



# CFA LEVEL 1

# MARATHON SERIES

**FIXED INCOME**



**Question 1:**

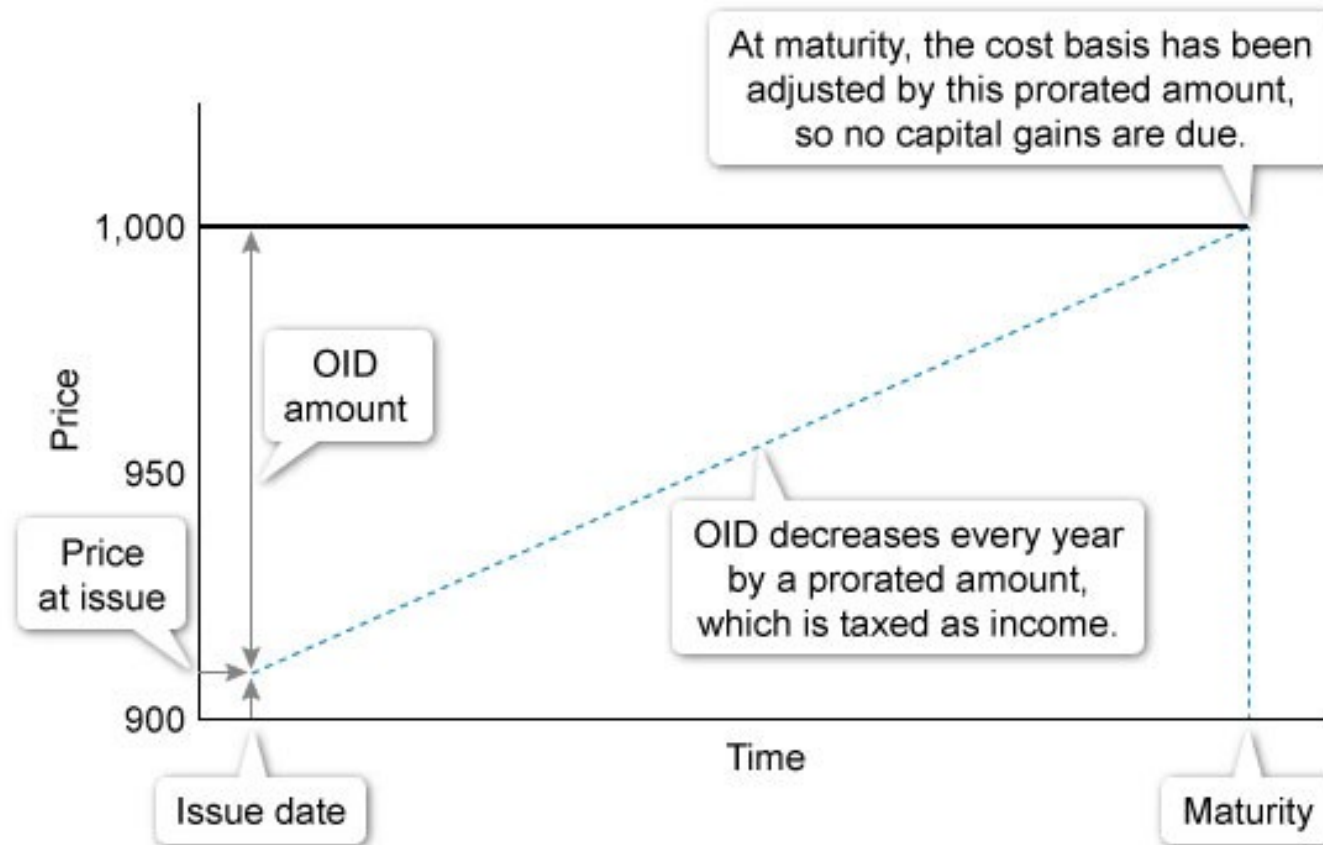
Which of the following statements about original issue discount (OID) bonds is least likely to be true based on the tax provisions applicable to OID bonds?

- A. The bond's cost basis increases each year.
- B. The income earned from OID bonds is taxed annually.
- C. Capital gains on OID bonds are taxed at maturity.

**Solution:****C is correct.**

The correct answer is C. OID bonds are originally issued at a discount to par value, and the discount is taxed as income annually (Choice B). To account for the discount, a prorated portion is added to the bond's cost basis each year (Choice A). This adjustment results in no capital gains taxes being due at maturity. Therefore, Choice C is the least likely statement to apply to OID bonds.

