Mercier Asset Management

Lynne Brosch, a portfolio manager at Mercier Asset Management, is launching the Mercier Global Fixed-Income Fund. The fund's objective is to replicate primary risk factors of the global fixed-income index, which tracks the total return performance of liquid bonds denominated in local currencies.

Lewis Olivera, Mercier's CIO, asks Brosch about the challenges of trading and valuing fixed-income securities in her fund. Brosch highlights the following challenges, noting that she:

Challenge 1:Tends to trade with dealers in smaller sizes due to Basel III capital requirements
Challenge 2:Rebalances her portfolio infrequently due to the illiquid nature of most fixed-income instruments
Challenge 3:Relies on matrix pricing to minimize variation between index performance and portfolio returns

Brosch uses a representative sample of the bonds in the index for constructing the fund. Given the complexity of managing bond investments in global markets, Brosch targets a tracking error for her fund of 3%. Olivera believes that Brosch's tracking error target is too high and asks Brosch to reduce the tracking error using the PV of distribution of cash flows methodology.

Eunice Lee, a fixed-income analyst at Mercier, worries about the increased costs to achieve the fund's objective while complying with Olivera's request to reduce the tracking error. Brosch responds that she can create an enhanced index replication and then use the following additional enhancement strategies to achieve the fund's objective:

Strategy 1:Evaluate specific call features to identify value given small yield changes.
Strategy 2:Use a model to gauge relative value at various points along the yield curve.
Strategy 3:Tilt exposure toward corporates given a tighter yield spread relative to duration exposure.

Another client of Mercier is the Redlinger Family Office. One of the Office's wealth managers asks Olivera to devise an investment strategy to manage the interest rate risk of its fixed-income investment portfolio against one-time shifts in the yield curve. Olivera proposes immunizing the single liabilities by using coupon bonds while continuously matching duration. The wealth manager suggests that this can be achieved with zero-coupon bonds held to maturity.

Question 1.1

Which of Brosch's challenges is *most likely* stated correctly?

A. Challenge 1 ✓

B. Challenge 2

C. Challenge 3

Explanation:

Challenges to replicating a bond market index
• Costly to fully replicate a broad fixed-income index • Wide array of public and private bonds available • Reliance on OTC/dealer trading • Reduced dealer inventories due to higher capital requirements • Relative illiquidity of most fixed-income securities

It is challenging to accurately replicate bond market indexes, which are larger, more diverse, and more reliant on over-the-counter dealers than equity market indexes. The sheer **number** of **fixed-income securities** in broad market indexes offers diversification but makes full **replication impractical** and costly for investors.

One consequence of **Basel III capital requirements** is the higher cost of having risk-weighted assets on a dealer's balance sheet, so dealers have reduced their inventories of fixed-income securities. This has resulted in less fixed-income trading and liquidity. Dealers are also less likely to execute larger block trades, instead preferring smaller transactions with wider bid-offer spreads.

(Choice B) Fixed-income indexes change frequently due to new debt issuances, bond maturities, shifts in credit ratings, and bond calls. Consequently, bond market indexes are typically rebalanced monthly, unlike equity market indexes, which are rebalanced less frequently.

(Choice C) Matrix pricing is commonly used for less actively traded fixed-income instruments when observable prices are unavailable. This process introduces potential variations between index performance and portfolio returns.

Things to remember:
Basel III's higher capital reserves have reduced dealers' fixed-income inventory, impacting liquidity and favoring smaller transactions over large trades. Bond indexes change frequently due to debt issuances, bond maturities, credit rating shifts, and bond calls, requiring more frequent rebalancing than equity indexes. Matrix pricing introduces performance variations between index performance and portfolio returns for infrequently traded bonds.

