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PRACTICE PROBLEMS

The following information relates to Questions 1–12

Amanda Rodriguez is an alternative investments analyst for a US investment management firm, Delphinus Brothers. Delphinus' Chief Investment Officer, Michael Tang, has informed Rodriguez that he wants to reduce the amount invested in traditional asset classes and gain exposure to the real estate sector by acquiring commercial property in the United States. Rodriguez is to analyze potential commercial real estate investments for Delphinus Brothers. Selected data on three commercial real estate properties is presented in Exhibit 1.

Exhibit 1 Selected Property Data

	Property #1	Property #2	Property #3
Property Type	**Downtown Office Building**	**Grocery-Anchored Retail Center**	**Multi-Family Building**
Location	New York, NY	Miami, FL	Boston, MA
Occupancy	90.00%	93.00%	95.00%
Square Feet or Number of Units	100,000 sf	205,000 sf	300 units
Gross Potential Rent	$4,750,000	$1,800,000	$3,100,000
Expense Reimbursement Revenue	$333,333	$426,248	$0
Other Income (includes % Rent)	$560,000	$15,000	$45,000
Potential Gross Income	$5,643,333	$2,241,248	$3,145,000
Vacancy Loss	($564,333)	($156,887)	($157,250)
Effective Gross Income	$5,079,000	$2,084,361	$2,987,750
Property Management Fees	($203,160)	($83,374)	($119,510)
Other Operating Expenses	($2,100,000)	($342,874)	($1,175,000)
Net Operating Income (NOI)	$2,775,840	$1,658,113	$1,693,240

Rodriguez reviews the three properties with Tang, who indicates that he would like her to focus on Property #1 because of his prediction of robust job growth in New York City over the next ten years. To complete her analysis, Rodriquez assembles additional data on Property #1, which is presented in Exhibits 2, 3 and 4.

As part of the review, Tang asks Rodriguez to evaluate financing alternatives to determine if it would be better to use debt financing or to make an all cash purchase. Tang directs Rodriguez to inquire about terms with Richmond Life Insurance Company, a publicly traded company, which is an active lender on commercial real estate property. Rodriquez obtains the following information from Richmond Life for a loan on Property #1: loan term of 5 years, interest rate of 5.75% interest-only, maximum loan to value of 75%, and minimum debt service coverage ratio of 1.5x.

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Exhibit 2 6-Year Net Operating Income (NOI) and DCF Assumptions for Property #1

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
NOI	$2,775,840	$2,859,119	$2,944,889	$3,033,235	$3,124,232	$3,217,959

DCF Assumptions	
Investment Hold Period	5 years
Going-in Cap Rate	5.25%
Terminal Cap Rate	6.00%
Discount Rate	7.25%
Income/Value Growth Rate	Constant

Exhibit 3 Sales Comparison Data for Property #1

Variable	Property 1	Sales Comp A	Sales Comp B	Sales Comp C
Age (years)	10	5	12	25
Condition	Good	Excellent	Good	Average
Location	Prime	Secondary	Secondary	Prime
Sale price psf		$415 psf	$395 psf	$400 psf
Adjustments				
Age (years)		–10%	2%	10%
Condition		–10%	0%	10%
Location		15%	15%	0%
Total Adjustments		**–5%**	**17%**	**20%**

Exhibit 4 Other Selected Data for Property #1

Land Value	$7,000,000
Replacement Cost	$59,000,000
Total Depreciation	$5,000,000

After reviewing her research materials, Rodriguez formulates the following two conclusions:

Conclusion 1 Benefits of private equity real estate investments include owners' ability to attain diversification benefits, to earn current income, and to achieve tax benefits.

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Conclusion 2 Risk factors of private equity real estate investments include business conditions, demographics, the cost of debt and equity capital, and financial leverage.

1 Which of the following is *most likely* accurate regarding Property #2 described in Exhibit 1?

A Operating expense risk is borne by the owner.

B The lease term for the largest tenant is greater than three years.

C There is a significant amount of percentage rent linked to sales levels.

2 Based upon Exhibits 2, 3 and 4, which of the following statements is *most* accurate regarding the valuation of Property #1?

A The cost approach valuation is $71,000,000.

B The adjusted price psf for Sales Comp B is $423 psf.

C The terminal value at the end of year 5 in the income approach is $53,632,650.

3 Based on Exhibit 2, the growth rate of Property #1 is *closest* to:

A 0.75%

B 1.25%.

C 2.00%.

4 Based on Exhibit 2, the value of Property #1 utilizing the discounted cash flow method is *closest* to:

A $48,650,100.

B $49,750,900.

C $55,150,300.

5 Based on Exhibit 2, relative to the estimated value of Property #1 under the discounted cash flow method, the estimated value of Property #1 using the direct capitalization method is:

A equal.

B lower.

C higher.

6 Based upon Exhibits 1 and 3, the estimated value of Property #1 using the sales comparison approach (assigning equal weight to each comparable) is *closest* to:

A 40,050,000.

B 40,300,000.

C 44,500,000.

7 In the event that Delphinus purchases Property #2, the due diligence process would *most likely* require a review of:

A all tenant leases.

B tenant sales data.

C the grocery anchor lease.

8 Compared to an all-cash purchase, a mortgage on Property #1 through Richmond Life would *most likely* result in Delphinus earning:

A a lower return on equity.

B a higher return on equity.

C the same return on equity.

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9 Assuming an appraised value of $48,000,000, Richmond Life Insurance Company's maximum loan amount on Property #1 would be *closest* to:

A $32,000,000.

B $36,000,000.

C $45,000,000.

10 Rodriguez's Conclusion 1 is:

A correct.

B incorrect, because tax benefits do not apply to tax-exempt entities.

C incorrect, because private real estate is highly correlated to stocks.

11 Rodriguez's Conclusion 2 is:

A correct.

B incorrect, because inflation is not a risk factor.

C incorrect, because the cost of equity capital is not a risk factor.

12 Richmond Life Insurance Company's potential investment would be *most likely* described as:

A private real estate debt.

B private real estate equity.

C publicly traded real estate debt.

The following information relates to Questions 13–28

First Life Insurance Company, Ltd., a life insurance company located in the United Kingdom, maintains a stock and bond portfolio and also invests in all four quadrants of the real estate market; private equity, public equity, private debt, and public debt. Each of the four real estate quadrants has a manager assigned to it. First Life intends to increase its allocation to real estate. The Chief Investment Officer (CIO) has scheduled a meeting with the four real estate managers to discuss the allocation to real estate and to each real estate quadrant. Leslie Green, who manages the private equity quadrant, believes her quadrant offers the greatest potential and has identified three investment properties to consider for acquisition. Selected information for the three properties is presented in Exhibit 1.

Exhibit 1 Selected Information on Potential Private Equity Real Estate Investments

	Property		
	A	B	C
Property description	**Single Tenant Office**	**Shopping Center**	**Warehouse**
Size (square meters)	3,000	5,000	9,000
Lease type	Net	Gross	Net
Expected loan to value ratio	70%	75%	80%
Total economic life	50 years	30 years	50 years
Remaining economic life	30 years	23 years	20 years

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Exhibit 1 (Continued)

	Property		
	A	B	C
Property description	**Single Tenant Office**	**Shopping Center**	**Warehouse**
Rental income (at full occupancy)	£575,000	£610,000	£590,000
Other income	£27,000	£183,000	£29,500
Vacancy and collection loss	£0	£61,000	£59,000
Property management fee	£21,500	£35,000	£22,000
Other operating expenses	£0	£234,000	£0
Discount rate	11.5%	9.25%	11.25%
Growth rate	2.0%	See Assumption 2	3.0%
Terminal cap rate		11.00%	
Market value of land	£1,500,000	£1,750,000	£4,000,000
Replacement costs			
■ Building costs	£8,725,000	£4,500,000	£12,500,000
■ Developer's profit	£410,000	£210,000	£585,000
Deterioration – curable and incurable	£4,104,000	£1,329,000	£8,021,000
Obsolescence			
■ Functional	£250,000	£50,000	£750,000
■ Locational	£500,000	£200,000	£1,000,000
■ Economic	£500,000	£100,000	£1,000,000
Comparable adjusted price per square meter			
■ Comparable Property 1	£1,750	£950	£730
■ Comparable Property 2	£1,825	£1,090	£680
■ Comparable Property 3	£1,675	£875	£725

To prepare for the upcoming meeting, Green has asked her research analyst, Ian Cook, for a valuation of each of these properties under the income, cost and sales comparison approaches using the information provided in Exhibit 1, and the following two assumptions:

Assumption 1 The holding period for each property is expected to be five years.

Assumption 2 Property B is expected to have the same net operating income for the holding period due to existing leases, and a one-time 20% increase in year 6 due to lease rollovers. No further growth is assumed thereafter.

In reviewing Exhibit 1, Green notes the disproportionate estimated obsolescence charges for Property C relative to the other properties and asks Cook to verify the reasonableness of these estimates. Green also reminds Cook that they will need to conduct proper due diligence. In that regard, Green indicates that she is concerned whether a covered parking lot that was added to Property A encroaches (is partially located) on adjoining properties. Green would like for Cook to identify an expert and present documentation to address her concerns regarding the parking lot.

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In addition to discussing the new allocation, the CIO informs Green that she wants to discuss the appropriate real estate index for the private equity real estate quadrant at the upcoming meeting. The CIO believes that the current index may result in over-allocating resources to the private equity real estate quadrant.

