of the LPs agree to do so.

Removal for cause: This provision allows for the firing of the GP or the termination of a fund given sufficient cause (e.g., a material breach of fund prospectus).

Investment restrictions: These specify leverage limits, a minimum amount of diversification, etc.

Co-investment: This provision allows the LPs to invest in other funds of the GP at low or no management fees. This provides the GP another source of funds. The provision also prevents the GP from using capital from different funds to invest in the same portfolio company. A conflict of interest would arise if the GP takes capital from one fund to invest in a troubled company that had received capital earlier from another fund.

Example: Applying distribution waterfalls methods

Suppose a fund has committed capital of \$100 million and carried interest of 20%. An investment of \$40 million is made. Later in the year, the fund exits the investment and earns a profit of \$22 million.

Determine whether the GP receives any carried interest under the three distribution waterfall methods.

Answer:

In the deal-by-deal method, carried interest can be distributed after each individual deal, so carried interest of $20\% \times \$22,000,000 = \$4,400,000$ is paid to the GP.

In the total return method #1, carried interest can be paid only after the portfolio value exceeds *committed* capital. Committed capital is \$100 million and total proceeds from the exit are only \$62 million, so no carried interest is paid.

In the total return method #2, carried interest can be paid when the value of the portfolio exceeds *invested* capital by some minimum amount (typically 20%).

Invested capital plus the 20% threshold is: $\$40,000,000 \times 1.20 = \48 million.

The total proceeds from the exit are \$62 million, so carried interest of \$4,400,000 is paid to the GP.

Example: Applying clawback provision methods

Continuing with the previous example, suppose that in the second year, another investment of \$25 million is exited and results in a loss of \$4 million. Assume the deal-by-deal method and a clawback with annual true-up apply.

Determine whether the GP must return any former profits to the LPs.

Answer:

In the deal-by-deal method, the GP had received carried interest of \$4,400,000.

With a subsequent loss of \$4 million, the GP owes the LPs 20% of the loss:

$$20\% \times \$4,000,000 = \$800,000$$

NET ASSET VALUE (NAV)

Because there is no ready secondary market for private equity investments, they are difficult to value. In a prospectus, however, the valuation is related to the fund's net asset value (NAV), which is the value of fund assets minus liabilities.

Ways to Determine NAV

The assets are valued by the GP in one of six ways:

1. At cost, adjusting for subsequent financing and devaluation.
2. At the minimum of cost or market value.
3. By revaluing a portfolio company anytime there is new financing.
4. At cost, with no adjustment until exit.
5. By using a discount factor for restricted securities (e.g., those that can only be sold to qualified investors).
6. Less frequently, by applying illiquidity discounts to values based on those of comparable publicly traded companies.

Issues in Calculating NAV

There are several issues with calculating NAV for a private equity fund:

- First, if the NAV is only adjusted when there are subsequent rounds of financing, then the NAV will be more stale when financings are infrequent.
- Second, there is no definitive method for calculating NAV for a private equity fund because the market value of portfolio companies is usually not certain until exit.

- Third, undrawn LP capital commitments are not included in the NAV calculation but are essentially liabilities for the LP. The value of the commitments depends on the cash flows generated from them, but these are quite uncertain. When a GP has trouble raising funds, this implies that the value of these commitments is low.
- Fourth, the investor should be aware that funds with different strategies and maturities may use different valuation methodologies. In the early stages, a venture capital investment is typically valued at cost. In the later stages, a method based on comparables may be used. Mature funds may use market comparables for their investments that are near exit. Asset price bubbles would inflate the value of these companies.
- Finally, it is usually the GP who values the fund. LPs are increasingly using third parties to value private equity funds.

Due Diligence of Private Equity Fund Investments

Before investing, outside investors should conduct a thorough due diligence of a private equity fund due to the following characteristics:

- First, private equity funds have returns that tend to persist. Hence, a fund's past performance is useful information. In other words, outperformers tend to keep outperforming and underperformers tend to keep underperforming or go out of business.
- Second, the return discrepancy between outperformers and underperformers is very large and can be as much as 20%.
- Third, private equity investments are usually illiquid, long-term investments. The duration of a private equity investment, however, is usually shorter than expected because when a portfolio company is exited, the funds are immediately returned to the fund investors.

LOS 45.g: Explain risks and costs of investing in private equity.

Post-Investment Investor Expectations

Once an investment is made by a private equity firm, the outside investors in the private equity fund expect to be apprised of the firm's performance. The following material now takes the perspective of this outside investor.

There are two important differences between investing in public equity and in a private equity fund. First, funds are committed in the private investments and later drawn down as capital is invested in portfolio companies. In a public firm, the committed capital is usually immediately deployed. Second, the returns on a private equity investment typically follow a J-Curve pattern through time. Initially, returns are negative but then turn positive as portfolio companies are sold at exit.

Private equity investments are usually regulated such that they are only available to "qualified" investors, usually defined as institutions and wealthy individuals. These regulations exist because of the high risks associated with private equity investing, which are disclosed in the private equity prospectus.

Risks of Investing in Private Equity

Classifying private equity risks broadly, the categories of private equity risk are general private equity risk (discussed in the following), risks specific to the investment strategy, industry risks, risks specific to the investment vehicle, and any regional or country risk.

General Risk Factors

The general private equity risk factors are as follows:

Liquidity risk: Because private equity investments are not publicly traded, it may be difficult to liquidate a position.

Unquoted investments risk: Because private equity investments do not have a publicly quoted price, they may be riskier than publicly traded securities.

Competitive environment risk: The competition for finding reasonably-priced private equity investments may be high.

Agency risk: The managers of private equity portfolio companies may not act in the best interests of the private equity firm and investors.

Capital risk: Increases in business and financial risks may result in a withdrawal of capital. Additionally, portfolio companies may find that subsequent rounds of financing are difficult to obtain.

Regulatory risk: The portfolio companies' products and services may be adversely affected by government regulation.

Tax risk: The tax treatment of investment returns may change over time.

Valuation risk: The valuation of private equity investments reflects subjective, not independent, judgment.

Diversification risk: Private equity investments may be poorly diversified, so investors should diversify across investment development stage, vintage, and strategy of private equity funds.

Market risk: Private equity is subject to long-term changes in interest rates, exchange rates, and other market risks. Short-term changes are usually not significant risk factors.

Costs of Private Equity Investing

The costs of investing in private equity are significantly higher than that with publicly traded securities and include the following:

Transaction costs: These costs include those from due diligence, bank financing, legal fees from acquisitions, and sales transactions in portfolio companies.

Investment vehicle fund setup costs: The legal and other costs of setting up the fund are usually amortized over the life of the fund.

Administrative costs: These are charged on a yearly basis and include custodian, transfer agent, and accounting costs.

Audit costs: These are fixed and charged annually.

Management and performance costs: These are typically higher than that for other investments and are commonly 2% for the management fee and a 20% fee for performance.

Dilution costs: As discussed previously, additional rounds of financing and stock options granted to portfolio company management will result in dilution. This is also true for options issued to the private equity firm.

Placement fees: Placement agents who raise funds for private equity firms may charge up-front fees as much as 2% or annual trailer fees as a percent of funds raised through limited partners.



Professor's Note: A trailer fee is the compensation paid by the fund manager to the person selling the fund to investors.

LOS 45.h: Interpret and compare financial performance of private equity funds from the perspective of an investor.

INTERNAL RATE OF RETURN (IRR)

The return metric recommended for private equity by the Global Investment Performance Standards (GIPS) is the IRR. The IRR is a cash-weighted (money-weighted) return measure. Although the private equity fund portfolio companies are actually illiquid, IRR assumes intermediate cash flows are reinvested at the IRR. Therefore, the IRR calculation should be interpreted cautiously.

Gross IRR

The IRR can be calculated gross or net of fees. Gross IRR reflects the fund's ability to generate a return from portfolio companies and is the relevant measure for the cash flows between the fund and portfolio companies.

Net IRR

Net IRR can differ substantially from Gross IRR because it is net of management fees, carried interest, and other compensation to the GP. Net IRR is the relevant measure for the cash flows between the fund and LPs and is therefore the relevant return metric for the LPs.

MULTIPLES

Multiples are also used to evaluate fund performance. Multiples are a popular tool of LPs due to their simplicity, ease of use, and ability to differentiate between realized and unrealized returns. Multiples, however, ignore the time value of money.

Quantitative Measures

The more popular multiples and those specified by GIPS include the following:

PIC (paid-in capital). This is the capital utilized by the GP. It can be specified in percentage terms as the paid-in capital to date divided by the committed capital. Alternatively, it can be specified in absolute terms as the cumulative capital utilized or called down.

DPI (distributed to paid-in capital). This measures the LP's realized return and is the cumulative distributions paid to the LPs divided by the cumulative invested capital. It is net of management fees and carried interest. DPI is also referred to as the cash-on-cash return.

RVPI (residual value to paid-in capital). This measures the LP's unrealized return and is the value of the LP's holdings in the fund divided by the cumulative invested capital. It is net of management fees and carried interest.

TVPI (total value to paid-in capital). This measures the LP's realized and unrealized return and is the sum of DPI and RVPI. It is net of management fees and carried interest.

Qualitative Measures

In addition to quantitative analysis of the fund, the investor should also analyze qualitative aspects of the fund, including the following:

- The realized investments, with an evaluation of successes and failures.
- The unrealized investments, with an evaluation of exit horizons and potential problems.
- Cash flow projections at the fund and portfolio company level.
- Fund valuation, NAV, and financial statements.

As an example, consider a fund that was started before the financial market collapse of 2007. If the RVPI is large relative to the DPI, this indicates that the firm has not successfully harvested many of its investments and that the fund may have an extended J-curve (it is taking longer than realized to earn a positive return on its investments). The investor should carefully examine the GP's valuations of the remaining portfolio companies, potential write-offs, and whether the routes for future exit have dried up.

Benchmarks

The benchmarking of private equity investments can be challenging. Private equity funds vary substantially from one to another; so before performance evaluation is performed, the investor should have a good understanding of the fund's structures, terms, valuation, and the results of due diligence. Because there are cyclical trends in IRR returns, the Net IRR should be benchmarked against a peer group of comparable private equity funds of the same vintage and strategy.



Professor's Note: The vintage refers to the year the fund was set up.

Note also that the private equity IRR is cash flow weighted whereas most other asset class index returns are time weighted. One solution to this problem has been to convert publicly traded equity benchmark returns to cash weighted returns using the cash flow patterns of private equity funds. This method, however, has some significant limitations.

