

**57****THE TERM STRUCTURE OF  
INTEREST RATES- SPOT, PAR, &  
FORWARD CURVES**

1. If the yield curve is downward-sloping, the no-arbitrage value of a bond calculated using spot rates will be:
  - (A) equal to the market price of the bond.
  - (B) greater than the market price of the bond.
  - (C) less than the market price of the bond.
  
2. Given that the two-year spot rate is 5.89% and the one-year forward rate one-year from now is 6.05%, assuming annual compounding what is the one-year spot rate?
  - (A) 5.67%.
  - (B) 5.73%.
  - (C) 5.91%.
  
3. Using the following spot rates for pricing the bond, what is the present value of a three-year security that pays a fixed annual coupon of 6%?  
Year 1: 5.0%  
Year 2: 5.5%  
Year 3: 6.0%
  - (A) 102.46.
  - (B) 95.07.
  - (C) 100.10.
  
4. A spot rate curve is most accurately described as yields to maturity for:
  - (A) money market securities.
  - (B) government bonds.
  - (C) zero-coupon bonds.
  
5. The following spot and forward rates currently exist in the market:
  - The 1-year spot rate is 3.75%.
  - The 1-year forward rate one year from today is 9.50%.
  - The 1-year forward rate two years from today is 15.80%.Given these rates and based on annual compounding, how much should an investor be willing to pay for each \$100 in par value for a three-year, zero-coupon bond?
  - (A) \$76.
  - (B) \$44.
  - (C) \$33.

6. An investor gathers the following information about a 2-year, annual-pay bond:

- Par value of \$1,000
- Coupon of 4%
- 1-year spot interest rate is 2%
- 2-year spot interest rate is 5%

Using the above spot rates, the current price of the bond is closest to:

- (A) \$983.
- (B) \$1,000.
- (C) \$1,010.

7. Using the following spot rates, what is the price of a three-year bond with annual coupon payments of 5%?

- One-year rate: 4.78%
- Two-year rate: 5.56%
- Three-year rate: 5.98%

- (A) \$93.27.
- (B) \$97.47.
- (C) \$98.87.

8. The one-year spot rate is 6% and the one-year forward rates starting in one, two and three years respectively are 6.5%, 6.8%, and 7%. What is the four-year spot rate?

- (A) 6.51%.
- (B) 6.57%.
- (C) 6.58%.

9. The six-year spot rate is 7% and the five-year spot rate is 6%. The implied one-year forward rate five years from now is closest to:

- (A) 12.0%.
- (B) 5.0%.
- (C) 6.5%.

10. A 2-year option-free bond (par value of \$10,000) has an annual coupon of 15%. An investor determines that the spot rate of year 1 is 16% and the year 2 spot rate is 17%. The bond price is closest to:

- (A) \$8,401.
- (B) \$9,694.
- (C) \$11,122.

11. Suppose the 3-year spot rate is 12.1% and the 2-year spot rate is 11.3%. Which of the following statements concerning forward and spot rates is most accurate? The 1-year:
- (A) forward rate one year from today is 13.7%.
  - (B) forward rate two years from today is 13.2%.
  - (C) forward rate two years from today is 13.7%.
12. Given the one-year spot rate  $S_1 = 0.06$  and the implied 1-year forward rates one, two, and three years from now of:  ${}_1y_{1y} = 0.062$ ;  ${}_2y_{1y} = 0.063$ ;  ${}_3y_{1y} = 0.065$ , what is the theoretical 4-year spot rate?
- (A) 6.25%.
  - (B) 6.75%.
  - (C) 6.00%.
13. The term structure of yield volatility illustrates the relationship between yield volatility and:
- (A) Macaulay duration.
  - (B) yield to maturity.
  - (C) time to maturity.
14. An investor who is calculating the arbitrage-free value of a government security should discount each cash flow using the:
- (A) government note yield that is specific to its maturity.
  - (B) government spot rate that is specific to its maturity.
  - (C) risk-free rate.
15. The one-year spot rate is 5% and the two-year spot rate is 6.5%. What is the one-year forward rate starting one year from now?
- (A) 5.00%.
  - (B) 7.87%.
  - (C) 8.02%.
16. An analyst collects the following information regarding spot rates:
- 1-year rate = 4%.
  - 2-year rate = 5%.
  - 3-year rate = 6%.
  - 4-year rate = 7%.
- The 2-year forward rate two years from today is closest to:
- (A) 7.02%.
  - (B) 8.03%.
  - (C) 9.04%.

17. The current 4-year spot rate is 4% and the current 5-year spot rate is 5.5%. What is the 1- year forward rate in four years?
- (A) 9.58%.
  - (B) 11.72%.
  - (C) 10.14%.
18. Assume that a callable bond's call period starts two years from now with a call price of \$102.50. Also assume that the bond pays an annual coupon of 6% and the term structure is flat at 5.5%. Which of the following is the price of the bond assuming that it is called on the first call date?
- (A) \$103.17.
  - (B) \$102.50.
  - (C) \$100.00.
19. The six-month spot rate is 4.0% and the 1 year spot rate is 4.5%, both stated on a semiannual bond basis. The implied six-month rate six months from now, stated on a semiannual bond basis, is closest to:
- (A) 4%.
  - (B) 5%.
  - (C) 6%.
20. A 3-year option-free bond (par value of \$1,000) has an annual coupon of 9%. An investor determines that the spot rate of year 1 is 6%, the year 2 spot rate is 12%, and the year 3 spot rate is 13%. Using the arbitrage-free valuation approach, the bond price is closest to:
- (A) \$ 912.
  - (B) \$ 968.
  - (C) \$ 1,080.
21. The arbitrage-free bond valuation approach can best be described as the:
- (A) geometric average of the spot interest rates.
  - (B) use of a series of spot interest rates that reflect the current term structure.
  - (C) use of a single discount factor.

