Question 1
L2R45TB-AC035-1512
LOS: LOS-9660
Lesson Reference: Lesson 6: Valuation and Analysis of Convertible Bonds
Difficulty: medium
Using an arbitrage-free framework, an analyst has estimated the inputs to value a callable convertible bond. The analysis showed that the value of an otherwise identical option-free bond is $982.30, the value of the conversion feature (the call on the issuer's stock) is $28.90, and the value of the call on the bond is $15.40. The analyst's estimate of the convertible bond's value is *most likely*:

- $968.80
- $995.80
- $1,026.60

Rationale

$968.80

The value of a callable convertible bond is as follows:

$$\begin{aligned} \text{Value of a callable convertible bond} &= \text{Value of a straight bond} + \text{Value of a call option o} \\ &= \$982.30 + \$28.90 - \$15.40 \\ &= \$995.80 \end{aligned}$$

Rationale

$995.80

The value of a callable convertible bond is as follows:

$$\begin{aligned} \text{Value of a callable convertible bond} &= \text{Value of a straight bond} + \text{Value of a call option o} \\ &= \$982.30 + \$28.90 - \$15.40 \\ &= \$995.80 \end{aligned}$$

Rationale

$1,026.60

The value of a callable convertible bond is as follows:

$$\begin{aligned} \text{Value of a callable convertible bond} &= \text{Value of a straight bond} + \text{Value of a call option o} \\ &= \$982.30 + \$28.90 - \$15.40 \\ &= \$995.80 \end{aligned}$$

Question 2
L2FI-TBB213-1412
LOS: LOS-9640
Lesson Reference: Lesson 5: Valuation and Analysis of Capped and Floored Floating-Rate Bonds
Difficulty: medium
A fixed-income analyst has calculated the value of the embedded cap in a capped floater to be \$5. The value of the capped floater is likely to be closest to:

- (selected) \$95.
- \$100.
- \$105.

Rationale

This Answer is Correct

Value of capped floater = value of straight FRN – value of embedded cap

Since the value of a straight FRN can be assumed to be close to par, the value of the capped floater will likely be close to \$100 – \$5 = \$95.

Question 3
L2AI-PQ4414-1501
LOS: LOS-9640
Lesson Reference: Lesson 5: Valuation and Analysis of Capped and Floored Floating-Rate Bonds
Difficulty: hard

Consider the following statements:

Statement 1: The coupon rate on ratchet bonds at the time of issuance is set at a level much higher than that of a standard floater.

Statement 2: The value of the floor embedded in a floored floater equals the value of the floored floater minus the value of an otherwise identical nonfloored floater.

Which of the following is *most* likely?

- (selected) Both statements are correct.
- Only one statement is correct.
- Both statements are incorrect.

Rationale

This Answer is Correct

In order to compensate investors for the fact that at any reset date, the effective coupon rate on a ratchet bond can only decline, the coupon rate on ratchet bonds at the time of issuance is set at a level much higher than that of a standard floater.

Value of embedded floor = Value of floored floater – Value of nonfloored floater

Question 4
L2R45TB-ITEMSET-AC004-1512
LOS: LOS-9600
LOS: LOS-9630
LOS: LOS-9610
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: medium

Use the following information to answer the next three questions:

Annie Gunn is a newly hired fixed-income analyst and her boss has asked her to study measures of interest rate risk in bond prices. She decides to examine three bonds that are otherwise identical except for their embedded options, if any. The following table shows the features and prices for these bonds:

	Bond X	Bond Y	Bond Z
Time to maturity	5 years	5 years	5 years
Coupon rate	6 percent	6 percent	6 percent
Bond options	Callable at par after one year	Putable at par after one year	Option-free
Current full price	102.59	104.84	103.51
Bond full price if yield curve shifts up by 30 basis points	101.80	103.88	102.32
Bond full price if yield curve shifts down by 30 basis points	102.81	106.22	104.77

Using the data provided from the table, Gunn computes effective duration and effective convexity of all three bonds for a summary write-up she is presenting to her boss. In her write-up, she makes the following statements:

> Statement A1: One limitation of effective duration and effective convexity is that they do not consider bond embedded options.
> Statement A2: One advantage of effective duration and effective convexity is that they allow non-parallel shifts in the yield curve. In reality, the bond yield curve does not generally move in a parallel way and the ability of effective duration and effective convexity to accommodate these non-parallel moves is particularly useful.

i.
Gunn will *most likely* be correct in stating that the effective duration of:

- ○ Bond X is 1.641 and it is bigger than the effective duration of Bond Z.
- ○ Bond Y is 3.720 and it is bigger than the effective duration of Bond Z.
- ● Bond Z is bigger than the effective durations of Bonds X and Y.

Rationale

This Answer is Correct

This question can be solved either of two ways. The first way is time consuming and involves calculating the effective durations for each bond. The second approach is to apply what you have learned from the material, which is that the effective duration of a callable bond and that of a putable bond are both smaller than the effective duration of an otherwise identical option-free bond. Using this knowledge, only answer C is possible.

This same result of answer C will be arrived at if the effective durations are calculated:

$$\text{Bond X's effective duration} = \frac{(\text{PV}_{-}) - (\text{PV}_{+})}{2 \times (\Delta \text{ yield}) \times (\text{PV}_0)} = \frac{(102.81) - (101.80)}{2 \times (0.003) \times (102.59)} = 1.641$$

$$\text{Bond Y's effective duration} = \frac{(\text{PV}_{-}) - (\text{PV}_{+})}{2 \times (\Delta \text{ yield}) \times (\text{PV}_0)} = \frac{(106.22) - (103.88)}{2 \times (0.003) \times (104.84)} = 3.720$$

$$\text{Bond Z's effective duration} = \frac{(\text{PV}_{-}) - (\text{PV}_{+})}{2 \times (\Delta \text{ yield}) \times (\text{PV}_0)} = \frac{(104.77) - (102.32)}{2 \times (0.003) \times (103.51)} = 3.945$$

As the calculations show, Bond Z's effective duration is the largest.

Rationale

This Answer is Correct

This question can be solved either of two ways. The first way is time consuming and involves calculating the effective durations for each bond. The second approach is to apply what you have learned from the material, which is that the effective duration of a callable bond and that of a putable bond are both smaller than the effective duration of an otherwise identical option-free bond. Using this knowledge, only answer C is possible.

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Rationale

This Answer is Correct

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This same result of answer C will be arrived at if the effective durations are calculated:

$$\text{Bond X's effective duration} = \frac{(\mathrm{PV}_-) - (\mathrm{PV}_+)}{2 \times (\Delta\text{ yield}) \times (\mathrm{PV}_0)} = \frac{(102.81) - (101.80)}{2 \times (0.003) \times (102.59)} = 1.641$$

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$$\text{Bond Z's effective duration} = \frac{(\mathrm{PV}_-) - (\mathrm{PV}_+)}{2 \times (\Delta\text{ yield}) \times (\mathrm{PV}_0)} = \frac{(104.77) - (102.32)}{2 \times (0.003) \times (103.51)} = 3.945$$

As the calculations show, Bond Z's effective duration is the largest.

ii.

Gunn will *most likely* be correct in stating that the effective convexity of:

- all three bonds cannot ever be negative.
- Bond X is 617.34.
- Bond Y is 445.12.

Rationale

This Answer is Incorrect

The effective convexity calculations for Bonds X and Y are as follows:

$$\text{Bond X's effective convexity} = \frac{(\mathrm{PV}_-) + (\mathrm{PV}_+) - [2 \times (\mathrm{PV}_0)]}{(\Delta\text{ Yield})^2 \times (\mathrm{PV}_0)} = \frac{(102.81) + (101.80) - 2 \times}{(0.003)^2 \times 102.59}$$

$$\text{Bond Y's effective convexity} = \frac{(\mathrm{PV}_-) + (\mathrm{PV}_+) - [2 \times (\mathrm{PV}_0)]}{(\Delta\text{ Yield})^2 \times (\mathrm{PV}_0)} = \frac{(106.22) + (103.88) - 2 \times}{(0.003)^2 \times 104.84}$$

Based on these calculations, answer choice C is correct. Only putable and straight bonds will always have positive effective convexities.

Rationale

This Answer is Incorrect

The effective convexity calculations for Bonds X and Y are as follows:

$$\text{Bond X's effective convexity} = \frac{(\text{PV}_{-}) + (\text{PV}_{+}) - [2 \times (\text{PV}_0)]}{(\Delta\ \text{Yield})^2 \times (\text{PV}_0)} = \frac{(102.81) + (101.80) - 2 \times}{(0.003)^2 \times 102.59}$$

$$\text{Bond Y's effective convexity} = \frac{(\text{PV}_{-}) + (\text{PV}_{+}) - [2 \times (\text{PV}_0)]}{(\Delta\ \text{Yield})^2 \times (\text{PV}_0)} = \frac{(106.22) + (103.88) - 2 \times}{(0.003)^2 \times 104.84}$$

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Rationale

This Answer is Incorrect

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$$\text{Bond Y's effective convexity} = \frac{(\text{PV}_{-}) + (\text{PV}_{+}) - [2 \times (\text{PV}_0)]}{(\Delta\ \text{Yield})^2 \times (\text{PV}_0)} = \frac{(106.22) + (103.88) - 2 \times}{(0.003)^2 \times 104.84}$$

Based on these calculations, answer choice C is correct. Only putable and straight bonds will always have positive effective convexities.

iii.

Regarding Statements A1 and A2 made by Gunn, she is *most likely* correct in making:

- (●) neither statement.
- ( ) only Statement A1.
- ( ) only Statement A2.

Rationale

This Answer is Incorrect

Both statements are wrong. A1 is wrong because effective duration and effective convexity both consider the impact of option exercise on changes in bond cash flows. A2 is wrong because both effective duration and convexity assume a parallel shift in yield curve.

Rationale

This Answer is Incorrect

Both statements are wrong. A1 is wrong because effective duration and effective convexity both consider the impact of option exercise on changes in bond cash flows. A2 is wrong because both effective duration and convexity assume a parallel shift in yield curve.

Rationale

This Answer is Incorrect

Both statements are wrong. A1 is wrong because effective duration and effective convexity both consider the impact of option exercise on changes in bond cash flows. A2 is wrong because both effective duration and convexity assume a parallel shift in yield curve.

Question 5
L2R45TB-AC011-1512
LOS: LOS-9520
Lesson Reference: Lesson 1: Overview of Embedded Options
Difficulty: medium
A bond with a sinking fund provision carries embedded options, including an accelerated sinking fund provision and a delivery option. The party or parties that hold these options are *most likely* the:

- (selected) bond issuer.
- bondholders.
- bondholders for the delivery option and the bond issuer for the accelerated sinking fund provision.

Rationale
✔ **bond issuer.**
The bond issuer holds both of these options, with these allowing the issuer the ability to satisfy the sinking fund provision at the lowest cost.

Rationale
✖ **bondholders.**
The bond issuer holds both of these options, with these allowing the issuer the ability to satisfy the sinking fund provision at the lowest cost.

Rationale
✖ **bondholders for the delivery option and the bond issuer for the accelerated sinking fund provision.**
The bond issuer holds both of these options, with these allowing the issuer the ability to satisfy the sinking fund provision at the lowest cost.

Question 6
L2R45TB-AC027-1512
LOS: LOS-9550
Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I
Difficulty: medium

An investor is analyzing the following three bonds issued by the same company; all three bonds carry the same credit risk:

> Bond A: a 3-year, 4 percent annual-pay, extendible bond. The holder has the right to extend the bond's life for two more years and continue to receive the 4 percent coupon during the extension period.
> Bond B: a 5-year, 4 percent annual-pay, callable bond. The call is exercisable at the end of years 3 and 4 and the exercise price is 100 for each year.
> Bond C: a 5-year, 4 percent annual-pay, putable bond. The put is exercisable at the end of years 3 and 4 and the exercise price is 100 for each year.

As interest rates decrease to a rate below 4 percent, the bond that is *most likely* to have the highest value is:

- ○ Bond A.
- ○ Bond B.
- ◉ Bond C.

Rationale
Bond A.

When interest rates decrease to a rate below 4 percent, Bonds A and C will both rise in value. Bond B will likely have the lowest value, as its upside from declining interest rates is capped by the ability of the issuer to call the bond and this call becomes valuable to the issuer when rates are below 4 percent.

The question is which bond, A or C, will most likely have the highest value. Bond A, as an extendible bond, is equivalent to a putable bond with the option to put the bond at the end of three years for 100. In comparison, the Bond C's holders have the option to put it at the end of both years 3 and 4 at a price of 100. This means Bond C, with a better option, will have a value equal to or greater than Bond A's value.

Rationale
Bond B.

When interest rates decrease to a rate below 4 percent, Bonds A and C will both rise in value. Bond B will likely have the lowest value, as its upside from declining interest rates is capped by the ability of the issuer to call the bond and this call becomes valuable to the issuer when rates are below 4 percent.

The question is which bond, A or C, will most likely have the highest value. Bond A, as an extendible bond, is equivalent to a putable bond with the option to put the bond at the end of three years for 100. In comparison, the Bond C's holders have the option to put it at the end of both years 3 and 4 at a price of 100. This means Bond C, with a better option, will have a value equal to or greater than Bond A's value.

Rationale

Bond C.

When interest rates decrease to a rate below 4 percent, Bonds A and C will both rise in value. Bond B will likely have the lowest value, as its upside from declining interest rates is capped by the ability of the issuer to call the bond and this call becomes valuable to the issuer when rates are below 4 percent.

The question is which bond, A or C, will most likely have the highest value. Bond A, as an extendible bond, is equivalent to a putable bond with the option to put the bond at the end of three years for 100. In comparison, the Bond C's holders have the option to put it at the end of both years 3 and 4 at a price of 100. This means Bond C, with a better option, will have a value equal to or greater than Bond A's value.

Question 7
L2R45TB-AC028-1512
LOS: LOS-9650
Lesson Reference: Lesson 5: Valuation and Analysis of Capped and Floored Floating-Rate Bonds
Difficulty: medium
A common motivation for a firm to issue convertible bonds is *most likely* cost savings that occur because:

- the firm can sell stock in the future at an effectively high price.
- convertible bonds carry a lower coupon rate than otherwise equivalent option-free bonds.
- the sum of the value of an option-free bond and the value of the option to convert is greater than the value of a convertible bond.

Rationale

the firm can sell stock in the future at an effectively high price.

Firms issue convertible bonds because they are cheaper to service due to lower interest rates than option-free bonds. In the case where the option to convert finishes out-of-the-money (when the stock price does not exceed the conversion price), the firm gets a good deal. Of course, when the stock price increases beyond the conversion price, the firm loses because it sells its shares in the future at a price below their market value at this future time. Given that markets are generally efficient, the sum of the value of an option-free bond and the value of the option to convert should be approximately equal to the value of a convertible bond.

Rationale

convertible bonds carry a lower coupon rate than otherwise equivalent option-free bonds.

Firms issue convertible bonds because they are cheaper to service due to lower interest rates than option-free bonds. In the case where the option to convert finishes out-of-the-money (when the stock price does not exceed the conversion price), the firm gets a good deal. Of course, when the stock price increases beyond the conversion price, the firm loses because it sells its shares in the future at a price below their market value at this future time. Given that markets are generally efficient, the sum of the value of an option-free bond and the value of the option to convert should be approximately equal to the value of a convertible bond.