Example: Comparing the financial performance of private equity funds

Two private equity funds, Fund A and Fund B, are being considered by an investor.

Financial Performance of Private Equity Fund A and Fund B

	<i>Fund A</i>	<i>Fund B</i>
Gross IRR	22.1%	2.4%
Net IRR	17.6%	-0.3%
Performance quartile	1	3
DPI	1.43	0.29
RVPI	1.52	1.03
TVPI	2.95	1.32
Maturity of fund	6 years	4 years

Interpret and compare the financial performance of private equity funds A and B.

Answer:

Examining its DPI, Fund A has distributed \$1.43 in return for every dollar invested. Additionally, the RVPI implies that it will return \$1.52 as other investments are harvested. Its Gross IRR of 22.1% is attractive, and after fees, the Net IRR is 17.6%. The fund ranks in the first quartile in its peer group of the same strategy and vintage.

At four years, Fund B is a less mature fund than Fund A. Fund B's DPI is 0.29, indicating that the realized returns for the fund are not substantial. Unrealized returns (RVPI) indicate that its investments not yet harvested should provide an additional return. The low Gross and Net IRRs indicate that the firm may still be affected by the J-curve, where a fund experiences initial losses before experiencing later profits. Currently, the firm is lagging its peers, as it ranks in the third quartile.

Note that in this illustrative example, we compared two funds of different maturities. As noted, a fund should be benchmarked against peers of the same vintage.

LOS 45.i: Calculate management fees, carried interest, net asset value, distributed to paid in (DPI), residual value to paid in (RVPI), and total value to paid in (TVPI) of a private equity fund.

In this section, we calculate the quantitative measures previously discussed using an example.

Example: Calculating performance measures

The GP for private equity Fund C charges a management fee of 2% of paid-in-capital and carried interest of 20%, using the first total return method (i.e., carried interest is paid only when the value of the investment portfolio exceeds committed capital). The total committed capital for the fund was \$150 million. The statistics for years 2011–2016 are shown in the following table (in millions).

Cash Flows for Private Equity Fund C

	<i>Capital Called Down</i>	<i>Paid-in Capital</i>	<i>Management Fees</i>	<i>Operating Results</i>	<i>NAV before Distributions</i>	<i>Carried Interest</i>	<i>Distributions</i>	<i>NAV after Distributions</i>
2011	50	50	1.0	–10	39.0			39.0
2012	20	70	1.4	–25	32.6			32.6
2013	30	100	2.0	25	85.6			85.6
2014	20	120	2.4	50	153.2	0.6	20	132.6
2015	10	130	2.6	60	200.0	9.4	40	150.6
2016	10	140	2.8	110	267.8	13.6	80	174.2



Professor's Note: In the table, assume the capital called down, operating results, and distributions were given. The other statistics can be calculated.

Calculate the management fees, carried interest, NAV before distributions, NAV after distributions, distributed to paid in (DPI), residual value to paid in (RVPI), and total value to paid in (TVPI) of private equity Fund C.

Answer:

Paid-in capital: This is just the cumulative sum of the capital called down. For example, in 2012, it is the sum of the capital called down in 2011 and 2012: $\$50 + \$20 = \$70$.

Management fees: In each year, these are calculated as the percentage fee (here 2%) multiplied by the paid-in capital. For example, in 2012, it is $2\% \times \$70 = \1.4 .

Carried interest: Carried interest is not paid until the GP generates realized and unrealized returns (as reflected in the NAV before distributions) greater than the committed capital of \$150.

In 2014, the NAV before distributions exceeded the committed capital for the first time. In this first year, the carried interest is 20% multiplied by the NAV before distributions minus the committed capital: $20\% \times (\$153.2 - \$150) = \$0.6$.

In subsequent years, it is calculated using the increase in the NAV before distributions. For example, in 2015, it is: $20\% \times (\$200 - \$153.2) = \$9.4$.

NAV before distributions: These are calculated as:

$$= \text{NAV after distributions in prior year} + \text{capital called down} - \text{management fees} + \text{operating results}$$

For example in 2015, NAV before distributions is: $\$132.6 + \$10 - \$2.6 + \$60 = \$200$.

NAV after distributions: These are calculated as:

$$= \text{NAV before distributions} - \text{carried interest} - \text{distributions}$$

For example in 2015, NAV after distributions is: $\$200 - \$9.40 - \$40 = \150.60 .

For DPI, RVPI, and TVPI, we will calculate these as of the most recent year (2016):

DPI: The DPI multiple is calculated as the cumulative distributions divided by the paid-in capital: $(\$20 + \$40 + \$80) / \$140 = 1.0$. This indicates that, in terms of distributed returns, the fund has returned every dollar invested.

RVPI: The RVPI multiple is calculated as the NAV after distributions (i.e., the net non-distributed value of the fund) divided by the paid-in capital: $\$174.2 / \$140 = 1.24$. This indicates that, although the distributed returns are not impressive for this fund, the fund has unrealized profits that should accrue to the LPs as investments are harvested.

TVPI: The TVPI multiple is the sum of the DPI and RVPI: $1.0 + 1.24 = 2.24$. This indicates that on a realized and unrealized basis, the GP has more than doubled the investment of the LPs.

LOS 45.j: Calculate pre-money valuation, post-money valuation, ownership fraction, and price per share applying the venture capital method 1) with single and multiple financing rounds and 2) in terms of IRR.

Here, we describe the valuation of an investment in an existing company using the **venture capital (VC) method**.

At the time of a new investment in the company, the discounted present value of the estimated exit value, $PV(\text{exit value})$, is called the **post-money value** (after the investment is made). The value before the investment is made can be calculated as the post-money value minus the investment amount and is called the **pre-money value**.

$$\text{POST} = PV(\text{exit value})$$

$$\text{PRE} = \text{POST} - \text{INV}$$

In order to determine the number of new shares issued to the venture capital firm ($\text{shares}_{\text{VC}}$) for an investment in an existing company, we need to determine the fraction of the company value (after the investment is made) that the investment represents. Based on the expected future value of the company (exit value) and the expected or required rate of return on the investment, we can do this in either of two ways with the same result.

The fraction of VC ownership (f) for the VC investment can be computed as:

The first method (**NPV method**):

$$f = \frac{\text{INV}}{\text{POST}}$$

where:

INV = amount of new investment for the venture capital investment.

POST = post-money value after the investment.

$$\text{POST} = \frac{\text{exit value}}{(1+r)^n}$$

The second method (**IRR method**):

$$f = \frac{\text{FV}(\text{INV})}{\text{exit value}}$$

where:

FV(INV) = future value of the investment in round 1 at the expected exit date.

exit value = value of the company upon exit.

As long as the same compound rate is used to calculate the present value of the exit value and to calculate the future value of the VC investment, the fractional ownership required (f) is the same under either method.

Once we have calculated f , we can calculate the number of shares issued to the VC ($\text{shares}_{\text{VC}}$) based on the number of existing shares owned by the company founders prior to investment ($\text{shares}_{\text{Founders}}$).

$$\text{shares}_{\text{VC}} = \text{shares}_{\text{Founders}} \left(\frac{f}{1-f} \right)$$

The price per share at the time of the investment (price) is then simply the amount of the investment divided by the number of new shares issued.

$$\text{price} = \frac{\text{INV}}{\text{shares}_{\text{VC}}}$$

Example: Calculations using the NPV venture capital method and a single financing round

Ponder Technologies is a biotech company. Ponder's entrepreneur founders believe they can sell the company for \$40 million in five years. They need \$5 million in capital now, and the entrepreneurs currently hold 1 million shares.

The venture capital firm, VC Investors, decides that given the high risk of this company, a discount rate of 40% is appropriate.

Calculate the pre-money valuation, post-money valuation, ownership fraction, and price per share applying the NPV venture capital method with a single financing round.

Answer:

Step 1: The post-money (POST) valuation is the present value of the expected exit value (this assumes the investment was made in the company):

$$\text{POST} = \frac{40,000,000}{(1 + 0.40)^5} = 7,437,377$$

Step 2: The pre-money (PRE) valuation is what the company would hypothetically be worth without the investment:

$$\text{PRE} = 7,437,377 - 5,000,000 = 2,437,377$$

Step 3: To put \$5 million in a company worth \$7.4 million, the private equity firm must own 67.23% of the company:

$$f = \frac{5,000,000}{7,437,377} = 67.23\%$$

Note that under the IRR method, f is the same:

$$f = \frac{5 \text{ million}(1.40^5)}{40 \text{ million}} = 67.23\%$$

Step 4: If the entrepreneurs want 1 million shares, the private equity firm must get 2.05 million shares to get 67.23% ownership:

$$S_{\text{VC}} = 1,000,000 \left[\frac{0.6723}{(1 - 0.6723)} \right] = 2,051,572$$

Step 5: Given a \$5 million investment and 2.05 million shares, the stock price per share (P) must be:

$$P = \frac{5,000,000}{2,051,572} = \$2.44 \text{ per share}$$



Professor's Note: For the purpose of differentiating terms between multiple rounds of venture capital investment, we are using subscripts 1 and 2 in this section to denote first and second round, respectively. For multiple rounds of VC financing, we work backwards (from last round to first).

If there is a second round of VC financing (INV_2), we can calculate the new fractional ownership from the new investment (f_2) and the number of new shares required ($shares_{VC2}$) using the NPV method, as:

$$f_2 = \frac{INV_2}{POST_2}$$

Where $POST_2$ is the discounted present value of the company as of the time of the second financing round, its post-money value after the second round investment.

$$POST_2 = \frac{\text{exit value}}{(1 + r_2)^{n_2}}$$

and

$$PRE_2 = POST_2 - INV_2$$

$POST_1$ is the discounted present value of the company as of the time of the first financing round, its post-money value after the first round investment.

$$POST_1 = \frac{PRE_2}{(1 + r_1)^{n_1}}$$

As before, we can calculate the fractional ownership from the first round investment (f_1) using the NPV method, as:

$$f_1 = \frac{INV_1}{POST_1}$$

The new shares required to be issued to the VC in return for the first round financing amount (INV_1) and the price per share can then be calculated as:

$$\text{shares}_{VC1} = \text{shares}_{\text{Founders}} \left(\frac{f_1}{1 - f_1} \right)$$

$$\text{price}_1 = \frac{INV_1}{\text{shares}_{VC1}}$$

The new shares required to be issued to the VC in return for the second round financing amount (INV_2) and the price per share can also be calculated as:

$$\text{shares}_{VC2} = (\text{shares}_{VC1} + \text{shares}_{\text{Founders}}) \left(\frac{f_2}{1 - f_2} \right)$$

$$\text{price}_2 = \frac{INV_2}{\text{shares}_{VC2}}$$

If the second round of financing is considered less risky than the first round (since the company has survived longer), a different, lower discount rate may be used in calculating the PV of the exit value at the time of the second round of financing. In the following example, we use a discount rate of 30% in calculating the company's value to reflect this fact.