Question 1.2

Olivera's recommendation of the PV of distribution of cash flows methodology is *most strongly* supported by that method's:

A. matching the yield curve risk of an index over continuous time.

B. alignment of the contribution to portfolio duration with that of the index. ✓

C. measurement of the percentage difference from market value to quantify the tracking error.

Explanation:

Primary risk factors in bond market indexing	
Risk factors	**Effect**
Modified adjusted duration	Factors in option-adjusted duration to account for securities with embedded call risk
Key rate duration	Reduces the portfolio’s exposure to changes in the yield curve
Percent in sector and quality	Effectively matches index yield
Sector and quality spread duration contribution	Minimizes deviation from the benchmark
Sector, coupon, and maturity call weights	Improves price sensitivity matching approximation, particularly for negative convexity
Issuer exposure	Reduces issuer-specific event risk

The **PV of distribution of cash flows methodology** manages portfolio interest rate risk by synchronizing cash flow timing and amounts with a benchmark index. This method aims to minimize tracking error by aligning the portfolio's cash flow distribution, usually evaluated based on **duration**, with that of the index. This alignment enables portfolio managers to predict and manage the impact of interest rate fluctuations on their investments compared with the benchmark index.

This methodology aligns the index's yield curve risk to that of the benchmark index by evaluating cash flow timing and value over *discrete periods* **(Choice A)**. Using discrete periods rather than continuous time provides a practical and effective framework for evaluating and managing interest rate risk in portfolios.

(Choice C) Olivera should evaluate portfolio duration, rather than difference from market value, to ensure more accurate exposure assessment against the benchmark. Market value fluctuations, influenced by factors like sentiment and liquidity, can distort comparisons with the benchmark index. In addition, the difference from market value approach does not involve the PV of cash flows methodology.

Things to remember:
The PV of distribution of cash flows methodology manages portfolio interest rate risk by aligning the portfolio's cash flow timing and amounts with a benchmark index to minimize tracking error. This approach attempts to match the yield curve risk of an index over discrete time periods.

Question 1.3

Which of Brosch's enhancement strategies will *most likely* reduce the index's tracking error?

A. Strategy 1

B. Strategy 2 ✓

C. Strategy 3

Explanation:

Enhancement strategies for reducing tracking error	
Lower cost enhancements	Minimize fund expenses or enhance trading processes to lower bid-ask trading costs
Issue selection enhancements	Use bond valuation models to identify undervalued issues
Yield curve enhancements	Use analytical models to evaluate the relative value of various maturities
Sector/quality enhancements	Overweight specific bond and credit sectors throughout the business cycle to boost returns
Call exposure enhancements	Manage the impact of expected yield changes on callable bond performance

The **stratified sampling** approach to **enhanced** index **replication** allows fixed-income asset managers to optimize portfolio performance with fewer securities than needed for full index replication. This **reduces tracking error** and minimizes the need for frequent rebalancing or trading thinly traded securities.

Several **enhancement strategies**, such as minimizing fund expenses and mitigating market movements, may further improve index tracking.

Yield curve enhancements use analytical models to assess the relative value of different maturities in the interest rate term structure. This allows managers to overweight (underweight) potentially undervalued (overvalued) maturities, thereby optimizing portfolio returns.

(Choice A) Call exposure enhancements manage the impact of anticipated yield changes on bond performance, particularly when a yield decline leads the pricing of callable bonds to shift from a YTM to a yield-to-call basis. Such enhancements emphasize the value of call protection during *significant* yield changes, considering potential tracking risks and market implications.

(Choice C) The sector/quality enhancement approach may increase exposure to corporates due to wider yield spreads per unit of duration or due to shorter maturities. Alternatively, this approach may adjust sector or quality weights based on business

cycle analysis (eg, shifting allocation from corporates to Treasuries if spread narrowing is expected, or from Treasuries to corporates if spreads widen.

Things to remember:
The stratified sampling approach enables fixed-income asset managers to optimize portfolio performance with fewer securities than needed for full index replication, minimizing tracking error and the need for frequent rebalancing or for trading thinly traded securities. Several enhancement strategies can further improve index tracking error.

