Question #1 of 37

Question ID: 1574290

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. ✗

Explanation

The value of a bond calculated using appropriate spot rates is its no-arbitrage value. If no arbitrage opportunities are present, this value is equal to the market price of a bond.

(Module 57.1, LOS 57.a)

Question #2 of 37

Question ID: 1574299

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%. ✗

Explanation

The spot rate is computed as follows:

$$\text{spot rate}_{0,1} = \frac{(1 + \text{spot rate}_{0,2})^2}{(1 + \text{forward rate}_{1,2})^1} - 1 = \frac{(1 + 0.0589)^2}{(1 + 0.0605)^1} - 1 = 5.73\%$$

(Module 57.1, LOS 57.b)

Question #3 of 37

Question ID: 1574277

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.

Explanation

This value is computed as follows:

$$\text{Present Value} = 6/1.05 + 6/1.055^2 + 106/1.06^3 = 100.10$$

The value 95.07 results if the coupon payment at maturity of the bond is neglected.

(Module 57.1, LOS 57.a)

Question #4 of 37

Question ID: 1574272

A spot rate curve is *most accurately* described as yields to maturity for:

A) money market securities.

B) government bonds.

C) zero-coupon bonds.

Explanation

A spot rate curve illustrates the yields for single payments to be made in various future periods, including short-term and long-term periods.

(Module 57.1, LOS 57.c)

Question #5 of 37

Question ID: 1574306

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.

Explanation

The discount rate on an N-year, zero-coupon bond is the spot rate for Year N. Thus, find the spot rate in Year 3:

$(1 + Z_3)^3 = (1.0375) \times (1.095) \times (1.158) = 1.31556$

$Z_3 = (1.31556)^{1/3} – 1 = 0.0957 = 9.573\%$

Now, price this three-year, zero-coupon bond to yield 9.57%:

N = 3; I/Y = 9.57; FV = 100; CPT PV = –76.02 (ignore sign)

Hint: 100 / (1.0375 × 1.095 × 1.158) = 76.02 saves a couple of calculations.

(Module 57.1, LOS 57.b)

Question #6 of 37

Question ID: 1574284

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.

Explanation

The value of the bond is simply the present value of discounted future cash flows, using the appropriate spot rate as the discount rate for each cash flow. The coupon payment of the bond is $40 (0.04 × 1,000). The bond price = 40/(1.02) + 1,040/(1.05)^2 = $982.53.

(Module 57.1, LOS 57.a)

Question #7 of 37

Question ID: 1574285

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.

Explanation

The bond price is computed as follows:

Bond price = (5 / 1.0478) + (5 / 1.0556^2) + (105 / 1.0598^3) = $97.47

(Module 57.1, LOS 57.a)

Question #8 of 37

Question ID: 1574295

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%.

Explanation

The four-year spot rate is computed as follows:

$$\text{Four-year spot rate} = [(1 + 0.06)(1 + 0.065)(1 + 0.068)(1 + 0.07)\,]^{1/4} - 1 = 6.57\%$$

(Module 57.1, LOS 57.b)

Question #9 of 37

Question ID: 1574292

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%.

Explanation

$5_y1_y = [(1 + S_6)^6 / (1 + S_5)^5] - 1 = [(1.07)^6/(1.06)^5] - 1 = [1.5 / 1.338] - 1 = 0.12$

(Module 57.1, LOS 57.b)

Question #10 of 37

Question ID: 1574283

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.

Explanation

We can calculate the price of the bond by discounting each of the annual payments by the appropriate spot rate and finding the sum of the present values. Price = [1,500/(1.16)] + [11,500/(1.17)^2] = \$9,694. Or, in keeping with the notion that each cash flow is a separate bond, sum the following transactions on your financial calculator:

N=1, I/Y=16.0, PMT=0, FV=1,500, CPT PV=1,293

N=2, I/Y=17.0, PMT=0, FV=11,500, CPT PV=8,401

Price = 1,293 + 8,401 = \$9,694.

(Module 57.1, LOS 57.a)

Question #11 of 37

Question ID: 1574293

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%.

Explanation

The equation for the three-year spot rate, S_3, is $(1 + S_1)(1 + {}_1y_1y)(1 + {}_2y_1y) = (1 + S_3)^3$. Also, $(1 + S_1)(1 + {}_1y_1y) = (1 + S_2)^2$. So, $(1 + {}_2y_1y) = (1 + S_3)^3 / (1 + S_2)^2$, computed as: $(1 + 0.121)^3 / (1 + 0.113)^2 = 1.137$. Thus, ${}_2y_1y = 0.137$, or 13.7%.

(Module 57.1, LOS 57.b)

Question #12 of 37

Question ID: 1574294

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%.

Explanation

$S_4 = [\,(1.06)\,(1.062)\,(1.063)\,(1.065)\,]^{.25} - 1 = 6.25\%$.

(Module 57.1, LOS 57.b)

Question #13 of 37

Question ID: 1576489

The term structure of yield volatility illustrates the relationship between yield volatility and:

A) Macaulay duration.

B) yield to maturity.

C) time to maturity.

Explanation

The term structure of yield volatility refers to the relationship between yield volatility and time to maturity.

