

Question 1 of 29

A plot of land can be improved at a construction cost of \$500,000 if the economy improves. In this case, the value of the improved property will be \$1.2 million. If the economy declines, the construction cost drops to \$200,000 and the improved property value drops to \$400,000. If comparable improved properties currently sell for \$900,000 and the risk-free rate is 0%, which of the following represents the risk-neutral probability of the economy declining?

- A. 25%
- B. 37.5%
- C. 50%
- D. 62.5%

EXPLANATION • Learning Objective 3.1.2

ID: L1-3.1.2-004

$$\begin{aligned}
 V_0 &= pV_{1,u} + (1-p)V_{1,d} \\
 \$900,000 &= [p \times \$1,200,000] + [(1-p) \times \$400,000] \\
 &= \$1,200,000p + \$400,000 - \$400,000p \\
 &= \$800,000p + \$400,000 \\
 \$800,000p &= \$500,000 \Rightarrow p = \frac{\$500,000}{\$800,000} = 62.5\%
 \end{aligned}$$

So, the probability of the economy improving is 62.5% and the probability of it declining is 37.5%.

Question 2 of 29

A university endowment makes a small allocation to a timberland investment. Which of the following best represents a drawback of this investment?

- A. fixed timber supply
- B. timber's low correlation with traditional assets
- C. long growth cycle
- D. timber's variable harvesting schedule

EXPLANATION • Learning Objective 3.1.3

ID: L1-3.1.3-004

Drawbacks for timberland investing -

1. Timber values are tied to cyclical industries (e.g., housing)
2. Long growth cycle
3. Risk of natural disasters

Other responses -

Timber's flexible harvesting schedule and low correlation with traditional assets are advantages of timberland investing.

Question 3 of 29

All else equal, which of the following natural resource development projects should be carried out first, based on the low-hanging-fruit principle?

- A. extracting oil in a region that has OPEC-imposed restrictions on production
- B. mining coal in a region that requires exploration permits
- C. mining copper in a region that is subject to rigorous environmental review

EXPLANATION • Learning Objective 3.1.1

ID: L1-3.1.1-004

The order in which natural resource properties are developed is governed by the low-hanging-fruit principle, i.e., a project with the highest benefits over costs is developed first (which is essentially the project that is easiest and most profitable to develop).

Most natural resource development projects require permits, so permits are generally not considered hindrances to development projects. However, rigorous environmental review and restrictions on production are more likely to present obstacles.

Question 4 of 29

The global demand for agricultural products is driven by which of the following macro factors?

- I. Changing diets in emerging markets
- II. Global population growth
- III. Lower incomes in developing markets
- IV. Increased use of biofuels

- A. II, III, and IV only
- B. I, II, and IV only
- C. I, II, III, and IV
- D. II and IV only

EXPLANATION • Learning Objective 3.1.4

ID: L1-3.1.4-011

Global demand for agricultural products is driven by three macro factors: 1) global population growth, 2) rising incomes (and thus changing diets) in emerging markets, and 3) increased use of biofuels.

Question 5 of 29

Pancho Morales is looking to purchase farmland that maximizes the multiple purpose value associated with the farmland. Given that each property he is considering can grow two different crops, which of the following farmland characteristics should Pancho select?

- A. The profitability of each crop is highly certain and the two crops are not highly positively correlated.
- B. The profitability of each crop is highly uncertain and the two crops are positively correlated.
- C. The profitability of each crop is highly certain and the two crops are positively correlated.
- D. The profitability of each crop is highly uncertain and the two crops are not highly positively correlated.

EXPLANATION • Learning Objective 3.1.4

ID: L1-3.1.4-003

The value of the multiple purpose of farmland is maximized when the profitability of each crop is highly volatile and the two crops are not highly correlated (and the profitabilities of the two crops are similar).

Question 6 of 29

Use the information below about a farmland investment to answer the question that follows.

Value of property	\$900,000
Annual revenue	\$280,000
Annual real estate tax	\$60,000
Annual insurance cost	\$40,000
Other annual operating expenses	\$104,000

Which of the following comes closest to the farmland investment's cap rate?