Question 1.4

The *most likely* reason for Olivera to reject the wealth manager's suggestion is that:

A. zero-coupon bonds will not eliminate price risk.

B. the appropriate zero-coupon bonds may not be available. ✓

C. the portfolio's Macaulay duration cannot be matched with that of the zero-coupon bond.

Explanation:

Interest rate immunization with zero-coupon bond	
Advantage	**Disadvantage**
• No reinvestment risk • No price risk	• Not always available

Interest rate immunization involves structuring a fixed-income portfolio to stabilize returns against interest rate fluctuations over a set timeframe. Purchasing a **zero-coupon bond** that matures exactly when a liability is due, matching both the amount and timing of the obligation, is one way to eliminate reinvestment and price risks associated with interest rate changes. This strategy ensures that the portfolio's cash flows closely align with the investor's financial obligations, minimizing the risk of unexpected interest rate movements.

Zero-coupon bonds are ideal for their ability to perfectly hedge against interest rate risk and to match cash flows and duration to future liabilities. However, zero-coupon bonds are not always available, which then precludes their use.

(Choice A) Olivera should adopt the wealth manager's idea of using zero-coupon bonds to eliminate the price risk associated with interest rate changes in Redlinger's fixed-income investment portfolio.

(Choice C) Matching an investor's investment horizon with a portfolio's Macaulay duration effectively immunizes the investor against interest rate risk. Since a zero-coupon bond's Macaulay duration is equal to its maturity, zero-coupon bonds should be used to achieve such immunization.

Things to remember:
Immunizing interest rate risk with zero-coupon bonds that mature precisely when a liability is due matches the obligation's cash flow amount and timing, eliminating reinvestment and price risks associated with interest rate changes. An investor with an investment horizon equal to the bond's Macaulay duration is effectively immunized from interest rate risk.

Delong Asset Management

Estipona Bank, operating in the US, has various liability portfolios. Danica Abad, Estipona's CFO, asks Taylor Chan, a fixed-income adviser at Delong Asset Management, to recommend a single 5-year liability for interest rate immunization.

Chan proposes choosing one of two portfolios of coupon-bearing government bonds. Exhibit 1 shows annualized data based on aggregated bond cash flows.

Exhibit 1 Portfolios of Coupon-Bearing Government Bonds

	Portfolio 1	Portfolio 2
Cash flow yield	4.0%	4.5%
Macaulay duration	12	10
Portfolio dispersion	35	40

After reviewing the portfolios proposed by Chan, Abad asks about the characteristics of a bond portfolio for single liability immunization. Chan describes three characteristics of such a portfolio:

Characteristic 1: It maximizes the portfolio convexity measure.
Characteristic 2: It requires regular rebalancing over the horizon to maintain the target duration.
Characteristic 3: It requires an initial market value equal to or greater than the amount due on the liability.

Abad also aims to minimize the duration gap stemming from Estipona's multiple liabilities. Exhibit 2 displays the current values and statistics of Estipona's liabilities and asset portfolio:

Exhibit 2 Estipona's Liabilities and Asset Portfolio

	Liabilities	Assets
Market value	USD 50 million	USD 65 million
Modified duration	7	4
Basis point value (BPV)	USD 35,000	USD 24,000

Chan recommends using a futures contract based on the 10-year US Treasury to manage the duration gap. Each contract has a notional value of USD 100,000, a 6% coupon rate, and an estimated BPV of USD 50 per contract based on deliverable bonds.

Abad expects 10-year yields to decline soon. He asks Chan if using a contingent immunization strategy would be cheaper than using futures contracts, given the initial surplus and negative duration gap.

Question 2.1

The immunized portfolio convexity for Portfolio 2 is *most likely*:

A. less than that for Portfolio 1. ✓

B. the same as that for Portfolio 1.

C. greater than that for Portfolio 1.

Explanation:

$$\text{Immunized portfolio convexity} = \frac{\text{MacDur}^2 + \text{MacDur} + \text{Dispersion}}{(1 + \text{Cash flow yield})^2}$$

Immunized portfolio convexity refers to the **measure** of **curvature** in the relationship between bond prices and interest rates within a portfolio that has been structured to offset interest rate risk. A portfolio's convexity helps investors understand how sensitive its value is to changes in interest rates, particularly with nonlinear movements. Interest rate immunization aims to **minimize** a portfolio's **convexity**, reducing its sensitivity to interest rate fluctuations and therefore providing **greater stability in value**.