22. Current spot rates are as follows:

1-Year: 6.5%

2-Year: 7.0%

3-Year: 9.2%

Which of the following statements is most accurate?

- (A) For a 3-year annual pay coupon bond, all cash flows can be discounted at 9.2% to find the bond's arbitrage-free value.
- (B) The yield to maturity for 3-year annual pay coupon bond can be found by taking the geometric average of the 3 spot rates.
- (C) For a 3-year annual pay coupon bond, the first coupon can be discounted at 6.5% the second coupon can be discounted at 7.0%, and the third coupon plus maturity value can be discounted at 9.2% to find the bond's arbitrage-free value.

23. A three-year annual coupon bond has a par value of \$1,000 and a coupon rate of 5.5%. The spot rate for year 1 is 5.2%, the spot rate for year two is 5.5%, and the spot rate for year three is 5.7%. The value of the coupon bond is closest to:

- (A) \$1,000.00.
- (B) \$937.66.
- (C) \$995.06.

24. The 3-year annual spot rate is 7%, the 4-year annual spot rate is 7.5%, and the 5-year annual spot rate is 8%. The 1-year forward rate four years from now is closest to:

- (A) 7%.
- (B) 9%.
- (C) 10%.

25. Given that the one-year spot rate is 6.05% and the two-year spot rate is 7.32%, assuming annual compounding what is the one-year forward rate starting one year from now?

- (A) 7.87%.
- (B) 8.61%.
- (C) 8.34%.

26. A yield curve for coupon bonds is composed of yields on bonds with similar:

- (A) maturities.
- (B) coupon rates.
- (C) issuers.

27. An investor wants to take advantage of the 5-year spot rate, currently at a level of 4.0%. Unfortunately, the investor just invested all of his funds in a 2-year bond with a yield of 3.2%. The investor contacts his broker, who tells him that in two years he can purchase a 3-year bond and end up with the same return currently offered on the 5-year bond. What 3-year forward rate beginning two years from now will allow the investor to earn a return equivalent to the 5-year spot rate?
- (A) 4.5%.  
(B) 5.6%.  
(C) 3.5%.
28. If the current two-year spot rate is 6% while the one-year forward rate for one year is 5%, what is the current spot rate for one year?
- (A) 5.0%.  
(B) 5.5%.  
(C) 7.0%.
29. A 2-year option-free bond (par value of \$1,000) has an annual coupon of 6%. An investor determines that the spot rate for year 1 is 5% and the year 2 spot rate is 8%. The bond price is closest to:
- (A) \$966.  
(B) \$992.  
(C) \$1,039.
30. The 3-year spot rate is 10%, and the 4-year spot rate is 10.5%. What is the 1-year forward rate 3 years from now?
- (A) 10.0%.  
(B) 11.0%.  
(C) 12.0%.
31. The Treasury spot rate yield curve is closest to which of the following curves?
- (A) Forward yield curve rate.  
(B) Par bond yield curve.  
(C) Zero-coupon bond yield curve.
32. Assume the following government spot yield curve.  
One-year rate: 5%  
Two-year rate: 6%  
Three-year rate: 7%
- If a 3-year annual-pay government bond has a coupon of 6%, its yield to maturity is closest to:
- (A) 6.08%.  
(B) 6.92%.  
(C) 7.00%.

33. A 10-year spot rate is least likely the:
- (A) appropriate discount rate on the year 10 cash flow for a 20-year bond.
  - (B) yield-to-maturity on a 10-year coupon bond.
  - (C) yield-to-maturity on a 10-year zero-coupon bond.
34. The one-year spot rate is 7.00%. One-year forward rates are 8.15% one year from today, 10.30% two years from today, and 12.00% three years from today. The value today of a 4-year, \$1,000 par value, zero-coupon bond is closest to:
- (A) \$665.
  - (B) \$700.
  - (C) \$640.
35. Given that the 2-year spot rate is 5.76% and the 3-year spot rate is 6.11%, what is the 1-year forward rate starting two years from now?
- (A) 6.81%.
  - (B) 6.97%.
  - (C) 7.04%.
36. A 4 percent Treasury bond has 2.5 years to maturity. Spot rates are as follows:

6 month	1 year	1.5 years	2 years	2.5 years
2%	2.5%	3%	4%	6%

The note is currently selling for \$976. Determine the arbitrage profit, if any, that is possible.

- (A) \$37.63.
  - (B) \$43.22.
  - (C) \$19.22.
37. Which of the following statements regarding zero-coupon bonds and spot interest rates is CORRECT?
- (A) If the yield to maturity on a 2-year zero coupon bond is 6%, then the 2-year spot rate is 3%.
  - (B) Price appreciation creates all of the zero-coupon bond's return.
  - (C) Spot interest rates will never vary across the term structure