- A. 8.4%
- B. 12.4%
- C. 16.4%
- D. 20.4%

EXPLANATION • Learning Objective 3.1.4

ID: L1-3.1.4-015

$$\begin{aligned} \text{Cap rate} &= \frac{\text{Annual operating income}}{\text{Value of property}} \\ &= \frac{\text{Income} - \text{Expenses}}{\text{Value of property}} = \frac{\$280,000 - (\$60,000 + \$40,000 + \$104,000)}{\$900,000} = 8.44\% \end{aligned}$$

Question 7 of 29

A farmland has annual revenues of \$50,000, with annual taxes of \$7,500. If the farmland owner expects the cap rate to be 8%, which of the following most closely represents the value of the farmland property?

- A. \$340,000
- B. \$531,250
- C. \$617,500
- D. \$625,000

EXPLANATION • Learning Objective 3.1.4

ID: L1-3.1.4-005

$$\text{Value of property} = \frac{\text{Annual operating income}}{\text{Cap Rate}} = \frac{\text{Income} - \text{Expenses}}{\text{Cap Rate}} = \frac{\$50,000 - \$7,500}{0.08} = \$531,250$$

Question 8 of 29

Which of the following best describes the type of undeveloped land on which construction has begun but is not yet ready for homebuilding?

- A. unfinished lot
- B. paper lot
- C. entitled lot
- D. blue top lot

EXPLANATION • Learning Objective 3.1.2

ID: L1-3.1.2-001

A blue top lot is a undeveloped land in which construction has begun, but is not ready for homebuilding.

Other responses -

- Entitled lots have completed the preliminary planning stages, having met all local regulatory requirements for development.
- Paper lots are vacant lots that have been approved for development by the local zoning authority, but no construction of infrastructure (e.g., utilities) has begun.

Question 9 of 29

Which of the following types of farmland comprise the NCREIF Farmland Index?

- A. vegetable crop land and industrial crop land
- B. row crop land and industrial crop land
- C. row crop land and permanent crop land
- D. vegetable crop land and permanent crop land

The NCREIF Farmland Index comprises row crop land and permanent crop land.

Question 10 of 29

If the economy improves, a plot of land can be improved at a construction cost of \$200,000 and the value of the improved property will become \$450,000. However, if the economy declines, the construction cost drops to \$50,000 and the improved property value drops to \$80,000. If comparable improved properties currently sell for \$300,000 and the risk-free rate is 0%, which of the following comes closest to the value of the land as a call option?

- A. \$160,900
- B. \$180,700
- C. \$220,450
- D. \$300,150

Use the comparable improved property value to find the risk-neutral probabilities.

$$V_0 = pV_{1,u} + (1-p)V_{1,d}$$

$$\begin{aligned} \$300,000 &= [p \times \$450,000] + [(1-p) \times \$80,000] \\ &= \$450,000p + \$80,000 - \$80,000p \\ &= \$370,000p + \$80,000 \end{aligned}$$

$$\$370,000p = \$220,000 \quad \Rightarrow \quad p = \frac{\$220,000}{\$370,000} = 59.5\%$$

Thus, the probability of the economy improving is 59.5%.

If the economy improves (i.e., in the up node of the binomial tree), the value of the development will be \$450,000 - \$200,000 = \$250,000.

If the economy declines (i.e., in the down node of the binomial tree), the value of the development will be \$80,000 - \$50,000 = \$30,000.

Therefore, the value of the land is a weighted average of these two values:

$$\begin{aligned} V_0 &= pV_{1,u} + (1-p)V_{1,d} \\ &= [0.595 \times 250,000] + [(1 - 0.595) \times 30,000] = \$160,900 \end{aligned}$$

Question 11 of 29

An undeveloped lot of land has a 20% chance of being developed. If development occurs, then the return on the land is expected to be 45%. If it remains undeveloped, the return is expected to be -5%. Which of the following is the expected return on the lot of land?