## Original issue discount (OID)



## Original issue discount (OID)

- |               |   |
|---------------|---|
| Description   | <ul style="list-style-type: none"><li>• Tax treatment for bonds originally issued at a discount to par</li><li>• The OID is the difference between par value and the issue price</li><li>• Zero-coupon bonds are a common example</li><li>• Prorated portion of the discount is taxed as income each year</li></ul> |
| Tax treatment | <ul style="list-style-type: none"><li>• Prorated portion is added to the cost basis</li><li>• No capital gains taxes at maturity</li><li>• Not applicable in all jurisdictions</li></ul>  |

**Question 2:**

In a nonagency residential mortgage-backed security (RMBS), which of the following risks are bondholders most likely exposed to when a significant portion of the securitized mortgages are nonrecourse and underwater?

- A. Contraction risk due to prepayment acceleration.
- B. Interest rate risk due to changes in bond value from interest rate volatility.
- C. Strategic default risk due to potential loss of principal and extension risk.

**Solution:****C is correct.**

When a significant portion of the securitized mortgages in an RMBS are nonrecourse and underwater, bondholders are most likely exposed to strategic default risk. Strategic default occurs when a borrower has sufficient resources to pay the mortgage but chooses to default, and it is more likely to occur in underwater mortgages with nonrecourse loans. In this scenario, the lender has claim only to the proceeds from the sale of the property, and there is no recourse for the lender to seize other assets from the borrower if the proceeds from selling the property are insufficient to fully repay the loan. Bondholders face potential loss of principal and extension risk since the anticipated maturity of the RMBS increases due to slower prepayments (Choice C). In contrast, contraction risk occurs when prepayments accelerate and reduce the expected maturity of the RMBS (Choice A). Interest rate risk refers to the change in the value of a bond that results from interest rate volatility (Choice B).

## Strategic default: residential mortgages

- Borrower has sufficient resources to pay but chooses to default
- Most often occurs with underwater mortgages
- Most prevalent with nonrecourse loans
- Has negative credit consequences for the borrower



**Question 3:**

An arbitrage collateralized debt obligation (CDO) has a portfolio of fixed-rate bonds and is funded in part by a senior tranche that pays floating interest rates. How is the interest rate mismatch between the fixed-rate collateral and the floating-rate senior tranche typically managed?

- A. By earning a risk-free profit for the CDO sponsor.
- B. By creating an excess spread to fund a cash reserve.
- C. By hedging with a fixed-for-floating interest rate swap.

**Solution:****C is correct.**

Collateralized debt obligations (CDOs) are asset securitizations that issue multiple tranches of securities to raise funds for a collateral pool. The collateral pool, typically composed of fixed-rate bonds, generates interest income to pay the distributions to investors. However, since the senior tranches, which are liabilities of the CDO, often pay floating interest rates, there is an interest rate mismatch between the fixed-rate collateral and the floating-rate senior tranches.