Rationale

the sum of the value of an option-free bond and the value of the option to convert is greater than the value of a convertible bond.

Firms issue convertible bonds because they are cheaper to service due to lower interest rates than option-free bonds. In the case where the option to convert finishes out-of-the-money (when the stock price does not exceed the conversion price), the firm gets a good deal. Of course, when the stock price increases beyond the conversion price, the firm loses because it sells its shares in the future at a price below their market value at this future time. Given that markets are generally efficient, the sum of the value of an option-free bond and the value of the option to convert should be approximately equal to the value of a convertible bond.

Question 8
L2R45TB-AC012-1512
LOS: LOS-9530
Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I
Difficulty: medium
Which of the following is *least likely* correct?

- Value of callable bond = Value of straight bond – Value of the issuer's call option.
- Value of bond with a death put = Value of straight bond – Value of the bondholder's death put option.
- Value of extendible bond = Value of straight bond + Value of the bondholder's option to extend the bond.

Rationale

Value of callable bond = Value of straight bond – Value of the issuer's call option.
A death put option is an investor option. It allows heirs of a deceased bondholder to sell the bond to the bond issuer at par value. This feature adds, not subtracts, to the value of the bond from the investor's viewpoint.

Rationale

Value of bond with a death put = Value of straight bond – Value of the bondholder's death put option.
A death put option is an investor option. It allows heirs of a deceased bondholder to sell the bond to the bond issuer at par value. This feature adds, not subtracts, to the value of the bond from the investor's viewpoint.

Rationale

Value of extendible bond = Value of straight bond + Value of the bondholder's option to extend the bond.
A death put option is an investor option. It allows heirs of a deceased bondholder to sell the bond to the bond issuer at par value. This feature adds, not subtracts, to the value of the bond from the investor's viewpoint.

Question 9
L2R45TB-AC032-1512
LOS: LOS-9660
Lesson Reference: Lesson 6: Valuation and Analysis of Convertible Bonds
Difficulty: medium

On April 1, 2015, Tina Fayez is analyzing a convertible bond issued in 2010 by Inspiration Inc. She has gathered the following information and intends to carefully examine the convertible bond issue to prepare a report:

- Issuer: Inspiration Inc.
- Issue date: April 1, 2010
- Maturity date: April 1, 2025
- Coupon rate: 6% payable annually
- Issue size: $75,000,000
- Bond par value: $1,000
- Issue price: $1,000 (at par)
- Callable: Callable by Inspiration Inc. at $1,300 at any time three years after issuance
- Conversion ratio: 45
- Conversion period: The bonds can be converted into common shares during the period starting ten years after the bond issue and ending upon the bond's maturity
- Share price on issue date: $15.10
- Current (4/1/2015) convertible bond price: $1,170
- Current (4/1/2015) Inspiration Inc. stock price: $24.60
- Current (4/1/2015) bond yield of comparable option-free bond: 6.2 percent

The market conversion premium ratio for the Inspiration convertible bond is *closest to*:

- 4.5 percent.
- 5.7 percent.
- 9.7 percent.

Rationale

4.5 percent.

To find the market conversion premium ratio, the market conversion price is required and it is calculated as:

$$\begin{aligned}\text{Market conversion price} &= \frac{\text{Convertible bond price}}{\text{Conversion ratio}}\\ &= \frac{\$1{,}170}{45}\\ &= \$26.00\end{aligned}$$

Using this price, the market conversion premium and premium ratio are as follows:

$$\text{Market conversion premium} = \text{Market conversion price} - \text{Share price} = \$26.00 - 24.60 = \$$$

$$\begin{aligned}\text{Market conversion premium ratio} &= \frac{\text{Market conversion premium}}{\text{Share price}} \\ &= \frac{\$1.40}{\$24.60} \\ &= 5.7\text{ percent}\end{aligned}$$

Rationale

✅ **5.7 percent.**

To find the market conversion premium ratio, the market conversion price is required and it is calculated as:

$$\begin{aligned}\text{Market conversion price} &= \frac{\text{Convertible bond price}}{\text{Conversion ratio}} \\ &= \frac{\$1{,}170}{45} \\ &= \$26.00\end{aligned}$$

Using this price, the market conversion premium and premium ratio are as follows:

$$\text{Market conversion premium} = \text{Market conversion price} - \text{Share price} = \$26.00 - 24.60 = \$$$

$$\begin{aligned}\text{Market conversion premium ratio} &= \frac{\text{Market conversion premium}}{\text{Share price}} \\ &= \frac{\$1.40}{\$24.60} \\ &= 5.7\text{ percent}\end{aligned}$$

Rationale

❌ **9.7 percent.**

To find the market conversion premium ratio, the market conversion price is required and it is calculated as:

$$\begin{aligned}\text{Market conversion price} &= \frac{\text{Convertible bond price}}{\text{Conversion ratio}} \\ &= \frac{\$1{,}170}{45} \\ &= \$26.00\end{aligned}$$

Using this price, the market conversion premium and premium ratio are as follows:

$$\text{Market conversion premium} = \text{Market conversion price} - \text{Share price} = \$26.00 - 24.60 = \$$$

$$
\begin{aligned}
\text{Market conversion premium ratio} &= \frac{\text{Market conversion premium}}{\text{Share price}} \\
&= \frac{\$1.40}{\$24.60} \\
&= 5.7 \text{ percent}
\end{aligned}
$$

Question 10

L2FI-TB0017-1412

LOS: LOS-9560

Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II

Difficulty: medium

When a normal yield curve sloping upward from 2% to 4% changes to an inverted curve sloping downward from 6% to 4%, it is *most likely* that:

- (selected) Both callable and putable bond values will fall.
- Callable bond values only will fall.
- Putable bond values only will fall.

Rationale

This Answer is Correct

All else equal, the value of the call option will increase as the yield curve flattens and inverts, since opportunities to call the bond will likely be more prevalent if implied forward rates are lower. This will cause the value of a callable bond to fall since the option is held by the issuer not the investor. A similar logic dictates that the value of the put option will fall as the curve inverts, leading to lower putable bond prices since the put option is held by the investor.

Question 11
L2AI-PQ4418-1501
LOS: LOS-9560
Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II
Difficulty: hard
Which of the following is *most* likely regarding a putable bond?

- (selected) The put option cushions the price reduction at high interest rates.
- The put option exacerbates the price reduction at low interest rates.
- The put option effectively increases the yield on a putable bond.

Rationale

This Answer is Correct

For a putable bond, at high interest rates, the put option cushions the price reduction as it increases in value.

Since the option is granted to the investor, it decreases the yield that an issuer must pay out on a bond.

Question 12
L2R45TB-AC029-1512
LOS: LOS-9580
Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II
Difficulty: medium
When a bond is callable, the bond's Z-spread will *most likely* be:

- (selected) greater than its OAS.
- less than its OAS.
- equal to its OAS.

Rationale
greater than its OAS.
The Z-spread ignores bond embedded options. Because callable bonds are generally priced lower than an otherwise identical option-free bond, Z-spreads implied by callable bond prices are always too high. OAS takes into account the effect of the option and generates a spread that is adjusted for the embedded option. Thus, the Z-spread will most likely be higher than the OAS for a callable bond.

Rationale
less than its OAS.
The Z-spread ignores bond embedded options. Because callable bonds are generally priced lower than an otherwise identical option-free bond, Z-spreads implied by callable bond prices are always too high. OAS takes into account the effect of the option and generates a spread that is adjusted for the embedded option. Thus, the Z-spread will most likely be higher than the OAS for a callable bond.

Rationale
equal to its OAS.
The Z-spread ignores bond embedded options. Because callable bonds are generally priced lower than an otherwise identical option-free bond, Z-spreads implied by callable bond prices are always too high. OAS takes into account the effect of the option and generates a spread that is adjusted for the embedded option. Thus, the Z-spread will most likely be higher than the OAS for a callable bond.

Question 13
L2R45TB-AC014-1512
LOS: LOS-9540
Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I
Difficulty: medium

An analyst has gathered/calculated the following table showing current par and spot rates:

Maturity in Years	Par Rate (%)	Spot Rate (%)
1	2.500	2.500
2	3.000	2.743
3	3.500	3.564

Given the rates shown above and assuming bond payments are made annually, the one-year forward rate two years from now is *closest to*:

- 4.391%
- 4.507%
- 5.226%

Rationale

4.391%

The forward rate is found using the spot rates, with the one-year forward rate two years from now being calculated as follows:

$$\begin{aligned}(1+S_3)^3 &= (1+S_2)^2 \times (1+F_{2,1})\\ (1.03564)^3 &= (1.02743)^2 \times (1+F_{2,1})\\ F_{2,1} &= 5.226 \text{ percent}\end{aligned}$$

Rationale

4.507%

The forward rate is found using the spot rates, with the one-year forward rate two years from now being calculated as follows:

$$\begin{aligned}(1+S_3)^3 &= (1+S_2)^2 \times (1+F_{2,1})\\ (1.03564)^3 &= (1.02743)^2 \times (1+F_{2,1})\\ F_{2,1} &= 5.226 \text{ percent}\end{aligned}$$

Rationale

5.226%

The forward rate is found using the spot rates, with the one-year forward rate two years from now being calculated as follows:

$$\begin{aligned}(1+\mathrm{S}_3)^3 &= (1+\mathrm{S}_2)^2 \times (1+\mathrm{F}_{2,1}) \\ (1.03564)^3 &= (1.02743)^2 \times (1+\mathrm{F}_{2,1}) \\ \mathrm{F}_{2,1} &= 5.226 \text{ percent}\end{aligned}$$

Question 14

L2FI-TB0015-1412

LOS: LOS-9540

Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I

Difficulty: medium

When using an interest rate tree to value a putable bond, an analyst should:

- (selected) Replace the ex-coupon value of the bond at any node with the put price if the value is less than the put price.
- Replace the put price of the bond at any node with the ex-coupon value of the bond if the value is less than the put price.
- Replace the ex-coupon value of the bond at any node with the put price if the value is greater than the put price.

Rationale

This Answer is Correct

When valuing a putable bond using a binomial model, the analyst will replaced the ex-coupon value of the bond in the tree with the put strike price if the ex-coupon value falls below the put strike price. This will represent the economic impact of the investor putting the bond back to the issuer when it is in their interests to do so.

Question 15
L2R45TB-AC009-1512
LOS: LOS-9580
Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II
Difficulty: medium

An analyst is calculating the OAS for a putable risky bond that is trading in the market at a price of 99.2. When the interest rate tree for a risk興free bond is used to value this putable risky bond, the value calculated is 98.8. The analyst will *most likely* calculate an OAS for the putable risky bond that is:

- less than 0.
- equal to 0.
- greater than 0.

Rationale

less than 0.

In order to raise the calculated value of the bond to the bond's market price, a negative option興adjusted spread has to be applied. The OAS in this case reduces each one興year forward rate in the tree. This outcome of the putable risky bond trading at a higher value than a risk興free straight bond appears to be indicating that the put is highly valuable.

Rationale

equal to 0.

In order to raise the calculated value of the bond to the bond's market price, a negative option興adjusted spread has to be applied. The OAS in this case reduces each one興year forward rate in the tree. This outcome of the putable risky bond trading at a higher value than a risk興free straight bond appears to be indicating that the put is highly valuable.

Rationale

greater than 0.

In order to raise the calculated value of the bond to the bond's market price, a negative option興adjusted spread has to be applied. The OAS in this case reduces each one興year forward rate in the tree. This outcome of the putable risky bond trading at a higher value than a risk興free straight bond appears to be indicating that the put is highly valuable.

Question 16

L2R45TB-AC016-1512

LOS: LOS-9530

Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I

Difficulty: medium

An extendible bond is *best* described as being equivalent to a:

- callable bond.
- putable bond.
- convertible bond.

Rationale

callable bond.

An extendible bond can be viewed as a putable bond. For example, a three- year bond that is extendible for two more years is the same as a five-year bond with put option at the end of year three.

Rationale

putable bond.

An extendible bond can be viewed as a putable bond. For example, a three- year bond that is extendible for two more years is the same as a five-year bond with put option at the end of year three.

Rationale

convertible bond.

An extendible bond can be viewed as a putable bond. For example, a three- year bond that is extendible for two more years is the same as a five-year bond with put option at the end of year three.

Question 17
L2R45TB-AC015-1512
LOS: LOS-9530
Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I
Difficulty: medium
Three bonds are being examined: one is callable, one is putable, and the third is extendible. Other than their respective embedded options, each bond has identical characteristics (e.g., coupon rate, credit quality). The bond that will *most likely* have the lowest value is the:

- (selected) callable bond.
- putable bond.
- extendible bond.

Rationale
callable bond.

The option embedded in the callable bond is an issuer option where the issuer can call the bond when interest rates are low. This is a negative to bondholders. As compared to an identical option-free bond, the callable bond will have a value that is equal or less (value of callable bond = value of straight bond – value of the issuer's call option).

The other two bonds have options that accrue to the bondholders. Thus, these options may have value to the bondholders and will result in these bonds having values that are greater than or equal to the value of an identical option-free bond.

Since the callable bond has a value that is less than or equal to the value of an identical option-free bond and the other two bonds have values that are greater than or equal to the value of an identical option-free bond, the callable bond will most likely have the lowest value.

Rationale
putable bond.

The option embedded in the callable bond is an issuer option where the issuer can call the bond when interest rates are low. This is a negative to bondholders. As compared to an identical option-free bond, the callable bond will have a value that is equal or less (value of callable bond = value of straight bond – value of the issuer's call option).

The other two bonds have options that accrue to the bondholders. Thus, these options may have value to the bondholders and will result in these bonds having values that are greater than or equal to the value of an identical option-free bond.

Since the callable bond has a value that is less than or equal to the value of an identical option-free bond and the other two bonds have values that are greater than or equal to the

value of an identical option-free bond, the callable bond will most likely have the lowest value.

Rationale

❌ **extendible bond.**

The option embedded in the callable bond is an issuer option where the issuer can call the bond when interest rates are low. This is a negative to bondholders. As compared to an identical option-free bond, the callable bond will have a value that is equal or less (value of callable bond = value of straight bond – value of the issuer's call option).

The other two bonds have options that accrue to the bondholders. Thus, these options may have value to the bondholders and will result in these bonds having values that are greater than or equal to the value of an identical option-free bond.

Since the callable bond has a value that is less than or equal to the value of an identical option-free bond and the other two bonds have values that are greater than or equal to the value of an identical option-free bond, the callable bond will most likely have the lowest value.

Question 18
L2FI-TBB209-1412
LOS: LOS-9610
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: medium
Bonds with embedded options will *most likely* have an effective duration relative to an equivalent option-free bond that is:

- (selected) Lower.
- Higher.
- Higher or lower, depending on the type of option and the level of interest rates.

Rationale

This Answer is Correct

The short call option embedded in a callable bond will curtail price rises at low yields leading to a lower effective duration verses an option free bond. The long put option embedded in a putable bond will increase in value at high yields and curtail price fall at high yields leading to a lower effective duration verses an option free bond.