13 The *most* effective justification that Green could present for directing the increased allocation to her quadrant would be that, relative to the other quadrants, her quadrant of real estate investments:

A provides greater liquidity.

B requires less professional management.

C enables greater decision-making control.

14 Relative to the expected correlation between First Life's portfolio of public REIT holdings and its stock and bond portfolio, the expected correlation between First Life's private equity real estate portfolio and its stock and bond portfolio is *most likely* to be:

A lower.

B higher.

C the same.

15 Which of the properties in Exhibit 1 exposes the owner to the greatest risk related to operating expenses?

A Property A

B Property B

C Property C

16 Which property in Exhibit 1 is *most likely* to be affected by import and export activity?

A Property A

B Property B

C Property C

17 Which property in Exhibit 1 would *most likely* require the greatest amount of active management?

A Property A

B Property B

C Property C

18 Which property in Exhibit 1 is *most likely* to have a percentage lease?

A Property A

B Property B

C Property C

19 The disproportionate charges for Property C noted by Green are *least likely* to explicitly factor into the estimate of property value using the:

A cost approach.

B income approach.

C sales comparison approach.

20 Based upon Exhibit 1, which of the following statements regarding Property A is *most* accurate?

A The going-in capitalization rate is 13.5%.

B It appears the riskiest of the three properties.

C The net operating income in the first year is £298,000.

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21 Based upon Exhibit 1, the value of Property C using the direct capitalization method is *closest* to:

A £3,778,900.

B £4,786,700.

C £6,527,300.

22 Based upon Exhibit 1 and Assumptions 1 and 2, the value of Property B using the discounted cash flow method, assuming a five-year holding period, is *closest* to:

A £4,708,700.

B £5,034,600.

C £5,050,900.

23 Which method under the income approach is *least likely* to provide a realistic valuation for Property B?

A Layer method

B Direct capitalization method

C Discounted cash flow method

24 Based upon Exhibit 1, the value of Property A using the cost approach is *closest* to:

A £5,281,000.

B £6,531,000.

C £9,385,000.

25 Based upon Exhibit 1, the value of Property B using the sales comparison approach is *closest* to:

A £4,781,000.

B £4,858,000.

C £6,110,000.

26 Which due diligence item would be *most* useful in addressing Green's concerns regarding Property A?

A Property survey

B Engineering inspection

C Environmental inspection

27 The real estate index currently being used by First Life to evaluate private equity real estate investments is *most likely:*

A an appraisal-based index.

B a transaction-based index.

C the NCREIF property index.

28 Based upon Exhibit 1, the property expected to be most highly leveraged is:

A Property A

B Property B

C Property C

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SOLUTIONS

1 B is correct. The lease term for the anchor tenant is typically longer than the usual 3 to 5 year term for smaller tenants. The data in Exhibit 1 suggest that the operating expenses are passed on to the tenant; the sum of Property Management Fees and Other Operating Expenses equal the Expense Reimbursement Revenue. Also, Other Income is only $15,000 suggesting that there is a minimal amount of percentage rent linked to sales thresholds.

2 C is correct. The terminal value using the income approach is $53,632,650 (= Year 6 NOI/terminal cap rate = $3,217,959 / 0.06). The value of the property using the cost approach is $61,000,000 (= Land Value + Building Replacement Cost – Total Depreciation = $7,000,000 + $59,000,000 – $5,000,000). The adjusted sales price per square foot for Sales Comp B is $462 psf (= $395 × 1.17).

3 C is correct. There is a constant growth rate in income and value; growth rate = discount rate (7.25%) – going-in cap rate (5.25%) = 2.00%.

4 B is correct. The value of Property 1 using the discounted cash flow method is $49,750,931, or $49,750,900 rounded, calculated as follows:

		Discount period	Discounted value*
Year 1 NOI	$2,775,840	1	$2,588,196
Year 2 NOI	$2,859,119	2	$2,485,637
Year 3 NOI	$2,944,889	3	$2,387,135
Year 4 NOI	$3,033,235	4	$2,292,540
Year 5 NOI	$3,124,232	5	$2,201,693
Terminal Value**	$53,632,650	5	$37,795,731
Property #1 DCF value			$49,750,932

* Discount rate = 7.25%
** The terminal value = Year 6 NOI/terminal cap rate = $3,217,959/0.06 = $53,632,650

5 C is correct. The direct capitalization method estimate of value for Property #1 is $52,873,143 (= Year 1 NOI/Going-in Cap Rate = $2,775,840/0.0525), which is greater than the estimated DCF value of $49,750,932.

Value of Property #1 under the discounted cash flow method:

		Discount period	Discounted value*
Year 1 NOI	$2,775,840	1	$2,588,196
Year 2 NOI	$2,859,119	2	$2,485,637
Year 3 NOI	$2,944,889	3	$2,387,135
Year 4 NOI	$3,033,235	4	$2,292,540
Year 5 NOI	$3,124,232	5	$2,201,693
Terminal Value**	$53,632,650	5	$37,795,731
Property #1 DCF value			$49,750,932

* Discount rate = 7.25%
** The terminal value = Year 6 NOI/terminal cap rate = $3,217,959/0.06 = $53,632,650

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6 C is correct. The estimate of the value of Property #1 using the sales comparison approach is:

	Unadjusted psf	Adjusted psf
Sales Comp 1	$415	$394 (= $415 × 0.95)
Sales Comp 2	$395	$462 (= $395 × 1.17)
Sales Comp 3	$400	$480 (= $400 × 1.20)
Average	$403	$445
Estimated Value of Property #1 = $44,500,000 (= $445 psf × 100,000 sf)		

7 C is correct. The due diligence process includes a review of leases for major tenants which would include the grocery anchor tenant. Typically, only major tenant leases will be reviewed in the due diligence process, and smaller tenant leases will likely not be reviewed. Also, the fact that Other Income is only $15,000 suggests that percentage rent linked to sales levels is minimal and has not been underwritten in the valuation and acquisition process.

8 B is correct. Delphinus will expect to earn a higher return on equity with the use of a mortgage to finance a portion of the purchase. The quoted mortgage interest rate of 5.75% is less than the discount rate of 7.25%.

9 A is correct. The maximum amount of debt that an investor can obtain on commercial real estate is usually limited by either the ratio of the loan to the appraised value of the property (loan to value or LTV) or the debt service coverage ratio (DSCR) depending on which measure results in the lowest loan amount. The maximum LTV is 75% of the appraised value of $48,000,000 or $36,000,000. The loan amount based on the minimum DSCR would be $32,183,652 determined as follows:

Maximum debt service = Year 1 NOI/DSCR = $2,775,840/1.5 = $1,850,560

Loan amount (interest only loan) = maximum debt service/mortgage rate = $1,850,560/0.0575 = $32,183,652 (rounded to $32,000,000).

10 A is correct. Benefits of private equity real estate investments include owners' ability to attain diversification benefits, to earn current income, and to achieve tax benefits.

11 A is correct. Business conditions, demographics, the cost of debt and equity capital, and financial leverage are characteristic sources of risk for real estate investments.

12 A is correct. Richmond Life's investment would be a mortgage which falls under private debt on the four quadrants.

13 C is correct. Private equity investments in real estate enable greater decision-making control relative to real estate investments in the other three quadrants. A private real estate equity investor or direct owner of real estate has responsibility for management of the real estate, including maintaining the properties, negotiating leases and collecting rents. These responsibilities increase the investor's control in the decision-making process. Investors in publicly traded REITs or real estate debt instruments would not typically have significant influence over these decisions.

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14 A is correct. Evidence suggests that private equity real estate investments have a lower correlation with stocks and bonds than publicly traded REITs. When real estate is publicly traded it tends to behave more like the rest of the stock market than the real estate market.

15 B is correct. Property B is a gross lease, which requires the owner to pay the operating expenses. Accordingly, the owner, First Life, incurs the risk of Property B's operating expenses, such as utilities, increasing in the future.

16 C is correct. Property C is a warehouse, and is most likely affected by import and export activity in the economy. Property A (office) and Property B (retail) would typically be less dependent on import and export activity when compared to a warehouse property.

17 B is correct. Property B is a shopping center and would most likely require more active management than a single tenant office (Property A) or a warehouse (Property C); the owner would need to maintain the right tenant mix and promote the facility.

18 B is correct. Property B is a shopping center, a type of retail property. A percentage lease is a unique aspect of many retail leases, which requires the tenant to pay additional rent once their sales reach a certain level. The lease will typically specify a "minimum rent" that must be paid regardless of the tenant's sales. Percentage rent may be paid by the tenant once the tenant's sales reach a certain level or breakpoint.

19 B is correct. Obsolescence charges reduce the value of a property using the cost approach and are factored into the sales comparison approach by adjustments, including condition and location, to the price per square foot. The cash flows to the property should reflect obsolescence; less rent is received if the property is not of an appropriate design for the intended use, is in a poor location, or if economic conditions are poor. Therefore, obsolescence is implicitly, not explicitly, factored into the estimate of property value using the income approach.

20 B is correct. Property A has been assigned the highest discount rate (11.5%) and thus is considered to be the riskiest investment of the three alternatives. This may be because of the reliance on a single tenant. The going-in capitalization rate is 9.5% (cap rate = discount rate – growth rate). The net operating income (NOI) is £580,500 (= rental income + other income – property management fee = £575,000 + £27,000 – £21,500).