- A. 2%
- B. 5%
- C. 13%
- D. 14%

EXPLANATION • Learning Objective 3.1.2

ID: L1-3.1.2-003

The expected return on the lot of land is the weighted average of possible expected returns if the land is developed or remains undeveloped.

$$E(r) = pE(r_d) + (1 - p)E(r_{ud}) = (20\% \times 45\%) + (80\% \times -5\%) = 5\%$$

Question 12 of 29

The asset volatility used to price an exchange option is driven by which of the following factors?

- I. Volatility of delivered asset
- II. Correlation between volatilities of delivered and received assets
- III. Strike price of received asset

- A. I and III only
- B. II only
- C. I and II only
- D. I only

EXPLANATION • Learning Objective 3.1.1

ID: L1-3.1.1-003

The volatility used in the value of an exchange option is driven by 3 factors.

1. Volatility of delivered asset
2. Volatility of received asset
3. Correlation between volatilities of delivered and received assets

Question 13 of 29

A large, appraised real estate property is estimated to have an annual volatility of returns of 9% and pair-wise correlations of returns with five other similar properties of 0.66. Which of the following best describes this property's return characteristics?

- A. The market-based return volatility is less than 9%, market-based return correlations are less than 0.66, and appraised returns are not lagged relative to market returns.
- B. The market-based return volatility is less than 9%, market-based return correlations are greater than 0.66, and appraised returns are lagged relative to market returns.
- C. The market-based return volatility is greater than 9%, market-based return correlations are greater than 0.66, and appraised returns are lagged relative to market returns.
- D. The market-based return volatility is greater than 9%, market-based return correlations are less than 0.66, and appraised returns are lagged relative to market returns.

EXPLANATION • Learning Objective 3.1.5

ID: L1-3.1.5-005

Effects of smoothing returns that can result from the appraisal process are: 1) lower volatility of returns than that of market returns, 2) lower correlation with other assets, and 3) lagged/delayed returns compared to market returns.

Therefore, market-based return volatility and correlations will be larger than corresponding appraised values.

Question 14 of 29

An investor has purchased 40 acres of farmland at \$3,000 per acre using a loan with a 50% loan-to-value ratio and a 5.4% annual interest rate. The farmland's annual property taxes are \$140 per acre and annual insurance costs are \$2,800. Given that the investor receives annual rent of \$600 per acre of farmland, which of the following represents the farmland investment's operating income and net income, respectively?

- A. \$14,600; \$11,600
- B. \$14,400; \$11,400
- C. \$15,600; \$12,360
- D. \$16,400; \$13,160

EXPLANATION • Learning Objective 3.1.4

ID: L1-3.1.4-016

Operating income = Income – Expenses (except financing costs)
 = Income – (Taxes + Insurance)
 = (40 x \$600) – ([40 x \$140] + \$2,800) = \$24,000 – \$8,400 = \$15,600

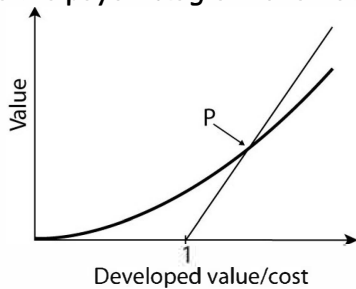
Net operating income = Operating income – Annual financing costs
 = \$15,600 – (5.4% of 50% of [40 acres x \$3,000]) = \$15,600 – \$3,240 = \$12,360

Breakdown of annual financing costs –

- Farmland cost: 40 acres x \$3,000 = \$120,000.
- Loan-to-value ratio is 50%, so 50% of \$120,000 is borrowed; i.e., \$60,000 is borrowed.
- Interest on the loan is 5.4% of \$60,000 = \$3,240.

Question 15 of 29

Use the payoff diagram of a natural resource development project below to answer the question that follows.



Which of the following statements regarding this project is accurate?

- I. For values above point P, the time value of the development option is positive.
- II. For values above point P, the development option value is greater if the option is exercised immediately.
- III. The development option is out-of-the-money only when horizontal-axis values are less than one.

