Question #1 of 38

For a 3-year, semiannual coupon payment bond, the number of interest rate paths that would be generated using the pathwise valuation is *closest* to:

A) 4

B) 64

C) 32

Explanation

For a 3-year, semiannual coupon bond, there will be six nodal periods resulting in $2^{(6-1)}$ = 32 paths.

(Study Session 12, Module 35.2, LOS 35.g)

Related Material

SchweserNotes - Book 4

Patrick Wall is a new associate at a large international financial institution. Wall has recently completed graduate school with a Master's degree in finance, and is also currently a CFA Level I candidate. His previous work experience includes three years as a credit analyst at a small retail bank. Wall's new position is as the assistant to the firm's fixed income portfolio manager. His boss, Charles Johnson, is responsible for getting Wall familiar with the basics of fixed income investing. Johnson asks Wall to evaluate the bonds shown in Table 1. The bonds are otherwise identical except for the call feature present in one of the bonds. The callable bond is callable at par and exercisable on the coupon dates only.

Table 1 Bond Descriptions

	Non-Callable	Callable Bond
Price	$100.83	$98.79
Time to Maturity (years)	5	5
Time to First Call Date	--	0
Annual Coupon	$6.25	$6.25
Interest Payment	Semi-annual	Semi-annual
Yield to Maturity	6.0547%	6.5366%
Price Value per Basis Point	428.0360	--

Wall is told to evaluate the bonds with respect to duration and convexity when interest rates declined by 50 basis at all maturities over the next six months.

Johnson supplies Wall with the requisite interest rate tree shown in Figure 1. Johnson explains to Wall that the prices of the bonds in Table 1 were computed using this interest rate lattice. Johnson instructs Wall to try and replicate the information in Table 1 and use his analysis to derive an investment decision for his portfolio.

Figure 1

									15.44%
								14.10%	
							12.69%		12.46%
						11.85%		11.38%	
					9.75%		10.25%		10.05%
				8.95%		9.57%		9.19%	
			7.91%		7.88%		8.28%		8.11%
		7.35%		7.23%		7.74%		7.42%	
	6.62%		6.40%		6.37%		6.69%		6.54%
6.05%		5.95%		5.85%		6.25%		5.99%	
	5.36%		5.17%		5.15%		5.40%		5.28%
		4.81%		4.73%		5.05%		4.83%	
			4.18%		4.16%		4.36%		4.26%
				3.82%		4.08%		3.90%	
					3.37%		3.52%		3.44%
						3.30%		3.15%	
							2.84%		2.77%
								2.54%	
									2.24%
Years	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5

Wall is having a few problems computing the bond prices using the interest rate tree. He would like to compute the value of the non-callable bond at node A given the relevant part of the tree. Using the referenced portions of the tree, what is the value of the non-callable bond at node A?

Relevant part of interest rate tree:

		8.95%
	7.91%	
		7.23%

Corresponding part of non-callable bond tree:

		$92.38

A →	–	
		$96.83

Question #2 of 38

The value of the bond at node A is *closest* to:

A) $94.01.

B) $90.56.

C) $97.02.

Explanation

This value of the non-callable bond at node A is computed as follows:

Bond Value = {0.5 × [Bond Value$_{up}$ + (Coupon / 2)]} + {0.5 × [Bond Value$_{down}$ + (Coupon / 2)]} / (1 + Interest Rate / 2)

Bond Value at node A = {0.5 × [$92.38 + ($6.25 / 2)]} + {0.5 × [$96.83 + ($6.25 / 2)]} / [1 + (7.91% / 2)] = $94.01

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #3 of 38

Johnson asks Wall to compute the value of the call option. Using the given information what is the value of the embedded call option?

A) $1.21.

B) $0.00.

C) $2.04.

Explanation

The call option value is simply the difference between the value of the callable and the non-callable bond.

Call Option Value = $100.83 − $98.79 = $2.04

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #4 of 38

Wall is a little confused over the relationship between the embedded option and the callable bond. How does the value of the embedded call option change when interest rate volatility increases? The value:

A) increases.

B) may increase or decrease.

C) decreases.

Explanation

All option values increase when the volatility of the underlying asset increases.

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #5 of 38

Wall wonders how the value of the callable bond changes when interest rate volatility increases. How will an increase in volatility affect the value of the callable bond? The value:

A) increases.