The convexity of the immunized portfolios proposed by Chan can be calculated as follows:

Immunized portfolio convexity

Portfolio 1	$\frac{12^2 + 12 + 35}{(1 + 0.04)^2} \approx 176.59$
Portfolio 2	$\frac{10^2 + 10 + 40}{(1 + 0.045)^2} \approx 137.36$

Therefore, the immunized portfolio convexity of Portfolio 2 is less than that of Portfolio 1 **(Choices B and C)**.

Things to remember:
An immunized portfolio's convexity measures the curvature in the relationship between bond prices and interest rates within the portfolio, helping investors assess its sensitivity to shifts in interest rates and mitigate interest rate risk. Low convexity indicates that the portfolio's value should be less sensitive to interest rate fluctuations.

Question 2.2

Which of Chan's listed characteristics *best describes* a single liability bond portfolio?

A. Characteristic 1

B. Characteristic 2 ✓

C. Characteristic 3

Explanation:

Characteristics of a bond portfolio for single liability immunization
• Macaulay duration = Liability due date • Minimize the portfolio convexity measure • Rebalance to maintain the target duration • Initial market value ≥ PV of liability • Balance transaction costs with maintaining a duration gap

Single liability immunization is a risk management strategy where a **portfolio** of assets is **structured** to **match** the **cash flows** of a **specific liability**, ensuring that the assets can satisfy the liability when due. This involves aligning the duration and cash flow pattern of the asset portfolio with those of the liability, minimizing the shortfall risk due to changes in interest rates, yield curve shape, or other market conditions.

Periodic rebalancing of the portfolio is necessary to **maintain** its **alignment** with the **target duration**, which corresponds to the due date of the liability. This adjustment ensures that the portfolio's cash flows remain consistent with the obligations of the liability despite changes in market conditions. Rebalancing preserves the effectiveness of the immunization strategy in mitigating risks associated with interest rate changes and market volatility.

(Choice A) Minimizing, not maximizing, portfolio convexity helps mitigate the impact of interest rate fluctuations on the portfolio's value, enhancing its immunization against liabilities.

(Choice C) The initial market value of the bond portfolio should be equal to or greater than the present value, not the face value, of the liability. This valuation ensures that the portfolio has the necessary assets to cover the future obligations associated with the liability.

Things to remember:
Single liability immunization ensures that a portfolio aligns its cash flows with those of a specific liability, protecting against shortfalls through duration and cash flow alignment. Periodic rebalancing maintains this alignment, strengthening immunization against interest rate changes and market volatility. In addition, ensuring the portfolio's initial market value equals or exceeds the liability's present value is crucial for meeting future obligations.

Question 2.3

To minimize Estipona's portfolio duration gap, the required number of Treasury futures contracts is *closest* to:

A. 50

B. 150

C. 220 ✓

Explanation:

Hedging duration gap with futures contracts

$$N_f = \text{Required number of futures contracts} = \frac{\text{Liability portfolio BPV} - \text{Asset portfolio BPV}}{\text{Futures BPV}}$$

Duration gap is the difference between the durations of a financial institution's assets and its liabilities. Duration gap arises due to varying maturities, interest rate sensitivities, and yield curve changes. It **measures** the balance sheet's exposure to **interest rate risk** and can be managed to mitigate potential financial losses that could arise due to adverse movements in interest rates.

Interest rate derivatives are preferred for managing a duration gap due to their flexibility, cost-effectiveness, and liquidity compared with buying or selling bonds. These derivatives can be an effective risk management tool, allowing portfolio managers to more precisely adjust duration and hedge against adverse interest rate movements.

In this scenario, Chan can calculate the required number of futures contracts as:

$$N_f = \frac{35{,}000 - 24{,}000}{50} = 220$$

A positive (negative) number means that the investor must buy (sell) futures contracts to close the duration gap. Chan needs to purchase 220 Treasury futures contracts to close the duration gap with Estipona's liabilities.