- A. II and III only
- B. I, II, and III
- C. II only
- D. I only

EXPLANATION • Learning Objective 3.1.1

ID: L1-3.1.1-005

The development option is in-the-money for horizontal-axis values > 1 and out-of-the-money for values < 1 . A natural resource should be developed when the development option is far in-the-money (i.e., above point P). Above P, the option has more value if it is exercised immediately (than if exercise is deferred).

Other response: Above P, time value is negative.

Question 16 of 29

Consider an investment in a vacant lot that is viewed as a call option, the value of which is influenced by a number of factors related to the development process. Which of the following is FALSE regarding the view of vacant land as a call option?

- A. The relevant volatility is that of the spread between expected sales price and construction costs.
- B. The underlying asset is the vacant lot and building.
- C. The payoff is the sales price of the completed development.
- D. The strike price is the cost of improving or building on the land.

EXPLANATION • Learning Objective 3.1.2

ID: L1-3.1.2-002

The payoff on the call option is the difference between the sales price of the completed development and the cost to complete the development.

Question 17 of 29

Which of the following is NOT an advantage of an investment in timber?

- A. flexible harvest schedule
- B. inflation hedge
- C. non-cyclical
- D. low correlation with stocks and bonds

EXPLANATION • Learning Objective 3.1.3

ID: L1-3.1.3-001

Timber is cyclical since the demand for timber is tied to markets that are cyclical, such as the housing market. This is a disadvantage of a timber investment.

Other responses – These are related to the potential benefits of timber investments.

1. Diversification potential – due to low returns correlation with stocks and bonds.
2. Timing option – i.e., flexible timber harvesting.
3. Inflation hedge.

Question 18 of 29

Which of the following quarterly return characteristics applies to timber investments over the past two decades?

- A. lower volatility than world equities and large positive kurtosis
- B. large volatility and low Sharpe ratio
- C. no clustering around the mean and small maximum drawdown
- D. markedly negative skewness and excess kurtosis

EXPLANATION • Learning Objective 3.1.6

ID: L1-3.1.6-001

Quarterly return trait of timber investments: lower volatility than world equities and large positive kurtosis.

Other responses should be -

- Positive skewness and kurtosis
- Low volatility and attractive/high Sharpe ratio
- Tight clustering around the mean and small maximum drawdown

Reminder: timber valuations are based on appraisals, which are smoothed (i.e., they have reduced volatilities).

Question 19 of 29

Roberto Torres is looking to add a farmland investment to his investment portfolio. Which of the following would LEAST likely be a primary motivation for him?

- A. Farmland has a liquid market with efficient prices.
- B. Farmland is generally independent of financial markets.
- C. Farmland serves as an effective hedge against inflation.

EXPLANATION • Learning Objective 3.1.4

ID: L1-3.1.4-010

Farmland's market is fairly illiquid. This is one of farmland's drawbacks.

Primary motivations for investing in farmland -

1. Inflation hedge
2. Diversification
3. Constrained supply (vs. relatively unlimited demand for agricultural products)

Question 20 of 29

A portion of private land in the U.S. state of Wyoming has split estates. Which of the following more accurately describes the consequence of this in Wyoming?

- A. Ownership of the land has different tax liabilities.
- B. The land is passed on to different heirs after the owner's death.
- C. Surface and mineral estates are owned by different parties.

EXPLANATION • Learning Objective 3.1.1

ID: L1-3.1.1-002

Land that has split estates means that surface and subsurface rights are owned by different entities. E.g., the private land owner owns the surface land and the U.S. government owns the subsurface (e.g., mineral rights).

Question 21 of 29

The cap rate used in real estate investment analysis is most similar to which of the following performance measures?

- A. return on equity
- B. funds from operations
- C. return on assets
- D. internal rate of return

EXPLANATION • Learning Objective 3.1.4

ID: L1-3.1.4-001

The cap rate is a property's income divided by its value. It is most similar to the return on assets measure of performance.

Question 22 of 29

Which of the following best describes a Timberland Investment Management Organization (TIMO)?