Example: Calculating shares issued and share price for a second round financing

Suppose that instead of a single round of financing of \$5 million, the company will need \$3 million in the first round and a second round of financing (three years later) of \$2 million to finance company expansion to the size expected at exit.

Use a discount rate of 40% for the first three years and 30% for the last two years. The company is still expected to be worth \$40 million after five years, and founders will hold 1 million shares.

The value of the company at the time of the second round of financing (two years remaining to exit) is:

$$\text{POST}_2 = \frac{\text{exit value}}{(1+r_2)^{n2}} = \frac{40,000,000}{(1.30)^2} = 23,668,639$$

The fractional VC ownership required for the second round investment of \$2 million is:

$$f_2 = \frac{\text{INV}_2}{\text{POST}_2} = \frac{2,000,000}{23,668,639} = 0.0845 \text{ or } 8.45\%$$

The value of the company before the second round financing would then be:

$$\text{PRE}_2 = \text{POST}_2 - \text{INV}_2 = 23,668,639 - 2,000,000 = 21,668,639$$

Value of the company at the first round of financing is:

$$\text{POST}_1 = \frac{\text{PRE}_2}{(1+r_1)^{n1}} = \frac{21,668,639}{(1.40)^3} = 7,896,734$$

The fractional VC ownership required for the first round investment of \$3 million is:

$$f_1 = \frac{\text{INV}_1}{\text{POST}_1} = \frac{3,000,000}{7,896,734} = 0.38 \text{ or } 38\%$$

Number of shares issued at the time of first round of financing is:

$$\text{shares}_{\text{VC1}} = \text{shares}_{\text{Founders}} \left(\frac{f_1}{1-f_1} \right) = 1,000,000 \left(\frac{0.38}{1-0.38} \right) = 612,903$$

The price per share at the time of first round of financing is:

$$\text{price}_1 = \frac{\text{INV}_1}{\text{shares}_{\text{VC1}}} = \frac{3,000,000}{612,903} = \$4.89$$

Number of shares issued to the VC firm at the time of the second round of financing is:

$$\begin{aligned} \text{shares}_{\text{VC2}} &= (\text{shares}_{\text{VC1}} + \text{shares}_{\text{Founders}}) \left(\frac{f_2}{1 - f_2} \right) \\ &= (612,903 + 1,000,000) \left(\frac{0.0845}{1 - 0.0845} \right) = 148,870 \end{aligned}$$

The price per share at the time of second round of financing is:

$$\text{price}_2 = \frac{\text{INV}_2}{\text{shares}_{\text{VC2}}} = \frac{2,000,000}{148,870} = \$13.43$$

After the second round, the first round investor's share dilutes from f_1 to $f_1(1 - f_2)$.

In this example, the dilution takes the investor's share from 38% to $0.38(1 - 0.0845) = 0.3479$ or 34.79%.

LOS 45.k: Demonstrate alternative methods to account for risk in venture capital.

Our previous discussions have been highly dependent on the assumptions, and sensitivity analysis should be used to determine how changes in the input variables will affect company valuation. The discount rate used and the estimate of terminal value will strongly influence the current valuation.

Projections by entrepreneurs are typically overly optimistic and based on an assumption that the company will not fail. Instead of arguing over the validity of the projections with the entrepreneurs, most investors simply apply a high discount rate that reflects both the probability of failure and lack of diversification available in these investments.

Adjusting the Discount Rate

One approach to arriving at a more realistic valuation is to adjust the discount rate to reflect the risk that the company may fail in any given year. In the following formula, r^* is adjusted for the probability of failure, q :

$$r^* = \frac{1 + r}{1 - q} - 1$$

where:

r = discount rate unadjusted for probability of failure

Example: Adjusting the discount rate for the probability of failure

Suppose that a private equity investor has a discount rate of 30%. The investor believes, however, that the entrepreneur's projection of the company's success is overly optimistic and that the chance of the company failing in a given year is 25%.

Calculate a discount rate that factors in the company's probability of failure.

Answer:

$$r^* = \frac{1 + 0.30}{1 - 0.25} - 1 = 73.33\%$$

Alternatively, the investor could have deflated each future cash flow for the cumulative probability that the company will fail. The adjusted discount rate approach is more straightforward.

Adjusting the Terminal Value Using Scenario Analysis

A second approach to generating a realistic valuation is to adjust the terminal value for the probability of failure or poor results. Typically to obtain the terminal value, the future earnings are estimated and multiplied by an industry multiple. The problem is that almost by definition, early-stage companies are innovative with few true comparables. Price multiples also fluctuate a great deal so that the current multiple may not be indicative of what can be obtained in the future. We should therefore use scenario analysis to calculate an expected terminal value, reflecting the probability of different terminal values under different assumptions.

In theory, we should just determine the present value of future cash flows to get the current value. But estimating future cash flows is subject to error, and this method may not be any better than a price multiple approach.

Example: Using scenario analysis to arrive at an expected terminal value

In the previous valuation example, we were given a terminal value of \$40 million. Assume that the scenario analysis is performed and examines three possible scenarios:

1. The expected earnings are \$4 million and the expected price-earnings multiple is 10, resulting in the \$40 million (as before).
2. The company is not as successful, and earnings are only \$2 million. Growth is slower, so the expected price-earnings multiple is 5. The expected terminal value is \$10 million.
3. The company fails, and its terminal value is \$0.

If each scenario is equally likely, each possible value is weighted by one-third, and the expected terminal value is:

$$= \frac{1}{3}(\$40) + \frac{1}{3}(\$10) + \frac{1}{3}(\$0) = \$16.7 \text{ million}$$

The terminal value of \$16.7 million is then used instead of the \$40 million in the valuation analysis above. This is an alternative to adjusting the discount rate for the probability of failure.

In summary, VC valuation is highly dependent on the assumptions used and how risk is accounted for. Additionally, scenario and sensitivity analysis should be used to determine how changes in the input variables will affect the valuation of the company.

Note that the purpose of the valuation procedures discussed here is not to ascertain the exact value of the company. Rather, the purpose is to place some bounds on the value of the company before negotiations begin between the startup (investee) company and the private equity firm. The final price paid for the investee company will also be affected by the bargaining power of the respective parties.

KEY CONCEPTS

LOS 45.a

The sources of value creation in private equity are: (1) the ability to reengineer the company, (2) the ability to obtain debt financing on more favorable terms, and (3) superior alignment of interests between management and private equity ownership.

LOS 45.b

Private equity firms use the following mechanisms to align their interests with those of the managers of portfolio companies:

- Manager's *compensation* tied to the company's performance.
- *Tag-along, drag-along* clauses ensure that anytime an acquirer acquires control of the company, they must extend the acquisition offer to all shareholders, including firm management.
- *Board representation* by private equity firm.
- *Noncompete clauses* required for company founders.
- *Priority in claims*. PE firms have priority if the portfolio company is liquidated.
- *Required approval* by PE firm for changes of strategic importance.
- *Earn-outs*. Acquisition price paid is tied to portfolio company's future performance.

LOS 45.c

Relative to buyouts, venture capital portfolio companies are characterized by: unpredictable cash flows and product demand; weak asset base and newer management teams; less debt; unclear risk and exit; high demand for cash and working capital; less opportunity to perform due diligence; higher returns from a few highly successful companies; limited capital market presence; company sales that take place due to relationships; smaller subsequent funding; and general partner revenue primarily in the form of carried interest.

LOS 45.d

<i>Valuation Issue</i>	<i>Buyout</i>	<i>Venture Capital</i>
Applicability of DCF Method	Frequently used to estimate value of equity	Less frequently used as cash flows are uncertain
Applicability of Relative Value Approach	Used to check the value from DCF analysis	Difficult to use because there may be no true comparable companies
Use of Debt	High	Low as equity is dominant form of financing
Key Drivers of Equity Return	Earnings growth, increase in multiple upon exit, and reduction in the debt	Pre-money valuation, investment, and subsequent equity dilution

LOS 45.e

The means and timing of the exit strongly influence the exit value.

The four typical exit routes:

- Initial public offerings usually result in the highest exit value due to increased liquidity, greater access to capital, and the potential to hire better quality managers.
- Secondary market sales to other investors or firms result in the second highest company valuations after IPOs.
- In an MBO, the company is sold to management, who utilize a large amount of leverage.
- A liquidation is pursued when the company is deemed no longer viable and usually results in a low exit value.

LOS 45.f

The most common form of ownership structure for private equity funds is the limited partnership where limited partners (LPs) provide funding and have limited liability. The general partner (GP) manages the investment fund.

The economic terms in a private equity prospectus address the following issues: management fees; transaction fees; carried interest (the GP's share of the fund profits); ratchet (the allocation of equity between stockholders and management of the portfolio company); hurdle rate (the IRR that the GP must meet before receiving carried interest); target fund size; vintage year; and term of the fund.

The corporate governance terms in the prospectus address the following issues: key man clause (the provisions for the absence of a key named executive); performance disclosure and confidentiality (specifies the fund performance information that can be disclosed); clawback (the provision for when the GP must return profits); distribution waterfall (the method in which profits will flow to the LPs before the GP receives carried interest); tag-along, drag-along clauses (give management the right to sell their equity stake if the private equity firm sells its stake); no-fault divorce (specify when a GP can be fired); removal for cause (provisions for the firing of the GP or the termination of a fund); investment restrictions; and co-investment (allows the LPs to invest in other funds of the GP at low or no management fees).

Valuations are difficult for private equity funds because there is no ready secondary market for their investments. Additional issues with NAV calculations include the following: (1) the NAV will be stale if it is only adjusted when there are subsequent rounds of financing; (2) there is no definitive method for calculating NAV; (3) undrawn LP capital commitments are not included in the NAV calculation but are essentially liabilities for the LP; (4) different strategies and maturities may use different valuation methodologies; and (5) it is the GP who usually values the fund.