(Choice A) 50 results from incorrectly equating the number of futures contracts to the estimated basis point value (BPV) of USD 50 per contract based on deliverable bonds.

(Choice B) 150 [= |(50,000,000 − 65,000,000)| / 100,000] incorrectly assumes that the number of futures contracts is determined solely by the difference in the market values of the debt liabilities and the asset portfolio, as well as the notional principal of the futures contract.

Things to remember:
Duration gap is the difference between the durations of a financial institution's assets and its liabilities, reflecting varying maturities and interest rate sensitivities. Interest rate derivatives, such as Treasury futures contracts, are preferred for closing this gap since

they offer flexibility, cost-effectiveness, and liquidity and enable precise adjustments and effective risk management.

Question 2.4

If Abad's recommended contingent immunization strategy is implemented, Chan would *most likely*:

A. under-hedge.

B. not hedge.

C. over-hedge. ✓

Explanation:

Contingent immunization strategy	
Interest rates	**Action**
Rising	Under-hedging
Falling	Over-hedging

Contingent immunization involves actively **managing** the **difference** between the market **values** of **assets** and **liabilities** (ie, the surplus) to lower the overall expense of meeting liabilities. This strategy offers flexibility in utilizing various asset classes for active investment, tailored to the entity's specific needs and market conditions.

Contingent immunization potentially retires debt at a lower cost compared with using a duration-matching approach. To address the duration gap, the manager buys interest rate futures contracts with the flexibility to over-hedge or under-hedge, depending on market conditions. Over-hedging during yield declines and under-hedging during rises —as opposed to simply closing the duration gap—can create a more cost-effective strategy.

In this situation, Chan expects a decrease in 10-year yields and therefore should over-hedge (ie, buy more futures contracts than needed to close the duration gap). The expected gains from this decision will boost the surplus and lower the expense of retiring the debt liabilities **(Choices A and B)**.

Things to remember:
Contingent immunization involves actively managing the surplus or the difference between the market values of assets and liabilities, using flexibility in asset class utilization to reduce overall expenses. The surplus enables potential debt retirement at a lower cost compared with conservative duration-matching approaches. To address the duration gap, buying or selling interest rate futures contracts allows flexibility in over-hedging or under-hedging based on expected market conditions and transaction costs.

Alcantar Corporation

The Alcantar Corporation, a US-based manufacturer, has a defined benefit pension plan that is currently underfunded, based on the projected benefit obligation (PBO) measure. Kong Shang, Alcantar's CFO, asks Lori Mitchell, the plan's actuarial advisor, why she uses PBO instead of the accumulated benefit obligation (ABO). Mitchell provides the following explanations:

Explanation 1:PBO is appropriate to use if the pension plan intends to keep the current design.
Explanation 2:PBO reflects less in total liabilities compared with ABO, assuming nominal wage growth.
Explanation 3:PBO signifies the sponsor's current legal obligation, regardless of changes to the plan's structure.

Shang and Paul Penttila, Schober Asset Management's fund manager, discuss the pension's funding status and duration gap. The pension fund's asset allocation is 60% equity and 40% fixed income. Exhibit 1 displays the 20X3 information about Alcantar's pension plan, as estimated by Mitchell:

Exhibit 1 Alcantar's Pension Plan Information

	Assets: Market Value	Liabilities: PV of Retirement Obligations
Amount (USD millions)	1,000	1,200
Basis point value (BPV) (USD millions)	0.5	1.2
Effective duration	25	9

Penttila anticipates an equity market recovery and narrowing corporate spreads. He suggests using interest rate derivatives to partially close the duration gap between the plan's assets and liabilities. Penttila presents Strategy 1 to Shang for further discussion.

- **Strategy 1**: A 30-year, 4.0% receive-fixed swap in exchange for a floating leg paying the three-month market reference rate (MRR), which has an effective duration of 15 and a BPV of 0.20 per USD 100 of notional principal

Shang asks Penttila about additional approaches. Penttila provides two more strategies using interest rate derivatives. Both strategies are based on a 30-year swap.

