

Basics of Derivative Pricing and Valuation

Literature:

Chapter 2: Basics of Derivative Pricing and Valuation, p. 1-54

PIRIE, Wendy L. **Derivatives**. Hoboken: Wiley, 2017. CFA institute investment series. ISBN 978-1-119-38181-5.

Chapters 5, 11, p. 107-134; 231-251

HULL, John. **Options, futures, and other derivatives**. Ninth edition. Harlow: Pearson, 2018. ISBN 978-1-292-21289-0.

Learning Outcomes

- explain how the concepts of arbitrage, replication, and risk neutrality are used in pricing derivatives;
- distinguish between value and price of forward and futures contracts;
- explain how the value and price of a forward contract are determined at expiration, during the life of the contract, and at initiation;
- describe monetary and nonmonetary benefits and costs associated with holding the underlying asset and explain how they affect the value and price of a forward contract;
- define a forward rate agreement and describe its uses;
- explain why forward and futures prices differ;
- explain how swap contracts are similar to but different from a series of forward contracts;
- distinguish between the value and price of swaps;
- explain how the value of a European option is determined at expiration;
- explain the exercise value, time value, and moneyness of an option;
- identify the factors that determine the value of an option and explain how each factor affects the value of an option;
- explain put–call parity for European options;
- explain put–call–forward parity for European options;
- explain how the value of an option is determined using a one-period binomial model;
- explain under which circumstances the values of European and American options differ;

Problems

1. An arbitrage opportunity is least likely to be exploited when:
 - A. one position is illiquid.
 - B. the price differential between assets is large.
 - C. the investor can execute a transaction in large volumes.
2. An arbitrageur will most likely execute a trade when:
 - A. transaction costs are low.
 - B. costs of short-selling are high.
 - C. prices are consistent with the law of one price.
3. An arbitrage transaction generates a net inflow of funds:
 - A. throughout the holding period.
 - B. at the end of the holding period.

- C. at the start of the holding period.
4. The price of a forward contract:
 - A. is the amount paid at initiation.
 - B. is the amount paid at expiration.
 - C. fluctuates over the term of the contract.
 5. Assume an asset pays no dividends or interest, and also assume that the asset does not yield any non-financial benefits or incur any carrying cost. At initiation, the price of a forward contract on that asset is:
 - A. lower than the value of the contract.
 - B. equal to the value of the contract.
 - C. greater than the value of the contract.
 6. With respect to a forward contract, as market conditions change:
 - A. only the price fluctuates.
 - B. only the value fluctuates.
 - C. both the price and the value fluctuate.
 7. The value of a forward contract at expiration is:
 - A. positive to the long party if the spot price is higher than the forward price.
 - B. negative to the short party if the forward price is higher than the spot price.
 - C. positive to the short party if the spot price is higher than the forward price.
 8. At the initiation of a forward contract on an asset that neither receives benefits nor incurs carrying costs during the term of the contract, the forward price is equal to the:
 - A. spot price.
 - B. future value of the spot price.
 - C. present value of the spot price.
 9. Stocks BWQ and ZER are each currently priced at \$100 per share. Over the next year, stock BWQ is expected to generate significant benefits whereas stock ZER is not expected to generate any benefits. There are no carrying costs associated with holding either stock over the next year. Compared with ZER, the one-year forward price of BWQ is most likely:
 - A. lower.
 - B. the same.
 - C. higher.
 10. If the net cost of carry of an asset is positive, then the price of a forward contract on that asset is most likely:
 - A. lower than if the net cost of carry was zero.
 - B. the same as if the net cost of carry was zero.
 - C. higher than if the net cost of carry was zero.
 11. If the present value of storage costs exceeds the present value of its convenience yield, then the commodity's forward price is most likely:
 - A. less than the spot price compounded at the risk-free rate.
 - B. the same as the spot price compounded at the risk-free rate.
 - C. higher than the spot price compounded at the risk-free rate.
 12. Which of the following factors most likely explains why the spot price of a commodity in short supply can be greater than its forward price?
 - A. Opportunity cost
 - B. Lack of dividends