Investors should conduct due diligence before investing in a private equity fund due to the persistence in returns in private equity fund returns, the return discrepancies between outperformers and underperformers, and their illiquidity.

LOS 45.g

The general private equity risk factors are liquidity risk, unquoted investments risk, competitive environment risk, agency risk, capital risk, regulatory risk, tax risk, valuation risk, diversification risk, and market risk.

The costs of investing in private equity are significantly higher than those associated with publicly traded securities and include transactions costs, investment vehicle fund setup costs, administrative costs, audit costs, management and performance fee costs, dilution costs, and placement fees.

LOS 45.h

The Gross IRR reflects the fund's ability to generate a return from portfolio companies. The Net IRR is the relevant return metric for the LPs and is net of management fees, carried interest, and other compensation to the GP. The Net IRR should be benchmarked against a peer group of comparable private equity funds of the same vintage and strategy.

LOS 45.i

The following statistics are important for evaluating the performance of a PE fund:

- Management fees are calculated as the percentage fee multiplied by the total paid-in capital.
- The carried interest is calculated as the percentage carried interest multiplied by the increase in the NAV before distributions.
 - ◆ The NAV before distributions is calculated as:

$$= \frac{\text{NAV after}}{\text{distributions in}} \text{ prior year} + \text{capital called down} - \text{management fees} + \text{operating results}$$

- ◆ The NAV after distributions is calculated as:

$$= \text{NAV before distributions} - \text{carried interest} - \text{distributions}$$

- The DPI multiple is the cumulative distributions divided by the paid-in capital.
- The RVPI multiple is the NAV after distributions divided by the paid-in capital.
- The TVPI multiple is the sum of the DPI and RVPI.

LOS 45.j

Under the NPV method, the proportion of the company (f) received for an investment in the company is calculated as the investment amount (INV) divided by the post-money (post-investment) value of the company. The post-money value of the company is calculated by discounting the estimated exit value for the company to its present value PV(exit value), as of the time the investment is made.

$$f = \frac{\text{INV}}{\text{POST}}$$

Alternatively, under the IRR method, we can calculate the fraction, f , as the future value of the VC investment at the time of exit (using the discount rate as a compound rate of return), divided by the value of the company at exit:

$$f = \frac{\text{FV}(\text{INV})}{\text{exit value}}$$

Once we have calculated this post-money ownership share, we can calculate the number of shares issued to the venture capital investor for the investment ($\text{shares}_{\text{VC}}$) and the price per share as:

$$\text{shares}_{\text{VC}} = \text{shares}_{\text{Founders}} \left(\frac{f}{1-f} \right)$$

$$\text{price} = \frac{\text{INV}}{\text{shares}_{\text{VC}}}$$

If there is a second round of financing, we first calculate the fraction of the company (f_2) purchased for the second round of financing as:

$$f_2 = \frac{\text{INV}_2}{\text{POST}_2}$$

where:

$$\text{POST}_2 = \frac{\text{exit value}}{(1+r_2)^{n_2}}$$

and

$$\text{PRE}_2 = \text{POST}_2 - \text{INV}_2$$

We then compute the fractional ownership from the first round of financing as:

$$f_1 = \frac{\text{INV}_1}{\text{POST}_1}$$

where:

$$\text{POST}_1 = \frac{\text{PRE}_2}{(1+r_1)^{n_1}}$$

We can finally compute the number of shares issued and price per share in each round as:

$$\text{shares}_{\text{VC1}} = \text{shares}_{\text{Founders}} \left(\frac{f_1}{1-f_1} \right)$$

$$\text{price}_1 = \frac{\text{INV}_1}{\text{shares}_{\text{VC1}}}$$

$$\text{shares}_{\text{VC2}} = (\text{shares}_{\text{VC1}} + \text{shares}_{\text{Founders}}) \left(\frac{f_2}{1-f_2} \right)$$

$$\text{price}_2 = \frac{\text{INV}_2}{\text{shares}_{\text{VC2}}}$$

LOS 45.k

The valuation of a venture capital investment is highly dependent on the assumptions used. The risk of the investment can be assessed using two methods.

- In the first approach, the discount rate is adjusted to reflect the risk that the company may fail in any given year:

$$r^* = \frac{1+r}{1-q} - 1$$

where:

r^* = discount rate adjusted for probability of failure

r = discount rate unadjusted for probability of failure

q = probability of failure in a year

- In the second approach, scenario analysis is used to calculate an expected terminal value, reflecting different values under different assumptions.

CONCEPT CHECKERS

1. Which of the following is *least likely* a source of value creation in private equity firms?
 - A. The use of debt with few covenants.
 - B. The overutilization of cheap equity financing in private equity firms.
 - C. The ability to reengineer companies through the use of an experienced staff of former senior managers.

2. Which of the following is *least likely* to be contained in a private equity term sheet?
 - A. Tag-along, drag-along clauses.
 - B. Earn-outs that ensure portfolio company manager compensation.
 - C. A clause that ensures private equity firm representation on the portfolio company board.

3. Which of the following is *more likely* to be associated with a venture capital investment as compared to a buyout investment?
 - A. Valuation using a discounted cash flow model.
 - B. High cash burn rate.
 - C. Due diligence covering all aspects of the business.

4. Which of the following is *most likely* to be a key driver for the equity return in a buyout opportunity?
 - A. The pre-money valuation.
 - B. The reduction in debt's claim on assets.
 - C. The potential subsequent equity dilution.

5. Which of the following exit routes typically results in the highest exit valuation?
 - A. An initial public offering.
 - B. A management buyout.
 - C. A secondary market sale.

6. Which of the following *best* describes the competitive environment risk of investing in private equity?
 - A. The competition for finding reasonably priced private equity investments may be high.
 - B. The competition for funds from private equity investors has increased as financial markets have fallen in activity.
 - C. The competitive environment in the product markets for portfolio companies has increased due to the economic slowdown.

7. Which of the following *best* describes the placement fee cost of investing in private equity?
 - A. The general partner may charge the fund fees for finding prospective portfolio companies.
 - B. Investment banking fees are paid when exiting a private equity portfolio company via an IPO.
 - C. Placement agents who raise funds for private equity firms may charge up-front or annual trailer fees.

8. What is the most typical organizational structure of a private equity investment?
- An S-corporation.
 - A limited partnership.
 - A sole proprietorship.
9. A private equity general partner has invested in portfolio Company A that has been funded by private equity Fund A. Portfolio Company A is experiencing financial difficulty, so the general partner uses funds from a newly formed private equity fund, Fund B, to assist the company. Which of the following terms in the private equity prospectus has the general partner *most likely* violated?
- The co-investment clause.
 - The no-fault divorce clause.
 - The tag-along, drag-along clause.
10. Using the information in the table below, which of the following firms *likely* has the best corporate governance system?
- Firm A.
 - Firm B.
 - Firm C.

	<i>Firm A</i>	<i>Firm B</i>	<i>Firm C</i>
Key Man Clause	Yes	Yes	No
Management Fees	1.5%	2.0%	2.3%
Transaction Fees	The split between LPs and GP is 50/50	The split between LPs and GP is 50/50	GP share is 100%
Carried Interest	25%	20%	22%
Hurdle Rate	10%	8%	9%
Clawback Provision	Yes	Yes	No
Distribution Waterfall	Total return	Total return	Deal-by-deal
Removal for Cause Clause	Yes	No	No

11. Which of the following *best* describes the method that most private equity funds use to incorporate undrawn capital commitments into NAV calculations?
- The GP uses public comparables to determine their value.
 - There is no straightforward method for calculating the value of the commitments.
 - The GP estimates the net present value of the capital commitments using the historical record of previous allocations to the portfolio companies.
12. Which of the following measures the limited partner's unrealized return in a private equity fund?
- The DPI.
 - The RVPI.
 - The TVPI.



Professor's Note: From this point on, this set of Concept Checkers contains several multi-part questions where questions "nest" on each other—meaning that you need the answer to one question to complete the next. It is unlikely you will encounter this situation on the exam. We recommend that after you complete a question, you check your answer to ensure that you begin the next question with the correct information.

Use the following information to answer Questions 13 through 21.

The GP for the private equity fund charges a management fee of 2% and carried interest of 20%, using the first total return method. The total committed capital for the fund was \$200 million. The figures in the table are in millions.

	<i>Capital Called Down</i>	<i>Paid-in Capital</i>	<i>Management Fees</i>	<i>Operating Results</i>	<i>NAV Before Distributions</i>	<i>Carried Interest</i>	<i>Distributions</i>	<i>NAV After Distributions</i>
2011	60	60	1.2	-15	43.8	?		43.8
2012	20	80	1.6	-20	42.2	?		42.2
2013	10	90	1.8	30	80.4	?		80.4
2014	20	110	2.2	50	148.2	?	30	118.2
2015	25	135	2.7	70	210.5	?	50	158.4
2016	10	?	?	120	?	?	90	?

13. What is the paid-in capital for 2016?
 - A. \$125.
 - B. \$142.
 - C. \$145.
14. What are the management fees for 2016?
 - A. \$2.7.
 - B. \$2.9.
 - C. \$15.4.
15. In what year is carried interest first paid?
 - A. 2014.
 - B. 2015.
 - C. 2016.
16. What is the NAV before distributions for 2016?
 - A. \$275.50.
 - B. \$285.50.
 - C. \$288.40.
17. What is the carried interest for 2016?
 - A. \$2.9.
 - B. \$15.0.
 - C. \$17.9.

18. What is the NAV after distributions for 2016?
 - A. \$180.50.
 - B. \$195.50.
 - C. \$270.50.
19. What is the DPI after 2016?
 - A. 0.62.
 - B. 0.83.
 - C. 1.17.
20. What is the RVPI after 2016?
 - A. 1.24.
 - B. 1.35.
 - C. 1.97.
21. What is the TVPI after 2016?
 - A. 1.76.
 - B. 2.41.
 - C. 3.14.

Use the following information to answer Questions 22 through 26.

ScaleIt is a startup specializing in mobile applications. The company's founders believe they can sell the company for \$50 million in four years. They need \$7 million in capital now, and the founders wish to hold 1 million shares. The venture capital investor firm decides that, given the high risk of this company, a discount rate of 45% is appropriate. Use the NPV venture capital method, assuming a single financing round.