- **Strategy 2**: A receiver swaption with a 3.5% strike rate, paying an upfront premium of 50 bps
- **Strategy 3**: A swaption collar to buy a 2.7% receiver swaption with a 45-bps upfront premium and sell a 4.7% payer swaption with a 75-bps upfront premium

Lastly, Shang asks Penttila about the potential issues associated with implementing these three strategies. Penttila outlines the following risks with his recommended strategies,

specifically that the pension plan would be exposed to:

- greater spread risk than Treasury futures contracts if Strategy 1 were adopted.
- collateral exhaustion risk if Strategy 2 were adopted with collateralization.
- credit risk if Strategy 3 were adopted.

Question 3.1

Which of Mitchell's explanations regarding PBO is *most likely* correct?

A. Explanation 1 ✓

B. Explanation 2

C. Explanation 3

Explanation:

Accumulated benefit obligation (ABO) vs. projected benefit obligation (PBO)

	ABO	PBO
Focus	• Current pension liability based on salaries and accrued benefits	• Forward-looking assessment • Considers future salary changes
Calculation	• PV of earned benefits at current salary levels	• PV of future benefits • Factors in salary growth and service years
Use	• Used in financial reporting to assess current pension liability • Excludes future salary or benefit changes	• Assesses long-term funding status and projects future funding needs

The **projected benefit obligation (PBO)** provides a forward-looking view of the pension plan's obligations by accounting for factors like salary growth and years of service. This enables managers and analysts to determine if the plan's assets are adequate to cover future obligations and helps the plan sponsors, regulators, and stakeholders gauge whether adjustments are needed.

The plan sponsor's choice of liability measure for risk management and asset allocation depends on factors such as potential acquisition. If the sponsor intends to maintain the pension plan's current structure long-term, it typically favors PBO over the accumulated benefit obligation (ABO).

(Choice B) Compared with ABO, PBO usually reflects a greater value of liabilities since it assumes nominal wage growth and, therefore, higher projected benefit payments over time.

(Choice C) ABO represents the sponsor's legal obligation at the present moment, regardless of any alterations made to the plan's structure or potential changes such as closure, conversion, or amendments to benefit terms: ABO is a measure of the sponsor's *current* liability for employees' accrued benefits.

Things to remember:
The PBO estimates future pension benefits based on factors like salary growth and years of service. This measure offers insight into the plan's financial health and funding needs and thus helps stakeholders decide on necessary contributions or adjustments.

Plan sponsors often favor PBO since it maintains the plan's current structure while serving as a liability measure for risk management and asset allocation, such as in an acquisition.

Question 3.2

If Penttila chooses to achieve an 80% hedging ratio for Strategy 1, the notional principal on the interest rate swap (in USD millions) is *closest* to:

A. 200

B. 280 ✓

C. 350

Explanation:

Notional principal on interest rate swap to eliminate duration gap

$$\text{Liability BPV} = \left(\text{NP} \times \frac{\text{Swap BPV}}{100}\right) + \text{Asset BPV}$$

BPV = Basis point value, NP = Notional principal

Duration gap refers to the **mismatch** between the timing of **cash flows** from assets (eg, investments) and liabilities (eg, debt or pension obligations). **Interest rate swaps** can be used to close the duration gap. By entering into an interest rate swap, one party can swap a floating interest rate for a fixed rate (or vice versa) to adjust the cash flow timing and manage interest rate risk more effectively.

The **hedging ratio** indicates the proportion of the asset–liability duration gap (ie, net interest rate risk) being offset, ranging from 0% to 100%. One approach is to use strategic hedging, which allows the manager some discretion with the hedging ratio. The manager can thus adjust the hedge based on market expectations (ie, more hedged when rates for gains are low and less hedged when those rates rise) and risk tolerance, striking a balance between reducing risk and maintaining potential returns.