B) decreases.

C) may increase or decrease.

Explanation

The value of the callable bond decreases if the interest rate volatility inreases because the value of the embedded call option increases. Since the value of the callable bond is the difference between the value of the non-callable bond and the value of the embedded call option, its value has to decrease.

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #6 of 38

Wall now turns his attention to the value of the embedded call option. How does the value of the embedded call option react to an increase in interest rates? The value of the embedded call is *most likely* to:

A) remain the same.

B) decrease.

C) increase.

Explanation

There are two different effects that an increase in interest rate will cause in this situation. The first (and primary) impact stems from the relationship between interest rates and bond values: when interest rates increase, bond values decrease. Since the underlying asset to the option (the bond) decreases in value, the option will decrease in value also. The second (and much smaller) effect stems from the fact that when interest rates are higher, call option prices are generally higher because holding a call (rather than the underlying) is more attractive when interest rates are high. However, this secondary effect is likely to be smaller than the impact of the change in bond value.

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #7 of 38

Wall believes he understands the relationship between interest rates and straight bonds but is unclear how callable bonds change as interest rates increase. How do prices of callable bonds react to an increase in interest rates? The price:

A) may increase or decrease.

B) decreases.

C) increases.

Explanation

Since the bond has a fixed coupon it becomes relatively less attractive to investors when interest rates increase. Its cash flows are now discounted at a higher discount rate which reduces the value of the bond.

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #8 of 38

The process of stripping is *most* likely to be used to earn arbitrage profits in a situation where:

A) a portfolio of treasury strips is trading for a lower price than an intact treasury bond.

B) one treasury bond trades at a lower price than another treasury bond with identical characteristics.

C) Security valuations are not consistent with the value additivity principle.

Explanation

If the principle of value additivity holds, it will not be possible to earn arbitrage profits through stripping (or reconstitution). If a portfolio of strips is trading for less than the price of an intact bond, one can purchase the strips, combine them ("reconstitution"), and sell them as a bond. Similarly, if the bond is worth less than its component parts, one could purchase the bond, break it into a portfolio of strips ("stripping"), and sell those components. When one security trades at a lower price than another security with identical characteristics, this is known as dominance, and the arbitrage required to earn a profit involves going long the underpriced security and short the overpriced security.

(Study Session 12, Module 35.1, LOS 35.a)

Related Material

SchweserNotes - Book 4

Question #9 of 38

Sam Roit, CFA, has collected the following information on the par rate curve, spot rates, and forward rates to generate a binomial interest rate tree consistent with this data.

Maturity	Par Rate	Spot Rate
1	5%	5.000%
2	6%	6.030%
3	7%	7.097%

The binomial tree generated is shown below (one year forward rates) assuming a volatility level of 10%:

0	1	2
5%	7.7099%	C
	A	9.2625%
		B

Roit also generated another tree using the same spot rates but this time assuming a volatility level of 20% as shown below:

0	1	2
5%	8.9480%	13.8180%
	5.9980%	9.2625%
		6.2088%

Is the binomial tree using the 20% volatility assumption calibrated properly?

A) The tree is not calibrated properly because adjacent nodes are not appropriate standard deviations apart.

B) The tree is calibrated properly.

C) The tree is not calibrated properly because it is not consistent with market prices.

Explanation

The tree is not calibrated properly – it does not value 3-year 7% bond at par (i.e., the market price):

$V_{2,UU}$ =

$$\frac{107}{(1.13818)} = \$94.01$$

$V_{2,UL}$ =

$$\frac{107}{(1.092625)} = \$97.93$$

$V_{2,LL}$ =

$$\frac{107}{1.062088} = \$100.74$$

$V_{1,U}$ =

$$\frac{1}{1.08948} \times \left[\frac{94.01 \ \ +97.93}{2} + 7\right] = \$94.51$$

$V_{1,L}$ =

$$\frac{1}{1.05998} \times \left[\frac{97.93 + 100.74}{2} + 7\right] = \$100.31$$

V_0 =

$$\frac{1}{1.05} \times \left[\frac{94.51 + 100.32}{2} + 7\right] = \$99.44$$

The adjacent nodes in the binomial tree for any nodal period are all two standard deviations apart.