(Module 57.1, LOS 57.a)

Question #14 of 37

Question ID: 1574289

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.

Explanation

To calculate a government bond's arbitrage-free value, each cash flow is discounted using the government spot rate that is specific to the maturity of the cash flow.

(Module 57.1, LOS 57.a)

Question #15 of 37

Question ID: 1574300

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%.

Explanation

The forward rate is computed as follows:

One-year forward rate = 1.065^2 / 1.05 – 1 = 8.02%

(Module 57.1, LOS 57.b)

Question #16 of 37

Question ID: 1574304

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%.

Explanation

$$\sqrt{\frac{(1.07)^4}{(1.05)^2}} - 1 = 0.0904,\ \text{or}\ \frac{(4\times7)-(2\times5)}{2} = 9\ \text{as an approximation.}$$

(Module 57.1, LOS 57.b)

Question #17 of 37

Question ID: 1574303

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%.

Explanation

$$4y1y = \frac{(1.055)^5}{(1.04)^4} - 1 = 0.1172$$

Note: 5(5.5) − 4(4) = 11.5%.

(Module 57.1, LOS 57.b)

Question #18 of 37

Question ID: 1574286

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.

Explanation

The bond price is computed as follows:

Bond price = 6/1.055 + (102.50 + 6)/1.055^2= $103.17

(Module 57.1, LOS 57.a)

Question #19 of 37

Question ID: 1574291

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%.

Explanation

6m6m/2 = [(1 + S_2/2)^2 / (1 + S_1/2)^1] - 1 = [(1.0225)^2/(1.02)^1] - 1

[1.0455 / 1.02] - 1 = 0.025

6m6m = 0.025 × 2 = 0.05

(Module 57.1, LOS 57.b)

Question #20 of 37

Question ID: 1574279

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.

Explanation

We can calculate the price of the bond by discounting each of the annual payments by the appropriate spot rate and finding the sum of the present values. Price = [90 / (1.06)] + [90 / (1.12)^2] + [1,090 / (1.13)^3] = 912. Or, in keeping with the notion that each cash flow is a separate bond, sum the following transactions on your financial calculator:

N = 1; I/Y = 6.0; PMT = 0; FV = 90; CPT → PV = 84.91

N = 2; I/Y = 12.0; PMT = 0; FV = 90; CPT → PV = 71.75

N = 3; I/Y = 13.0; PMT = 0; FV = 1,090; CPT → PV = 755.42

Price = 84.91 + 71.75 + 755.42 = $912.08.

(Module 57.1, LOS 57.a)

Question #21 of 37

Question ID: 1574280

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.

Explanation

The use of multiple discount rates (i.e., a series of spot rates that reflect the current term structure) will result in more accurate bond pricing and in so doing, will eliminate any meaningful arbitrage opportunities. That is why the use of a series of spot rates to discount bond cash flows is considered to be an arbitrage-free valuation procedure.

(Module 57.1, LOS 57.a)

Question #22 of 37

Question ID: 1574282

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.

Explanation

Spot interest rates can be used to price coupon bonds by taking each individual cash flow and discounting it at the appropriate spot rate for that year's payment. Note that the yield to maturity is the bond's internal rate of return that equates all cash flows to the bond's price. Current spot rates have nothing to do with the bond's yield to maturity.

(Module 57.1, LOS 57.a)

Question #23 of 37

Question ID: 1574281

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.

Explanation

You need the find the present value of each cash flow using the spot rate that coincides with each cash flow.

The present value of cash flow 1 is: FV = $55; PMT = 0; I/Y = 5.2%; N = 1; CPT → PV = -$52.28.

The present value of cash flow 2 is: FV = $55; PMT = 0; I/Y = 5.5%; N = 2; CPT → PV = –$49.42.

The present value of cash flow 3 is: FV = $1,055; PMT = 0; I/Y = 5.7%; N = 3; CPT → PV = –$893.36.

The most you pay for the bond is the sum of: $52.28 + $49.42 + $893.36 = $995.06.

(Module 57.1, LOS 57.a)

Question #24 of 37

Question ID: 1574305

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%.

Explanation

Implied 1-year forward rate in four years =
$\frac{(1+S_5)^5}{(1+S_4)^4} - 1 = \frac{1.08^5}{1.075^4} - 1 = \frac{1.4693}{1.3355} - 1$ = 0.1002 or 10.02%. Alternatively, 5 × 8% – 4 × 7.5% = 10%.

(Module 57.1, LOS 57.b)

Question #25 of 37

Question ID: 1574297

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%. ✗

Explanation

The forward rate is computed as follows:

$$\text{Forward rate}_{1,2} = \frac{\left(1 + \text{spot rate}_{0,2}\right)^2}{\left(1 + \text{spot rate}_{0,1}\right)^1} - 1 = \frac{(1 + 0.0732)^2}{(1 + 0.0605)^1} - 1 = 8.61\%$$

(Module 57.1, LOS 57.b)

Question #26 of 37

Question ID: 1574273

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

A) maturities. ✗

B) coupon rates. ✗

C) issuers. ✓

Explanation

Yield curves are typically constructed for bonds of the same or similar issuers, such as a government bond yield curve or AA rated corporate bond yield curve.