21 C is correct. Under the direct capitalization method, the value of the property = NOI/(r – g).

Calculate net operating income (NOI):

NOI = rental income + other income – vacancy and collection loss – property management costs
NOI = £590,000 + £29,500 – £59,000 – £22,000 = £538,500

Then, value the property using the cap rate:

Value of property = £538,500/(11.25% – 3.0%) = £6,527,273, rounded to £6,527,300.

22 B is correct. The value of Property B using the discounted cash flow method is £5,034,600.

The value using the discounted cash flow method is based on the present value of the net operating income (NOI) and the estimated property resale price.

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Calculate NOI (constant during five-year holding period from Assumption 2)

NOI = rental income (at full occupancy) + other income – vacancy and collection loss – property management fee – other operating expenses
NOI = £610,000 + £183,000 – £61,000 – £35,000 – £234,000 = £463,000

Estimate property value at end of five years:

NOI starting in year 6 is 20% higher due to lease rollovers (from Assumption 2)

NOI starting in year 6 = £463,000 × 1.20 = £555,600

Terminal cap rate (given) = 11%

Applying the terminal cap rate yields a property value of £5,050,909 (= £555,600/0.11)

Find the present value of the expected annual NOI and the estimated property resale value using the given discount rate of 9.25%:

N = 5
FV = £5,050,909
PMT = £463,000
I = 9.25

Solving for PV, the current value of the property is estimated to be £5,034,643, or £5,034,600 rounded.

23 B is correct. The net operating income for Property B is expected to be level for the next 5 years, due to existing leases, and grow 20% in year 6. A direct capitalization method would not be appropriate due to the multiple growth rates. A discounted cash flow method that assigns a terminal value, or a layer method, should be used.

24 A is correct. The value of Property A using the cost method is equal to the replacement cost, adjusted for the different types of depreciation (loss in value):

Value of Property A = land value + (replacement building cost + developer's profit) – deterioration – functional obsolescence – locational obsolescence – economic obsolescence
= £1,500,000 + (£8,725,000 + £410,000) – £4,104,000 – £250,000 – £500,000 – £500,000
= £5,281,000

25 B is correct. The value of a property using the sales comparison approach equals the adjusted price per square meter using comparable properties times property size. The value of Property B using the sales comparison approach is:

Average adjusted price per square meter of comparable properties 1, 2, and 3 for Property B = (£950 + £1,090 + £875)/3 = £971.67

Applying the £971.67 average adjusted price per square meter to Property B gives a value of £4,858,300 (= £971.67 × 5,000 square meters = £4,858,350, or £4,858,000 rounded).

26 A is correct. A property survey can determine whether the physical improvements, such as the covered parking lot, are in the boundary lines of the site and if there are any easements that would affect the value of the property.

27 A is correct. An appraisal-based index is most likely to result in the overallocation mentioned by the CIO due to the appraisal lag. The appraisal lag tends to "smooth" the index meaning that it has less volatility. It behaves

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somewhat like a moving average of what an index would look like if based on values obtained from transactions rather than appraisals. Thus, appraisal-based indexes may underestimate the volatility of real estate returns. Because of the lag in the index, appraisal-based real estate indexes will also tend to have a lower correlation with other asset classes. This is problematic if the index is used in asset allocation models; the amount allocated to the asset class that appears to have lower correlation with other asset classes and less volatility will be greater than it should be.

28 C is correct. Property C has an expected loan to value ratio of 80%, which is higher than the loan to value ratio for Property A (70%) or Property B (75%).

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PRACTICE PROBLEMS

The following information relates to Questions 1–6

Hui Lin, CFA is an investment manager looking to diversify his portfolio by adding equity real estate investments. Lin and his investment analyst, Maria Nowak, are discussing whether they should invest in publicly traded real estate investment trusts (REITs) or public real estate operating companies (REOCs). Nowak expresses a strong preference for investing in public REITs in taxable accounts.

Lin schedules a meeting to discuss this matter, and for the meeting, Lin asks Nowak to gather data on three specific REITs and come prepared to explain her preference for public REITs over public REOCs. At the meeting, Lin asks Nowak:

> "Why do you prefer to invest in public REITs over public REOCs for taxable accounts?"

Nowak provides Lin with an explanation for her preference of public REITs and provides Lin with data on the three REITs shown in Exhibits 1 and 2.

The meeting concludes with Lin directing Nowak to identify the key investment characteristics along with the principal risks of each REIT and to investigate the valuation of the three REITs. Specifically, Lin asks Nowak to value each REIT using four different methodologies:

Method 1	Net asset value
Method 2	Discounted cash flow valuation using a two-step dividend model
Method 3	Relative valuation using property subsector average P/FFO multiple
Method 4	Relative valuation using property subsector average P/AFFO multiple

Exhibit 1 Select REIT Financial Information

	REIT A	REIT B	REIT C
Property subsector	**Office**	**Storage**	**Health Care**
Estimated 12 months cash net operating income (NOI)	$350,000	$267,000	$425,000
Funds from operations (FFO)	$316,965	$290,612	$368,007
Cash and equivalents	$308,700	$230,850	$341,000
Accounts receivable	$205,800	$282,150	$279,000
Debt and other liabilities	$2,014,000	$2,013,500	$2,010,000
Non-cash rents	$25,991	$24,702	$29,808
Recurring maintenance-type capital expenditures	$63,769	$60,852	$80,961
Shares outstanding	56,100	67,900	72,300

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Exhibit 2 REIT Dividend Forecasts and Average Price Multiples

	REIT A	REIT B	REIT C
Expected annual dividend next year	$3.80	$2.25	$4.00
Dividend growth rate in years 2 and 3	4.0%	5.0%	4.5%
Dividend growth rate (after year 3 into perpetuity)	3.5%	4.5%	4.0%
Assumed cap rate	7.0%	6.25%	6.5%
Property subsector average P/FFO multiple	14.4x	13.5x	15.1x
Property subsector average P/AFFO multiple	18.3x	17.1x	18.9x

Note: Nowak estimates an 8% cost of equity capital for all REITs and a risk-free rate of 4.0%.

1 Nowak's *most likely* response to Lin's question is that the type of real estate security she prefers:

A offers a high degree of operating flexibility.

B provides dividend income that is exempt from double taxation.

C has below-average correlations with overall stock market returns.

2 Based upon Exhibits 1 and 2, the value per share for REIT A using valuation Method 1 is *closest* to:

A $51.26.

B $62.40.

C $98.30.

3 Based upon Exhibits 1 and 2, the value per share of REIT B using valuation Method 3 is *closest* to:

A $40.77.

B $57.78.

C $73.19.

4 Based on Exhibit 2, the value per share of REIT C using valuation Method 2 is *closest* to:

A $55.83.

B $97.57.

C $100.91.

5 Based upon Exhibits 1 and 2, the value per share of REIT A using valuation Method 4 is *closest* to:

A $58.32.

B $74.12.

C $103.40.

6 The risk factor *most likely* to adversely impact an investment in REIT B is:

A new competitive facilities.

B tenants' sales per square foot.

C obsolescence of existing space.

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The following information relates to Questions 7–12

Tim Wang is a financial advisor specializing in commercial real estate investing. He is meeting with Mark Caudill, a new client who is looking to diversify his investment portfolio by adding real estate investments. Caudill has heard about various investment vehicles related to real estate from his friends and is seeking a more in-depth understanding of these investments from Wang.

Wang begins the meeting by advising Caudill of the many options that are available when investing in real estate, including:

Option 1 Direct ownership in real estate

Option 2 Publicly traded real estate investment trusts (REITs)

Option 3 Publicly traded real estate operating companies (REOCs)

Option 4 Publicly-traded residential mortgage-backed securities (RMBSs)

Wang next asks Caudill about his investment preferences. Caudill responds by telling Wang that he prefers to invest in equity securities that are highly liquid, provide high income, and are not subject to double taxation.

Caudill asks Wang how the economic performance of REITs and REOCs is evaluated, and how their shares are valued. Wang advises Caudill there are multiple measures of economic performance for REITs and REOCs, including:

Measure 1 Net operating income (NOI)

Measure 2 Funds from operations (FFO)

Measure 3 Adjusted funds from operations (AFFO)

In response, Caudill asks Wang:

> "Which of the three measures is the best measure of a REIT's current economic return to shareholders?"

To help Caudill's understanding of valuation, Wang presents Caudill with data on Baldwin, a health care REIT that primarily invests in independent and assisted senior housing communities in large cities across the United States. Select financial data on Baldwin for the past two years are provided in Exhibit 1.

Before the meeting, Wang had put together some valuation assumptions for Baldwin in anticipation of discussing valuation with Caudill. Wang explains the process of valuing a REIT share using discounted cash flow analysis, and proceeds to estimate the value of Baldwin on a per share basis using a two-step dividend discount model using the data provided in Exhibit 2.