(Study Session 12, Module 35.2, LOS 35.e)

Related Material

SchweserNotes - Book 4

Question #10 of 38

The government bond spot rate curve is given below:

Maturity (years)	Spot rate
0.5	1.25%
1.0	1.30%
1.5	1.80%
2.0	2.00%
2.5	2.20%
3.0	2.25%
3.5	2.28%
4.0	2.30%

Compute the issue price of a 3-year, 3% semiannual coupon government bond with a par value of $100.

A) $104.09

B) $102.20

C) $102.15

Explanation

Value =

$$\frac{1.50}{\left[1+\frac{0.0125}{2}\right]^1}+\frac{1.50}{\left[1+\frac{0.013}{2}\right]^2}+\frac{1.50}{\left[1+\frac{0.018}{2}\right]^3}+\frac{1.50}{\left[1+\frac{0.02}{2}\right]^4}+\frac{1.50}{\left[1+\frac{0.022}{2}\right]^5}+\frac{101.50}{\left[1+\frac{0.0225}{2}\right]^6}$$

= $102.20

(Study Session 12, Module 35.1, LOS 35.b)

Related Material

SchweserNotes - Book 4

Question #11 of 38

With respect to interest rate models, backward induction refers to determining:

A) one portion of the yield curve from another portion.

B) convexity from duration.

C) the current value of a bond based on possible final values of the bond.

Explanation

Backward induction refers to the process of valuing a bond using a binomial interest rate tree. For a bond that has N compounding periods, the current value of the bond is determined by computing the bond's possible values at period N and working "backwards."

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #12 of 38

A 3-year, 3% annual pay, $100 par bond is valued using pathwise valuation. The interest rate paths are provided below:

Path	Year 1	Year 2	Year 3
1	2%	2.8050%	4.0787%
2	2%	2.8050%	3.0216%
3	2%	2.0780%	3.0216%
4	2%	2.0780%	2.2384%

The value of the bond in path 3 is closest to:

A) $101.85

B) $99.88

C) $100.02

Explanation

Answer: Path 3 value =

$$\frac{3.0}{(1.02)} + \frac{3.0}{(1.02)(1.02078)} + \frac{103.0}{(1.02)(1.02078)(1.030216)} = 101.85$$

(Study Session 12, Module 35.2, LOS 35.g)

Related Material

SchweserNotes - Book 4

Question #13 of 38

Why is the backward induction methodology used to value a bond rather than a forward induction scheme?

A) The convexity of a bond changes over time.

B) The price of the bond is known at maturity.

C) Future interest rate changes are difficult to forecast.

Explanation

The objective is to value a bond's current price while the bond price at maturity is known. Therefore, price at maturity is used as a starting point, and we work backward to the current value.

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #14 of 38

A 3-year, 3% annual pay, $100 par bond is valued using pathwise valuation. The interest rate paths are provided below:

Path	Year 1	Year 2	Year 3
1	2%	2.8050%	4.0787%
2	2%	2.8050%	3.0216%
3	2%	2.0780%	3.0216%
4	2%	2.0780%	2.2384%

The value of the bond in path 1 is *closest* to:

A) $100.18

B) $101.88

C) $98.77

Explanation

Path 1 value =

$$\frac{3.0}{(1.02)} + \frac{3.0}{(1.02)(1.02805)} + \frac{103.0}{(1.02)(1.02805)(1.040787)} = 100.18$$

(Study Session 12, Module 35.2, LOS 35.g)

Related Material

SchweserNotes - Book 4

Question #15 of 38

Using the following interest rate tree of semiannual interest rates what is the value of an option free bond that has one year remaining to maturity and has 5% coupon rate with semi-annual coupon payments.

Today	6 Months
	7.30%
6.20%	
	5.90%

A) 97.53.

B) 98.98.

C) 98.67.

Explanation

The option-free bond price tree is as follows:

		100.00
	A → 98.89	
98.67		100.00
	99.56	
		100.00

As an example, the price at node A is obtained as follows:

> Price_A = (prob × (P_{up} + (coupon / 2)) + prob × (P_{down} + (coupon / 2)) / (1 + (rate / 2)) = (0.5 × (100 + 2.5) + 0.5 × (100 + 2.5) / (1 + (0.0730 / 2)) = 98.89. The bond values at the other nodes are obtained in the same way.