- A. A manufacturing firm that specializes in supplying wood products to homebuilders and developers.
- B. A firm that brokers timberland deals and looks after timber investments for institutional investors.
- C. A publicly-traded real estate investment trust that specializes in timberland investments.
- D. An institutional investor that makes investments in a variety of assets, including timberland.

EXPLANATION • Learning Objective 3.1.3

ID: L1-3.1.3-002

A TIMO brokers and manages timberland real estate investments for institutional investors. TIMOs advise on and manage the investments in return for a management fee and a share of the profits from the harvest.

Question 23 of 29

A farmland owner hires a farmer to manage his land. Since the farmland owner lives far from the land, he is unable to monitor all of the farmer's activities. As a result, the farmer sometimes gets lazy and does not maximize the potential value of the crops. This is an example of which of the following?

- A. degradation
- B. selection bias
- C. efficiency cost
- D. agency cost

EXPLANATION • Learning Objective 3.1.4

ID: L1-3.1.4-006

Agency cost refers to the deviation from an optimal outcome caused by an agent whose incentives are not aligned with those of the principal. In this case, it refers to actions taken or not taken by the farmer (the agent) that reduce the value of the crops for the farmland owner (the principal).

Question 24 of 29

Which of the following is the best possible way to try to achieve a pure play investment in coal?

- A. invest in a master limited partnership that primarily owns coal
- B. invest in a coal mine located on public land
- C. buy and store coal
- D. own the stock of a company that invests solely in coal futures contracts

EXPLANATION • Learning Objective 3.1.1

ID: L1-3.1.1-001

A pure play investment provides direct exposure to an investment's risks and returns with no other exposures. In practice, this is difficult to achieve. Of the responses, investing in an MLP that primarily owns coal is the closest pure play investment (least likely to have other exposures).

Question 25 of 29

Which of the following is most accurate regarding the difference between an investment in farmland and an investment in timberland?

- A. Farmland acts as a better inflation hedge.
- B. The harvest schedule of farm crops is much more flexible than that of timber.
- C. Farmland is less versatile than timberland.
- D. The value of farmland is more heavily influenced by political risk than the value of timberland.

EXPLANATION • Learning Objective 3.1.4

ID: L1-3.1.4-004

Government regulators tend to be active in policy making for farm crops (such as subsidies), which can negatively affect the value of crops.

Question 26 of 29

Which of the following likely best explains the divergence in performance observed between the NCREIF Property Index and the NAREIT Index during the global financial crisis?

- A. The NCREIF Property Index's volatile prices were largely due to the use of appraisals.
- B. The NAREIT's price volatility is an accurate indicator of the true volatility of the underlying property values.
- C. The NCREIF Property Index's volatile prices declined at the same pace as underlying market prices.
- D. The NAREIT's price volatility was due in part to a contagion effect of the public equity market.

EXPLANATION • Learning Objective 3.1.5

ID: L1-3.1.5-003

The NAREIT's price volatility was due in part to a contagion effect of the public equity market.

Contagion refers to major moves (particularly price declines or volatility increases) in one market affecting another market.

Other responses -

- The NCREIF Property Index's prices are smoothed due to the use of appraisals, and decline on a delayed basis relative to market prices.
- The NAREIT's price volatility is not an accurate indicator of the true volatility of underlying property values, since it also includes a contagion effect.

Question 27 of 29

Use the information below to answer questions 27 through 28.

An analyst has been asked to review an investment opportunity in an apartment complex with the following projections.

Market Value of Property	\$3,500,000
Mortgage Amount	\$2,500,000
Equity Investment	\$1,000,000
Annual Revenues	\$500,000
Property Taxes	\$150,000
Insurance	\$50,000
Interest	\$125,000

An analyst has been asked to review an investment opportunity in an apartment complex with the following projections.

Market Value of Property	\$3,500,000
Mortgage Amount	\$2,500,000
Equity Investment	\$1,000,000
Annual Revenues	\$500,000
Property Taxes	\$150,000
Insurance	\$50,000
Interest	\$125,000

Which of the following comes closest to the investment's return on assets?