Question 19

L2AI-PQ4410-1501

LOS: LOS-9620

Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options

Difficulty: hard

One-sided duration and effective duration for a callable bond are *most* likely to diverge when the embedded call option is:

- In-the-money.
- Near-the-money.
- Out-of-the-money.

Rationale

This Answer is Correct

The average price response to up-and down-movements in interest rates (i.e., effective duration) is not as effective in capturing the interest rate sensitivity of callable and putable bonds as (1) the price response to up-movements (i.e., one-sided up-duration) and (2) the price response to down-movements (i.e., one-sided down-duration). This is true especially when the embedded option is near-the-money.

Question 20
L2FI-ITEMSET-TB0031-1412
LOS: LOS-9570
Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II
Difficulty: N/A

The next three questions relate to the following arbitrage興free interest rate tree:

Year 0	Year 1	Year 2
		7.15%
	5.00%	
3.30%		5.30%
	3.70%	
		3.93%

i.

The interest rate volatility assumed in the model is closest to:

- 4%.
- 15%.
- 30%.

Rationale

This Answer is Correct

The interest rates in the nodes of a lognormal model for interest rates for a specific time period will differ by a factor of $e^{2??}$. Hence, for year 1: 5% = 3.7% $e^{2??}$.

Clearly, $e^{2??}$ = 5 / 3.7 = 1.351; hence, ?? = ln(1.351) / 2 = 0.15 or 15%.

ii.

The value of a three興year 6.2% annual coupon bond callable at par one year and two years from today is:

- 100.00.
- 102.81.
- 105.23.

Rationale

This Answer is Correct

Using the interest rates to calculate the value of an option興free bond at each node yields the following tree:

99.11

101.12

105.23 100.85

103.88

102.19

The value in each node is the probability weighted average of the values that follow it plus the coupon paid at that time discounted by the rate relevant to the node.

For example, the numbers in the top row of the tree are calculated as follows

99.11 = [(0.5 ?? (100 + 6.2)) + (0.5 ?? (100 + 6.2))]/(1.0715)

101.12 = [(0.5 ?? (99.11 + 6.2)) + (0.5 ?? (100.85 + 6.2))]/(1.05)

105.23 = [(0.5 ?? (101.12 + 6.2)) + (0.5 ?? (103.88 + 6.2))]/(1.033)

The bond would be called each time the theoretical value in the node is greater than 100. Replacing the value of the bond with par in these cases gives a new tree:

99.11

100.00

102.81 100.00

100.00

100.00

The fair value of 102.81 is calculated using backward induction replacing the value in the tree with 100 where indicated to represent the bond being called by the issuer.

iii.

The value of a three興year 6.2% annual coupon bond putable at par one year and two years from today is:

- ○ 100.00.
- ○ 105.23.
- ◉ 105.44.

Rationale

This Answer is Correct

Using the interest rates to calculate the value of an option???free bond at each node yields the following tree:

99.11

101.12

105.23 100.85

103.88

102.19

The value in each node is the probability weighted average of the values that follow it plus the coupon paid at that time discounted by the rate relevant to the node.

For example, the numbers in the top row of the tree are calculated as follows

99.11 = [(0.5 ?? (100 + 6.2)) + (0.5 ?? (100 + 6.2))]/(1.0715)

101.13 = [(0.5 ?? (99.11 + 6.2)) + (0.5 ?? (100.85 + 6.2))]/(1.05)

105.23 = [(0.5 ?? (101.12 + ?? 6.2)) + (0.5 ?? (103.88 + 6.2))]/(1.033)

The bond would be put by the investor each time the theoretical value in the node is less than 100. Replacing the value of the bond with par in these cases gives a new tree:

		100.00
	101.55	
105.44		100.85
	103.88	
		102.19

The fair value of 105.44 is calculated using backward induction replacing the value in the tree with 100 where indicated to represent the bond being put by the investor.

Question 21
L2AI-PQ4421-1501
LOS: LOS-9680
Lesson Reference: Lesson 6: Valuation and Analysis of Convertible Bonds
Difficulty: hard

Consider the following statements:

Statement 1: The maximum loss that could be borne by the holder of a convertible bond equals the difference between the price paid for the convertible security and the straight value at time of purchase.

Statement 2: As the underlying share price moves down toward the conversion price, the return on the convertible bond is greater than the return on the underlying stock.

Which of the following is *most* likely?

- ○ Only Statement 1 is correct.
- ◉ Only Statement 2 is correct.
- ○ Both statements are incorrect.

Rationale

This Answer is Correct

The maximum loss that must be borne by the holder of a convertible bond equals the difference between the price paid for the convertible security and the straight value at any point during the term of the security. The straight value acts as a moving floor on the value of the convertible.

As the underlying share price moves down toward the conversion price, the relative change in the convertible bond's price is less than the change in the share price because the convertible bond has a floor on its value. Therefore, the return on the convertible bond is greater (less negative) than the return on the underlying stock.

Question 22
L2R45TB-ITEMSET-AC001-1512
LOS: LOS-9660
LOS: LOS-9680
LOS: LOS-9670
Lesson Reference: Lesson 6: Valuation and Analysis of Convertible Bonds
Difficulty: medium

Use the following information to answer the next three questions:

Peter Wise, CFA, is a fixed-income specialist who is very interested in convertible bonds. He decides to investigate a specific convertible bond issued by HDTV Inc.

HDTV Inc. is a technology company founded in 2009 by four college students from Austin, TX. They have a patented technology to significantly increase the picture quality on most HDTVs. The firm needed financing in 2010 to expand, but found that its borrowing cost would be quite high. In order to mitigate the high cost of debt, the firm issued convertible bonds in 2010.

A summary of the convertible bond issue is given below:

- Issuer: HDTV Inc.
- Issue Date: July 1, 2010
- Maturity Date: July 1, 2025
- Coupon rate: 6% payable annually
- Issue Size: $20,000,000
- Bond par value: $1,000
- Issue Price: $1,000 (at par)
- Convertible bond callable: N/A
- Conversion Ratio: 40
- Conversion period: The bonds can be converted into common shares during the period starting one year after the bond issue and ending upon the bond's maturity
- Share price on issue date: $4.50
- Current (7/1/2014) convertible bond price: $1,476.00
- Current (7/1/2014) HDTV Inc. stock price: $37.10
- Current (7/1/2014) bond yield of comparable option-free bond: 3.8 percent

Wise's supervisor, Kim Su, asks the following questions:

1. What's the convertible bond's market conversion price?
2. What's the convertible bond's premium over straight bond value?
3. Given the current HDTV stock and convertible bond prices, if there is a sudden increase in interest rates, how will the convertible bond price change? Or if there is a sudden increase in the stock price how will the convertible bond price change?

Wise investigates the convertible bond issue and prepares his answers.

i.
The convertible bond's market conversion price is *closest to*:

- $36.90
- $36.00
- $25.00

Rationale

This Answer is Correct

The market conversion price is calculated as follows:

$$\text{Market conversion price} = \frac{\text{Convertible bond price}}{\text{Conversion ratio}} = \frac{\$1{,}476}{40} = \$36.90$$

Rationale

This Answer is Correct

The market conversion price is calculated as follows:

$$\text{Market conversion price} = \frac{\text{Convertible bond price}}{\text{Conversion ratio}} = \frac{\$1{,}476}{40} = \$36.90$$

Rationale

This Answer is Correct

The market conversion price is calculated as follows:

$$\text{Market conversion price} = \frac{\text{Convertible bond price}}{\text{Conversion ratio}} = \frac{\$1{,}476}{40} = \$36.90$$

ii.

The convertible bond's premium over straight bond value is *closest to*:

- 18.3%
- 19.0%
- 23.5%

Rationale

This Answer is Incorrect

First, we compute the straight bond's value based on an 11-year remaining life (15-year original maturity, but four years have passed):

$$\begin{aligned}\text{Straight bond value} &= \sum_{t=1}^{\mathrm{T}} \frac{\text{Coupon payments}}{(1+\mathrm{YTM})^t} + \frac{\text{Par value at maturity}}{(1+\mathrm{YTM})^{\mathrm{T}}} \\ &= \sum_{t=1}^{11} \frac{0.06 \times \$1{,}000}{(1+0.038)^t} + \frac{\$1{,}000}{(1+0.038)^{11}} = \$1{,}194.83\end{aligned}$$

Next, we compute the premium over straight bond value:

$$\text{Premium over straight value} = \frac{\text{Convertible bond price}}{\text{Straight bond value}} - 1 = \frac{\$1{,}476.00}{1{,}194.83} - 1 = 23.5\%$$

Rationale

This Answer is Incorrect

First, we compute the straight bond's value based on an 11-year remaining life (15-year original maturity, but four years have passed):

$$\begin{aligned}\text{Straight bond value} &= \sum_{t=1}^{\mathrm{T}} \frac{\text{Coupon payments}}{(1+\mathrm{YTM})^t} + \frac{\text{Par value at maturity}}{(1+\mathrm{YTM})^{\mathrm{T}}} \\ &= \sum_{t=1}^{11} \frac{0.06 \times \$1{,}000}{(1+0.038)^t} + \frac{\$1{,}000}{(1+0.038)^{11}} = \$1{,}194.83\end{aligned}$$

Next, we compute the premium over straight bond value:

$$\text{Premium over straight value} = \frac{\text{Convertible bond price}}{\text{Straight bond value}} - 1 = \frac{\$1{,}476.00}{1{,}194.83} - 1 = 23.5\%$$

Rationale

This Answer is Incorrect

First, we compute the straight bond's value based on an 11-year remaining life (15-year original maturity, but four years have passed):

$$\begin{aligned}\text{Straight bond value} &= \sum_{t=1}^{\mathrm{T}} \frac{\text{Coupon payments}}{(1+\mathrm{YTM})^t} + \frac{\text{Par value at maturity}}{(1+\mathrm{YTM})^{\mathrm{T}}} \\ &= \sum_{t=1}^{11} \frac{0.06 \times \$1{,}000}{(1+0.038)^t} + \frac{\$1{,}000}{(1+0.038)^{11}} = \$1{,}194.83\end{aligned}$$

Next, we compute the premium over straight bond value:

$$\text{Premium over straight value} = \frac{\text{Convertible bond price}}{\text{Straight bond value}} - 1 = \frac{\$1{,}476.00}{1{,}194.83} - 1 = 23.5\%$$

iii.

In considering the third question asked by Kim Su, Peter Wise is *most likely* correct in indicating that the convertible bond price will:

- (selected) not change significantly when interest rates increase sharply, but will rise significantly when the stock price increases sharply.
- fall significantly when interest rates increase sharply and rise significantly when the stock price increases sharply.
- not change significantly when interest rates increase sharply or when the stock price increases sharply.

Rationale

This Answer is Incorrect

The convertible bond's price of $1,476 is close to the value as if converted. A bondholder who converts will receive 40 shares of a stock that is price at $37.10; hence, the bondholder receives a value of $1,484. The convertible price is essentially reflecting the value to be received if converted. Thus, if the stock price rises sharply, the convertible bond should rise as well. With respect to a sharp rise in interest rates, the effect on the convertible bond's price will be minimal because the bond is trading on its converted value and not its straight bond value.

Rationale

This Answer is Incorrect

The convertible bond's price of $1,476 is close to the value as if converted. A bondholder who converts will receive 40 shares of a stock that is price at $37.10; hence, the bondholder receives a value of $1,484. The convertible price is essentially reflecting the value to be received if converted. Thus, if the stock price rises sharply, the convertible bond should rise as well. With respect to a sharp rise in interest rates, the effect on the convertible bond's price will be minimal because the bond is trading on its converted value and not its straight bond value.

Rationale

This Answer is Incorrect

The convertible bond's price of $1,476 is close to the value as if converted. A bondholder who converts will receive 40 shares of a stock that is price at $37.10; hence, the bondholder receives a value of $1,484. The convertible price is essentially reflecting the value to be received if converted. Thus, if the stock price rises sharply, the convertible bond should rise as well. With respect to a sharp rise in interest rates, the effect on the convertible bond's price will be minimal because the bond is trading on its converted value and not its straight bond value.

Question 23
L2FI-TBB212-1412
LOS: LOS-9630
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: medium
The effective convexity of a putable bond:

- (selected) Cannot be negative.
- Turns negative when the embedded option is at the money.
- Turns negative when the embedded option is deeply in the money.

Rationale

This Answer is Correct

A putable bond will never exhibit negative convexity since it remains convex at all yield levels.

Question 24

L2FI-TB0018-1412

LOS: LOS-9580

Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II

Difficulty: medium

Which of the following statements regarding the option adjusted spread (OAS) is *most likely* to be accurate?

- ○ The option adjusted spread is equal to the fixed spread added to treasury spot rates required in order to discount the cash flows of a bond back to its market price.
- ◉ The option adjusted spread is equal to the fixed spread added to treasury forward rates required in order to discount the cash flows of a bond back to its market price.
- ○ The option adjusted spread is equal to the fixed spread added to treasury yield to maturities required in order to discount the cash flows of a bond back to its market price.

Rationale

This Answer is Correct

The first choice refers to the definition of the zero興volatility or Z spread. The third choice refers to the nominal spread. The option adjusted spread is based on the fixed spread above benchmark forward rates in an interest rate tree required to price the bond correctly.

Question 25
L2AI-PQ4419-1501
LOS: LOS-9660
Lesson Reference: Lesson 6: Valuation and Analysis of Convertible Bonds
Difficulty: hard
Gamma Corp. issues a convertible security that currently trades at $1,180. It has a par value of $1,000. The security is convertible into 20 shares of the company. The common stock of the company currently trades at $55. Given that the straight value of the bond (without the conversion option) is $988.50, the minimum value of the convertible security is *closest to*:

- ○ $988.50
- ● $1,100
- ○ $1,180

Rationale

This Answer is Correct

Conversion value = Market price of common stock × Conversion ratio

Conversion value = $55 × 20 = **$1,100**

Since the conversion value of the security is greater than the straight value of the bond, the minimum value of a convertible security equals $1,100.

Question 26
L2AI-PQ4409-1501
LOS: LOS-9610
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: hard

A portfolio manager currently holds only fixed-rate bonds in her portfolio. In order to lower the effective duration of her portfolio, which of the following bonds would she *most* likely add to the portfolio?

- ○ Zero-coupon bonds.
- ◉ Floating-rate bonds.
- ○ Callable bonds.

Rationale

This Answer is Correct

If a portfolio manager wants to shorten the effective duration of a portfolio of fixed-rate bonds, she could do so by adding floating-rate bonds to the portfolio. This is because the duration of a floater approximately equals the time remaining until the next reset date, which is typically very short.

Question 27
L2AI-PQ4405-1501
LOS: LOS-9570
Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II
Difficulty: hard

Consider the following statements:

Statement 1: All other things remaining the same, the values of (1) a five-year 3.50% bond that is putable at t = 4 and (2) a four-year 3.50% bond that is extendible by one year will be identical.

Statement 2: All other things remaining the same, the higher the call price, the lower the price of a callable bond.

Which of the following is *most* likely?

- (selected) Only Statement 1 is correct.
- Only Statement 2 is correct.
- Both statements are incorrect.

Rationale

This Answer is Correct

Statement 1 is correct.

All other things remaining the same, the higher the call price, the **higher** the price of a callable bond.