22. What is the post-money valuation?
 - A. \$4,310,922.
 - B. \$11,310,922.
 - C. \$50,000,000.
23. What is the pre-money valuation?
 - A. \$4,310,922.
 - B. \$7,310,922.
 - C. \$43,000,000.
24. What is the ownership fraction for the venture capital firm?
 - A. 14.00%.
 - B. 38.11%.
 - C. 61.89%.
25. What is the number of shares for the venture capital firm?
 - A. 615,846.
 - B. 1,623,983.
 - C. 2,603,078.
26. What is the stock price per share?
 - A. \$2.69.
 - B. \$4.31.
 - C. \$11.37.

Use the following information to answer Questions 27 through 32.

A company's founders believe that their company can be sold for \$60 million in four years. The company needs \$6 million in capital now and \$3 million in three years. The entrepreneurs want to hold 1 million shares. The venture capital firm uses a discount rate of 50% over all four years.

27. What is the post-money valuation at the time of second-round financing?
 - A. \$17,777,778.
 - B. \$40,000,000.
 - C. \$57,000,000.
28. What is the post-money valuation at the time of first-round financing?
 - A. \$4,962,963.
 - B. \$9,851,259.
 - C. \$10,962,963.
29. What is the required fractional ownership for the second-round investors?
 - A. 5.00%.
 - B. 7.50%.
 - C. 16.88%.
30. What is the fractional ownership for the first-round investors, after dilution by the second-round investors?
 - A. 50.63%.
 - B. 54.73%.
 - C. 92.50%.
31. What is the stock price per share after the first round of financing?
 - A. \$4.96.
 - B. \$5.85.
 - C. \$6.00.
32. What is the stock price per share after the second round of financing?
 - A. \$5.77.
 - B. \$16.75.
 - C. \$37.00.

Use the following information to answer Questions 33 through 36.

The venture capital company's founders believe they can sell the company for \$70 million in five years. They need \$9 million in capital now, and the entrepreneurs wish to hold 1 million shares. The venture capital investor requires a return of 35%. Use the IRR venture capital method, assuming a single financing round.

33. What is the investor's ownership fraction?
 - A. 12.86%.
 - B. 42.35%.
 - C. 57.65%.

34. What is the stock price per share?
- A. \$2.39.
 - B. \$6.61.
 - C. \$12.25.
35. What is the post-money valuation?
- A. \$6.61 million.
 - B. \$15.61 million.
 - C. \$70.00 million.
36. What is the pre-money valuation?
- A. \$6.61 million.
 - B. \$9.00 million.
 - C. \$61.00 million.
37. A private equity investor has a discount rate of 30%. The investor believes, however, that the entrepreneur's projection of the company's success is overly optimistic and that the chance of the company failing in a given year is 20%. What is the discount rate that factors in the company's probability of failure?
- A. 50.0%.
 - B. 62.5%.
 - C. 71.4%.

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ANSWERS – CONCEPT CHECKERS

1. **B** It is actually the overutilization of cheap *debt* financing in private equity firms that leads to value creation. Private equity firms carry more debt than public firms but have a reputation for paying it back.
2. **B** Earn-outs do not ensure portfolio company manager compensation. Earn-outs tie the acquisition price paid by private equity firms to the portfolio company's future performance. These are used predominantly in venture capital investments.
3. **B** Venture capital investments typically have significant cash burn rates. Discounted cash flow analysis is typically used for companies with substantial operating history and is, therefore, more likely to be associated with a buyout investment rather than a venture capital investment. Full due diligence is conducted for a buyout investment. Due diligence for typical venture capital investment is limited to technological feasibility and commercial potential due to limited operating results history.
4. **B** The pre-money valuation, investment, and potential subsequent equity dilution are issues for venture capital equity return. The key drivers of equity return for buyouts are earnings growth, the increase in multiple upon exit, and the reduction in the debt.
5. **A** Initial public offerings usually result in the highest exit value due to increased liquidity, greater access to capital, and the potential to hire better-quality managers.
6. **A** Competitive environment risk examines risk from the perspective of an investor who is considering an investment in private equity. It refers to the fact that the competition for finding reasonably priced private equity investments may be high.
7. **C** Placement fees are those charged by placement agents who raise funds for private equity firms. They may charge up-front fees as much as 2% or annual trailer fees as a percent of funds raised from limited partners.
8. **B** The most typical organizational structure of a private equity investment is a limited partnership. In a limited partnership, the limited partners provide funding and have limited liability. The general partner manages the investment fund.
9. **A** The clause in the private equity prospectus that the general partner has likely violated is the co-investment clause. The co-investment clause prevents the GP from using capital from different funds to invest in the same portfolio company. A conflict of interest arises here because portfolio Company A may be a poor use of the funds from Fund B investors.
10. **A** Firm A likely has the best corporate governance system. A large amount of the GP's compensation comes in the form of incentive-based compensation as the carried interest and hurdle rate necessary to obtain carried interest is the highest, but the compensation unrelated to performance (the management and transactions fees are the lowest). The clawback provision also incentivizes the GP because they have to return previously received profits.

Furthermore, the key man clause and the removal for cause clause give the LPs the right to dismiss an underperforming GP. The total return distribution waterfall method is used instead of the deal-by-deal method, in which the GP can receive carried interest even in cases when the LPs have not earned a net positive return.

11. **B** There is no straightforward method for calculating the value of the commitments, which are essentially liabilities for the LP. The value of the commitments depends on the cash flows generated from them, but these are quite uncertain.
12. **B** The RVPI (residual value to paid-in capital) measures the limited partner's unrealized return in a private equity fund. It is the value of the LP's holdings in the fund divided by the cumulative invested capital. It is net of management fees and carried interest. The DPI (distributed to paid-in capital) measures the LP's realized return, and the TVPI (total value to paid-in capital) measures both the LP's realized and unrealized return.
13. **C** This is the cumulative sum of the capital called down, and in 2016 is:
 $\$135 + \$10 = \$145$.
14. **B** These are calculated as the percentage fee of 2% times the paid-in capital:
 $2\% \times \$145 = \2.9 .
15. **B** Carried interest is not paid until the NAV before distributions exceeds the committed capital of \$200 million, which is the year 2015.
16. **B** NAV before distributions is calculated as:

$$= \frac{\text{NAV after}}{\text{distributions in}} \text{ prior year} + \text{capital called down} - \text{management fees} + \text{operating results}$$

For 2016, NAV before distributions is: $\$158.4 + \$10 - \$2.9 + \$120 = \$285.50$.

17. **B** It is calculated as the percentage carried interest times the increase in the NAV before distributions. In 2016, it is: $20\% \times (\$285.50 - \$210.50) = \$15.00$.
18. **A** NAV after distributions is calculated as:

$$= \text{NAV before distributions} - \text{carried interest} - \text{distributions}$$

In 2016, NAV after distributions is: $\$285.50 - \$15.00 - \$90 = \180.50 .

19. **C** The DPI multiple is calculated as the cumulative distributions divided by the paid-in capital: $(\$30 + \$50 + \$90) / \$145 = 1.17$. The GP has distributed more than the paid-in capital.
20. **A** The RVPI multiple is calculated as the NAV after distributions divided by the paid-in capital: $(\$180.50) / \$145 = 1.24$. The net unrealized returns are more than the paid-in capital.
21. **B** The TVPI multiple is the sum of the DPI and RVPI: $1.17 + 1.24 = 2.41$.
22. **B** The post-money valuation is the present value of the expected exit value:

$$\text{POST} = \frac{50,000,000}{(1 + 0.45)^4} = 11,310,922$$

23. **A** The pre-money valuation is what the company is worth before the investment:

$$\text{PRE} = 11,310,922 - 7,000,000 = 4,310,922$$

24. C To put up \$7 million in a company worth \$11.3 million, the venture capital firm must own 61.89% of the company:

$$f = \frac{7,000,000}{11,310,922} = 61.89\%$$

25. B If the entrepreneurs want 1 million shares, the venture capital firm must receive 1.6 million shares to get 61.89% ownership:

$$\text{Shares}_{\text{VC}} = 1,000,000 \left[\frac{0.6189}{(1 - 0.6189)} \right] = 1,623,983$$

26. B Given a \$7 million investment and 1.6 million shares, the stock price per share must be:

$$P = \frac{7,000,000}{1,623,983} = \$4.31 \text{ per share}$$

27. B Discount the terminal value of the company at exit back to the time of second round financing to obtain the post-money (POST₂) valuation:

$$\text{POST}_2 = \frac{60,000,000}{(1 + 0.5000)} = \$40,000,000$$

28. C First, calculate the second-round pre-money (PRE₂) valuation by netting the second-round investment (INV₂) from the post-money (POST₂) valuation:

$$\text{PRE}_2 = 40,000,000 - 3,000,000 = \$37,000,000$$

Next, discount the second-round pre-money valuation back to the time of the first-round financing to obtain the post-money (POST₁) valuation:

$$\text{POST}_1 = \frac{37,000,000}{(1 + 0.50)^3} = \$10,962,963$$

29. B The required fractional ownership for the second-round investors is:

$$f_2 = \frac{3,000,000}{40,000,000} = 7.50\%$$

30. A The required fractional ownership for the first-round investors is:

$$f_1 = \frac{6,000,000}{10,962,963} = 54.73\%$$

The first round investors will be later diluted by the second round investors to an ownership of: $54.73\% \times (1 - 0.0750) = 50.63\%$.

31. **A** First determine the number of shares the first-round venture capital investors ($\text{Shares}_{\text{VC1}}$) need to obtain their fractional ownership:

$$\text{Share}_{\text{VC1}} = 1,000,000 \left[\frac{0.5473}{(1 - 0.5473)} \right] = 1,208,968$$

To obtain a 54.73% share of the company, the first-round investors must receive 1,208,968 shares.

Next, determine the stock price per share after the first round of financing (P_1):

$$P_1 = \frac{6,000,000}{1,208,968} = \$4.96$$

32. **B** First determine the number of shares the second-round venture capital investors ($\text{Shares}_{\text{VC2}}$) need to obtain their fractional ownership:

$$\text{Shares}_{\text{VC2}} = (1,000,000 + 1,208,968) \left[\frac{0.0750}{(1 - 0.0750)} \right] = 179,106$$

To obtain a 7.50% share of the company, the second-round investors must receive 179,106 shares.