(Module 57.1, LOS 57.c)

Question #27 of 37

Question ID: 1574302

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%.

Explanation

$(1.04^5 / 1.032^2)^{1/3} – 1 = 4.5\%$.

(Module 57.1, LOS 57.b)

Question #28 of 37

Question ID: 1574298

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%.

Explanation

$(1 + {}_1y_1y)(1 + s_1) = (1 + s_2)^2$

$(1 + 0.05)(1 + s_1) = (1 + 0.06)^2$

$(1 + s_1) = (1.06)^2 / (1 + 0.05)$

$1 + s_1 = 1.1236 / 1.05$

$1 + s_1 = 1.0701$

$s_1 = 0.07$ or 7%

(Module 57.1, LOS 57.b)

Question #29 of 37

Question ID: 1574278

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. ✗

Explanation

We can calculate the price of the bond by discounting each of the annual payments by the appropriate spot rate and finding the sum of the present values. Bond price = $[60 / (1.05)] + [1{,}060 / (1.08)^2]$ = $966. Or, in keeping with the notion that each cash flow is a separate bond, sum the following transactions on your financial calculator:

N = 1; I/Y = 5.0; PMT = 0; FV = 60; CPT → PV = 57.14

N = 2; I/Y = 8.0; PMT = 0; FV = 1,060; CPT → PV = 908.78

Price = 57.14 + 908.78 = $966.

(Module 57.1, LOS 57.a)

Question #30 of 37

Question ID: 1574301

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%.

Explanation

$[(1 + S_4)^4 / (1 + S_3)^3] - 1 = 12.01\% = 12\%$.

(Module 57.1, LOS 57.b)

Question #31 of 37

Question ID: 1574271

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.

Explanation

The spot rate yield curve shows the appropriate rates for discounting single cash flows occurring at different times in the future. Conceptually, these rates are equivalent to yields on zero-coupon bonds. The par bond yield curve shows the YTMs at which bonds of various maturities would trade at par value. Forward rates are expected future short-term rates.

(Module 57.1, LOS 57.c)

Question #32 of 37

Question ID: 1574276

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%.

Explanation

First determine the current price of the bond:

$$= 6 / 1.05 + 6 / (1.06)^2 + 106 / (1.07)^3 = 5.71 + 5.34 + 86.53 = 97.58$$

Then compute the yield of the bond:

N = 3; PMT = 6; FV = 100; PV = -97.58; CPT → I/Y = 6.92%

(Module 57.1, LOS 57.a)

Question #33 of 37

Question ID: 1574275

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.

Explanation

A 10-year spot rate is the yield-to-maturity on a 10-year zero-coupon security, and is the appropriate discount rate for the year 10 cash flow for a 20-year (or any maturity greater than or equal to 10 years) bond. Spot rates are used to value bonds and to ensure that bond prices eliminate any possibility for arbitrage resulting from buying a coupon security, stripping it of its coupons and principal payment, and reselling the strips as separate zero-coupon securities. The yield to maturity on a 10-year bond is the (complex) average of the spot rates for all its cash flows.

(Module 57.1, LOS 57.a)

Question #34 of 37

Question ID: 1574287

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. ✗

Explanation

Based on the given spot and forward rates, the 4-year spot rate equals $[(1.07)(1.0815)(1.103)(1.120)]^{1/4} - 1 = 9.35\%$.

Bond value: N = 4; FV = 1,000; I/Y = 9.35; PMT = 0; CPT → PV = –699.40

(Module 57.1, LOS 57.a)

Question #35 of 37

Question ID: 1574296

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%. ✗

Explanation

$(1 + S_3)^3 = (1 + S_2)^2(1 + 2y1y)$

$(1 + 2y1y) = (1 + S_3)^3 / (1 + S_2)^2$

$(1 + 2y1y) = (1.0611)^3 / (1.0576)^2 = 1.0681$

2y1y = 6.81%

(Module 57.1, LOS 57.b)

Question #36 of 37

Question ID: 1574288

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.

Explanation

The no-arbitrage price of a bond is determined by discounting each of its cash flows at the appropriate spot rate. Any difference between the no-arbitrage price and the market price of a bond represents a potential arbitrage profit.

$$= \frac{20}{1.01} + \frac{20}{1.0125^2} + \frac{20}{1.015^3} + \frac{20}{1.02^4} + \frac{1020}{1.03^5}$$

$$= 19.80 + 19.51 + 19.13 + 18.48 + 879.86 = \$956.78$$

$$976 - 956.78 = \$19.22$$

(Module 57.1, LOS 57.a)

Question #37 of 37

Question ID: 1574274

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.

Explanation

Zero-coupon bonds are quite special. Because zero-coupon bonds have no coupons (all of the bond's return comes from price appreciation), investors have no uncertainty about the rate at which coupons will be invested. Spot rates are defined as interest rates used to discount a single cash flow to be received in the future. If the yield to maturity on a 2-year zero is 6%, we can say that the 2-year spot rate is 6%.

(Module 57.1, LOS 57.a)