The calculation for node 0 or time 0 is

> 0.5[(98.89 + 2.5) / (1+ 0.062 / 2) + (99.56 + 2.5) / (1 + 0.062 / 2)] =
>
> 0.5(98.3414 + 98.9913) = 98.6663

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #16 of 38

Which of the following choices is *least-likely* a property of a binomial interest rate tree?

A) Adjacent forward rates in a nodal period are one standard deviation apart.

B) Non-negative interest rates.

C) Higher volatility at higher rates.

Explanation

A binomial interest rate tree has two desirable properties: non-negative interest rates and higher volatility at higher rates. Additionally, adjacent forward rates in a nodal period are *two* standard deviations apart.

(Study Session 12, Module 35.1, LOS 35.c)

Related Material

SchweserNotes - Book 4

Question #17 of 38

Tim Brospack is generating a binomial interest rate tree assuming a volatility of 15%. Current 1-year spot rate is 5%. The 1-year forward rate in the second year is either a low estimate of 5.250% or a high estimate of 7.087%. The middle 1-year forward rate in year three is estimated at 6.25%. The upper node 1-year forward rate in year three is *closest* to:

A) 6.445%

B) 7.747%

C) 8.437%

Explanation

Upper node interest rate = $6.25 \times e^{2 \times 0.15} = 8.437\%$

(Study Session 12, Module 35.1, LOS 35.c)

Related Material

SchweserNotes - Book 4

Question #18 of 38

A binomial model or any other model that uses the backward induction method cannot be used to value a mortgage-backed security (MBS) because:

A) the prepayments occur linearly over the life of an interest rate trend (either up or down).

B) the cash flows for the MBS are dependent upon the path that interest rates follow.

C) the cash flows for an MBS only depend on the current rate, not the path that rates have followed.

Explanation

A binomial model or any other model that uses the backward induction method cannot be used to value an MBS because the cash flows for the MBS are dependent upon the path that interest rates have followed.

(Study Session 12, Module 35.2, LOS 35.h)

Related Material

SchweserNotes - Book 4

Question #19 of 38

Sam Roit, CFA, has collected the following information on the par rate curve, spot rates, and forward rates to generate a binomial interest rate tree consistent with this data.

Maturity	Par Rate	Spot Rate
1	5%	5.000%
2	6%	6.030%
3	7%	7.097%

The binomial tree generated is shown below (one year forward rates) assuming a volatility level of 10%:

0	1	2
5%	7.7099%	C
	A	9.2625%
		B

Roit also generated another tree using the same spot rates but this time assuming a volatility level of 20% as shown below:

0	1	2
5%	8.9480%	13.8180%
	5.9980%	9.2625%
		6.2088%

The one-year forward rate represented by 'B' is closest to:

A) 7.4223%

B) 8.7732%

C) 7.5835%

Explanation

Value represented by 'B' = 9.2625 / $e^{2x0.10}$ = 7.5835%

(Study Session 12, Module 35.2, LOS 35.e)

Related Material

SchweserNotes - Book 4

Question #20 of 38

Suppose that we calculate the value of an option-free, fixed-rate coupon bond, discounting the cash flows using two methods:

I. the zero-coupon yield curve.
II. an arbitrage-free binomial lattice.

Compared to the first methodology, the second method is expected to produce:

A) the same value.

B) a lower value if the bond carries a coupon higher than the corresponding benchmark bond.

C) a higher value in the presence of volatility.

Explanation

Because these two valuation methods are arbitrage-free, the two values obtained must be the same. An option-free bond that is valued by discounting by the spot rates should have the same value as if the binomial interest rate tree was used.

(Study Session 12, Module 35.2, LOS 35.f)

Related Material

SchweserNotes - Book 4

Question #21 of 38

Using the following interest rate tree of semiannual interest rates what is the value of an option free semiannual bond that has one year remaining to maturity and has a 6% coupon rate?

	6.53%
6.30%	
	5.67%

A) 98.52.

B) 97.53.

C) 99.81.

Explanation

As an example, the price at node A is obtained as follows:

			100.00
A ==> 99.74			
99.81			100.00
		100.16	
			100.00

As an example, the price at node A is obtained as follows:

> Price_A = (prob × (P_{up} + coupon/2) + prob × (P_{down} + coupon/2))/(1 + rate/2) = (0.5 × (100 + 3) + 0.5 × (100 + 3))/(1 + 0.0653/2) = 99.74. The bond values at the other nodes are obtained in the same way.