Exhibit 1 Baldwin REIT Summarized Income Statement (in thousands of dollars, except per share data)

	Year Ending December 31	
	2011	2010
Rental income	339,009	296,777
Other property income	6,112	4,033
Total income	345,121	300,810
Rental expenses		
Property operating expenses	19,195	14,273
Property taxes	3,610	3,327

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(continued)

Exhibit 1 (Continued)

	Year Ending December 31	
	2011	2010
Total property expenses	22,805	17,600
Net operating income	322,316	283,210
Other income (gains on sale of properties)	2,162	1,003
General and administrative expenses	21,865	19,899
Depreciation and amortization	90,409	78,583
Net interest expenses	70,017	56,404
Net income	142,187	129,327
Weighted average shares outstanding	121,944	121,863
Earnings per share	1.17	1.06
Dividend per share	0.93	0.85
Price/FFO, based upon year-end stock price	11.5x	12.7x

Exhibit 2 Baldwin Valuation Projections and Assumptions

Current risk-free rate	4.0%
Baldwin beta	0.90
Market risk premium	5.0%
Appropriate discount rate (CAPM)	8.5%
Expected dividend per share, 1 year from today	$1.00
Expected dividend per share, 2 years from today	$1.06
Long-term growth rate in dividends, starting in year 3	5.0%

7 Based on Caudill's investment preferences, the type of real estate investment Wang is *most likely* to recommend to Caudill is:

A Option 2.

B Option 3.

C Option 4.

8 Relative to Option 2 and Option 3, an advantage of investing in Option 1 is:

A greater liquidity.

B lower investment requirements.

C greater control over property level investment decisions.

9 The Baldwin REIT is *least likely* to experience long-run negative effects from a/an:

A economic recession.

B unfavorable change in population demographics.

C major reduction in government funding of health care.

10 The *most appropriate* response to Caudill's question is:

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A Measure 1

B Measure 2

C Measure 3

11 Based on Exhibit 1, the 2011 year-end share price of Baldwin was *closest* to:

A $13.23.

B $21.73.

C $30.36.

12 Based upon Exhibit 2, the intrinsic value of the Baldwin REIT on a per share basis using the two-step dividend discount model is *closest* to:

A $26.72.

B $27.59.

C $28.76.

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SOLUTIONS

1 B is correct. REITs are tax-advantaged entities whereas REOC securities are not typically tax-advantaged entities. More specifically, REITs are typically exempted from the double taxation of income that comes from taxes being due at the corporate level and again when dividends or distributions are made to shareholders in some jurisdictions such at the United States.

2 B is correct. The NAV is $62.40.

Estimated Cash NOI	350,000
Assumed cap rate	0.07
Estimated value of operating real estate (350,000/.07)	5,000,000
Plus: cash + accounts receivable	514,500
Less: Debt and other liabilities	2,014,000
Net Asset Value	3,500,500
Shares outstanding	56,100
NAV/share	**$62.40**

3 B is correct. The value per share is $57.78, calculated as:

Funds from operations (FFO) = $290,612

Shares outstanding = 67,900 shares

FFO/share = $290,612/67,900 shares = $4.28

Applying the property subsector average P/FFO multiple of 13.5x yields a value per share of:

$4.28 × 13.5 = $57.78.

4 C is correct. The value per share for REIT C is $100.91.

	Step One			Step Two
	Year 1	Year 2	Year 3	Year 4
Dividends per share:	$4.00	$4.18	$4.37	$4.54
Value of stock at end of 2013[a]:			$113.57	
			$117.94	
Discount rate: 8.00%				
Net present value of all dividends[b]: $100.91				

[a] Calculated as $4.54 / (0.08 – 0.04) = $113.57
[b] Calculated as: $4.00 / (1.08) + $4.18 / $(1.08)^2$ + $117.94 / $(1.08)^3$ = $100.91

5 B is correct. The value per share is $74.11, calculated as:

Funds from operations (FFO) = $316,965

Less: Non-cash rents: $25,991

Less: Recurring maintenance-type capital expenditures: $63,769

Equals: AFFO: $227,205

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Shares outstanding = 56,100 shares

AFFO/share = $227,205/56,100 shares = $4.05.

Applying the property subsector average P/AFFO multiple of 18.3x yields a value per share of:

$4.05 × 18.3 = $74.12.

6 A is correct. As a storage REIT, this investment faces competitive pressures because of the ease of entry into the field of self-storage properties can lead to periods of overbuilding.

7 A is correct. Option 2, publicly traded REITs, best satisfy Caudill's investment preferences. REITs are equity investments that, in general, are income tax exempt at the corporate/trust level, so there is no double income taxation. To qualify for the income tax exemption, REITs are legally obligated to pay out a high percentage of income to their shareholders, and this typically results in relatively high income for investors. Lastly, public REITs are generally liquid as they are traded in stock exchanges.

8 C is correct. Direct property ownership offers greater control over property level investment decisions in comparison to the level of control exhibited by shareholders in REITs and REOCs.

9 A is correct. Baldwin, a health care REIT, is largely resistant to economic recessions but is exposed to changes in population demographics and changes in government funding for health care.

10 C is correct. Measure 3, adjusted funds from operations (AFFO), is a refinement of FFO that is designed to be a more accurate measure of current economic income. In essence, FFO is adjusted to remove any non-cash rent and to include a provision for maintenance-type capital expenditures and leasing costs. Maintenance expenses are required for a business to continue as a going concern.

11 B is correct. Baldwin's FFO per share in 2011 was $1.89, and the resulting share price was $21.73. First, calculate FFO per share in 2011, and then apply the year-end P/FFO multiple of 11.5x.

FFO = accounting net earnings, excluding: (a) depreciation charges on real estate, (b) deferred tax charges, and (c) gains or losses from sales of property and debt restructuring.

2011 accounting net income: $142,187

2011 depreciation charges: $90,409

2011 deferred tax charges: N/A

2011 gains on sale of properties (other income): $2,162

2011 shares outstanding = 121,944

2011 year-end price/FFO = 11.5x

2011 Baldwin's FFO per share = ($142,187 + $90,409 – $2,162)/121,944 shares = $1.89. At the given 2011 year-end price/FFO multiple of 11.5x, this results in a share price for Baldwin of $1.89 × 11.5 = $21.73.

12 C is correct. The estimated value per share for the Baldwin REIT using a two-step dividend discount model is $28.76, calculated as:

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	Step One		Step Two
	Year 1	Year 2	Year 3
Dividends per share:	$1.00	$1.06	$1.11
Value of stock at end of Year 2[1]:		$31.71	
		$32.77	
Discount rate: 8.50%			
Net present value of all dividends[2]: $28.83			

[1] Calculated as $1.11/(0.085 – 0.05) = $31.71
[2] Calculated as: $1.00/(1.085) + $32.77/$(1.085)^2$ = $28.76

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PRACTICE PROBLEMS

1 Jo Ann Ng is a senior analyst at SING INVEST, a large regional mid-market buyout manager in Singapore. She is considering the exit possibilities for an existing investment in a mature automotive parts manufacturer that was acquired 3 years ago at a multiple of 7.5 times EBITDA. SING INVEST originally anticipated exiting its investment in China Auto Parts, Inc. within 3 to 6 years. Ng noted that current market conditions have deteriorated and that companies operating in a similar business trade at an average multiple of 5.5 times EBITDA. She deemed, however, based on analyst reports and industry knowledge that the market is expected to recover strongly within the next two years because of the fast increasing demand for cars in emerging markets. Upon review of market opportunities, Ng also noted that China Gear Box, Inc., a smaller Chinese auto parts manufacturer presenting potential strong synergies with China Auto Parts, Inc., is available for sale at an EBITDA multiple of 4.5. Exits by means of an IPO or a trade sale to a financial or strategic (company) buyer are possible in China. How would you advise Ng to enhance value upon exit of China Auto Parts?

2 Wenda Lee, CFA, is a portfolio manager at a UK-based private equity institutional investor. She is considering an investment in a mid-market European buyout fund to achieve a better diversification of her firm's existing private equity portfolio. She short listed two funds that she deemed to have a similar risk return profile. Before deciding which one to invest in, she is carefully reviewing and comparing the terms of each fund.

	Mid-Market Fund A	Mid-Market Fund B
Management fees	2.5%	1.5%
Transaction fees	100% to the GP	50–50% split
Carried interest	15%	20%
Hurdle rate	6%	9%
Clawback provision	No	Yes
Distribution waterfall	Deal-by-deal	Total return

Based on the analysis of terms, which fund would you recommend to Lee?

3 Jean Pierre Dupont is the CIO of a French pension fund allocating a substantial portion of its assets to private equity. The existing private equity portfolio comprises mainly large buyout funds, mezzanine funds, and a limited allocation to a special situations fund. The pension fund decided to further increase its allocation to European venture capital. The investment committee of the pension fund requested Dupont present an analysis of five key investment characteristics specific to venture capital relative to buyout investing. Can you assist Dupont in this request?

4 Discuss the ways that private equity funds can create value.

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5 What problems are encountered when using comparable publicly traded companies to value private acquisition targets?

6 What are the main ways in which the performance of private equity limited partnerships can be measured A) during the life of the fund, and B) once all investments have been exited?

The following information relates to Questions 7–12

Martha Brady is the chief investment officer (CIO) of the Upper Darby County (UDC) public employees' pension system. Brady is considering an allocation of a portion of the pension system's assets to private equity. She has asked two of her analysts, Jennifer Chau, CFA, and Matthew Hermansky, to provide more information about the workings of the private equity market.

Brady recognizes that the private equity asset class covers a broad spectrum of equity investments that are not traded in public markets. She asks Chau to describe the major differences between assets that constitute this asset class. Chau notes that the private equity class ranges from venture capital financing of early stage companies to complete buyouts of large publicly traded or even privately held companies. Chau describes some of the characteristics of venture capital and buyout investments.

Chau mentions that private equity firms take care to align the economic interests of the managers of the investments they control with the interests of the private equity firms. Various contractual clauses are inserted in the compensation contracts of the management team in order to reward or punish managers who do not meet agreed on target objectives.