- A. 8.6%
- B. 17.5%
- C. 21%
- D. 30%

EXPLANATION • Learning Objective 3.1.4

ID: L1-3.1.4-008

Return on assets (ROA) = Operating income/Total assets = Operating income/\$3,500,000

Now find Operating income (OI) -

$OI = \text{Income} - (\text{Taxes} + \text{Insurance cost}) = \$500,000 - (\$150,000 + \$50,000) = \$300,000$

Plug OI = \$300,000 into ROA above.

$\Rightarrow ROA = OI/\$3,500,000 = \$300,000/\$3,500,000 = 8.57\%$

Question 28 of 29

Use the information below to answer questions 27 through 28.

An analyst has been asked to review an investment opportunity in an apartment complex with the following projections.

Market Value of Property	\$3,500,000
Mortgage Amount	\$2,500,000
Equity Investment	\$1,000,000
Annual Revenues	\$500,000
Property Taxes	\$150,000
Insurance	\$50,000
Interest	\$125,000

An analyst has been asked to review an investment opportunity in an apartment complex with the following projections.

Market Value of Property	\$3,500,000
Mortgage Amount	\$2,500,000
Equity Investment	\$1,000,000
Annual Revenues	\$500,000
Property Taxes	\$150,000
Insurance	\$50,000
Interest	\$125,000

Which of the following comes closest to the investment's return on equity?

- A. 8.6%
- B. 17.5%
- C. 21%
- D. 30%

EXPLANATION • Learning Objective 3.1.4

ID: L1-3.1.4-007

$$\begin{aligned} \text{Return on equity (ROE)} &= \text{Net income} / \text{Total Equity investment} \\ &= (\text{Operating Income} - \text{Interest}) / \text{Total Equity investment} \\ &= (\text{Operating Income} - \$125,000) / 1,000,000 \end{aligned}$$

Now find Operating Income (OI):

$$\begin{aligned} \text{OI} &= \text{Income} - (\text{Taxes} + \text{Insurance Cost}) \\ &= \$500,000 - (\$150,000 + \$50,000) = \$300,000 \end{aligned}$$

Plug OI = \$300,000 into ROE above:

$$\text{ROE} = (\$300,000 - \$125,000) / 1,000,000 = 17.5\%$$

Question 29 of 29

Which of the following most accurately describes the change in timber ownership in the U.S. resulting from the dismantling of forest-products companies over the past 30 years?

- A. more retail investors
- B. fewer institutional investors
- C. fewer retail investors
- D. more institutional investors

EXPLANATION • Learning Objective 3.1.3

ID: L1-3.1.3-003

As forest-products companies in the U.S. were dismantled, timberland was sold to institutional investors (through Timberland Investment Management Organizations [TIMOs]).

UpperMark, Inc.

Answer Key

Question #	Question ID	Correct Response
1	L1-3.1.2-004	B
2	L1-3.1.3-004	C
3	L1-3.1.1-004	B
4	L1-3.1.4-011	B
5	L1-3.1.4-003	D
6	L1-3.1.4-015	A
7	L1-3.1.4-005	B
8	L1-3.1.2-001	D
9	L1-3.1.4-012	C
10	L1-3.1.2-005	A
11	L1-3.1.2-003	B
12	L1-3.1.1-003	C
13	L1-3.1.5-005	C
14	L1-3.1.4-016	C
15	L1-3.1.1-005	A
16	L1-3.1.2-002	C
17	L1-3.1.3-001	C
18	L1-3.1.6-001	A
19	L1-3.1.4-010	A
20	L1-3.1.1-002	C
21	L1-3.1.4-001	C
22	L1-3.1.3-002	B
23	L1-3.1.4-006	D
24	L1-3.1.1-001	A
25	L1-3.1.4-004	D
26	L1-3.1.5-003	D
27	L1-3.1.4-008	A
28	L1-3.1.4-007	B
29	L1-3.1.3-003	D