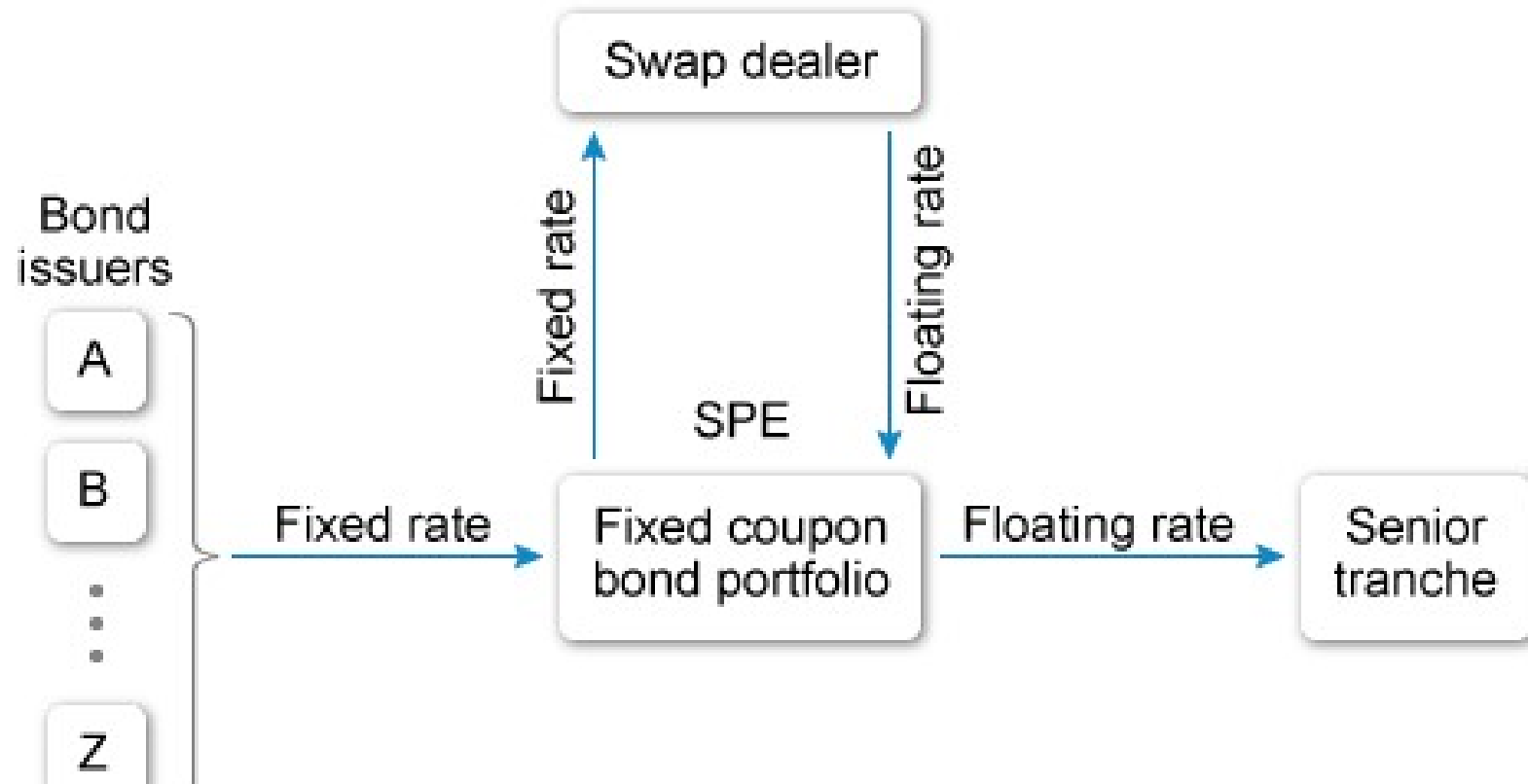
To manage the interest rate risk, CDOs often use interest rate swaps to hedge the mismatch. A fixed-for-floating interest rate swap allows the CDO to swap its fixed-rate collateral payments for floating-rate payments to match the floating-rate liability of the senior tranche.

Choice A is incorrect because an arbitrage CDO is not necessarily a risk-free strategy. It is a type of CDO where the sponsor aims to earn a spread by investing in a portfolio of assets that generate more income than the interest owed on the debt tranches.

Choice B is incorrect because any excess interest income generated by the collateral pool above the interest owed on the debt tranches is typically distributed to the equity tranche investors as the residual claimants of the CDO.

Remember that CDOs often have an interest rate mismatch between fixed-rate collateral and floating-rate senior tranches, which can be managed by hedging with interest rate swaps.

## Hedging collateralized debt obligation (CDO) interest rate risk



**Question 4:**

An investor buys a bond for 115.443470 per 100 par value. The bond has 10 years left until maturity, a 5% YTM, and a 7% annual coupon. Four years later, the bond is sold for 112.894681 at a YTM of 4.5%. The capital gain or loss is closest to a:

- A. 2.5488 loss.
- B. 2.7433 gain.
- C. 3.6286 gain.

**Solution:**

**B is correct.**

### Present value of a coupon bond

$$\text{Present value} = \frac{\text{Coupon payment}_1}{\left(1 + \frac{\text{YTM}}{m}\right)^1} + \frac{\text{Coupon payment}_2}{\left(1 + \frac{\text{YTM}}{m}\right)^2} + \dots + \frac{\text{Coupon payment}_n + \text{Face value}}{\left(1 + \frac{\text{YTM}}{m}\right)^n}$$

$m$  = number of coupon payments per period (ie, year)

$n$  = number of periods (ie, years)

**Capital gain or loss = Selling price – Carrying value**

The **capital gain or loss** on a bond trade is the **difference between** the **selling price** and the **bond's carrying value**, not the purchase price. For bonds sold prior to maturity, the carrying value is the **present value** of the **remaining cash flows**, using the YTM at purchase, not the current YTM, to discount those remaining cash flows.