One concern is the illiquidity of private equity investments over time. But some funds are returned to investors over the life of the fund because a number of investment opportunities are exited early. A number of provisions describe the distribution of returns to investors, some of which favor the limited partners. One such provision is the distribution waterfall mechanism that provides distributions to limited partners (LP) before the general partner (GP) receives the carried interest. This distribution mechanism is called the total return waterfall.

Chau prepares the following data to illustrate the distribution waterfall mechanism and the funds provided to limited partners when a private equity fund with a zero hurdle rate exits from its first three projects during a three-year period.

Exhibit 1 Investment Returns and Distribution Waterfalls

Private equity committed capital	$400 million
Carried interest	20%
First project investment capital	$20 million
Second project investment capital	$45 million
Third project investment capital	$50 million
Proceeds from first project	$25 million
Proceeds from second project	$35 million
Proceeds from third project	$65 million

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Chau cautions that investors must understand the terminology used to describe the performance of private equity funds. Interpretation of performance numbers should be made with the awareness that much of the fund assets are illiquid during a substantial part of the fund's life. She provides the latest data in Exhibit 2 for Alpha, Beta, and Gamma Funds—diversified high-technology venture capital funds formed five years ago and each with five years remaining to termination.

Chau studies the data and comments: "Of the three funds, the Alpha Fund has the best chance to outperform over the remaining life. First, because the management has earned such a relatively high residual value on capital and will be able to earn a high return on the remaining funds called down. At termination, the RVPI will earn double the '0.65' value when the rest of the funds are called down. Second, its 'cash on cash' return as measured by DPI is already as high as that of the Beta Fund. PIC, or paid-in capital, provides information about the proportion of capital called by the GP. The PIC of Alpha is relatively low relative to Beta and Gamma."

Exhibit 2 Financial Performance of Alpha, Beta, and Gamma Funds

Fund	PIC	DPI	RVPI
Alpha	0.30	0.10	0.65
Beta	0.85	0.10	1.25
Gamma	0.85	1.25	0.75

Hermansky notes that a private equity fund's ability to properly plan and execute its exit from an investment is vital for the fund's success. Venture funds such as Alpha, Beta, and Gamma take special care to plan for exiting from investments. Venture funds tend to focus on certain types of exits, especially when equity markets are strong.

Brady then asks the analysts what procedures private equity firms would use to value investments in their portfolios as well as any other investments that might be added to the portfolio. She is concerned about buying into a fund with existing assets that do not have public market prices to ascertain value. In such cases, the GP may overvalue the assets and new investors in the fund will pay a higher NAV for the fund assets than they are worth.

Hermansky makes three statements regarding the valuation methods used in private equity transactions during the early stages of selling a fund to investors.

Statement 1 For venture capital investment in the early stages of analysis, emphasis is placed on the discounted cash flow approach to valuation.

Statement 2 For buyout investments, income-based approaches are used frequently as a primary method of valuation.

Statement 3 If a comparable group of companies exist, multiples of revenues or earnings are used frequently to derive a value for venture capital investments.

7 The characteristic that is *most likely* common to both the venture capital and buyout private equity investment is:

A measurable and assessable risk.

B the extensive use of financial leverage.

C the strength of the individual track record and ability of members of management.

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8 The contractual term enabling management of the private equity controlled company to be rewarded with increased equity ownership as a result of meeting performance targets is called:

A a ratchet.

B the tag-along right.

C the clawback provision.

9 For the projects described in Exhibit 1, under a deal-by-deal method with a clawback provision and true-up every three years, the cumulative dollar amount the GP receives by the end of the three years is equal to:

A one million.

B two million.

C three million.

10 Are Chau's two reasons for interpreting Alpha Fund as the best performing fund over the remaining life correct?

A No.

B Yes.

C The first reason is correct, but the second reason is incorrect.

11 The exit route for a venture capital investment is *least likely* to be in the form of a(n):

A initial public offering (IPO).

B sale to other venture funds targeting the same sector.

C buyout by the management of the venture investment.

12 Which statement by Hermansky is the *least* valid?

A Statement 1.

B Statement 2.

C Statement 3.

The following information relates to questions 13–18

Daniel Collin is a junior analyst at JRR Equity Partners (JRR), a private equity firm. Collin is assigned to work with Susan Tseng, a senior portfolio manager. Tseng and Collin meet to discuss existing and potential investments.

Tseng starts the meeting with a discussion of LBO firms and VC firms. Collin tells Tseng:

> LBO firms tend to invest in companies with predicable cash flows and experienced management teams, whereas VC firms tend to invest in companies with high EBITDA or EBIT growth and where an exit is fairly predictable.

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Tseng and Collin next analyze a potential investment in the leveraged buyout of Stoneham Industries. Specifically, they assess the expected gain if they elect to purchase all the preference shares and 90% of the common equity in the LBO. Details of the LBO include the following:

- The buyout requires an initial investment of $10 million.
- Financing for the deal includes $6 million in debt, $3.6 million in preference shares that promise a 15% annual return paid at exit, and $0.4 million in common equity.

The expected exit value in six years is $15 million, with an estimated reduction in debt of $2.8 million over the six years prior to exit.

Tseng and Collin next discuss JRR's investment in Venture Holdings, a private equity fund. Selected details on the Venture Holdings fund include the following:

- Total committed capital is $115 million.
- The distribution waterfall follows the deal-by-deal method, and carried interest is 20%.
- On its first exit event a few years ago, the fund generated a $10 million profit.
- At the end of the most recent year, cumulative paid-in capital was $98 million, cumulative distributions paid out to LPs were $28 million, and the year-end NAV, before and after distributions, was $170.52 million and $131.42 million, respectively.
- Tseng and Collin estimate that the fund's NAV before distributions will be $242.32 million at the end of next year.

Finally, Tseng and Collin evaluate two venture capital funds for potential investment: the Squire Fund and the Treble Fund. Both funds are in Year 7 of an estimated 10-year term. Selected data for the two funds are presented in Exhibit 1.

Exhibit 1 Selected Data for the Squire Fund and the Treble Fund

	Squire Fund	Treble Fund
DPI	0.11	0.55
RVPI	0.95	0.51
Gross IRR	–11%	10%
Net IRR	–20%	8%

After reviewing the performance data in Exhibit 1, Collin draws the following conclusions:

Conclusion 1 The unrealized return on investment for the Squire Fund is greater than the unrealized return on investment for the Treble Fund.

Conclusion 2 The TVPI for the Treble Fund is higher than the TVPI for the Squire Fund because the Treble Fund has a higher gross IRR.

13 Is Collin's statement about LBO firms and VC firms correct?

A Yes

B No, because he is wrong with respect to VC firms.

C No, because he is wrong with respect to LBO firms.

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14 The multiple of expected proceeds at exit to invested funds for JRR's Stoneham LBO investment is *closest* to:

A 2.77×.

B 2.89×.

C 2.98×.

15 The distribution available to the limited partners of the Venture Holdings fund from the first exit is *closest* to:

A $2 million.

B $8 million.

C $10 million.

16 At the end of the most recent year, the total value to paid-in capital (TVPI) ratio for the Venture Holdings fund was *closest* to:

A 0.29×.

B 1.34×.

C 1.63×.

17 Based on Tseng and Collin's estimate of NAV next year, the estimate of carried interest next year is *closest* to:

A $14.36 million.

B $22.18 million.

C $25.46 million.

18 Which of Collin's conclusions regarding the Squire Fund and the Treble Fund is correct?

A Only Conclusion 1

B Only Conclusion 2

C Both Conclusion 1 and Conclusion 2

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SOLUTIONS

1 The exit strategies available to SING INVEST to divest their holding in China Auto Parts, Inc. will largely depend on the following two factors:

- Time remaining until the fund's term expires. If the time remaining is sufficiently long, the fund's manager has more flexibility to work out an exit at more favorable market circumstances and terms.
- Amount of undrawn commitments from LPs in the fund. If sufficient LP commitments can be drawn, the fund manager may take advantage of current market investment opportunities at depressed market prices with the objective to enhance returns upon exit in an expected more favorable market environment.

In the case of China Auto Parts Inc., depending on an analysis of the above, Ng could advise the acquisition of China Gear Box, Inc. subject to an in-depth analysis of potential synergies with China Auto Parts, Inc. The objective here may thus be twofold: benefit from short-term market conditions and enhance the value of existing investments by reinforcing their market potential with a strategic merger.

2 Assuming that both funds have similar risk return characteristics, a closer analysis of economic and corporate governance terms should be instrumental in determining which fund to select.

In economic terms, Mid-Market Fund B has a higher carried interest relative to Mid-Market Fund A, but Mid-Market Fund B has a fee structure that is better aligned with the interests of LPs. A larger proportion of Mid-Market Fund B's fees will be on achieving successful exits (through the carried interest), whereas Mid-Market Fund A will earn relatively larger fees on running the fund (management fees and transaction fees) without necessarily achieving high performance. In addition, the 9 percent hurdle rate of Mid-Market Fund B is indicative of a stronger confidence of the fund manager to achieve a minimum compounded 9 percent return to LPs under which no carried interest will be paid.

In corporate governance terms, Mid-Market Fund B is far better aligned with the interests of LPs as a result of a clawback provision and a more favorable distribution waterfall to LPs that will allow payment of carried interest on a total return basis instead of deal-by-deal.

The conclusion is that Mid-Market Fund B appears better aligned with the interests of LPs.