Question 28

L2AI-ITEMSET-PQ4422-1501

LOS: LOS-9520

Lesson Reference: Lesson 1: Overview of Embedded Options

Difficulty: hard

Consider a sinking fund bond with a call option, a delivery option, and an acceleration provision. How many of the three embedded options are *most* likely investor options?

- (selected) Zero.
- One.
- Two.

Rationale

This Answer is Correct

All three of these options are **issuer** options.

A call option allows the issuer to redeem the entire issue at any point in time following the lockout period.

An acceleration provision allows the issuer to repurchase more than the mandatory amount of bonds.

A delivery option allows the issuer to satisfy a sinking fund payment by delivering bonds to the trustee instead of cash.

Question 29

L2FI-TB0019-1412

LOS: LOS-9580

Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II

Difficulty: medium

The option adjusted spread represents the risk premium offered by a bond for facing:

- ○ Credit risk only.
- ◉ Credit risk and liquidity risk.
- ○ Credit risk, liquidity risk, and optionality risk.

Rationale

This Answer is Correct

The option adjusted spread has been adjusted to remove the impact of optionality on the zero volatility spread. Hence, it represents extra return associated with credit risk and liquidity risk relative to the benchmark security.

Question 30
L2AI-PQ4404-1501
LOS: LOS-9560
Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II
Difficulty: hard

Consider the following statements:

Statement 1: As interest rates increase, the value of a putable bond decreases less than that of a straight bond.

Statement 2: The value of the embedded put option in a putable bond increases as the yield curve goes from being upward-sloping to being flat to being downward-sloping.

Which of the following is *most* likely?

- (selected) Only Statement 1 is correct.
- Only Statement 2 is correct.
- Both statements are incorrect.

Rationale

This Answer is Correct

As interest rates increase, the value of a straight bond decreases, but the value of the embedded put option in a putable bond increases. Since the investor is effectively long on the embedded call option, the value of the putable bond decreases less than that of the straight bond, offering the investor protection on the downside.

The value of the embedded put option **decreases** as the yield curve goes from being upward-sloping to being flat to being downward-sloping. When the yield curve is upward-sloping, forward rates are high, resulting in lower present values of expected cash flows and greater opportunities for investors to put the bond. As the yield curve flattens or inverts, forward rates fall, resulting in higher present values of future cash flows and fewer opportunities to put the bond.

Question 31
L2AI-PQ4411-1501
LOS: LOS-8460
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: hard

Consider the following statements:

Statement 1: For an option-free bond trading at par, the only par rate that has an impact on its price is the rate corresponding to its maturity.

Statement 2: The higher the coupon rate relative to the market rate, the greater the chance of the bond having some negative key rate durations.

Which of the following is *most* likely?

- (selected) Only Statement 1 is correct.
- Only Statement 2 is correct.
- Both statements are correct.

Rationale

This Answer is Correct

For option-free bonds trading at par, the par rate corresponding to the bond's maturity is the only one that affects its price. For example, if there is a change in the 2-year or 6-year par rate, the value of a 10-year 4% coupon bond that is trading at par will not change.

Key rate durations can sometimes be negative at maturity points that are shorter than the maturity of the bond if the bond has a very low coupon rate or is a zero-coupon bond. Therefore, the higher the coupon rate, the **lower** the chance of the bond having some negative key rate durations.

Question 32
L2AI-ITEMSET-PQ4429-1501
LOS: LOS-9660
Lesson Reference: Lesson 6: Valuation and Analysis of Convertible Bonds
Difficulty: hard

Use the following information to answer the next four questions:

Consider a $1,000 par convertible bond that has four years remaining to maturity. The bond offers a coupon rate of 6% and it is currently trading at $1,040. The estimated straight value of the bond is $981.50. The bond can be converted into 20 shares of the company. The company's common stock currently trades at $45 and offers an annual dividend of $1.00 per share.

i.
The market conversion price of the convertible bond is *closest* to:

- (selected) $52
- $900
- $1,040

Rationale
This Answer is Correct

Market conversion price = Market price of convertible security/Conversion ratio

Market conversion price = $1,040/20 = **$52**

ii.
The conversion premium per share is *closest* to:

- $7
- $40
- $140

Rationale
This Answer is Incorrect

Conversion premium per share = Market conversion price – Current market price

Conversion premium per share = $52 – $45 = **$7**

iii.
The conversion premium ratio is *closest* to:

- 4%
- (selected) 15.56%

88.89%

Rationale

This Answer is Correct

Conversion premium ratio = Conversion premium per share/Market price of common stock

Conversion premium ratio = $7/$45 = **15.56%**

iv.

The premium over straight value is *closest* to:

0.71%

1.88%

5.96%

Rationale

This Answer is Correct

$$\text{Premium over straight value} = \frac{\text{Market price of convertible bond}}{\text{Straight value}} - 1$$

$$\text{Premium over straight value} = \frac{\$1{,}040}{981.5} - 1 = 5.96\%$$

Question 33
L2R45TB-AC024-1512
LOS: LOS-9630
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: medium
The current full price of a putable bond is 102.84. If the whole yield curve shifts up by 30 basis points, the bond full price changes to 101.93 based on using the binomial tree. If the whole yield curve shifts down by 30 basis points, the bond full price changes to 104.44 based on using the binomial tree. The effective convexity for this putable bond is *closest to*:

- 2.24
- 8.14
- 745.49

Rationale

2.24

The effective convexity is calculated as follows:

$$\begin{aligned}\text{Effective convexity} &= \frac{(\mathrm{PV}_{-})+(\mathrm{PV}_{+})-[2\times(\mathrm{PV}_0)]}{(\Delta\,Yield)^2\times(PV_0)}\\ &= \frac{(104.44)-(101.93)-[2\times(102.84)]}{(0.003)^2\times(102.84)}\\ &= 745.49\end{aligned}$$

Rationale

8.14

The effective convexity is calculated as follows:

$$\begin{aligned}\text{Effective convexity} &= \frac{(\mathrm{PV}_{-})+(\mathrm{PV}_{+})-[2\times(\mathrm{PV}_0)]}{(\Delta\,Yield)^2\times(PV_0)}\\ &= \frac{(104.44)-(101.93)-[2\times(102.84)]}{(0.003)^2\times(102.84)}\\ &= 745.49\end{aligned}$$

Rationale

745.49

The effective convexity is calculated as follows:

$$
\begin{aligned}
\text{Effective convexity} &= \frac{(\mathrm{PV}_{-})+(\mathrm{PV}_{+})-[2\times(\mathrm{PV}_0)]}{(\Delta\, Yield)^2\times(PV_0)} \\
&= \frac{(104.44)-(101.93)-[2\times(102.84)]}{(0.003)^2\times(102.84)} \\
&= 745.49
\end{aligned}
$$

Question 34
L2AI-PQ4401-1501
LOS: LOS-9520
Lesson Reference: Lesson 1: Overview of Embedded Options
Difficulty: hard

Consider the following statements:

Statement 1: The conversion option in a convertible bond, the put option in a putable bond, and the extension option in an extendible bond are all investor options.

Statement 2: Under a long straddle strategy, the greater the change in the underlying, the greater the benefit to the investor.

Which of the following is *most* likely?

- ○ Only Statement 1 is incorrect.
- ○ Only Statement 2 is incorrect.
- ◉ Both statements are correct.

Rationale

This Answer is Correct

The conversion option gives the holder of the convertible bond the option to convert her bond into the issuer's stock.

An extendible bond gives the holder the right to keep the bond a number of years after maturity, possibly at a different coupon.

The put option gives the holder the right to sell the bond back to the issuer.

A long straddle is an option strategy whereby both a call and a put are purchased with the same exercise price and exercise date. This strategy benefits the investor when the underlying moves up or down. The greater the extent of the up or down move, the greater the benefit to the investor.

Question 35
L2FI-TBB210-1412
LOS: LOS-9600
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: medium

A risk analyst collects the following data for a putable bond:

Yield curve shift (basis points)	10
Average shift in yield of bond (basis point)	8
Current price of the bond	103.90
Price of bond when yields shift down	104.03
Price of bond when yields shift up	103.80

The effective duration of the bond is closest to:

- ○ 0.78.
- ● 1.11.
- ○ 1.38.

Rationale

This Answer is Correct

Effective duration = ((104.03 – 103.80) / (2 × 103.90 × 0.001)) = 1.11.

Question 36

L2R45TB-AC030-1512

LOS: LOS-9580

Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II

Difficulty: medium

When a bond is extendible, the bond's Z興spread will *most likely* be:

- ○ greater than its OAS.
- ◉ less than its OAS.
- ○ equal to its OAS.

Rationale

❌ **greater than its OAS.**

An extendible bond can generally be thought of as a putable bond, with the put being exercisable on the date that the bondholder can choose to extend the bond's life. The Z興spread ignores bond embedded options. Because putable (extendible) bonds are generally priced higher than an otherwise identical option興free bond, Z興spreads implied by putable bond prices are always too low. OAS takes into account the effect of the option and generates a spread that is adjusted for the embedded option. Thus, the Z興spread will most likely be lower than the OAS for a putable bond.

Rationale

✅ **less than its OAS.**

An extendible bond can generally be thought of as a putable bond, with the put being exercisable on the date that the bondholder can choose to extend the bond's life. The Z興spread ignores bond embedded options. Because putable (extendible) bonds are generally priced higher than an otherwise identical option興free bond, Z興spreads implied by putable bond prices are always too low. OAS takes into account the effect of the option and generates a spread that is adjusted for the embedded option. Thus, the Z興spread will most likely be lower than the OAS for a putable bond.

Rationale

❌ **equal to its OAS.**

An extendible bond can generally be thought of as a putable bond, with the put being exercisable on the date that the bondholder can choose to extend the bond's life. The Z興spread ignores bond embedded options. Because putable (extendible) bonds are generally priced higher than an otherwise identical option興free bond, Z興spreads implied by putable bond prices are always too low. OAS takes into account the effect of the option and generates a spread that is adjusted for the embedded option. Thus, the Z興spread will most likely be lower than the OAS for a putable bond.

Question 37
L2R45TB-AC022-1512
LOS: LOS-9530
Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I
Difficulty: medium
A floating-rate bond with a floor will *most likely* have a value that is greater than or equal to an otherwise identical:

- capped floating-rate bond and a value that is greater than or equal to an otherwise identical floating-rate bond.
- capped floating-rate bond and a value that is less than or equal to an otherwise identical floating-rate bond.
- floating-rate bond and a value that is less than or equal to an otherwise identical capped floating-rate bond.

Rationale
capped floating-rate bond and a value that is greater than or equal to an otherwise identical floating-rate bond.
The floor protects the bondholder and is a valuable feature to the value of the bond. The value of a floored floater is equal to the value of a straight floating- rate bond plus the value of the embedded floor. The value of a capped floater is equal to the value of a straight floating-rate bond minus the value of the embedded cap. Thus, the value of the floored floater should be greater than or equal to the value of otherwise identical straight floating-rate or capped floating-rate bonds.

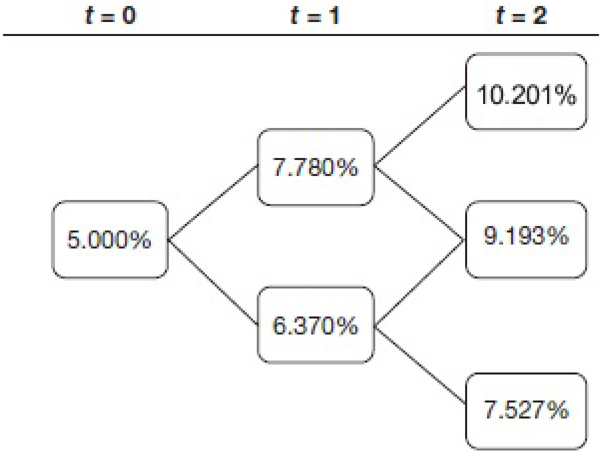
Rationale
capped floating-rate bond and a value that is less than or equal to an otherwise identical floating-rate bond.
The floor protects the bondholder and is a valuable feature to the value of the bond. The value of a floored floater is equal to the value of a straight floating- rate bond plus the value of the embedded floor. The value of a capped floater is equal to the value of a straight floating-rate bond minus the value of the embedded cap. Thus, the value of the floored floater should be greater than or equal to the value of otherwise identical straight floating-rate or capped floating-rate bonds.

Rationale
floating-rate bond and a value that is less than or equal to an otherwise identical capped floating-rate bond.
The floor protects the bondholder and is a valuable feature to the value of the bond. The value of a floored floater is equal to the value of a straight floating- rate bond plus the value of the embedded floor. The value of a capped floater is equal to the value of a straight floating-rate bond minus the value of the embedded cap. Thus, the value of the floored

floater should be greater than or equal to the value of otherwise identical straight floating-rate or capped floating-rate bonds.

Question 38
L2R45TB-AC025-1512
LOS: LOS-9570
Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II
Difficulty: medium

An investor is analyzing Bond X, which is a callable bond. This bond has 3 years to maturity, pays an 8 percent annual coupon, has a par value of 100, and the call option is exercisable at the end of the second year only, with an exercise price of 100. The investor has developed the following binomial interest rate tree to use in analyzing the callable bond:



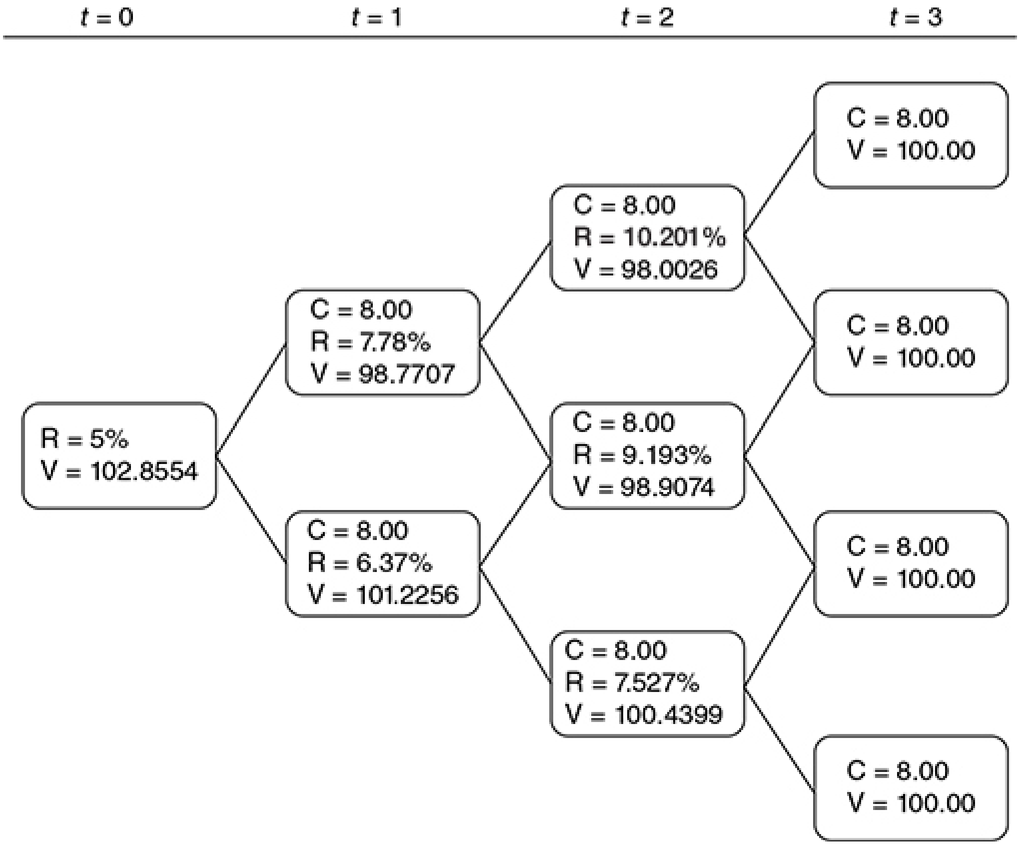
Using the binomial tree and a backward induction valuation approach, the value of the call option in the callable Bond X is *closest* to:

- 0.053
- 0.099
- 0.583

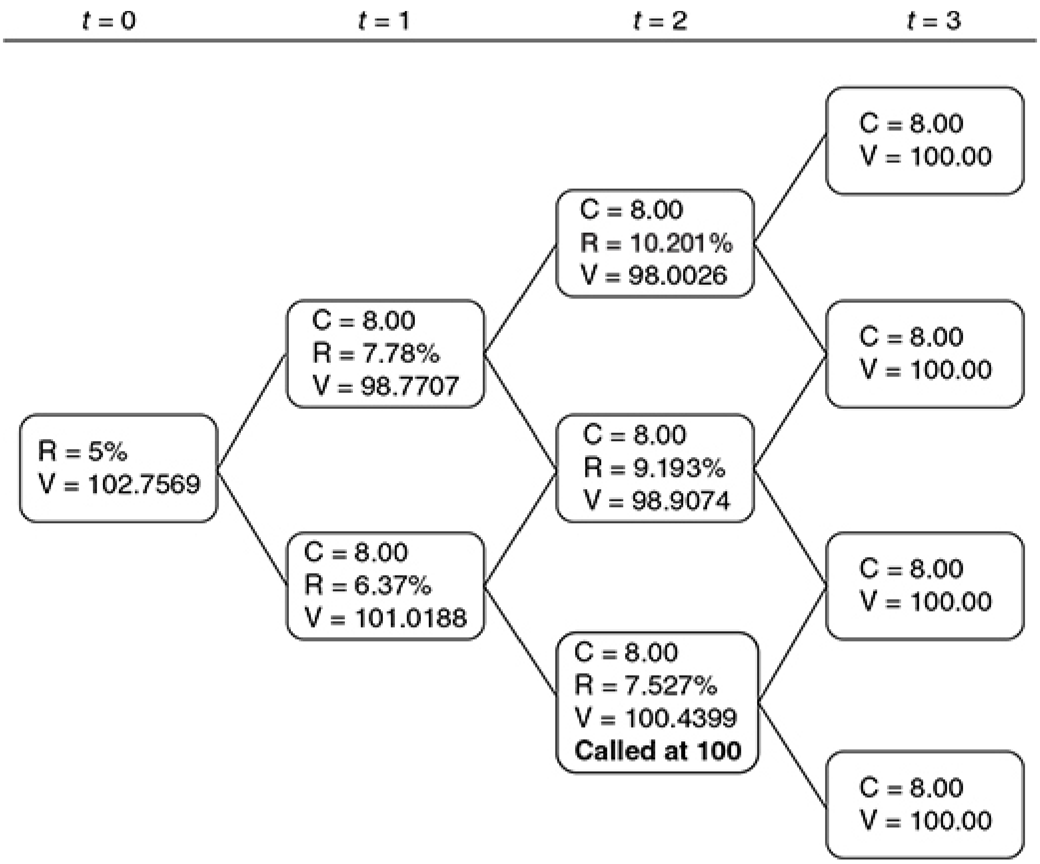
Rationale

0.053

The first step is to find the value of the 3-year, 8 percent annual-pay option-free bond using the binomial tree and the backward induction process:



Next, we value the callable bond using the tree above and adjusting for when the bond is called:

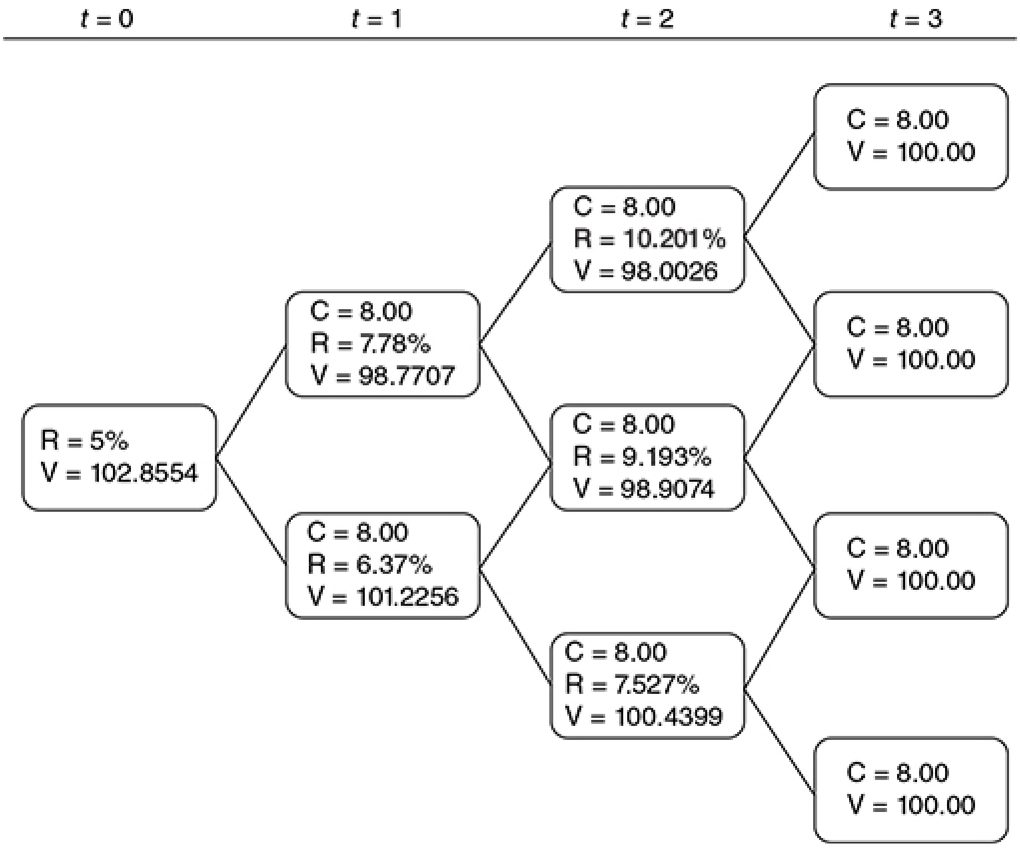


The value of the call is 0.098 (102.655 − 102.557), which is the difference between the two bond's values.

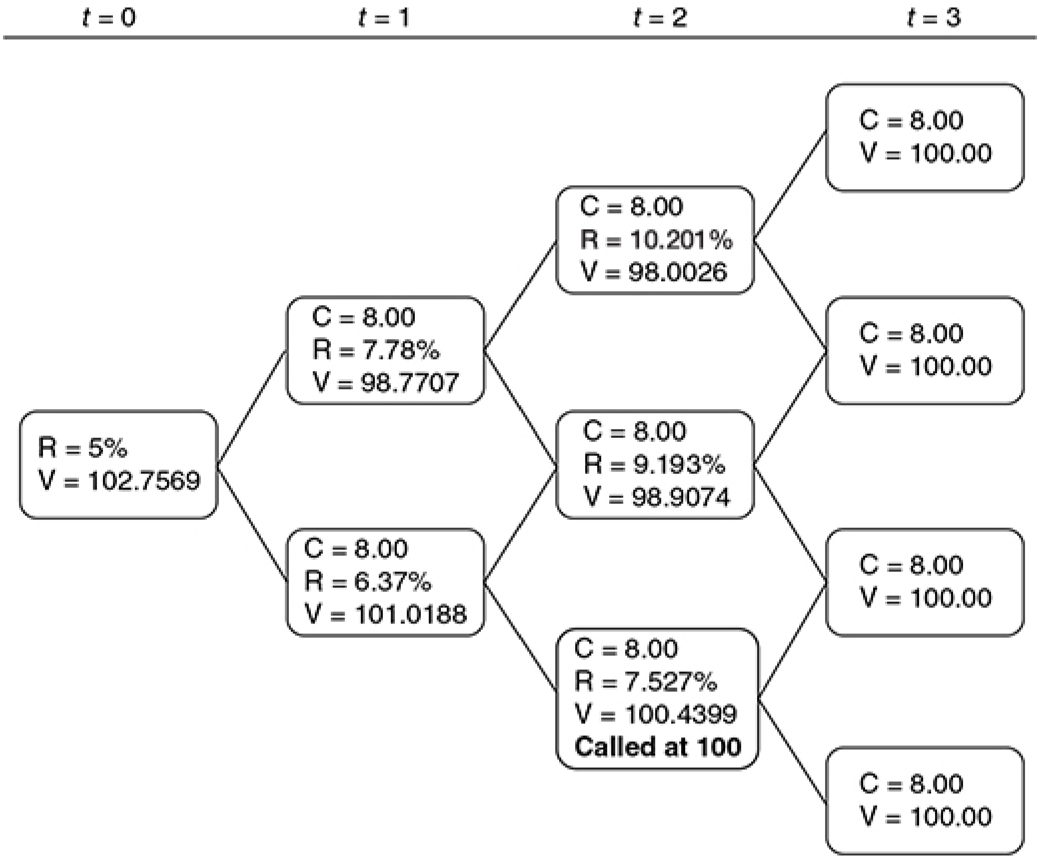
Rationale

0.099

The first step is to find the value of the 3-year, 8 percent annual-pay option-free bond using the binomial tree and the backward induction process:



Next, we value the callable bond using the tree above and adjusting for when the bond is called:

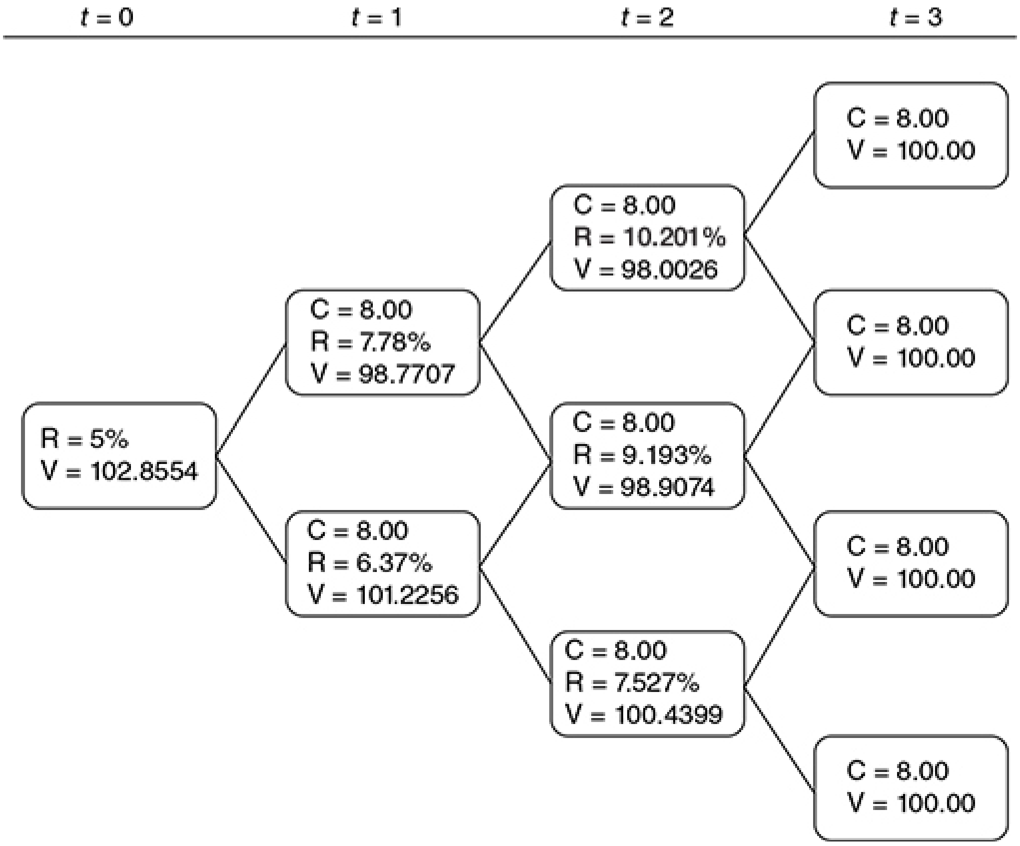


The value of the call is 0.098 (102.655 − 102.557), which is the difference between the two bond's values.

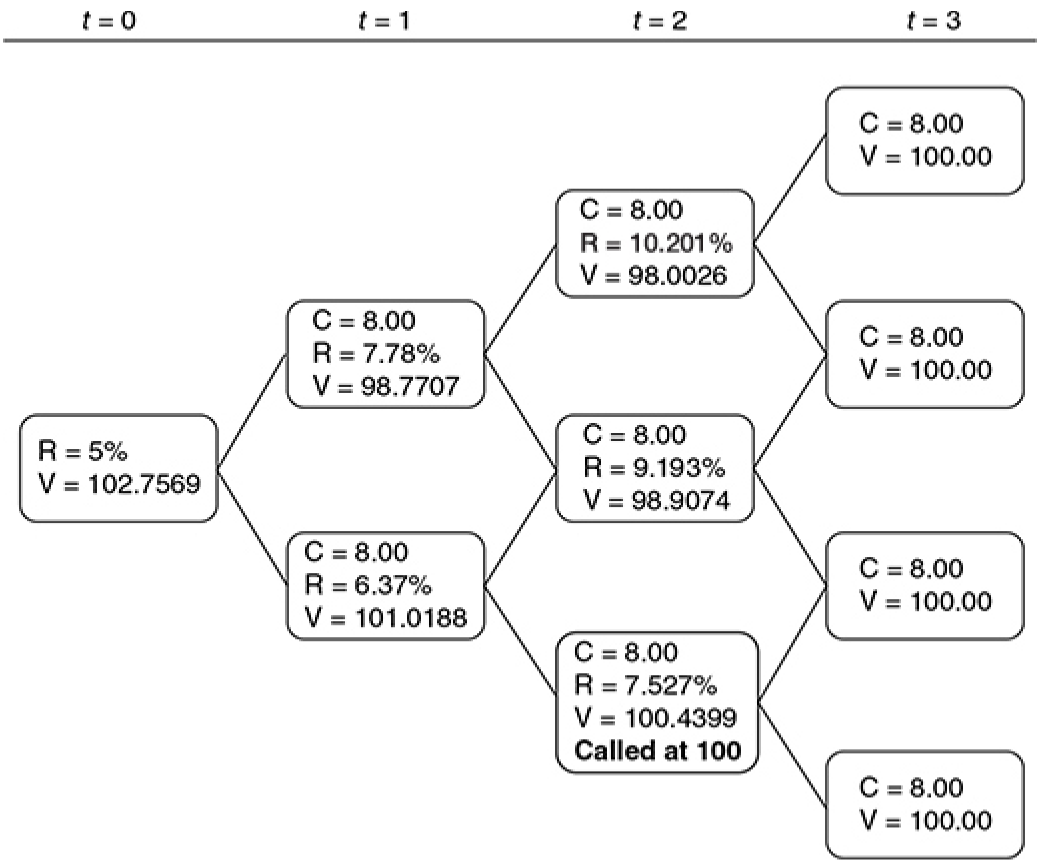
Rationale

❌ **0.583**

The first step is to find the value of the 3-year, 8 percent annual-pay option-free bond using the binomial tree and the backward induction process:



Next, we value the callable bond using the tree above and adjusting for when the bond is called:



The value of the call is 0.098 (102.655 − 102.557), which is the difference between the two bond's values.