Next, determine the stock price per share after the second round of financing (P_2):

$$P_2 = \frac{3,000,000}{179,106} = \$16.75$$

33. **C** First, calculate the investor's expected future wealth (W):

$$W = 9,000,000 \times (1 + 0.35)^5 = 40,356,301$$

Given this expected wealth, we determine the required fractional ownership (f) by calculating how much of the terminal value should be the investor's:

$$f = \frac{40,356,301}{70,000,000} = 57.65\%$$

34. **B** First, determine the number of shares the venture capital firm ($\text{Shares}_{\text{VC}}$) requires for its fractional ownership:

$$\text{Shares}_{\text{VC}} = 1,000,000 \left[\frac{0.5765}{(1 - 0.5765)} \right] = 1,361,275$$

Next, determine the stock price per share (P):

$$P = \frac{9,000,000}{1,361,275} = \$6.61$$

35. **B** Divide the investment by the fractional ownership to obtain the post-money (POST) valuation:

$$\text{POST} = \frac{9,000,000}{0.5765} = 15.61 \text{ million}$$

36. **A** Determine the pre-money (PRE) valuation by netting the investment (INV) from the post-money (POST) valuation:

$$\text{PRE} = 15.61 \text{ million} - 9 \text{ million} = 6.61 \text{ million}$$

37. **B** The discount rate that factors in the company's probability of failure is calculated as:

$$r^* = \frac{1+r}{1-q} - 1$$

$$r^* = \frac{1+0.30}{1-0.20} - 1 = 62.5\%$$

COMMODITY AND COMMODITY DERIVATIVES: AN INTRODUCTION

Study Session 15

EXAM FOCUS

This topic review will help you understand different commodity sectors and key factors influencing prices in those sectors. Pay special attention to what backwardation and contango mean in terms of spot and futures prices. You should understand the different components of returns to commodity futures and what determines whether roll return is positive or negative. Finally, familiarize yourself with the insurance perspective, the hedging pressure hypothesis, and the theory of storage and what they say about futures prices.

LOS 46.a: Compare characteristics of commodity sectors.

Commodities can be classified by their characteristics into sectors, including:

- Energy—crude oil, natural gas, and refined petroleum products.
- Industrial metals—aluminum, nickel, zinc, lead, tin, iron, and copper.
- Grains—wheat, corn, soybeans, and rice.
- Livestock—hogs, sheep, cattle, and poultry.
- Precious metals—gold, silver, and platinum.
- Softs (cash crops)—coffee, sugar, cocoa, and cotton.

The factors that influence supply and demand and the nature of production differ for these sectors. A summary of these differences can help explain the differences in price dynamics among the sectors.

The **energy sector** comprises crude oil, natural gas, and refined products. It is the sector with the greatest market value and is a very important source of revenue to many countries and regions.

Crude oil from different regions has different characteristics. Light oil (high viscosity) and sweet oil (low sulfur content) are less costly to refine and, therefore, sell at a premium relative to heavier or higher sulfur crude oils. Crude oil can be stored indefinitely by keeping it in the ground and is also stored in tanks and aboard tanker ships. Many countries store large amounts of crude oil as strategic reserves.

The supply of crude oil has been augmented by advances in drilling and extraction technology, especially in the 21st century. While global economic growth is an important driver of worldwide demand for oil, other factors have slowed this growth

in demand. Improvements in refining technology have tended to increase the output of petroleum distillates from each barrel of crude oil, and improved engines are able to produce more work from each gallon of these distillates.

Economic cycles also affect the demand for oil, which is higher during expansions when credit is widely available and can decrease sharply when contractions lead to reductions in the availability of credit.

Improvements in the efficiency of alternative sources of energy production have also reduced the overall growth in the demand for oil. Increasingly stringent restrictions on oil exploration and production in response to environmental concerns have tended to increase the cost of oil production and decrease supply.

Political risk is an important factor in oil supply. Over half the crude oil supply comes from countries in the Middle East, and conflict there can reduce supply dramatically.

Refined products, such as gasoline, heating oil, and jet fuel, are only stored for short periods. Refinery output is the relevant supply consideration. The geographic concentration of refinery capacity means that extreme weather in some coastal regions can significantly affect the supply of refined products.

Seasonal factors affect the demand for refined products in that greater vacation travel in the summer months increases gasoline demand, and colder weather in the winter increases the demand for heating oil.

Unlike crude oil, **natural gas** can be used just as it comes out of the ground with very little processing. Transportation costs play an important role in energy pricing. Crude oil can be transported at a relatively low cost on ships, while natural gas must be cooled to its liquid state to be transported by ship, significantly increasing the cost of transport.

The supply of *associated gas*—gas produced in conjunction with the extraction of crude oil—is tied to the production of crude oil. *Unassociated gas* is produced from formations where oil is not present so that its supply is not tied to the demand for and production of crude oil.

Worldwide demand and supply for gas depends on many of the same factors as supply and demand for crude oil, but seasonality due to weather is more pronounced. Cold winters increase the demand for gas for heating fuel. Hot summers increase the demand for gas as well (for cooling) because gas is a primary source of fuel for electrical power generation.

Demand for **industrial metals** is primarily tied to GDP growth and business cycles because these metals are used extensively in construction and manufacturing. Storage of metals is not costly.

Political factors, especially union strikes and restrictive environmental regulations, can have a significant effect on the supply of an industrial metal. Industrial metals must be smelted from mined ore. Both mines and smelters are large-scale operations with high development costs and high fixed costs.

Grains are grown over an annual cycle and stored, although multiple crops in a single year are possible in some areas. The risks to grain supply are the usual: droughts, hail, floods, pests, diseases, changes in climate, and so on. It would be difficult to overstate the importance of grains in feeding the world's population, especially given the potential for political instability when grain stocks are insufficient.

Precious metals are used in electronics and for jewelry and can be stored indefinitely. Gold has long been used as a store of value and has provided a hedge against the inflation risk of holding currency. Jewelry demand is high where wealth is being accumulated. Industrial demand for precious metals is sensitive to business cycles.

Livestock supply depends on the price of grain, which is the primary input in its production. When increasing grain prices increase the cost of feeding livestock, the rate of slaughter also increases, which leads to a decrease in price. Such a drawdown in population can result in subsequent increases in price over time.

Weather can affect the production of some animals. Disease is a source of significant risk to livestock producers, and some diseases have had a large impact on market prices.

Income growth in developing economies is an important source of growth in demand for livestock. Freezing allows the storage of meat products for a limited amount of time.

Softs refers to cotton, coffee, sugar, and cocoa, which are all grown in the warmer climates of the lower latitudes. Just as with grains, weather is the primary factor in determining production and price, but disease is a significant risk as well. Demand increases with increases in incomes in developing economies but is dependent on consumer tastes as well.

LOS 46.b: Compare the life cycle of commodity sectors from production through trading or consumption.

The life cycle of crude oil begins with the time it takes to drill a well and extract the crude. After being transported, crude oil is typically stored for no more than a few months. The next step is refining the crude oil into various fuels such as gasoline, heating oil, diesel oil, and jet fuel. These fuels must then be transported to the consumer.

Natural gas requires minimal processing after it is extracted. While natural gas often reaches the consumer through a pipeline, it can be cooled to liquid form and transported on specially constructed ships. Energy commodities are delivered year-round, but demand is seasonal to some extent.

The life cycle of industrial metals is straightforward: the extracted ore is smelted into the quality of metal that end users need. Industrial metals can be stored indefinitely in most cases, and the regular flow of output means that end users can meet their needs with monthly deliverable futures contracts.

A key characteristic of industrial metals production is economies of scale due to large, efficient mining and smelting operations. The large size projects required for efficient operation cost billions of dollars and take significant time to construct. Construction of new capacity or facilities when capacity utilization and earnings are high can result in the additional capacity coming online at or past the peak of the economic cycle. Mining and smelting operations are most efficient running near their capacity, so individual producers are hesitant to decrease production when prices fall because the peak of the economic cycle has passed or because facilities growth has created excess capacity in the industry.

Livestock production times vary with animal size, with chickens ready for slaughter after only weeks, hogs in about six months, and cattle after a few years. Freezing allows storage for some period after slaughter and allows international trade in livestock. Livestock production has a significant seasonal component.

Grain production is seasonal, so deliverable futures contracts are available on dates to coincide with the harvest. Because planting occurs five months or more before harvest, quantities harvested are set largely by expectations for demand when crops are planted. Grains can be stored for significant time periods after harvest. The six-month offset to harvest times in the northern and southern hemispheres brings crops to markets more frequently.

Production cycles and storage options for softs vary by product. Among softs, coffee offers an example of an agricultural commodity that is harvested somewhere around the world in almost every month. Coffee is stored in warehouses after transport by ship. Local coffee roasters then roast the beans and deliver to end users or to retail sales outlets. Coffee plants can take up to four years to produce the fruit that will become coffee beans, so there is a significant lag between investment in new capacity and increases in supply.

To hedge their price risk, coffee producers can sell in the futures market for delivery to a warehouse, and consumer companies can buy in the futures market and take delivery at the warehouse. Two different types of coffee beans are traded, robusta and arabica, with arabica being the premium product.

LOS 46.c: Contrast the valuation of commodities with the valuation of equities and bonds.

Unlike stocks and bonds, commodities are physical assets, have no cash flows, and may incur storage and transportation costs.

Stocks and bonds (financial assets) can be valued by calculating the present value of their expected future cash flows (e.g., dividends, interest, etc.). Commodities produce no earnings or cash flows; however, the current (spot) price of a commodity can be viewed as the discounted value of the expected selling price at some future date. Storage costs for commodities can lead to forward prices that are higher the further the forward settlement date is in the future.

LOS 46.d: Describe types of participants in commodity futures markets.

Participants in commodity futures markets can be categorized as hedgers, traders and investors, exchanges, analysts, and regulators.

Traders and investors in the commodities market can be classified as informed investors—those who provide liquidity to the markets—and arbitrageurs. **Hedgers** are considered informed investors because they either produce or use the commodity. Hedgers reduce their risk by buying (going long) or selling (going short) futures contracts. A corn farmer can reduce the uncertainty about the price she will receive for her corn by selling corn futures. A cattle producer, however, would hedge his price risk by buying corn futures to reduce his uncertainty about the cost of feed for the cattle.



Professor's Note: Hedgers are said to “do in the futures market what they must do in the future.” A wheat farmer will need to sell wheat in the future (i.e., after the harvest) and can hedge price risk by selling futures contracts. A grain miller will need to buy wheat in the future and can hedge price risk by buying futures contracts.

Speculators take on commodity risk in futures markets and may act as informed investors, seeking to exploit an information or information processing advantage to profit from trading with hedgers. Speculators can also earn profits by providing liquidity to markets: buying futures when short hedgers (commodity producers) are selling and selling futures when long hedgers (commodity users) are buying.