3

Venture Capital	Buyout
Primarily equity funded. Use of leverage is rare and very limited.	Extensive use of leverage consisting of a large proportion of senior debt and a significant layer of junior and/or mezzanine debt.
Returns of investment portfolios are generally characterized by very high returns from a limited number of highly successful investments and a significant number of write-offs from low performing investments or failures.	Returns of investment portfolios are generally characterized by lower variance across returns from underlying investments. Bankruptcies are rare events.

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Venture Capital	Buyout
Venture capital firm monitors achievement of milestones defined in business plan and growth management.	Buyout firm monitors cash flow management and strategic and business planning.
Expanding capital requirement if in the growth phase.	Low working capital requirement.
Assessment of risk is difficult because of new technologies, new markets, and lack of operating history.	Risk is measurable (e.g., mature businesses, long operating history, etc.).

4 The main ways that private equity funds can create value include the following:

- Operational improvements and clearly defined strategies. In the case of later stage companies and buyouts, private equity owners can often create value by focusing the business on its most profitable opportunities and providing new strategic direction for the business. In the case of venture capital deals, the private equity funds can provide valuable business experience, mentor management, and offer access to their network of contacts and other portfolio companies.
- Creating incentives for managers and aligning their goals with the investors. This is often achieved by providing significant monetary rewards to management if the private equity fund secures a profitable exit. In the case of buyouts, the free cash flow available to management is minimized by taking on significant amounts of debt financing.
- Optimizing the financial structure of the company. In the case of buyouts, the use of debt can reduce the tax payments made by the company and reduce the cost of capital. There may also be opportunities in certain market conditions to take advantage of any mispricing of risk by lenders, which can allow the private equity funds to take advantage of interest rates that do not fully reflect the risks being carried by the lenders. Many would point to the period from mid-2006 to mid-2007 as a period when such conditions prevailed.

5 There are many complexities in using comparable companies to value private targets, including the following:

- The lack of public comparison companies operating in the same business, facing the same risks, and at the same stage of development. It is often possible to identify "approximate" comparisons but very rare to find an exact match. It is essential, therefore, to use judgment when using comparison company information, rather than just taking the average multiples derived from a sample of disparate companies.
- Comparison companies may have different capital structures, so estimated beta coefficients and some financial ratios should be adjusted accordingly.
- Reported accounting numbers for earnings must be chosen carefully and adjusted for any exceptional items, atypical revenues, and costs in the reference year. Care must also be taken to decide which earnings figures to compare—the main choices are trailing earnings (the last 12 months), earnings from the last audited accounts, or prospective year-ahead earnings.

6 In the early years of a fund, all measures of returns are of little relevance because fees drag down the reported returns and investments are initially valued at cost. This produces the J-curve effect. After a few years (longer in the case of venture capital investments), performance measures become more meaningful and the two main measures used by investors are IRR and return

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multiples (of the initial sum invested). During the life of the fund it is necessary to value the non-exited investments and add them to the realized returns. The former inevitably involves an element of judgment on the part of the General Partner, especially when it is difficult to estimate the likely market value of the investment. Once all the investments have been exited, the multiples and IRR can be estimated easily, taking account of the exact timing of the cash flows into and out of the fund. The most relevant measures for investors are computed net of management fees and any carried interest earned by the General Partner.

7 C is correct. Members of both the firm being bought out and the venture capital investment usually have strong individual management track records. Extensive financial leverage is common in buyouts but not venture capital investments, whereas measurable risk is more common in buyouts than in venture capital situations.

8 A is correct.

9 B is correct. On a cumulative basis for three years, the fund earns $10 million, of which $2 million goes to the GP. The $2 million earned by the GP corresponds to 20 percent of the difference between total three-year proceeds and three-year invested capital, or 0.2[(25 + 35 + 65) – (20 + 45 + 50)].

10 A is correct. Chau misinterprets DPI, RVPI, and PIC. The returns earned to date are for each dollar of invested capital, that which has been drawn down, not total returns. Chau mistakenly believes (assuming the same management skill) the result for Alpha Fund at termination will be on the order of 3 × 0.65 = 1.95 instead of 0.65. In both cases, Alpha Fund has underperformed relative to the other two funds.

11 C is correct. Leverage needed to finance a management buyout is not readily available to firms with limited history.

12 A is correct. Statement 1 is the least likely to be valid.

13 B is correct. LBO firms generally invest in firms with a predictable cash flow pattern (EBITDA or EBIT growth) and experienced management teams. In contrast, venture capital firms tend to invest in new firms and new technologies with high revenue growth. Also, VC investments tend to be characterized as having exits that are difficult to anticipate.

14 B is correct. The investment exit value is $15 million. The expected payoff to JRR is calculated as (all amounts in millions):

Expected exit value:	$15.00
Debt remaining at exit: ($6.0 – 2.8)	3.20
Preference shares: [$3.60 × $(1.15)^6$]	8.33
Common equity: ($15 exit – 3.2 debt – 8.33 preference)	3.47

Initial investment: $3.6 (preference) + 0.9 × $0.4 (common) = $3.96

Proceeds at exit: $8.33 (preference) + 0.9 × $3.47 (common) = $11.45

Multiple of expected proceeds to invested funds: $11.45 exit value/$3.96 initial investment = 2.89×

15 B is correct. The distribution waterfall for the Venture Holdings fund follows the deal-by-deal method. The investment generated a profit of $10 million, and with carried interest of 20%, the general partner would receive $2 million ($10 million × 20%), leaving $8 million for the limited partners.

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16 C is correct. Total value to paid-in capital (TVPI) represents the fund's distributed value and undistributed value as a proportion of the cumulative invested capital. TVPI is the sum of distributed to paid-in capital (DPI) and residual value to paid-in capital (RVPI):

$$\text{DPI} = \frac{\text{Cumulative distributions}}{\text{Cumulative invested capital}} = \frac{\$28 \text{ million}}{\$98 \text{ million}} = 0.29\times$$

$$\text{RVPI} = \frac{\text{NAV (after distributions)}}{\text{Cumulative invested capital}} = \frac{\$131.42 \text{ million}}{\$98 \text{ million}} = 1.34\times$$

$$\text{TVPI} = \frac{\text{Cumulative distribution} + \text{NAV (after distributions)}}{\text{Cumulative invested capital}}$$

$$= \frac{\$28 \text{ million} + 131.42 \text{ million}}{\$98 \text{ million}} = 1.63\times$$

17 A is correct. Provided that NAV before distribution exceeds committed capital, the general partner is entitled to carried interest, calculated as the given 20% multiplied by the increase in NAV before distributions. So, the carried interest is calculated as follows:

Carried interest = 20% × ($242.32 – $170.52) = $14.36 million.

18 A is correct. DPI provides an indication of a fund's realized return, whereas RVPI provides an indication of a fund's unrealized return. The Squire Fund has a higher RVPI (0.95) than the Treble Fund (0.51). TVPI, which is the sum of DPI and RVPI, is the same for both funds: 0.11 + 0.95 = 1.06 for the Squire Fund, and 0.55 + 0.51 = 1.06 for the Treble Fund.

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PRACTICE PROBLEMS

The following information relates to Questions 1–8

Raffi Musicale is the portfolio manager for a defined benefit pension plan. He meets with Jenny Brown, market strategist with Menlo Bank, to discuss possible investment opportunities. The investment committee for the pension plan has recently approved expanding the plan's permitted asset mix to include alternative asset classes.

Brown proposes the Apex Commodity Fund (Apex Fund) offered by Menlo Bank as a potentially suitable investment for the pension plan. The Apex Fund attempts to produce trading profits by capitalizing on the mispricing between the spot and futures prices of commodities. The fund has access to storage facilities, allowing it to take delivery of commodities when necessary. The Apex Fund's current asset allocation is presented in Exhibit 1.

Exhibit 1 Apex Fund's Asset Allocation

Commodity Sector	Allocation (%)
Energy	31.9
Livestock	12.6
Softs	21.7
Precious metals	33.8

Brown explains that the Apex Fund has had historically low correlations with stocks and bonds, resulting in diversification benefits. Musicale asks Brown, "Can you identify a factor that affects the valuation of financial assets like stocks and bonds but does not affect the valuation of commodities?"

Brown shares selected futures contract data for three markets in which the Apex Fund invests. The futures data are presented in Exhibit 2.

Exhibit 2 Selected Commodity Futures Data*

Month	Gold Price	Coffee Price	Gasoline Price
July	1,101.2	1.1600	1.2701
September	1,101.2	1.1795	1.2076
December	1,101.2	1.2055	1.0307

* Gold: US$/troy ounce; Coffee: US$/pound; Gasoline: US$/gallon

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Menlo Bank recently released a report on the coffee market. Brown shares the key conclusion from the report with Musicale: "The coffee market had a global harvest that was greater than expected. Despite the large harvest, coffee futures trading activity is balanced between producers and consumers. This balanced condition is not expected to change over the next year."

Brown shows Musicale the total return of a recent trade executed by the Apex Fund. Brown explains that the Apex Fund took a fully collateralized long futures position in nearby soybean futures contracts at the quoted futures price of 865.0 (US cents/bushel). Three months later, the entire futures position was rolled when the near-term futures price was 877.0 and the farther-term futures price was 883.0. During the three-month period between the time that the initial long position was taken and the rolling of the contract, the collateral earned an annualized rate of 0.60%.