Question 39
L2R45TB-AC023-1512
LOS: LOS-9600
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: medium
The current full price of a putable bond is 102.84. If the whole yield curve shifts up by 30 basis points, the bond full price changes to 101.93 based on using the binomial tree. If the whole yield curve shifts down by 30 basis points, the bond full price changes to 104.44 based on using the binomial tree. The effective duration for this putable bond is *closest to*:

- 0.81
- 4.07 (selected)
- 8.14

Rationale

❌ **0.81**

The effective duration is calculated as follows:

$$\begin{aligned}\text{Effective duration} &= \frac{(\text{PV}_{-})-(\text{PV}_{+})}{2\times(\Delta \mathit{Yield})\times(\text{PV}_0)}\\ &= \frac{(104.44)-(101.93)}{2\times(0.003)\times(102.84)}\\ &= 4.0678\end{aligned}$$

Rationale

✅ **4.07**

The effective duration is calculated as follows:

$$\begin{aligned}\text{Effective duration} &= \frac{(\text{PV}_{-})-(\text{PV}_{+})}{2\times(\Delta \mathit{Yield})\times(\text{PV}_0)}\\ &= \frac{(104.44)-(101.93)}{2\times(0.003)\times(102.84)}\\ &= 4.0678\end{aligned}$$

Rationale

❌ **8.14**

The effective duration is calculated as follows:

$$\begin{aligned}\text{Effective duration} &= \frac{(\text{PV}_{-})-(\text{PV}_{+})}{2\times(\Delta \mathit{Yield})\times(\text{PV}_0)}\\ &= \frac{(104.44)-(101.93)}{2\times(0.003)\times(102.84)}\\ &= 4.0678\end{aligned}$$

Question 40
L2AI-PQ4416-1501
LOS: LOS-9630
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: hard
For a callable bond, which of the following is *most* likely regarding convexity at high and low yield levels?

	Low Yields	High Yields
A.	Negative	Positive
B.	Positive	Positive
C.	Positive	Negative

- (selected) Row A
- Row B
- Row C

Rationale
This Answer is Correct
Callable bonds exhibit negative convexity at low yields and positive convexity at high yields.

Question 41
L2AI-PQ4413-1501
LOS: LOS-9630
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: hard
Which of the following bonds is *least* likely to exhibit positive convexity at low interest rates?

- (selected) Callable bond.
- Putable bond.
- Option-free bond.

Rationale

This Answer is Correct

Callable bonds display negative convexity at low interest rates, as the call price effectively serves as a cap on their value.

Question 42
L2R45TB-AC021-1512
LOS: LOS-9630
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: medium

An analyst has calculated the effective duration and effective convexity for three bonds, with one being callable, one putable, and the other being an option-free bond. The resulting data is presented below:

Bond	Effective Duration	Effective Convexity
X	4.56	192.7
Y	7.84	–123.2
Z	8.12	125.6

The bond that is *most likely* to be a callable bond is:

- Bond X.
- Bond Y.
- Bond Z.

Rationale
Bond X.
A callable bond can have negative convexity, while the putable and option-free bonds always have positive convexities.

Rationale
Bond Y.
A callable bond can have negative convexity, while the putable and option-free bonds always have positive convexities.

Rationale
Bond Z.
A callable bond can have negative convexity, while the putable and option-free bonds always have positive convexities.

Question 43
L2R45TB-AC031-1512
LOS: LOS-9660
Lesson Reference: Lesson 6: Valuation and Analysis of Convertible Bonds
Difficulty: medium

On April 1, 2015, Tina Fayez is analyzing a convertible bond issued in 2010 by Inspiration Inc. She has gathered the following information and intends to carefully examine the convertible bond issue to prepare a report:

- Issuer: Inspiration Inc.
- Issue date: April 1, 2010
- Maturity date: April 1, 2025
- Coupon rate: 6% payable annually
- Issue size: $75,000,000
- Bond par value: $1,000
- Issue price: $1,000 (at par)
- Callable: Callable by Inspiration Inc. at $1,300 at any time three years after issuance
- Conversion ratio: 45
- Conversion period: The bonds can be converted into common shares during the period starting ten years after the bond issue and ending upon the bond's maturity
- Share price on issue date: $15.10
- Current (4/1/2015) convertible bond price: $1,170
- Current (4/1/2015) Inspiration Inc. stock price: $25.10
- Current (4/1/2015) bond yield of comparable option-free bond: 6.2 percent

The initial conversion price for the Inspiration convertible bond is *closest to*:

- $15.10
- $22.22
- $26.00

Rationale

$15.10

The initial conversion price is calculated as follows:

$$\begin{aligned}\text{Initial conversion price} &= \frac{\text{Convertible bond par value}}{\text{Conversion ratio}}\\ &= \frac{\$1{,}000}{45}\\ &= 22.22\end{aligned}$$

Rationale

$22.22

The initial conversion price is calculated as follows:

$$\begin{aligned}\text{Initial conversion price} &= \frac{\text{Convertible bond par value}}{\text{Conversion ratio}} \\ &= \frac{\$1{,}000}{45} \\ &= 22.22\end{aligned}$$

Rationale

$26.00

The initial conversion price is calculated as follows:

$$\begin{aligned}\text{Initial conversion price} &= \frac{\text{Convertible bond par value}}{\text{Conversion ratio}} \\ &= \frac{\$1{,}000}{45} \\ &= 22.22\end{aligned}$$

Question 44

L2FI-TBB208-1412

LOS: LOS-9590

Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II

Difficulty: medium

An increase in assumed Interest rate volatility is *most likely* to cause option興adjusted spreads for callable bonds to:

- ○ Increase.
- ◉ Decreased.
- ○ Remain the same.

Rationale

This Answer is Correct

A higher interest rate volatility assumption in a bond pricing model will attribute more of the return of the bond to the option risk and less to risk factors outside of the option, which is what the option adjusted spread measures.

Question 45
L2R45TB-AC020-1512
LOS: LOS-9600
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: medium

An analyst has calculated the effective durations for several putable bonds. A co-worker states that these calculated durations may be of limited use because:

1. the benchmark yield curve does not shift in a parallel manner.
2. several of the putable bonds have puts that are deep out of the money and when this is the case, the calculated effective duration is averaging a price move of approximately zero when rates rise and much larger price change when rates fall by an equal amount.

The co-worker is *most likely* correct in stating:

- (1), only.
- both (1) and (2).
- neither (1) nor (2).

Rationale
(1), only.
Effective duration has two weaknesses in that it assumes parallel yield curve shifts (statement 1) and it does not work well when the embedded option on a bond is at- or in-the-money. Statement 2 is incorrect because some of the putable bonds have deep out-of-the-money puts and these have little or no effect on their price changes. Hence, the calculated changes when rates rise will not be near zero. In fact, a putable bond with a deep out-of-the-money put will have predicted price changes that approximate those of a straight bond.

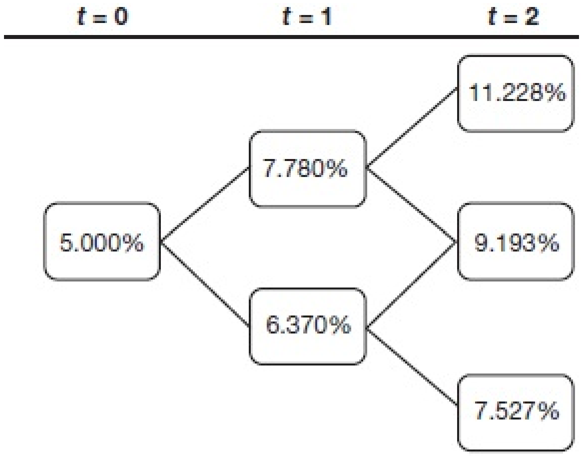
Rationale
both (1) and (2).
Effective duration has two weaknesses in that it assumes parallel yield curve shifts (statement 1) and it does not work well when the embedded option on a bond is at- or in-the-money. Statement 2 is incorrect because some of the putable bonds have deep out-of-the-money puts and these have little or no effect on their price changes. Hence, the calculated changes when rates rise will not be near zero. In fact, a putable bond with a deep out-of-the-money put will have predicted price changes that approximate those of a straight bond.

Rationale
neither (1) nor (2).

Effective duration has two weaknesses in that it assumes parallel yield curve shifts (statement 1) and it does not work well when the embedded option on a bond is at- or in-the-money. Statement 2 is incorrect because some of the putable bonds have deep out-of-the-money puts and these have little or no effect on their price changes. Hence, the calculated changes when rates rise will not be near zero. In fact, a putable bond with a deep out-of-the-money put will have predicted price changes that approximate those of a straight bond.

Question 46
L2R45TB-AC026-1512
LOS: LOS-9570
Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II
Difficulty: medium

An investor is analyzing Bond Y, which is a putable bond. This bond has 3 years to maturity, pays an 8 percent annual coupon, has a par value of 100, and the put option is exercisable at the end of the first and second years, with an exercise price of 99. The investor has developed the following binomial interest rate tree (based on 10 percent volatility) to use in analyzing the



putable bond:

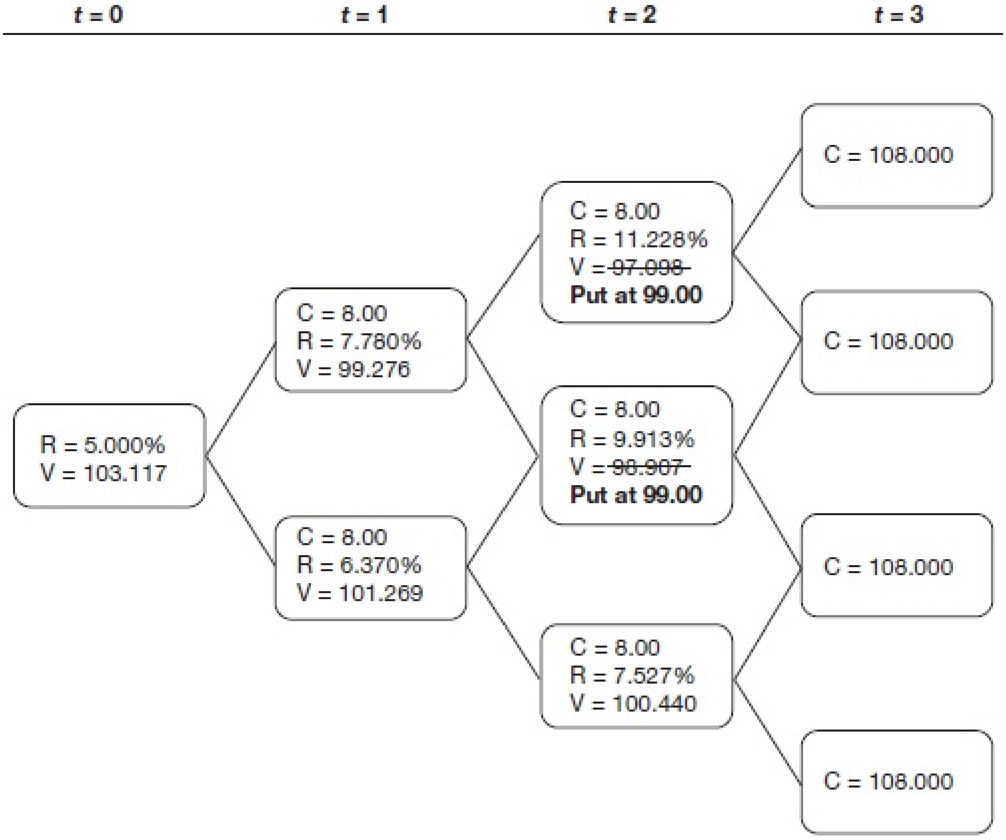
Using the binomial tree and a backward induction valuation approach, the value of Bond Y is *closest to*:

- 102.985
- 103.117
- 103.782

Rationale

102.985

Using the binomial tree and the backward induction process, the value of the putable bond is calculated as follows:

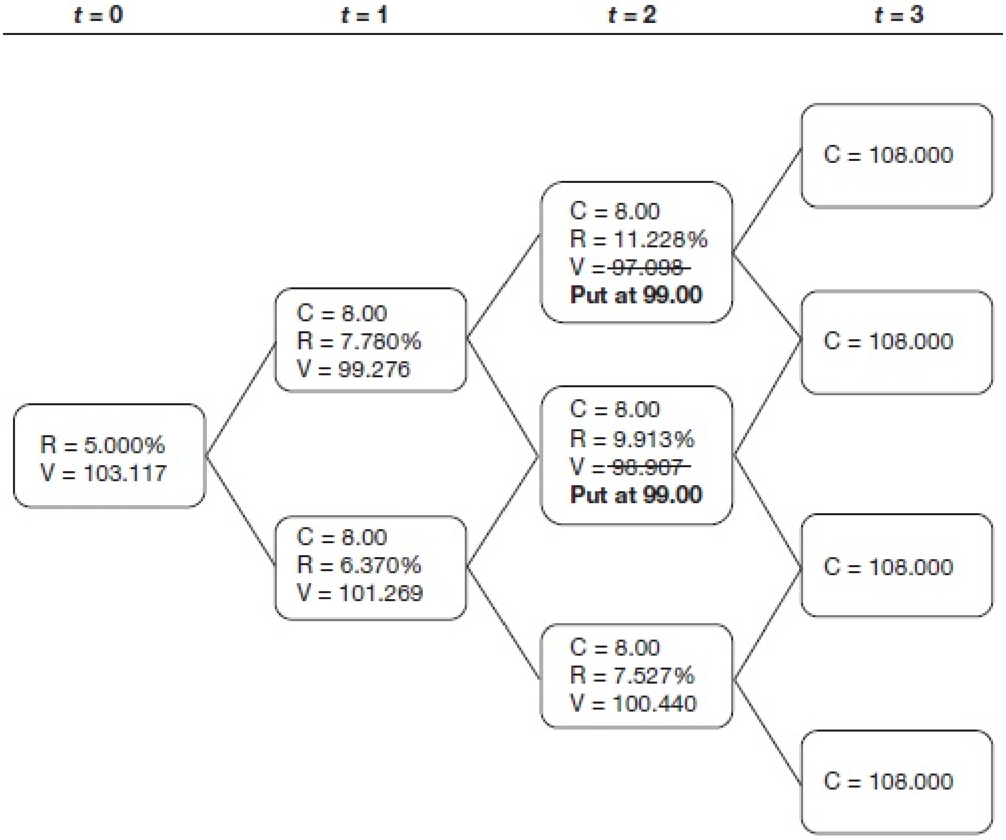


The value of the putable bond is $103.117.