Arbitrageurs in the commodity markets are often those in the business of buying, selling, and storing the physical commodities when the difference between spot and futures prices is too large or too small based on the actual cost of storing the commodity. When the difference is too large, an arbitrageur can buy and store the commodity and sell it at its (too high) futures price. When the difference is too small, an arbitrageur can effectively “not store” the commodity by selling from his own inventory and going long futures, replacing the inventory at the future date.

Commodity exchanges operate in many of the world's financial centers to reflect the worldwide production and consumption of commodities as well as the globalization of financial markets in general. Investors can trade commodity futures on a smart phone or via a Bloomberg terminal.

Commodity market analysts, considered nonmarket participants, use market information to perform analytical work for various entities including governments, universities, economic forecasters, and commercial data analysis firms.

Various **commodity regulators** are responsible for the regulation of commodities markets around the world. In the U.S., the Commodities Futures Trading Commission (CFTC) is responsible for market regulation.

LOS 46.e: Analyze the relationship between spot prices and expected futures prices in markets in contango and markets in backwardation.

The difference between the spot (cash) market price and the futures price for a date in the future is referred to as the **basis** of that particular contract. The basis is calculated as the spot price minus the futures price and can be positive or negative. The difference between the futures price of a more distant maturity and the futures price of a nearer maturity is known as the **calendar spread**.

When futures prices are higher at dates further in the future, the futures market (or futures curve) is said to be in **contango**. In a contango market, the calendar spread and basis are negative. Conversely, if futures prices are lower at dates further in the future, the market is said to be in **backwardation**, and the basis and calendar spread are positive.

When a futures market is in backwardation, long futures positions have a positive returns component (the “roll return,” which we will describe later in this topic review). With a futures curve in backwardation, futures prices are lower than spot prices for the commodity. Since futures prices converge to spot prices over the term of a futures contract, there is a positive returns component from the passage of time.

When a futures market is in contango, so that futures prices are greater than spot prices, there is a negative returns component for long futures positions. As time passes, convergence of futures prices to spot prices (or longer-dated futures prices to nearer-term futures prices) results in a decrease in the value of a long futures position.

LOS 46.f: Compare theories of commodity futures returns.

Three theories of the determinants of returns on commodities, based on the shape of the futures curve, have been expounded: the insurance theory, the hedging pressure hypothesis, and the theory of storage.

Economist John Maynard Keynes put forward the **insurance theory** of futures returns, which states that the desire of commodity producers to reduce their price risk drives commodity futures returns. Producers face uncertainty about the price they will receive for their output and reduce this uncertainty by selling futures contracts. This selling drives down futures prices. The insurance theory states that the futures prices will be less than current spot prices to provide a return to those buying futures from producers (i.e., speculators). In this view, the resulting positive return to the buyers of futures contracts is their return for providing insurance against price uncertainty to producers. Keynes contended that this results in backwardation “normally,” and the situation was termed “normal backwardation” based on this theory.

The insurance theory was found to be lacking based on two empirical findings. The first finding is that for markets in backwardation, buying futures has not resulted in the extra returns the theory says buyers should receive for providing “insurance.” The second

finding is that many markets are not in backwardation but are in contango (future prices higher than spot prices), which would imply a negative return for providing insurance to producers.

The **hedging pressure hypothesis** added the hedging behavior of commodity consumers to the insurance theory in an attempt to better explain observed futures returns. Just as a wheat farmer faces uncertainty about the price at which he will sell his wheat in the future, a baking company faces uncertainty about the price it will pay for flour in the future. To hedge its price risk, the baking company will go long wheat futures. The more commodity users hedge with long positions (buying futures), the more upward price pressure there is on the futures price. Under the hedging pressure theory, when producers' hedging behavior dominates, the market will be in backwardation, and when users' hedging behavior dominates, the market will be in contango.

Despite the intuitive appeal of the hedging pressure hypothesis, it has some shortcomings. Producers typically face more concentrated price risk than consumers. Individual consumers will spend only a small portion of their income on a single commodity, and for commercial users of the commodity, the actual cost of the commodity may represent only a small portion of the total cost of the production.

Additionally, both producers and consumers may be speculators in the market, not just hedgers. Another problem with the hedging pressure hypothesis is that hedging pressure is not observable, so we cannot directly test the hypothesis that relative hedging pressure is the cause of backwardation and contango.

The **theory of storage** is based on the idea that whether a futures market is in backwardation or contango depends on the relationship between the costs of storing the commodity for future use and the benefits of holding physical inventory of the commodity. When the costs of storage outweigh the benefits of holding physical inventory, futures are more attractive than current inventory, futures will trade at a higher price than spot, and the market will be in contango. Conversely, when the benefits of holding physical inventory outweigh the costs of storage, current possession is more attractive than future possession, spot prices are higher than futures prices, and the market will be in backwardation.

The benefits of having physical inventory available are referred to as a commodity's **convenience yield**. When physical stocks are low and there is a high probability that the commodity will be in short supply, the benefits of holding physical stock (and the convenience yield) are higher.

The theory of storage takes both the costs and benefits of holding a commodity into account in the following relation:

$$\text{Futures price} = \text{Spot price} + \text{Storage costs} - \text{Convenience yield}$$

Relative to spot prices, futures prices are higher when storage costs are higher, and futures prices are lower when the convenience yield is higher. Further, we can say that the shape of the futures price curve depends on available supply (i.e., current inventory of the commodity) along with expected future supply and demand.

Even with these three theories, we are left without a complete theory of commodity futures returns. “Hedging pressure” and “convenience yield” are not observable, and storage costs are not readily disclosed by participant firms.

LOS 46.g: Describe, calculate, and interpret the components of total return for a fully collateralized commodity futures contract.

An investor who desires long exposure to a commodity price will typically achieve this exposure through a derivative investment in forwards or futures. Some physical commodities cannot be effectively purchased and stored long term, and for others, such as precious metals, derivative positions may be a more efficient means of gaining long exposure than purchasing the commodities outright and storing them long term.

The return on a derivatives position is not the same as the return on a commodity itself. The total return on a fully collateralized long futures position has three components: collateral return, price return, and roll return.

To take a position in futures, an investor must post collateral. When a futures portfolio is *fully collateralized*, the investor has posted cash or acceptable securities with a value equal to the notional value (price multiplied by contract size) of the futures contracts in the portfolio. If U.S. Treasury bills are deposited as collateral, the **collateral return** or **collateral yield** is simply the holding period yield on the T-bills.

The **price return** or **spot yield** on an investment in commodity futures is the change in spot prices (which can be proxied by futures prices on near-month contracts).

$$\text{Price return} = (\text{current price} - \text{previous price}) / \text{previous price}$$

Since commodity derivative contracts expire, an investor who wants to maintain a position over time must close out the expiring futures position and reestablish a new position with a settlement date further in the future. This process is referred to as *rolling over* the position and leads to gains or losses which are termed the **roll return** or **roll yield**. The roll return can be positive if the futures price curve is in backwardation or negative if the futures price curve is in contango.

To hold the value of a long position constant, an investor must buy more contracts if the new longer-dated futures are trading at a lower price (market in backwardation) and buy fewer contracts if the new longer-dated futures are trading at a higher price (market in contango). In any event, the roll return on the contracts traded can be calculated as:

$$\text{roll return} = \frac{\text{price of expiring futures contract} - \text{price of new futures contract}}{\text{price of expiring futures contract}}$$

Roll return has a relatively small impact on overall returns on commodity futures over the short term but can have a meaningful impact over longer periods.

LOS 46.h: Contrast roll return in markets in contango and markets in backwardation.

Consider a situation where the manager of a portfolio of commodity futures contracts is rolling over July corn futures trading at 397 (cents per bushel) into November corn futures trading at 406. The roll return is:

$$\frac{397 - 406}{397} = -2.27\%$$

With the corn futures market in contango, the roll return is negative.

Now consider a situation where the manager is rolling over July natural gas futures trading at 2.35 (dollars per million cubic feet) into August futures trading at 2.22. In this case the roll return is:

$$\frac{2.35 - 2.22}{2.35} = 5.53\%$$

Suppose we wanted a specific dollar exposure to natural gas, say \$10,000. We would have originally gone long $10,000 / 2.35$, or approximately 4,255 contracts. To maintain the dollar exposure upon rolling over into new contracts, we would have gone long $10,000 / 2.22$, or approximately 4,504 contracts. Hence, when the contract is in backwardation, the roll return is positive and results in a larger number of long contracts upon rolling over.

If natural gas exposure is 8.5% of the manager's portfolio, we can calculate the **net roll return** for the portfolio as $0.085 \times 5.53\% = 0.47\%$.

LOS 46.i: Describe how commodity swaps are used to obtain or modify exposure to commodities.

Swaps can be used to increase or decrease exposure to commodities risk. Swaps are customized instruments created and sold by dealers, who may take on the risk of their swap exposure or hedge their exposure by entering into an offsetting swap contract (in which they have the opposite exposure to the risk factor) or by holding the physical commodity.

Swaps are created for which the payments between the two parties are based on various risk factors such as the excess returns on a commodity, the total return on the commodity, or a measure of price volatility.

In a **total return swap**, the swap buyer (the long) will receive periodic payments based on the change in the price of a commodity, in return for a series of fixed payments. Each period, the long will receive the total return on holding the commodity times a notional

principal amount, net of the payment promised to the short. If the total return is negative, the long makes the promised fixed payment percentage *plus* the negative return percentage on the commodity over the period, times the notional amount.

For example, consider a total return swap on oil with a notional value of \$10 million, in which for two years the long must pay 25 basis points monthly and will receive the total return on West Texas Intermediate (WTI) crude oil. If over the first month the price of WTI increases from 41.50 bbl to 42.10 bbl (+1.45%), the long will receive a net payment of $(0.0145 - 0.0025) \times \$10 \text{ million} = \$120,000$.

If over the second month the price of WTI decreases from 42.10 to 41.20 (-2.14%), the long must make a payment of $(-0.0214 - 0.0025) \times \$10 \text{ million} = \$239,000$ to the short.

Total return swaps are often used by institutions to gain exposure to the price risk of the underlying commodity, avoiding either holding the commodity or managing a long position in futures contracts over time.



Professor's Note: Some of the swaps described here are not constructed with two periodic payment streams and net payments based on the difference between the two payments each period, as we have seen with interest rate, currency, and equity swaps. The swap buyer instead may make a single payment at the initiation of the swap and then receive periodic payments based on the total returns, excess returns, or price volatility of a commodity, essentially "buying" exposure to the underlying risk factor.