Calculations	Steps
$110.151384 = \frac{7}{(1.05)^1} + \frac{7}{(1.05)^2} + \dots + \frac{107}{(1.05)^6}$	Calculate the carrying value: price the bond based on remaining time to maturity, using the purchase YTM
$+2.7433 = 112.894681 - 110.151384$	Calculate the gain or loss: subtract carrying value from selling price

Since they must converge with par value by maturity, the carrying values for bonds purchased at a premium decline over time. Although the bond in this instance sold for less than its purchase price, its sale price was higher than its carrying value, so there is a capital gain.

**Question 5:**

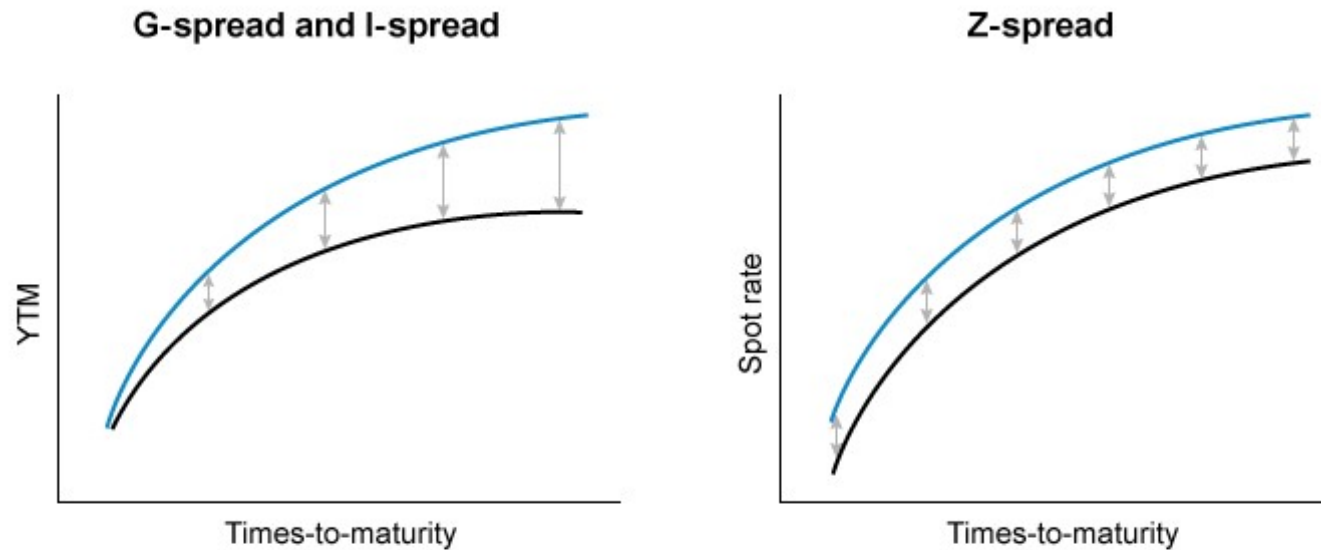
An analyst evaluates a bond by determining a spread over a LIBOR/swap spot curve. The spread is the same for all times-to-maturity. The analyst is most likely calculating a(n):

- A. I-spread.
- B. Z-spread.
- C. G-spread.



**Solution:**

**B is correct.**



G-spread	I-spread	Z-spread
Spread over <i>government bond YTM curve</i>	Spread over <i>swap rate YTM curve</i>	Yield spread over <i>government or swap spot curve</i>
Spread differs across times-to-maturity		Spread is the same for all times-to-maturity

The G-spread, I-spread, and Z-spread are used to compare a bond's risk with a benchmark's. However, the Z-spread is fundamentally different than the G-spread and I-spread.

The Z-spread (ie, zero-volatility spread) for a given bond is the constant yield spread that, when added to the benchmark spot rates (not YTM's) and used to discount each of a bond's cash flows, equates the present value of the cash flows with the bond's observed price. In contrast to the G-spread and I-spread, the Z-spread is the same for all times-to-maturity. The G-spread and I-spread use YTM, which is a single discount rate that equates a bond's price to the present value of its cash flows. The Z-spread uses the applicable benchmark spot rate, which differs for each time-to-maturity, plus the Z-spread (a constant) for each of the bond's cash flows (Choices A and C).

	<b>G-spread</b>	<b>I-spread</b>	<b>Z-spread</b>
<b>Benchmark</b>	Government bond <i>YTM</i>	Swap rate <i>YTM</i>	Government or swap <i>spot rate curve</i>
<b>Across times-to-maturity, spread</b>	varies	varies	constant

Both the G-spread and I-spread are the difference between the YTM of a given bond and that of a benchmark. The yield curves formed from G-spreads or I-spreads show the term structure of spreads since the spreads differ across bond times-to-maturity.