Brown tells Musicale that the pension fund could alternatively gain long exposure to commodities using the swap market. Brown and Musicale analyze the performance of a long position in an S&P GSCI total return swap having monthly resets and a notional amount of $25 million. Selected data on the S&P GSCI are presented in Exhibit 3.

Exhibit 3 Selected S&P GSCI Data

Reference Date	Index Level
April (swap initiation)	3,042.35
May	3,282.23
June	3,225.21

1 The Apex Fund is *most likely* to be characterized as:

A a hedger.

B a speculator.

C an arbitrageur.

2 Which factor would *most likely* affect the supply or demand of all four sectors of the Apex Fund?

A Weather

B Spoilage

C Government actions

3 The *most appropriate* response to Musicale's question regarding the valuation factor is:

A storage costs.

B transportation costs.

C expected future cash flows.

4 Which futures market in Exhibit 2 is in backwardation?

A Gold

B Coffee

C Gasoline

5 Based on the key conclusion from the Menlo Bank coffee market report, the shape of the coffee futures curve in Exhibit 2 is *most consistent* with the:

A insurance theory.

B theory of storage.

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C hedging pressure hypothesis.

6 Based on Exhibit 2, which commodity's roll returns will *most likely* be positive?

A Gold

B Coffee

C Gasoline

7 The Apex Fund's three-month total return on the soybean futures trade is *closest* to:

A 0.85%.

B 1.30%.

C 2.22%.

8 Based on Exhibit 3, on the June settlement date, the party that is long the S&P GSCI total return swap will:

A owe a payment of $434,308.38.

B receive a payment of $1,502,621.33.

C receive a payment of $1,971,173.60.

The following information relates to Questions 9–15

Jamal Nabli is a portfolio manager at NextWave Commodities (NWC), a commodity-based hedge fund located in the United States. NWC's strategy uses a fixed-weighting scheme to allocate exposure among 12 commodities, and it is benchmarked against the Thomson/Reuters/CoreCommodity CRB Index (TR/CC CRB). Nabli manages the energy and livestock sectors with the help of Sota Yamata, a junior analyst.

Nabli and Yamata meet to discuss a variety of factors that affect commodity values in the two sectors they manage. Yamata tells Nabli the following:

Statement 1 Storage costs are negatively related to futures prices.

Statement 2 In contrast to stocks and bonds, most commodity investments are made by using derivatives.

Statement 3 Commodities generate future cash flows beyond what can be realized through their purchase and sale.

Nabli and Yamata then discuss potential new investments in the energy sector. They review Brent crude oil futures data, which are presented in Exhibit 1.

Exhibit 1 Selected Data on Brent Crude Oil Futures

Spot Price	Near-Term Futures Price	Longer-Term Futures Price
77.56	73.64	73.59

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Yamata presents his research related to the energy sector, which has the following conclusions:

- Consumers have been more concerned about prices than producers have.
- Energy is consumed on a real-time basis and requires minimal storage.

After concluding the discussion of the energy sector, Nabli reviews the performance of NWC's long position in lean hog futures contracts. Nabli notes that the portfolio earned a –12% price return on the lean hog futures position last year and a –24% roll return after the contracts were rolled forward. The position was held with collateral equal to 100% of the position at a risk-free rate of 1.2% per year.

Yamata asks Nabli to clarify how the state of the futures market affects roll returns. Nabli responds as follows:

Statement 4 Roll returns are generally negative when a futures market is in contango.

Statement 5 Roll returns are generally positive when a futures market is in backwardation.

As part of their expansion into new markets, NWC is considering changing its benchmark index. Nabli investigates two indexes as a possible replacement. These indexes both use similar weighting and rebalancing schemes. Index A includes contracts of commodities typically in contango, whereas Index B includes contracts of commodities typically in backwardation. Nabli asks Yamata how the two indexes perform relative to each other in a market that is trending upward.

Because of a substantial decline in drilling activity in the North Sea, Nabli believes the price of Brent crude oil will increase more than that of heavy crude oil. The actual price volatility of Brent crude oil has been lower than its expected volatility, and Nabli expects this trend to continue. Nabli also expects the level of the ICE Brent Index to increase from its current level. Nabli and Yamata discuss how to use swaps to take advantage of Nabli's expectations. The possible positions are (1) a basis swap long on Brent crude oil and short on heavy crude oil, (2) a long volatility swap on Brent crude oil, and (3) a short position in an excess return swap that is based on a fixed level (i.e., the current level) of the ICE Brent Index.

9 Which of Nabli's statements regarding the valuation and storage of commodities is correct?

A Statement 1

B Statement 2

C Statement 3

10 Based on Exhibit 1, Yamata should conclude that the:

A calendar spread for Brent crude oil is $3.97.

B Brent crude oil futures market is in backwardation.

C basis for the near-term Brent crude oil futures contract is $0.05 per barrel.

11 Based on Exhibit 1 and Yamata's research on the energy sector, the shape of the futures price curve for Brent crude oil is most consistent with the:

A insurance theory.

B theory of storage.

C hedging pressure hypothesis.

12 The total return (annualized excluding leverage) on the lean hog futures contract is:

A –37.2%.

B –36.0%.

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C –34.8%.

13 Which of Nabli's statements about roll returns is correct?

A Only Statement 4

B Only Statement 5

C Both Statement 4 and Statement 5

14 The *best* response to Nabli's question about the relative performance of the two indexes is that Index B is *most likely* to exhibit returns that are:

A lower than those of Index A.

B the same as those of Index A.

C higher than those of index A.

15 Given Nabli's expectations for crude oil, the *most appropriate* swap position is the:

A basis swap.

B volatility swap.

C excess return swap.

The following information relates to Questions 16–22

Mary McNeil is the corporate treasurer at Farmhouse, which owns and operates several farms and ethanol production plants in the United States. McNeil's primary responsibility is risk management. Katrina Falk, a recently hired junior analyst at Farmhouse, works for McNeil in managing the risk of the firm's commodity price exposures. Farmhouse's risk management policy requires the use of futures to protect revenue from price volatility, regardless of forecasts of future prices, and prohibits risk managers from taking speculative positions.

McNeil meets with Falk to discuss recent developments in two of Farmhouse's commodity markets, grains and livestock. McNeil asks Falk about key characteristics of the two markets that affect revenues and costs. Falk tells McNeil the following:

Statement 1 The life cycle for livestock depends on the product and varies widely by product.

Statement 2 Grains have uniform, well-defined seasons and growth cycles specific to geographic regions.

A material portion of Farmhouse's revenue comes from livestock exports, and a major input cost is the cost of grains imported from outside the United States. Falk and McNeil next discuss three conclusions that Falk reached in an analysis of the grains and livestock markets:

Conclusion 1 Assuming demand for grains remains constant, extreme heat in the regions from which we import our grains will result in a benefit to us in the form of lower grain prices.

Conclusion 2 New tariffs on cattle introduced in our primary export markets will likely result in higher prices for our livestock products in our local market.

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Conclusion 3 Major improvements in freezing technology allowing for longer storage will let us better manage the volatility in the prices of our livestock products.

McNeil asks Falk to gather spot and futures price data on live cattle, wheat, and soybeans, which are presented in Exhibit 1. Additionally, she observes that (1) the convenience yield of soybeans exceeds the costs of its direct storage and (2) commodity producers as a group are less interested in hedging in the forward market than commodity consumers are.

Exhibit 1 Selected Commodity Price Data*

Market	Live Cattle Price	Wheat Price	Soybeans Price
Spot	109	607	846
Futures	108	607	850

* Live cattle: US cents per pound; wheat and soybeans: US cents per bushel.

A key input cost for Farmhouse in producing ethanol is natural gas. McNeil uses positions in natural gas (NG) futures contracts to manage the risk of natural gas price volatility. Three months ago, she entered into a long position in natural gas futures at a futures price of $2.93 per million British thermal units (MMBtu). The current price of the same contract is $2.99. Exhibit 2 presents additional data about the three-month futures position.

Exhibit 2 Selected Information—Natural Gas Futures Three-month Position*

			Prices	
Commodity	Total Current $ Exposure	Position	Near-Term Futures (Current Price)	Farther-Term Futures
Natural Gas (NG)	5,860,000	Long	2.99	3.03

* NG: $ per MMBtu; 1 contract = 10,000 MMBtu.

The futures position is fully collateralized with a 3% rate. McNeil decides to roll forward her current exposure in the natural gas position.

Each month, McNeil reports the performance of the energy futures positions, including details on price returns, roll returns, and collateral returns, to the firm's executive committee. A new committee member is concerned about the negative roll returns on some of the positions. In a memo to McNeil, the committee member asks her to explain why she is not avoiding positions with negative roll returns.

16 With respect to its risk management policy, Farmhouse can be *best* described as:

A a trader.

B a hedger.

C an arbitrageur.

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17 Which of Falk's statements regarding the characteristics of the grains and livestock markets is correct?

A Only Statement 1

B Only Statement 2

C Both Statement 1 and Statement 2

18 Which of Falk's conclusions regarding commodity markets is correct?

A Conclusion 1

B Conclusion 2

C Conclusion 3

19 Which commodity market in Exhibit 1 is currently in a state of contango?

A Wheat

B Soybeans

C Live cattle

20 Based on Exhibit 1 and McNeil's two observations, the futures price of soybeans is *most* consistent with the:

A insurance theory.

B theory of storage.

C hedging pressure hypothesis.

21 Based on Exhibit 2, the total return from the long position in natural gas futures is *closest* to:

A 1.46%.

B 3.71%.