Rationale

103.117

Using the binomial tree and the backward induction process, the value of the putable bond is calculated as follows:

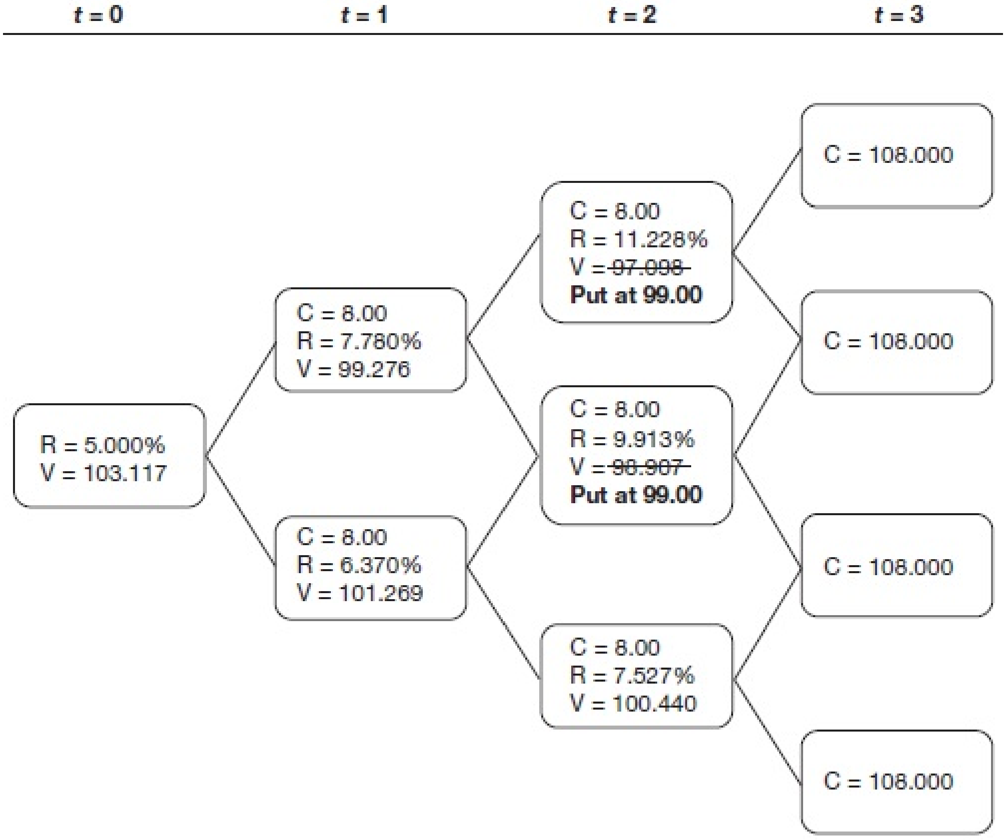


The value of the putable bond is $103.117.

Rationale

❌ **103.782**

Using the binomial tree and the backward induction process, the value of the putable bond is calculated as follows:



The value of the putable bond is $103.117.

Question 47
L2R45TB-AC010-1512
LOS: LOS-9630
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: medium

An analyst is examining two risky bonds that are identical except one is callable and the other is putable. Each bond has the same coupon and each has four years remaining to maturity. The call option on the callable bond and the put option on the putable bond can each be exercised in one year and the respective exercise prices are 100. The analyst has calculated the effective duration and effective convexity for each bond and these are shown below:

	Callable Bond	Putable Bond
Effective duration	2.85	1.33
Effective convexity	–51.3	78.5

If interest rates fall by 20 bps, the callable bond's upside potential relative to the putable bond's upside potential is *most likely*:

- ○ more because the callable bond has a larger effective duration.
- ○ more because the callable bond's effective duration is larger and the convexity effect is small given the small change in rates.
- ◉ less because the negative convexity indicates the call option has value now and the value of the call option—a negative value to the bondholder—increases as rates fall.

Rationale

❌ **more because the callable bond has a larger effective duration.**

The call option feature must have value to the issuer in order for the effective duration to be negative. A callable bond's effective convexity turns negative when the bond's call option is at-the-money. When rates fall, the call option becomes more likely to be exercised and the standard effective duration calculated using parallel changes up and down is not appropriate. The one-sided duration would be a better measure and, for an interest rate decline, it would be very low for a callable bond where the convexity is negative. Therefore, as rates fall, the upside potential for the callable bond shown is very low. In contrast, the upside potential for the putable bonds is not capped and the putable bond will most likely rise more than the callable bond—the callable bond's upside is less.

Rationale

❌ **more because the callable bond's effective duration is larger and the convexity effect is small given the small change in rates.**

The call option feature must have value to the issuer in order for the effective duration to be negative. A callable bond's effective convexity turns negative when the bond's call option is at-the-money. When rates fall, the call option becomes more likely to be exercised and the standard effective duration calculated using parallel changes up and down is not appropriate. The one-sided duration would be a better measure and, for an interest rate decline, it would be very low for a callable bond where the convexity is negative. Therefore, as rates fall, the upside potential for the callable bond shown is very low. In contrast, the upside potential for the putable bonds is not capped and the putable bond will most likely rise more than the callable bond—the callable bond's upside is less.

Rationale

less because the negative convexity indicates the call option has value now and the value of the call option—a negative value to the bondholder—increases as rates fall.
The call option feature must have value to the issuer in order for the effective duration to be negative. A callable bond's effective convexity turns negative when the bond's call option is at-the-money. When rates fall, the call option becomes more likely to be exercised and the standard effective duration calculated using parallel changes up and down is not appropriate. The one-sided duration would be a better measure and, for an interest rate decline, it would be very low for a callable bond where the convexity is negative. Therefore, as rates fall, the upside potential for the callable bond shown is very low. In contrast, the upside potential for the putable bonds is not capped and the putable bond will most likely rise more than the callable bond—the callable bond's upside is less.

Question 48

L2AI-PQ4406-1501

LOS: LOS-9580

Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II

Difficulty: hard

Which of the following spreads is *most* likely used to value a callable bond?

- ○ Z-spread.
- ◉ Option-adjusted spread.
- ○ TED-spread

Rationale

This Answer is Correct

The OAS is used when valuing a bond with embedded options using a binomial tree.

The z-spread is used to value a risky bond with no embedded options.

Question 49
L2FI-ITEMSET-TBX106-1502
LOS: LOS-9650
LOS: LOS-9660
LOS: LOS-9670
LOS: LOS-9680
Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II
Difficulty: N/A
The next four questions relate to the following information regarding a convertible bond issue of Ganet Inc.

Ganet Inc. 3.5% convertible bond	
Annual coupon	3.5%
Time to maturity	5 years
Risk興free rate	2%
Ganet credit spread	3%
Stock price	$62.50
Conversion ratio per $100,000 par value	1,200
Current convertible market price	$95,000

i.
If the convertible bond was issued at par, the initial conversion price was *closest* to:

- $62.5.
- $79.2.
- $83.3.

Rationale
This Answer is Correct

Initial conversion price = Initial price of bond / Conversion ratio

= $100,000 / 1,200 = $83.33

ii.
The minimum value of $100,000 par value of the convertible bond is *closest* to:

- $75,000.
- $83,333.
- $93,506.

Rationale
This Answer is Correct

The minimum value of the convertible bond will be the greater of the conversion value of the bond and the value of the underlying option興free bond.

The conversion value of the bond is 1,200 ?? $62.50 = $75,000.

The value of the underlying option興free bond can be found using a financial calculator:

N = 5, *I*/ *Y* = (2%+3%) = 5%, PMT = $3,500, FV = $100,000, CPT PV = $93,506

Hence, the minimum value of the convertible bond is $93,506.

iii.

The value of the call option embedded in $100,000 par value of the convertible bond is *closest* to:

- (selected) $1,494.
- $5,000.
- $6,494.

Rationale

This Answer is Correct

Value of convertible bond = Value of straight bond + Value of call option on the issuer's stock. The value of the underlying option興free bond can be found using a financial calculator:

N = 5, *I*/ *Y* = (2%+3%) = 5%, PMT = $3,500, FV = $100,000, CPT PV = $93,506

Hence:

$95,000 = $93,506 + Value of the call option

therefore, the value of the call option must be equal to $95,000 﨤 $93,506 = $1,494.

iv.

A convertible bond will have the highest market conversion premium when trading as:

- (selected) A busted convertible.
- Hybrid.
- A stock equivalent.

Rationale

This Answer is Correct

When trading as a busted convertible, the stock price will be low, and the convertible price is likely to be supported by the straight value of the bond. Hence, the convertible value is likely to be much higher than the conversion value and thus exhibit a high market conversion premium.

Question 50
L2FI-TB0020-1412
LOS: LOS-9690
Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II
Difficulty: medium

An investor collects the following information regarding a debt issue in Robson Holdings, a diversified logistics and distribution company in the energy sector:

Probability of default (% per year)	Expected loss ($ per 100 par)	Present value of expected loss
0.75	$30	$25

If the price of an otherwise identical and riskless government bond is observed as $115. Which of the following is closest to the theoretical value of the bond issued by Robson Holdings?

- $70.
- $75.
- $90.

Rationale

This Answer is Correct

The present value of the expected loss represents the exact dollar difference one should pay or receive on the bond relative to an otherwise identical and riskless government bond. In this case this implies that investors should be willing to pay $115 甛 $25 = $90 for the bond issued by Robson Holdings.

Question 51

L2R45TB-AC018-1512

LOS: LOS-9610

Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options

Difficulty: medium

All else being the same for three bonds, the bond with the highest effective duration is *most likely* to be the:

- callable bond.
- putable bond.
- straight bond.

Rationale

callable bond.

When the embedded option in the callable or putable bond has value, the respective options cause each bond's value to change less than the change in the straight bond's value when rates change. In addition, when the embedded option in the callable or putable bond is deep out-of-the-money (the options have no value), each bond's value changes in line with the change in the straight bond's value. Therefore, the effective duration of a straight bond is equal to or greater than that of a callable or a putable bond.

Rationale

putable bond.

When the embedded option in the callable or putable bond has value, the respective options cause each bond's value to change less than the change in the straight bond's value when rates change. In addition, when the embedded option in the callable or putable bond is deep out-of-the-money (the options have no value), each bond's value changes in line with the change in the straight bond's value. Therefore, the effective duration of a straight bond is equal to or greater than that of a callable or a putable bond.

Rationale

straight bond.

When the embedded option in the callable or putable bond has value, the respective options cause each bond's value to change less than the change in the straight bond's value when rates change. In addition, when the embedded option in the callable or putable bond is deep out-of-the-money (the options have no value), each bond's value changes in line with the change in the straight bond's value. Therefore, the effective duration of a straight bond is equal to or greater than that of a callable or a putable bond.

Question 52
L2AI-PQ4402-1501
LOS: LOS-9550
Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I
Difficulty: hard

Consider the following statements:

Statement 1: An increase in interest rate volatility increases the value of a callable bond.

Statement 2: An increase in interest rate volatility decreases the value of a putable bond.

Which of the following is *most* likely?

- ○ Both statements are correct.
- ○ Only one statement is incorrect.
- ◉ Both statements are incorrect.

Rationale

This Answer is Correct

The embedded call option increases in value with higher interest rate volatility. Therefore, the value of a callable bond **decreases** with higher volatility.

The embedded put option also increases in value with higher interest rate volatility. Therefore, the value of a putable bond **increases** with higher volatility.

Question 53
L2R45TB-AC019-1512
LOS: LOS-9610
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: medium

An analyst is examining the following three bonds:

Bond X: a five-year zero-coupon bond.
Bond Y: a five-year putable bond, with the put not being exercisable until years 3 and 4.
Bond Z: a ten-year floating-rate bond with semi-annual coupon resets.

The bond that is *most likely* to have the lowest effective duration is:

- ○ Bond X.
- ○ Bond Y.
- ● Bond Z.

Rationale
Bond X.
The effective duration of the floater is the smallest. It is close to 0.5 (years) because of its semi-annual coupon resets. The five-year zero coupon bond has an effective duration of approximately 5. The effective duration of a five-year putable bond is less than that of the corresponding option-free, zero-coupon bond, but shouldn't be less than that of the floater.

Rationale
Bond Y.
The effective duration of the floater is the smallest. It is close to 0.5 (years) because of its semi-annual coupon resets. The five-year zero coupon bond has an effective duration of approximately 5. The effective duration of a five-year putable bond is less than that of the corresponding option-free, zero-coupon bond, but shouldn't be less than that of the floater.

Rationale
Bond Z.
The effective duration of the floater is the smallest. It is close to 0.5 (years) because of its semi-annual coupon resets. The five-year zero coupon bond has an effective duration of approximately 5. The effective duration of a five-year putable bond is less than that of the corresponding option-free, zero-coupon bond, but shouldn't be less than that of the floater.

Question 54
L2R45TB-AC034-1512
LOS: LOS-9660
Lesson Reference: Lesson 6: Valuation and Analysis of Convertible Bonds
Difficulty: medium

On April 1, 2015, Tina Fayez is analyzing a convertible bond issued in 2010 by Inspiration Inc. She has gathered the following information and intends to carefully examine the convertible bond issue to prepare a report:

- Issuer: Inspiration Inc.
- Issue date: April 1, 2010
- Maturity date: April 1, 2025
- Coupon rate: 6% payable annually
- Issue size: $75,000,000
- Bond par value: $1,000
- Issue price: $1,000 (at par)
- Callable: Callable by Inspiration Inc. at $1,300 at any time three years after issuance
- Conversion ratio: 45
- Conversion period: The bonds can be converted into common shares during the period starting ten years after the bond issue and ending upon the bond's maturity
- Share price on issue date: $15.10
- Current (4/1/2015) convertible bond price: $1,170
- Current (4/1/2015) Inspiration Inc. stock price: $24.60
- Current (4/1/2015) bond yield of comparable option-free bond: 6.2 percent

If the stock price of Inspiration Inc. increases overnight to $40 a share due to merger speculation, the value of the convertible bond will *most likely*:

- stay near its recent $1,170 price.
- increase to a price near to $1,300. (selected)
- increase to a price near to $1,800.

Rationale

stay near its recent $1,170 price.

Based on the minimum value, which is the greater of (1) the conversion value and (2) the value of an option-free (not convertible) bond that is otherwise identical to the convertible bond, the first expectation is that the price will rise to $1,800 (the conversion value, which is 45 × $40). But this convertible cannot be immediately converted because five years remain before the conversion option can be exercised and it is immediately callable at $1,300. This call limits the upside and the bond will most likely rise to a price near $1,300.

Rationale

increase to a price near to $1,300.
Based on the minimum value, which is the greater of (1) the conversion value and (2) the value of an option-free (not convertible) bond that is otherwise identical to the convertible bond, the first expectation is that the price will rise to $1,800 (the conversion value, which is 45 × $40). But this convertible cannot be immediately converted because five years remain before the conversion option can be exercised and it is immediately callable at $1,300. This call limits the upside and the bond will most likely rise to a price near $1,300.