The calculation for node 0 or time 0 is

> 0.5[(99.74 + 3)/(1+ 0.063/2) + (100.16 + 3)/(1 + 0.063/2)] =
>
> 99.81

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #22 of 38

A bond with a 10% annual coupon will mature in two years at par value. The current one-year spot rate is 8.5%. For the second year, the yield volatility model forecasts that the one-year rate will be either 8% or 9%. Using a binomial interest rate tree, what is the current price?

A) 102.659.

B) 101.837.

C) 103.572.

Explanation

The tree will have three nodal periods: 0, 1, and 2. The goal is to find the value at node 0. We know the value in nodal period 2: V_2=100. In nodal period 1, there will be two possible prices:

> $V_{1,U}$=[(100+10)/1.09+(100+10)/1.09]/2= 100.917
>
> $V_{1,L}$=[(100+10)/1.08+(100+10)/1.08]/2= 101.852

Thus

> V_0=[(100.917+10)/1.085+(101.852+10)/1.085]/2= 102.659

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #23 of 38

Which of the following is a *correct* statement concerning the backward induction technique used within the binomial interest rate tree framework? From the maturity date of a bond:

A) the corresponding interest rates and interest rate probabilities are used to discount the value of the bond.

B) a deterministic interest rate path is used to discount the value of the bond.

C) the corresponding interest rates are weighted by the bond's duration to discount the value of the bond.

Explanation

For a bond that has N compounding periods, the current value of the bond is determined by computing the bond's possible values at period N and working "backwards" to the present. The value at any given node is the probability-weighted average of the discounted values of the next period's nodal values.

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Dawn Adams, CFA, along with her recently hired staff, have responsibilities that require them to be familiar with backward induction methodology as it is used with a binomial valuation model. Adams, however, is concerned that some of her staff, particularly those not enrolled in the CFA program, are a little weak in this area. To assess their understanding of the binomial model and its uses, Adams presented her staff with the first two years of the binomial interest rate tree for an 8% annually compounded bond (shown below). The forward rates and the corresponding values shown in this tree are based on an assumed interest rate volatility of 20%.

A member of Adams' staff has been asked to respond to the following:

Question #24 of 38

Compute V_{1L}, the value of the bond at node 1L.

A) \$95.99.

B) \$103.58.

C) \$101.05.

Explanation

V_{1L} = (½)[(V_{2LU} + C) / (1 + r_{1L})] + [($V_{2,LL}$ + C) / (1 + r_{1L})]

V_{1L} = (½)[(99.455 + 8) / (1 + 0.05331)] + [(102.755 + 8) / (1 + 0.05331)] = \$103.583

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #25 of 38

Compute V_{1U}, the value of the bond at node 1U.

A) \$99.01.

B) \$91.72.

C) \$99.13.

Explanation

$V_{1U} = (½)[(V_{2,UU} + C) / (1 + r_{1U})] + [(V_{2,UL} + C)/(1 + r_{1U})]$

$V_{1U} = (½)[(98.565 + 8) / (1 + 0.079529)] + [(99.455 + 8) / (1 + 0.079529)] = \$99.127$

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #26 of 38

Compute V_0, the value of the bond at node 0.

A) \$99.07.

B) \$101.35.

C) \$104.76.

Explanation

$V_0 = (½)[(V_{1U} + C) / (1 + r_0)] + [(V_{1L} + C) / (1 + r_0)]$

From the previous question the value for V_{1U} was determined to be \$99.127

$V_0 = (½)[(99.127 + 8) / (1 + 0.043912)] + [(103.583 + 8)/(1 + 0.043912)] = \$104.755$

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #27 of 38

Assume that the bond is putable in one year at par ($100) and that the put will be exercised if the computed value is less than par. What is the value of the putable bond?

A) $103.04.

B) $105.17.

C) $95.38.

Explanation

The relevant value to be discounted using a binomial model and backward induction methodology for a putable bond is the value that will be received if the put option is exercised or the computed value, whichever is greater.

In this case, the relevant value at node 1U is the exercise price ($100.000) since it is greater than the computed value of $99.127. At node 1L, the computed value of $103.583 must be used.