C 4.14%.

22 The *most appropriate* response to the new committee member's question is that:

A roll returns are negatively correlated with price returns.

B such roll returns are the result of futures markets in backwardation.

C such positions may outperform other positions that have positive roll returns.

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SOLUTIONS

1 C is correct. Commodity arbitrage involves an ability to inventory physical commodities and the attempt to capitalize on mispricing between the commodity (along with related storage and financing costs) and the futures price. The Apex Fund has access to storage facilities and uses these facilities in the attempt to capitalize on mispricing opportunities.

2 C is correct. Government actions can affect the supply or demand of all four sectors of the Apex Fund. With respect to energy, environmental mandates imposed by governments have tightened pollution standards, which have led to increasing processing costs that negatively affect demand. The supply of livestock, such as hogs and cattle, is affected by government-permitted use of drugs and growth hormones. Softs, or cash crops, can be affected by government actions, such as the attempt to maintain strategic stockpiles to control domestic prices. The level of demand and relative value of a precious metal, such as gold, is directly linked to government actions associated with managing to inflation targets.

3 C is correct. Expected future cash flows affect the valuation of financial assets, such as stocks and bonds, but do not affect the valuation of commodities. Financial assets (stocks and bonds) are valued based on expected future cash flows. In contrast, the valuation of a commodity is based on a discounted forecast of a future commodity price, which incorporates storage and transportation costs.

4 C is correct. When the near-term (i.e., closer to expiration) futures contract price is higher than the longer-term futures contract price, the futures market for the commodity is in backwardation. Because gasoline is the only one of the three futures markets in Exhibit 2 in which the near-term futures contract price ($1.2701) is higher than the longer-term contract price ($1.0307), the gasoline futures market is the only one in backwardation.

5 B is correct. The theory of storage focuses on the level of commodity inventories and the state of supply and demand. A commodity that is regularly stored should have a higher price in the future (contango) to account for those storage costs. Because coffee is a commodity that requires storage, its higher future price is consistent with the theory of storage.

6 C is correct. Roll returns are generally positive (negative) when the futures market is in backwardation (contango) and zero when the futures market is flat. Because the gasoline market is in backwardation, its roll returns will most likely be positive.

7 A is correct. The total return on the trade represents the sum of three components: price return, roll return, and collateral return.

Price return = (Current price – Previous price)/Previous price = (877.0 – 865.0)/865.0 = 1.387%.

Roll return = [(Near-term futures contract closing price – Farther-term futures contract closing price)/Near-term futures contract closing price] × Percentage of the position in the futures contract being rolled.

Because the entire position is being rolled, the percentage of the position in the futures contract being rolled is equal to 100%. So:

Roll return = [(877.0 – 883.0)/877.0] × 100% = –0.684%.

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Collateral return = [3 months/12 months] × 0.60% = 0.15%.

Total return = 1.387% – 0.684% + 0.15% = 0.853%.

8 A is correct. The total return swap involves a monthly cash settlement (reset) based on the performance of the underlying reference asset (S&P GSCI) given a notional amount of $25 million. If the level of the index increases between the two valuation dates (in this case, May and June), the long position (the swap buyer) receives payment. If the level of the index decreases between the two valuation dates, the swap seller receives payment.

The return on the reference index for the month of June is [(3,225.21 – 3,282.23)/3,282.23], which is equivalent to –1.7372%. Therefore, the swap buyer (long position) must pay the swap seller a cash settlement for the month of June. The June payment calculation is equal to $25,000,000 × –1.7372%, or –$434,308.38.

9 B is correct. The most common way to invest in commodities is via derivatives, and commodities do not generate future cash flows beyond what can be realized through their purchase and sale. Also, storage costs are positively related to futures prices. Physical assets have to be stored, and storage incurs costs (rent, insurance, spoilage, etc.). Therefore, a commodity that is regularly stored should have a higher price in the future to account for those storage costs.

10 B is correct. The Brent crude oil futures market is in a state of backwardation. Commodity futures markets are in a state of backwardation when the spot price is greater than the price of near-term (i.e., nearest-to-expiration) futures contracts and, correspondingly, the price of near-term futures contracts is greater than that of longer-term contracts. The calendar spread is the difference between the near-term futures contract price and the longer-term futures contract price, which is $73.64 – $73.59 = $0.05. The basis for the near-term Brent crude oil futures contract is the difference between the spot price and the near-term futures price: $77.56 – $73.59 = $3.97.

11 B is correct. The Brent crude oil futures market is in a state of backwardation: The spot price is greater than the price of near-term (i.e., nearest-to-expiration) futures contracts. Commodities (in this case, Brent crude oil) are physical assets, not virtual assets, such as stocks and bonds. Physical assets have to be stored, and storage incurs costs (rent, insurance, inspections, spoilage, etc.). According to the theory of storage, a commodity that is consumed along a value chain that allows for just-in-time delivery and use (i.e., minimal inventories and storage) can avoid these costs. Yamata's research concluded that energy is consumed on a real-time basis and requires minimal storage. In this situation, demand dominates supply, and current prices are higher than futures prices (state of backwardation).

12 C is correct. The contract was held for one year, so the price return of –12% is an annualized figure. Additionally, the –24% roll return is also annualized. Nabli's collateral return equals 1.2% per year × 100% initial collateral investment = 1.2%. Therefore, the total return (annualized) is calculated as follows:

Total return = Price return + Roll return + Collateral return
Total return = –12% + (–24%) + 1.26% = –34.8%.

13 C is correct. Roll returns are generally negative (positive) when the futures market is in contango (backwardation) and zero when the futures market is flat.

14 C is correct. Index B is likely to have higher performance than Index A in a market that is trending upward. Indexes that (perhaps inadvertently) contain contracts that more commonly trade in backwardation may improve

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forward-looking performance because this generates a positive roll return. Similarly, indexes that contain contracts that more commonly trade in contango may hurt performance for the same reason (i.e., negative roll return).

15 A is correct. Nabli expects the price of Brent crude oil to increase more than that of heavy crude oil, and Nabli can take advantage of this prediction by entering into a basis swap that is long Brent crude oil and short heavy crude oil. Nabli should take a short (not long) position in a volatility swap to take advantage of his prediction that Brent crude oil's price volatility will be lower than its expected volatility. Nabli should take a long (not short) position in an excess return swap to take advantage of his expectation that the level of the ICE Brent Index will increase faster than leading oil benchmarks.

16 B is correct. Hedgers trade in the futures markets to hedge their exposures related to the commodity, as stated in Farmhouse's risk management policy.

17 C is correct. The life cycle of livestock does vary widely by product. Grains have uniform, well-defined seasons and growth cycles specific to geographic regions. Therefore, both statements are correct.

18 C is correct. Commodity prices are affected by supply and demand, and improvements in freezing technology can improve the firm's ability to store its products for longer periods and manage the volatility of supply and demand. For example, during times of excess supply, a livestock producer, such as Farmhouse, can freeze its products and offer them during better market supply conditions.

19 B is correct. The futures market for soybeans is in a state of contango because the spot price is lower than the futures price.

20 C is correct. In Exhibit 1, the spot price of soybeans is less than the futures price. This observation can be explained only by the hedging pressure hypothesis. According to this hypothesis, hedging pressure occurs when both producers and consumers seek to protect themselves from commodity market price volatility by entering into price hedges to stabilize their projected profits and cash flows. If consumers are more interested in hedging than producers are, the futures price will exceed the spot price.

In contrast, the insurance theory predicts that the futures price has to be lower than the current spot price as a form of payment or remuneration to the speculator who takes on the price risk and provides price insurance to the commodity seller. Similarly, the theory of storage also predicts that when a commodity's convenience yield is greater than its direct storage costs, the futures price will be lower than the spot price.

21 A is correct. The total return for a fully collateralized position is the sum of the price return, the roll return, and the collateral return:

$$\begin{aligned}
\text{Price return} &= (\text{Current price} - \text{Previous price})/\text{Previous price} \\
&= (2.99 - 2.93)/2.93 \\
&= 2.05\%. \\
\text{Roll return} &= (\text{Near-term futures closing price} - \text{Farther-term} \\
&\quad \text{futures closing price})/\text{Near-term futures closing price} \times \\
&\quad \text{Percentage of position in futures contract being rolled} \\
&= [(2.99 - 3.03)/2.99] \times 100\% \\
&= -1.34\%. \\
\text{Collateral return} &= \text{Annual rate} \times \text{Period length as a fraction of the} \\
&\quad \text{year} \\
&= 3\% \times 0.25 \\
&= 0.75\%.
\end{aligned}$$

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Therefore, the total return for three months = 2.05% − 1.34% + 0.75% = 1.46%.

22 C is correct. Investment positions are evaluated on the basis of total return, and the roll return is part of the total return. Even though negative roll return negatively affects the total return, this effect could be more than offset by positive price and collateral returns. Therefore, it is possible that positions with negative roll returns outperform positions with positive roll returns, depending on the price and collateral returns.

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Portfolio Management

STUDY SESSIONS

Study Session 16	Portfolio Management (1)
Study Session 17	Portfolio Management (2)

TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to explain and demonstrate the use of portfolio theory in risk and return estimation, security selection, and other practical applications. The candidate should also be able to explain the portfolio management process.

Portfolio management and risk management are key investment activities. Incorporating investor objectives, constraints, capital market expectations, and relevant risk considerations, together with portfolio construction, execution, and evaluation represent core activities in the investment process.

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