In an **excess return swap**, a party may make a single payment at the initiation of the swap and then receive periodic payments of any percentage by which the commodity price exceeds some fixed or benchmark value, times the notional value of the swap. In months in which the commodity price does not exceed the fixed value, no payments are made.

In a **basis swap**, the variable payments are based on the difference between the prices of two commodities. Often the two commodities are one that has liquid traded futures available for hedging and the other (the one the swap buyer actually uses in production) with no liquid futures contracts available. Because the price changes of the two commodities are less than perfectly correlated, the difference between them (the basis) changes over time. By combining a hedge using the liquid futures with a basis swap, the swap buyer can hedge the price risk he faces from the input that does not have a liquid futures market.

In a **commodity volatility swap**, the underlying factor is the volatility of the commodity's price. If the volatility of the commodity's price is higher than the expected level of volatility specified in the swap, the volatility buyer receives a payment. When actual volatility is lower than the specified level, the volatility seller receives a payment. A similar swap settles based on variance in price levels of a commodity, with a swap buyer receiving a payment if the actual variance exceeds the fixed variance established at the onset of the swap. If the actual variance is lower, the variance seller receives a payment.

LOS 46.j: Describe how the construction of commodity indexes affects index returns.

There are several published commodity indexes. To be most useful, an index should be investable, in that an investor should be able to replicate the index with available liquid futures contracts. The available commodity indexes differ in the following dimensions:

- Which commodities are included
- The weighting of the commodities in the index
- The method of rolling contracts over as they near expiration
- The method of rebalancing portfolio weights

While no index methodology will consistently outperform another index methodology, differences in methodology do result in returns differences, at least over shorter periods. Over long periods, differences between the mix and weights of constituent commodities in individual indexes will result in differences between returns, as some commodities outperform others.

Indexes may be equal weighted or weighted on some factor, such as the value of global production of an individual commodity or commodity sector. A production value weighted index will have more exposure to energy than to livestock or softs, for example.

With regard to roll methodology, a passive strategy may be to simply roll the expiring futures contracts into the near-month contract each month. A more active strategy would be to maximize roll return by selecting the further-out contracts with the greatest backwardation or smallest contango.

The frequency of rebalancing will also affect commodity index returns. Rebalancing portfolio weights will decrease returns when prices are trending but increase returns when price changes are choppy and mean-reverting. For this reason, price behavior across rebalancing periods will influence returns. If the prices of a commodity are choppy over short horizons but trending on a longer-term basis, frequent rebalancing may capture gains from mean reversion over the shorter periods but give up some of the gains from the trend of the commodity's price over the longer term.

While differences in index construction methodology will lead to differences among index returns over relatively shorter periods, no one methodology is necessarily superior over longer periods. Correlations between returns on different indexes have been relatively high, while correlations between commodity indexes and returns on stocks and bonds have been low.

KEY CONCEPTS

LOS 46.a

Commodity sectors include energy (crude oil, natural gas, and refined petroleum products); industrial metals (aluminum, nickel, zinc, lead, tin, iron, and copper); grains (wheat, corn, soybeans, and rice); livestock (hogs, sheep, cattle, and poultry); precious metals (gold, silver, and platinum); and softs or cash crops (coffee, sugar, cocoa, and cotton).

Crude oil must be refined into usable products but may be shipped and stored in its natural form. Natural gas may be used in its natural form but must be liquefied to be shipped overseas.

Industrial and precious metals have demand that is sensitive to business cycles and typically can be stored for long periods.

Production of grains and softs is sensitive to weather. Livestock supply is sensitive to the price of feed grains.

LOS 46.b

The life cycle of commodity sectors includes the time it takes to produce, transport, store, and process the commodities.

- Crude oil production involves drilling a well and extracting and transporting the oil. Oil is typically stored for only a short period before being refined into products that will be transported to consumers.
- Natural gas requires little processing and may be transported to consumers by pipeline.
- Metals are produced by mining and smelting ore, which requires producers to construct large-scale fixed plants and purchase equipment. Most metals can be stored long term.
- Livestock production cycles vary with the size of the animal. Meat can be frozen for shipment and storage.
- Grain production is seasonal, but grains can be stored after harvest. Growing seasons are opposite in the northern and southern hemispheres.
- Softs are produced in warm climates and have production cycles and storage needs that vary by product.

LOS 46.c

In contrast to equities and bonds, which are valued by estimating the present value of their future cash flows, commodities do not produce periodic cash inflows. While the spot price of a commodity may be viewed as the estimated present value of its future selling price, storage costs (i.e., cash outflows) may result in forward prices that are higher than spot prices.

LOS 46.d

Participants in commodity futures markets include hedgers, speculators, arbitrageurs, exchanges, analysts, and regulators.

Informed investors are those who have information about the commodity they trade. Hedgers are informed investors because they produce or use the commodity. Some speculators act as informed investors and attempt to profit from having better information or a better ability to process information. Other speculators profit from providing liquidity to the futures markets.

LOS 46.e

Basis is the difference between the spot price and a futures price for a commodity. Calendar spread is the difference between futures prices for contracts with different expiration dates.

A market is in contango if futures prices are greater than spot prices, or in backwardation if futures prices are less than spot prices. Calendar spreads and basis are negative in contango and positive in backwardation.

LOS 46.f

Insurance theory states that futures returns compensate contract buyers for providing protection against price risk to futures contract sellers (i.e., the producers). This theory implies that backwardation is a normal condition.

The hedging pressure hypothesis expands on insurance theory by including long hedgers as well as short hedgers. This theory suggests futures markets will be in backwardation when short hedgers dominate and in contango when long hedgers dominate.

The theory of storage states that spot and futures prices are related through storage costs and convenience yield.

LOS 46.g

The total return on a fully collateralized long futures position consists of collateral return, price return, and roll return. Collateral return is the yield on securities the investor deposits as collateral for the futures position. Price return or spot yield is produced by a change in spot prices. Roll return results from closing out expiring contracts and reestablishing the position in longer-dated contracts.

LOS 46.h

Roll return is positive when a futures market is in backwardation because a long position holder will be buying longer-dated contracts that are priced lower than the expiring contracts. Roll return is negative when a futures market is in contango because the longer-dated contracts are priced higher than the expiring contracts.

LOS 46.i

Investors can use swaps to increase or decrease exposure to commodities. In a total return swap, the variable payments are based on the change in price of a commodity. In an excess return swap, the variable payments are based on the difference between a commodity price and a benchmark value. In a basis swap, the variable payments are based on the difference in prices of two commodities. In a commodity volatility swap, the variable payments are based on the volatility of a commodity price.

LOS 46.j

Returns on a commodity index are affected by how the index is constructed. The index components and weighting method affect which commodities have the greatest influence on the index return. The methodology for rolling over expiring contracts may be passive or active. Frequent rebalancing of portfolio weights may decrease index returns in trending markets or increase index returns in choppy or mean-reverting markets.

CONCEPT CHECKERS

1. The commodity sector that is *least affected* by weather risk is:
 - A. grains.
 - B. precious metals.
 - C. refined energy products.

2. For which of the following commodities is the production and consumption cycle *least affected* by seasonality?
 - A. Hogs.
 - B. Coffee.
 - C. Natural gas.

3. Which of the following factors is *most likely* to distinguish the valuation of a commodity from the valuation of an equity that pays no dividends?
 - A. Holding costs.
 - B. Discount rate.
 - C. Timing of the future sale.

4. A commodity is *most likely* to be physically stored by a(n):
 - A. exchange.
 - B. speculator.
 - C. arbitrageur.

5. A futures market in backwardation will exhibit:
 - A. positive basis and positive calendar spreads.
 - B. negative basis and positive calendar spreads.
 - C. negative basis and negative calendar spreads.

6. Which theory of commodity futures returns is *least likely* to explain why futures markets can be in contango?
 - A. Insurance theory.
 - B. Theory of storage.
 - C. Hedging pressure hypothesis.

7. Suppose that a commodity market exhibits the following futures curve on July 1, 20X1:
 - Spot price: 42.0
 - August futures price: 41.5
 - October futures price: 40.8
 - December futures price: 39.7

An investor establishes a fully collateralized long position on July 1, 20X1, and maintains the position for one year. The futures curve on July 1, 20X2, is identical to the futures curve on July 1, 20X1, and calendar spreads did not change significantly during the year. The investor's total return on the position is *most likely*:

- A. equal to the collateral return.
- B. less than the collateral return.
- C. greater than the collateral return.

8. An investor enters into a swap contract under which the net payment will vary directly with the price of a commodity. This contract is *most accurately* described as a(n):
- A. basis swap.
 - B. total return swap.
 - C. excess return swap.

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ANSWERS – CONCEPT CHECKERS

1. **B** Precious metals mining and smelting are less susceptible to changing weather. Weather is an important factor in grain production with both droughts and flooding affecting crop yields. Oil refineries are concentrated in coastal areas where hurricanes and other extreme weather cause periodic refinery shutdowns.
2. **B** Coffee has a long production cycle but is grown at warm latitudes and harvested throughout the year. Livestock production is strongly influenced by seasonality. Natural gas demand has a seasonal component due to its uses for heating and electricity generation for cooling.
3. **A** While a commodity or a nondividend-paying equity security can be valued in terms of the present value of its future sale price, a commodity may have holding costs, such as storage, that can result in a forward price that is higher than the spot price.
4. **C** Arbitrageurs may store a physical inventory of a commodity to exploit differences between spot and futures prices relative to the costs of storing the commodity.
5. **A** In backwardation, longer-dated futures contracts are priced lower than shorter-dated contracts or spot prices, resulting in positive basis and calendar spreads.
6. **A** According to insurance theory, backwardation is normal because futures contract buyers should earn a positive return for protecting commodity producers (short hedgers) from price risk. The hedging pressure hypothesis and the theory of storage can explain either backwardation or contango.
7. **C** The price return is zero because the spot price is unchanged over the life of the position. The roll return is positive because the market is in backwardation. Therefore the total return (price return + roll return + collateral return) is greater than the collateral return.
8. **B** In a total return swap, the variable payment is based on the price of a commodity. In an excess return swap, the variable payment is based on the amount by which a commodity price is greater than a benchmark, and the payment is zero if the price is less than the benchmark. The variable payment of a basis swap depends on the difference between two commodity prices.

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