Therefore, the value of the putable bond is:

$$V_0 = (½)[(100.00 + 8) / (1 + 0.043912)] + [(103.583 + 8) / (1 + 0.043912)] = \$105.17314$$

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #28 of 38

Assume that the bond is putable in one year at par ($100) and that the put will be exercised if the computed value is less than par. What is the value of the put option?

A) $3.70.

B) $1.86.

C) $0.42.

Explanation

$$V_{putable} = V_{nonputable} + V_{put}$$

Rearranging, the value of the put can be stated as:

$$V_{put} = V_{putable} - V_{nonputable}$$

$V_{putable}$ was computed to be $105.173 in the previous question, and $V_{nonputable}$ was determined to be $104.755 in the question prior to that. So the value of the embedded put option for the bond under analysis is:

$$\$105.173 - 104.755 = \$0.418$$

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #29 of 38

Which of the following statements regarding the option adjusted spread (OAS) for a callable bond is *least* accurate?

A) The OAS is the spread on a bond with an embedded option after the embedded option cost has been removed.

B) The OAS is equal to the Z-spread plus the option cost.

C) The OAS for a corporate bond must be calculated using a binomial interest rate model.

Explanation

The OAS is equal to the Z-spread *minus* the option cost. Both of the other choices are true statements.

(Study Session 12, Module 35.1, LOS 35.d)

Related Material

SchweserNotes - Book 4

Question #30 of 38

Tim Brospack is generating a binomial interest rate tree assuming a volatility of 15%. Current 1-year spot rate is 5%. The 1-year forward rate in the second year is either a low estimate of 5.250% or a high estimate of 7.087%.The middle 1-year forward rate in year three is estimated at 6.25%. The lower node 1-year forward rate in year three is *closest* to:

A) 6.747%

B) 5.342%

C) 4.63%

Explanation

Lower node interest rate = 6.25 / $e^{2\times0.15}$ = 4.63%

(Study Session 12, Module 35.1, LOS 35.c)

Related Material

SchweserNotes - Book 4

Question #31 of 38

A 3-year, 3% annual pay, $100 par bond is valued using pathwise valuation. The interest rate paths are provided below:

Path	Year 1	Year 2	Year 3
1	2%	2.8050%	4.0787%
2	2%	2.8050%	3.0216%
3	2%	2.0780%	3.0216%
4	2%	2.0780%	2.2384%

The value of the bond in path 4 is *closest* to:

A) $100.02

B) $102.58

C) $101.88

Explanation

Path 4 value =

$$\frac{3.0}{(1.02)} + \frac{3.0}{(1.02)(1.02078)} + \frac{103.0}{(1.02)(1.02078)(1.022384)} = 102.58$$

(Study Session 12, Module 35.2, LOS 35.g)

Related Material

SchweserNotes - Book 4

Question #32 of 38

Sam Roit, CFA, has collected the following information on the par rate curve, spot rates, and forward rates to generate a binomial interest rate tree consistent with this data.

Maturity	Par Rate	Spot Rate
1	5%	5.000%
2	6%	6.030%
3	7%	7.097%

The binomial tree generated is shown below (one year forward rates) assuming a volatility level of 10%:

0	1	2
5%	7.7099%	C
	A	9.2625%
		B

Riot also generated another tree using the same spot rates but this time assuming a volatility level of 20% as shown below:

0	1	2
5%	8.9480%	13.8180%
	5.9980%	9.2625%
		6.2088%

The one-year forward rate represented by 'A' is closest to:

A) 6.3123%

B) 6.7732%

C) 5.4223%

Explanation

Value represented by 'A' = 7.7099 / $e^{2 \times 0.10}$ = 6.3123%

(Study Session 12, Module 35.2, LOS 35.e)

Related Material

SchweserNotes - Book 4

Question #33 of 38

Government par curve is provided below:

Maturity (years)	Par rate
1	5.0%
2	6.0%
3	6.5%
4	7.0%

The value of a 4-year, 5% annual pay, $100 par government bond is closest to:

A) $98.49

B) $93.15

C) $101.12

Explanation

Answer: First we compute the spot rates:

S_1: (given) = 5%

S_2: 100 =

$$\frac{6.0}{(1.05)} + \frac{106.0}{(1+S_2)^2} \rightarrow S_2 + 6.03\%$$

S_3: 100 =

$$\frac{6.5}{(1.05)} + \frac{6.5}{(1.0603)^2} + \frac{106.5}{(1+S_3)^3} \rightarrow S_3 = 6.56\%$$