- C. Convenience yield
13. When interest rates are constant, futures prices are most likely:
- A. less than forward prices.
 - B. equal to forward prices.
 - C. greater than forward prices.
14. In contrast to a forward contract, a futures contract:
- A. trades over-the-counter.
 - B. is initiated at a zero value.
 - C. is marked-to-market daily.
15. To the holder of a long position, it is more desirable to own a forward contract than a futures contract when interest rates and futures prices are:
- A. negatively correlated.
 - B. uncorrelated.
 - C. positively correlated.
16. The value of a swap typically:
- A. is non-zero at initiation.
 - B. is obtained through replication.
 - C. does not fluctuate over the life of the contract.
17. The price of a swap typically:
- A. is zero at initiation.
 - B. fluctuates over the life of the contract.
 - C. is obtained through a process of replication.
18. The value of a swap is equal to the present value of the:
- A. fixed payments from the swap.
 - B. net cash flow payments from the swap.
 - C. underlying at the end of the contract.
19. A European call option and a European put option are written on the same underlying, and both options have the same expiration date and exercise price. At expiration, it is possible that both options will have:
- A. negative values.
 - B. the same value.
 - C. positive values.
20. At expiration, a European put option will be valuable if the exercise price is:
- A. less than the underlying price.
 - B. equal to the underlying price.
 - C. greater than the underlying price.
21. The value of a European call option at expiration is the greater of zero or the:
- A. value of the underlying.
 - B. value of the underlying minus the exercise price.
 - C. exercise price minus the value of the underlying.
22. For a European call option with two months until expiration, if the spot price is below the exercise price, the call option will most likely have:
- A. zero time value.
 - B. positive time value.

- C. positive exercise value.
23. When the price of the underlying is below the exercise price, a put option is:
- A. in-the-money.
 - B. at-the-money.
 - C. out-of-the-money.
24. If the risk-free rate increases, the value of an in-the-money European put option will most likely:
- A. decrease.
 - B. remain the same.
 - C. increase.
25. The value of a European call option is inversely related to the:
- A. exercise price.
 - B. time to expiration.
 - C. volatility of the underlying.
26. The table below shows three European call options on the same underlying:

	Time to Expiration	Exercise Price
Option 1	3 months	\$100
Option 2	6 months	\$100
Option 3	6 months	\$105

- The option with the highest value is most likely:
- A. Option 1.
 - B. Option 2.
 - C. Option 3.
27. The value of a European put option can be either directly or inversely related to the:
- A. exercise price.
 - B. time to expiration.
 - C. volatility of the underlying.
28. Prior to expiration, the lowest value of a European put option is the greater of zero or the:
- A. exercise price minus the value of the underlying.
 - B. present value of the exercise price minus the value of the underlying.
 - C. value of the underlying minus the present value of the exercise price.
29. A European put option on a dividend-paying stock is most likely to increase if there is an increase in:
- A. carrying costs.
 - B. the risk-free rate.
 - C. dividend payments.
30. Based on put-call parity, a trader who combines a long asset, a long put, and a short call will create a synthetic:
- A. long bond.
 - B. fiduciary call.
 - C. protective put.
31. Which of the following transactions is the equivalent of a synthetic long call position?
- A. Long asset, long put, short call

- B. Long asset, long put, short bond
 - C. Short asset, long call, long bond
32. Which of the following is least likely to be required by the binomial option pricing model?
- A. Spot price
 - B. Two possible prices one period later
 - C. Actual probabilities of the up and down moves
33. An at-the-money American call option on a stock that pays no dividends has three months remaining until expiration. The market value of the option will most likely be:
- A. less than its exercise value.
 - B. equal to its exercise value.
 - C. greater than its exercise value.
34. At expiration, American call options are worth:
- A. less than European call options.
 - B. the same as European call options.
 - C. more than European call options.
35. Which of the following circumstances will most likely affect the value of an American call option relative to a European call option?
- A. Dividends are declared
 - B. Expiration date occurs
 - C. The risk-free rate changes
36. Combining a protective put with a forward contract generates equivalent outcomes at expiration to those of a:
- A. fiduciary call.
 - B. long call combined with a short asset.
 - C. forward contract combined with a risk-free bond.