**Question 6:**

Which of the following statements is least accurate regarding bond features?

- A. Negative covenants restrict the bond issuer from carrying out certain actions.
- B. The par value of a bond is usually \$1,000 per bond.
- C. Long-term bonds usually have a maturity of one to five years.

**Solution:****C is correct.**

Long-term bonds usually have a maturity of more than ten years, whereas short-term bonds have a maturity of one to five years. The par value of a bond is typically \$1,000 per bond, and negative covenants restrict the bond issuer from carrying out certain actions, such as not taking on additional debt, not paying dividends, and not making key appointments without the lender's knowledge.

**Question 7:**

Which of the following repayment structures is associated with higher credit risk?

- A. A bullet repayment structure
- B. An amortizing repayment structure
- C. Both structures have the same amount of credit risk

**Solution:****A is correct.**

Bond issues can have a bullet or an amortizing repayment structure. In a bullet repayment structure, the entire principal is paid off in a lump sum at maturity. In contrast, an amortizing repayment structure involves regular repayment of principal and interest throughout the life of the bond. Since there is no regular repayment of the principal in a bullet repayment structure, it carries more credit risk than an amortizing repayment structure. Therefore, option A is the correct answer.

**Question 8:**

The present value of a newly issued 8-year, \$1,000 par value security, that will pay \$24 every three months with an annual YTM of 6%, is closest to:

- A. \$1174.30
- B. \$492.97
- C. \$1,227.40



**Solution:**

**C is correct.**

**Using the financial calculator:**

$N = 32; PMT = 24; FV = 1,000; I/Y = 1.5; CP T \Rightarrow PV = -1,227.40$

A is incorrect. It assumes the annual yield to maturity ;

$N = 32; PMT = 24; FV = 1,000; I/Y = 6; CP T \Rightarrow PV = -492.97$

**Question 9:**

A 5-year corporate bond has a yield of 6.75% and its benchmark, the 5-year Treasury note, has a yield of 3.25%. Calculate the corporate bond's benchmark spread.

- A. 325 bps
- B. 350 bps
- C. 1000 bps

**Solution:****C is correct.**

If a 5-year corporate bond has a yield of 6.75% and its benchmark, the 5-year Treasury note, has a yield of 3.25%, the corporate bond has a benchmark spread of  $6.75\% - 3.25\% = 3.5\% = 350$  basis points (1 basis point =  $1/10,000$  or 0.01%)

Note: A benchmark spread is simply the yield difference between two bonds.

A is incorrect. It assumes that the Treasury note yield of 3.25% (=325 bps) is equal to the benchmark spread.

C is incorrect. It calculates the benchmark spread as  $6.75\% + 3.25\% = 10\%$  (=1000bps).

**Question 10:**

Which of the following tranches has the highest priority in receiving the repayment of the principal amount from the collateral in a Collateralized Mortgage Obligation (CMO)?

- A. Z-tranche
- B. Inverse floating rate tranche
- C. Planned amortization class (PAC) tranche

**Solution:****C is correct.**

In a CMO, the PAC tranche has the highest priority in receiving the repayment of the principal amount from the collateral. PAC tranches are structured to receive scheduled principal payments on a pro-rata basis and are thus protected against both extension and contraction risks.

A is incorrect. A Z-tranche is the last tranche to receive principal payments from the collateral, after all other tranches have been fully paid off.

B is incorrect. An inverse floating rate tranche is a tranche in which the coupon rate varies inversely with a reference rate such as LIBOR. Its cash flows are therefore more volatile and uncertain than those of a PAC tranche.

**Question 11:**

Which of the following statements regarding reinvestment risk is the least accurate?

- A. Holding a coupon bond until maturity eliminates reinvestment risk.
- B. A bond's yield calculation assumes that coupons and investment cash flows can be reinvested at the yield to maturity.
- C. Reinvestment risk is primarily concerned with the potential for a decrease in interest rates.

**Solution:****A is correct.**

The statement that holding a coupon bond until maturity eliminates reinvestment risk is the least accurate. While investors in zero-coupon bonds do not face reinvestment risk, investors in coupon bonds are exposed to the risk that periodic coupons will have to be reinvested at a lower interest rate. This is because coupon bonds pay periodic interest payments that must be reinvested, unlike zero-coupon bonds that do not have any cash flows until maturity. Therefore, an investor in a fixed coupon bond cannot eliminate reinvestment risk by holding the bond until maturity. The other statements are accurate: the yield calculation assumes that all cash flows can be reinvested at the yield to maturity, and investors are primarily concerned with the potential for a decrease in interest rates, which would lead to lower returns on reinvested cash flows.