S_4: 100 =

$$\frac{7.0}{(1.05)} + \frac{7.0}{(1.0603)^2} + \frac{7.0}{(1.0656)^3} + \frac{107.0}{(1+S_4)^4} \rightarrow S_4 = 7.10\%$$

Then we use the spot rates to value the 4-year, 5% annual pay bond:

Value =

$$\frac{5.0}{(1.05)^1} + \frac{5.0}{(1.0603)^2} + \frac{5.0}{(1.0656)^3} + \frac{105.0}{(1.071)^4} = 93.15$$

(Study Session 12, Module 35.1, LOS 35.b)

Related Material

SchweserNotes - Book 4

Question #34 of 38

Increasing the number of paths generated in a Monte Carlo simulation is *most likely* to increase the:

A) fundamental accuracy of the estimated value.

B) utility of the model.

C) statistical accuracy of the estimated value.

Explanation

Increasing the number of paths would increase the statistical accuracy of the estimate but does nothing for the fundamental accuracy of the estimated value which depends on the quality of model inputs. Model utility depends on valuation accuracy of the model and hence would not increase as we increase the number of paths.

(Study Session 12, Module 35.2, LOS 35.h)

Related Material

SchweserNotes - Book 4

Question #35 of 38

Which of the following choices is least-likely a property of a binomial interest rate tree?

A) Mean reversion of interest rates.

B) Higher volatility at higher rates.

C) Non-negative interest rates.

Explanation

A binomial interest rate tree has two desirable properties: non-negative interest rates and higher volatility at higher rates. Binomial trees do not force mean reversion of rates.

(Study Session 12, Module 35.1, LOS 35.c)

Related Material

SchweserNotes - Book 4

Question #36 of 38

Relative to the binomial model, Monte Carlo method is *most likely*:

A) less flexible in forcing interest rates to mean revert.

B) more suitable when valuing securities whose cash flows are interest rate path dependent.

C) more flexible as it does not need a volatility estimate.

Explanation

Monte Carlo method does not require that cash flows of a security are path dependent and hence is suitable alternative to the binomial model to value securities such as mortgage backed securities whose cash flows are path dependent. The model generating interest rates paths in a Monte Carlo simulation is based on an assumed level of volatility (i.e., model needs a volatility input). The model generating interest rates in a Monte Carlo simulation can incorporate bounds for interest rates to force mean reversion of rates. Such bounded optimization is not possible in a binomial model.

(Study Session 12, Module 35.2, LOS 35.h)

Related Material

SchweserNotes - Book 4

Question #37 of 38

Sam Roit, CFA, has collected the following information on the par rate curve, spot rates, and forward rates to generate a binomial interest rate tree consistent with this data.

Maturity	Par Rate	Spot Rate
1	5%	5.000%
2	6%	6.030%
3	7%	7.097%

The binomial tree generated is shown below (one year forward rates) assuming a volatility level of 10%:

0	1	2
5%	7.7099%	C
	A	9.2625%
		B

Riot also generated another tree using the same spot rates but this time assuming a volatility level of 20% as shown below:

0	1	2
5%	8.9480%	13.8180%
	5.9980%	9.2625%
		6.2088%

The one-year forward rate represented by 'C' is closest to:

A) 11.3132%

B) 8.7732%

C) 7.4223%

Explanation

Value represented by 'C' = 9.2625 x $e^{2 \times 0.10}$ = 11.3132%

(Study Session 12, Module 35.2, LOS 35.e)

Related Material

SchweserNotes - Book 4

Question #38 of 38

A 3-year, 3% annual pay, $100 par bond is valued using pathwise valuation. The interest rate paths are provided below:

Path	Year 1	Year 2	Year 3
1	2%	2.8050%	4.0787%
2	2%	2.8050%	3.0216%
3	2%	2.0780%	3.0216%
4	2%	2.0780%	2.2384%

The value of the bond in path 2 is *closest* to:

A) $101.15

B) $100.88

C) $102.72

Explanation

Path 2 value =

$$\frac{3.0}{(1.02)} + \frac{3.0}{(1.02)(1.02805)} + \frac{103.0}{(1.02)(1.02805)(1.030216)} = 101.15$$

(Study Session 12, Module 35.2, LOS 35.g)

Related Material

SchweserNotes - Book 4