Rationale

increase to a price near to $1,800.
Based on the minimum value, which is the greater of (1) the conversion value and (2) the value of an option-free (not convertible) bond that is otherwise identical to the convertible bond, the first expectation is that the price will rise to $1,800 (the conversion value, which is 45 × $40). But this convertible cannot be immediately converted because five years remain before the conversion option can be exercised and it is immediately callable at $1,300. This call limits the upside and the bond will most likely rise to a price near $1,300.

Question 55
L2FI-TB0013-1412
LOS: LOS-9520
Lesson Reference: Lesson 1: Overview of Embedded Options
Difficulty: medium
An extendible bond has optionality that resembles:

- A call option.
- A put option.
- A conversion option.

Rationale

This Answer is Correct

An extendible bond gives the option to the holder to extend the life of the bond should they choose to at maturity. The investor will choose to exercise this option when interest rates have fallen and the value of the bond has risen as a result. If the investor had a putable bond and rates had fallen, they would not exercise the put and keep the bond. If rates have risen then the extendible bond investor would not choose to extend the life of the bond and reinvest the proceeds at higher rates. The putable bond investor would choose to put the bond in a higher interest rate environment and also reinvest at higher rates. This makes the exposure economically the same under both instruments. The first option is incorrect since the call option is held by the issuer and would be exercised when rates fall. The second option is incorrect since it involves the option to convert debt to equity, which does not exist under the extendible bond.

Question 56
L2R45TB-AC033-1512
LOS: LOS-9660
Lesson Reference: Lesson 6: Valuation and Analysis of Convertible Bonds
Difficulty: medium

On April 1, 2015, Tina Fayez is analyzing a convertible bond issued in 2010 by Inspiration Inc. She has gathered the following information and intends to carefully examine the convertible bond issue to prepare a report:

- Issuer: Inspiration Inc.
- Issue date: April 1, 2010
- Maturity date: April 1, 2025
- Coupon rate: 6% payable annually
- Issue size: $75,000,000
- Bond par value: $1,000
- Issue price: $1,000 (at par)
- Callable: Callable by Inspiration Inc. at $1,300 at any time three years after issuance
- Conversion ratio: 45
- Conversion period: The bonds can be converted into common shares during the period starting ten years after the bond issue and ending upon the bond's maturity
- Share price on issue date: $15.10
- Current (4/1/2015) convertible bond price: $1,170
- Current (4/1/2015) Inspiration Inc. stock price: $24.60
- Current (4/1/2015) bond yield of comparable option-free bond: 6.2 percent

The minimum value of the Inspiration convertible bond is *closest to*:

- ○ $980
- ○ $1,000
- ● $1,110

Rationale

✖ **$980**

The minimum (floor) value of a convertible is equal to the greater of (1) the conversion value or (2) the value of an option-free (not convertible) bond that is otherwise identical to the convertible bond. The conversion value for the Inspiration convertible bond is:

$$\text{Conversion value} = \text{Share price} \times \text{Conversion ratio} = \$24.60 \times 45 = \$1{,}107$$

The value of an otherwise identical option-free bond with 10 years remaining is:

$$\begin{aligned}\text{Straight bond value} &= \sum_{t=1}^{T} \frac{\text{Coupon payments}}{(1+\text{YTM})^{t}} + \frac{\text{Par value at maturnity}}{(1+\text{YTM})^{T}} \\ &= \sum_{t=1}^{10} \frac{0.06\times\$1{,}000}{(1.062)^{t}} + \frac{\$1{,}000}{(1.062)^{10}} \\ &= \$985.42\end{aligned}$$

The greater of the two calculated values is $1,107, which represents the minimum value of this convertible bond.

Rationale

$1,000

The minimum (floor) value of a convertible is equal to the greater of (1) the conversion value or (2) the value of an option-free (not convertible) bond that is otherwise identical to the convertible bond. The conversion value for the Inspiration convertible bond is:

$$\text{Conversion value} = \text{Share price} \times \text{Conversion ratio} = \$24.60 \times 45 = \$1{,}107$$

The value of an otherwise identical option-free bond with 10 years remaining is:

$$\begin{aligned}\text{Straight bond value} &= \sum_{t=1}^{T} \frac{\text{Coupon payments}}{(1+\text{YTM})^{t}} + \frac{\text{Par value at maturnity}}{(1+\text{YTM})^{T}} \\ &= \sum_{t=1}^{10} \frac{0.06\times\$1{,}000}{(1.062)^{t}} + \frac{\$1{,}000}{(1.062)^{10}} \\ &= \$985.42\end{aligned}$$

The greater of the two calculated values is $1,107, which represents the minimum value of this convertible bond.

Rationale

$1,110

The minimum (floor) value of a convertible is equal to the greater of (1) the conversion value or (2) the value of an option-free (not convertible) bond that is otherwise identical to the convertible bond. The conversion value for the Inspiration convertible bond is:

$$\text{Conversion value} = \text{Share price} \times \text{Conversion ratio} = \$24.60 \times 45 = \$1{,}107$$

The value of an otherwise identical option-free bond with 10 years remaining is:

$$\begin{aligned}\text{Straight bond value} &= \sum_{t=1}^{T} \frac{\text{Coupon payments}}{(1+\text{YTM})^{t}} + \frac{\text{Par value at maturnity}}{(1+\text{YTM})^{T}} \\ &= \sum_{t=1}^{10} \frac{0.06\times\$1{,}000}{(1.062)^{t}} + \frac{\$1{,}000}{(1.062)^{10}} \\ &= \$985.42\end{aligned}$$

The greater of the two calculated values is $1,107, which represents the minimum value of this convertible bond.

Question 57
L2R45TB-AC007-1512
LOS: LOS-9520
Lesson Reference: Lesson 1: Overview of Embedded Options
Difficulty: medium
Which of the following bond-embedded options is *most likely* held by the issuer?

- (selected) Call option on a callable bond.
- Extension option on an extendible bond.
- Conversion option for a convertible bond.

Rationale

Call option on a callable bond.

The call option on a callable bond is the only option (from the three choices) that is held by the issuer. The issuer holds this option because it has the right to call the bond. The other two choices are options that are held by bondholders.

Rationale

Extension option on an extendible bond.

The call option on a callable bond is the only option (from the three choices) that is held by the issuer. The issuer holds this option because it has the right to call the bond. The other two choices are options that are held by bondholders.

Rationale

Conversion option for a convertible bond.

The call option on a callable bond is the only option (from the three choices) that is held by the issuer. The issuer holds this option because it has the right to call the bond. The other two choices are options that are held by bondholders.

Question 58
L2R45TB-AC013-1512
LOS: LOS-9540
Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I
Difficulty: medium

An analyst has gathered the following table showing current par rates:

Maturity in Years	Par Rate (%)
1	2.000
2	3.500
3	4.500

Given the par rates shown above and assuming bond payments are made annually, the two-year spot rate is *closest to*:

- 3.500%
- 3.527%
- 3.589%

Rationale

3.500%

Based on the one-year par rate of 2 percent, we know the one-year spot rate is also 2 percent. Given the two-year par rate of 3.5 percent, a two-year bond selling at par of 100 would have to pay an annual coupon of 3.5 percent. Knowing that a two- year, 3.5 percent annual bond is selling for par, the two-year spot rate is calculated as follows:

$$\begin{aligned} 100 &= \frac{3.50}{1+0.02} + \frac{103.50}{(1+S_2)^2} \\ S_2 &= 3.527 \text{ percent} \end{aligned}$$

Rationale

3.527%

Based on the one-year par rate of 2 percent, we know the one-year spot rate is also 2 percent. Given the two-year par rate of 3.5 percent, a two-year bond selling at par of 100 would have to pay an annual coupon of 3.5 percent. Knowing that a two- year, 3.5 percent annual bond is selling for par, the two-year spot rate is calculated as follows:

$$\begin{aligned} 100 &= \frac{3.50}{1+0.02} + \frac{103.50}{(1+S_2)^2} \\ S_2 &= 3.527 \text{ percent} \end{aligned}$$

Rationale

3.589%

Based on the one-year par rate of 2 percent, we know the one-year spot rate is also 2 percent. Given the two-year par rate of 3.5 percent, a two-year bond selling at par of 100 would have to pay an annual coupon of 3.5 percent. Knowing that a two- year, 3.5 percent annual bond is selling for par, the two-year spot rate is calculated as follows:

$$\begin{aligned} 100 &= \frac{3.50}{1+0.02} + \frac{103.50}{(1+S_2)^2} \\ S_2 &= 3.527 \text{ percent} \end{aligned}$$

Question 59

L2FI-TB0014-1412

LOS: LOS-9530

Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I

Difficulty: medium

Which of the following relationships is *most likely* to be accurate?

- ○ Callable bond value > straight bond value > putable bond value.
- ● Callable bond value < straight bond value < putable bond value.
- ○ Callable bond value > straight bond value < putable bond value.

Rationale

This Answer is Correct

The holder of a callable bond is short the call option hence will pay less than the value of a straight bond. The holder of a put option is long the put option hence will pay more than the value of the straight bond.

Question 60
L2R45TB-AC017-1512
LOS: LOS-9580
Lesson Reference: Lesson 3: Valuation and Analysis of Callable and Putable Bonds Part II
Difficulty: medium

An analyst makes the following two statements about the similarities and differences between option???adjusted spread (OAS) and Z???spread:

> **Statement 1:** The Z???spread is a constant spread across different maturities, while the OAS is a variable spread added to each one???period forward rate in the binomial tree.
> **Statement 2:** Both the Z???spread and the OAS consider bond embedded options.

The analyst is *most likely* correct in making:

- both statements.
- statement 1, only.
- neither statement.

Rationale
both statements.
Both statements are incorrect. The OAS is a constant spread added to each one???period forward rate in the binomial tree and the Z???spread does not consider bond embedded options.

Rationale
statement 1, only.
Both statements are incorrect. The OAS is a constant spread added to each one???period forward rate in the binomial tree and the Z???spread does not consider bond embedded options.

Rationale
neither statement.
Both statements are incorrect. The OAS is a constant spread added to each one???period forward rate in the binomial tree and the Z???spread does not consider bond embedded options.

Question 61
L2R45TB-AC008-1512
LOS: LOS-9530
Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I
Difficulty: medium
Compared to an otherwise identical straight bond, which of the following bond(s) will *most likely* trade at a price below the straight bond's price?

- Putable bond.
- Callable bond.
- Extendible bond.

Rationale
Putable bond.

The callable bond is the only bond that is valued lower than the straight bond because it grants the issuer the option to call the bond when interest rates are low in the future. Essentially, the issuer purchases a call option from the bondholders. As a result, the bondholders don't have to pay the full price of the straight bond when they buy a callable bond.

Bondholders own the right to put a putable bond or extend an extendible bond. Therefore, the prices of these bonds should be equal to or greater than the value of an otherwise identical straight bond.

Rationale
Callable bond.

The callable bond is the only bond that is valued lower than the straight bond because it grants the issuer the option to call the bond when interest rates are low in the future. Essentially, the issuer purchases a call option from the bondholders. As a result, the bondholders don't have to pay the full price of the straight bond when they buy a callable bond.

Bondholders own the right to put a putable bond or extend an extendible bond. Therefore, the prices of these bonds should be equal to or greater than the value of an otherwise identical straight bond.

Rationale
Extendible bond.

The callable bond is the only bond that is valued lower than the straight bond because it grants the issuer the option to call the bond when interest rates are low in the future. Essentially, the issuer purchases a call option from the bondholders. As a result, the bondholders don't have to pay the full price of the straight bond when they buy a callable bond.

Bondholders own the right to put a putable bond or extend an extendible bond. Therefore, the prices of these bonds should be equal to or greater than the value of an otherwise identical straight bond.

Question 62
L2FI-TBB211-1412
LOS: LOS-9620
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: medium

A risk analyst collects the following data for a bond:

Duration Measure	Effective Duration	One-Sided Up-duration	One-Sided Down-duration
Value	2.90	1.45	4.41

The bond in question is *least likely* to be:

- Option-free.
- Callable.
- Putable.

Rationale

This Answer is Correct

For a callable bond, up-duration is more than down-duration, and vice versa for putable bond. The second option is correct. One-sided up-duration measures the sensitivity of a bond's price to a shift up in interest rates. Similarly, one-sided down duration measures the sensitivity of a bond's price to a shift down in interest rates. Both a putable bond and an option free bond will have a convex price-yield relationship where down duration will be higher than up duration. This will not be the case for a callable bond at low yields since the bond will exhibit negative convexity and down duration will be less than up-duration.

Question 63
L2AI-PQ4415-1501
LOS: LOS-9630
Lesson Reference: Lesson 4: Interest Rate Risk of Bonds with Embedded Options
Difficulty: hard

A putable bond offers a coupon rate of 8%, while market yields currently stand at 12%. An increase in market yields would *most* likely result in:

- (selected) A decrease in the price of the putable bond, but the decrease in price would be less than the price decrease that a similar straight bond would undergo.
- An increase in the price of the putable bond, but the increase in price would be less than the price increase that a similar straight bond would undergo.
- A decrease in the price of the putable bond, and the decrease in price would be greater than the price decrease that a similar straight bond would undergo.

Rationale

This Answer is Correct

When market yields are greater than the coupon rate on a putable bond, the embedded put option rises in value and cushions the decrease in the price of the putable bond as compared to the price of a similar straight bond.

Question 64
L2AI-ITEMSET-PQ4424-1501
LOS: LOS-9530
Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I
Difficulty: hard

Use the following information to answer the next three questions:

Consider the following four-year bonds that are issued by the same entity and have the same characteristics except for the options embedded in their structure:

Bond A is a straight bond.

Bond B is putable at par two and three years from today.

Bond C is callable and putable at par two and three years from today.

i.
Compared to Bond A, the value of Bond B is *most* likely:

- ○ The same.
- ◉ Higher.
- ○ Lower.

Rationale
This Answer is Correct
A putable bond is worth more than an otherwise identical straight bond, as the investor holds the embedded put option.

ii.
Compared to Bond B, the value of Bond C is *most* likely:

- ○ The same.
- ○ Higher.
- ◉ Lower.

Rationale
This Answer is Correct
Bond C will hold lower value to the investor than Bond B because the call option embedded in Bond C favors the issuer.

iii.
If interest rates were to rapidly decline over the term of the bonds, Bond C would *most* likely:

- ◉ Be called by the issuer.
- ○ Be put by the investor.
- ○ Remain outstanding until maturity.

Rationale

This Answer is Correct

A steep decline in interest rates would result in an increase in the value of the straight bond, which would result in the issuer calling the bond.

Question 65
L2FI-TB0016-1412
LOS: LOS-9550
Lesson Reference: Lesson 2: Valuation and Analysis of Callable and Putable Bonds Part I
Difficulty: medium
A fall in expected interest rate volatility will *most likely* cause:

- A rise in putable bond prices.
- A fall in callable bond prices.
- No change in straight bond prices.

Rationale

This Answer is Correct

A fall in expected interest rate volatility will most likely cause a fall in interest rate related option values. This will cause the value of the put option to fall, lowering the value of putable bonds. It will also cause the value of call options to fall, increasing the value of callable bonds. The value of straight bonds with no optionality will not be affected.