**Question 12:**

Which of the following negative covenants in a fixed rate bond indenture is most likely to provide the strongest protection for bondholders against potential dilution of their claims?

- A. Restriction on debt.
- B. Restriction on asset sales.
- C. Restriction on mergers and acquisitions.



**Solution:****A is correct.**

Restrictions on debt issuance are considered the most potent negative covenant in a bond indenture to protect bondholders against dilution of their claims. By specifying maximum acceptable debt usage ratios and minimum acceptable interest coverage ratios, these covenants limit the issuer's ability to take on new debt and thus ensure that bondholders' claims remain senior.

**Question 13:**

If a 180-day US Treasury bill has a bank discount yield of 4.28%, the T-bill's money market yield is closest to:

- A. 4.37%.
- B. 4.43%.
- C. 4.73%.

**Solution:**

**C is correct.**

$$\begin{aligned}r_{MM} &= \frac{(360 \times r_{BD})}{360 - (t)(r_{BD})} \\ &= \frac{(360 \times 4.28\%)}{360 - 180 \times 4.28\%} \\ &= 4.374\%\end{aligned}$$

**Question 14:**

A company is considering issuing the following bonds: Zero coupon bond, Floating rate bond, Convertible bond. The bond indenture will most likely have a contingency provision for:

- A. Zero coupon bond
- B. Floating rate bond
- C. Convertible bond

**Solution:****C is correct.**

“A convertible bond is a hybrid security with both debt and equity features. It gives the bondholder the right to exchange the bond for a specified number of common shares in the issuing company. Thus, a convertible bond can be viewed as the combination of a straight bond (option-free bond) plus an embedded equity call option.” Thus, the bond indenture for a convertible bond will have a clause outlining the contingency provision.

**Question 15:**

If the one-year forward rate three years from today is 7.25%, the one-year forward rate four years from today is 8.00%, and the three-year spot rate is 6.10%, the five-year implied spot rate is closest to:

- A. 7.467%
- B. 7.168%
- C. 6.701%

**Solution:**

**C is correct.**

$$(1+S5) = (1.061^3) \times (1.0725) \times (1.08)$$

$$S5 = 6.7071\%$$

**Question 16:**

Which of the following is most likely true regarding the relationship between bond maturity and price sensitivity to changes in yield?

- A. Bonds with shorter maturities are less sensitive to a given change in yield than bonds with longer maturities.
- B. Bonds with shorter maturities are more sensitive to a given change in yield than bonds with longer maturities.
- C. Bonds with shorter maturities and bonds with longer maturities have equal sensitivity to a given change in yield.



**Solution:****A is correct.**

The price sensitivity of a bond to a change in yield depends on its time to maturity. Other factors being equal, the price of a shorter-term bond is less sensitive to a given change in yield than the price of a longer-term bond. This is due to the fact that the cash flows of a shorter-term bond are more concentrated in time, meaning that changes in interest rates have a smaller effect on the present value of those cash flows

**Question 17:**

An investor obtains a USD 13.75 million non-recourse mortgage loan. After six years the outstanding principal on the loan is USD 11.42 million, the market value of the property is USD 10.10 million, and the investor defaults. The lender forecloses on the property and subsequently sells it at market value. The investor most likely owes the bank:

- A. USD 0.
- B. USD 1.32 million.
- C. USD 2.33 million.

**Solution:****A is correct.**

The mortgage has a non-recourse feature, so the bank does not have a claim against the borrower for the shortfall between the amount of the mortgage balance outstanding and proceeds received from the sale of property. Thus, the bank is simply entitled to foreclose on the property and sell it.

**Question 18:**

If an investor with a seven-year investment horizon purchases a bond with ten years to maturity and a Macaulay duration of approximately 8 years, then he will most likely be exposed to greater:

- A. credit risk.
- B. market price risk.
- C. reinvestment risk.

**Solution:****B is correct.**

The duration gap is positive in this scenario.

$$\begin{aligned}\text{Duration gap} &= \text{Macaulay duration} - \text{Investment period} \\ &= 8 - 7 \\ &= 1\end{aligned}$$

Positive duration gaps expose the investor to higher market price risk from increasing interest rates.