In this scenario, the notional principal (NP) on the interest rate swap needed to close the duration gap to zero can be calculated as:

$$500{,}000 + \left(\text{NP} \times \frac{0.20}{100}\right) = 1{,}200{,}000$$

$$\text{NP} = 350{,}000{,}000$$

To achieve a hedging ratio of 80%, the required NP for the receive-fixed interest rate swap is USD 280 million (= 350 million × 0.80).

(Choice A) USD 200 million is the difference between the market value of the pension plan's assets (USD 1 billion) and the present value of the retirement obligation (USD 1.2 billion).

(Choice C) USD 350 million incorrectly applies a hedging ratio of 100%.

Things to remember:
Interest rate swaps can be used to close duration gaps, manage risk, and enhance risk-adjusted returns, offering flexibility in the optimization of a portfolio. The hedging ratio

indicates the level of risk management. One approach is to use strategic hedging, which allows some manager discretion to adjust the hedge ratio based on market expectations and risk tolerance.

Question 3.3

Strategy 3 is a *more appropriate* choice than Strategy 2 based on its:

A. lower cost. ✓

B. limited potential loss.

C. greater potential gain.

Explanation:

Swaption vs. swaption collar		
	Swaption	**Swaption collar**
Structure	Option to enter an interest rate swap either to receive or pay fixed-rate payments	Combines long and short positions in receiver and payer swaptions
Purpose	Hedging or speculating	Hedging interest rate fluctuations
Risk profile	Gain offsets adverse market moves, while retaining potential gains from favorable market moves	Long swaption hedges against losses; short swaption offsets gain

A **swaption**, commonly used for hedging or speculation, grants the buyer the **right** to enter an interest rate swap as either a fixed-rate receiver or fixed-rate payer. A **swaption collar** combines a long position in a receiver swaption and a short position in a payer swaption to hedge against interest rate fluctuations, reduce hedging cost, and potentially generate income from premiums.

The **cost** of a **swaption collar** can be **less** than that of a fixed-rate **receiver swaption** since the upfront premium paid in the receiver swaption is mostly offset by the premium collected in the payer swaption. In Strategy 3, the swaption collar is a **zero-cost collar** since the 75-bps upfront premium from the payer swaption offsets the 45-bps upfront premium paid in the receiver swaption.

(Choice B) The potential loss from the fixed-rate receiver swaption in Strategy 2 is limited by the upfront premium paid. However, the potential loss from the swaption collar in Strategy 3 is unlimited if the 30-year swap rates increase beyond 5.0%.

(Choice C) The potential gains from the fixed-rate receiver swaption in Strategy 2 are the same as those from the swaption collar in Strategy 3. Both strategies will result in a gain if the 30-year swap rates are below 3.0% at expiration.

Things to remember:
A swaption grants the option to enter into an interest rate swap as a fixed-rate receiver or fixed-rate payer. A swaption collar combines a receiver swaption and a payer

swaption to hedge against interest rate fluctuations. The collar structure offsets costs by collecting the premium from the payer swaption.

Question 3.4

Which of the following risks is *most likely* associated with Penttila's recommended strategies? The pension plan would be exposed to:

A. credit risk if Strategy 3 is adopted. ✓

B. collateral exhaustion risk if Strategy 2 is adopted with collateralization.

C. greater spread risk than Treasury futures contracts if Strategy 1 is adopted.

Explanation:

A swaption collar, in which **both parties** are exposed to **counterparty risk**, consists of:

- a receiver swaption, which is an option to receive fixed-rate payments, and
- a payer swaption, which is an option to pay fixed-rate payments.

For the party purchasing the receiver swaption, there is the risk that the writer of the swaption may fail to meet its obligation to pay the fixed-rate payments if the option is exercised. Similarly, for the party writing the payer swaption, there is the risk that the buyer may default on its obligation to make fixed-rate payments if the option is exercised.

(Choice B) Collateral exhaustion happens when the collateral posted becomes insufficient or depleted, often due to market value fluctuations. In that case, more collateral needs to be posted, possibly straining cash flow. For a collateralized receiver swaption, the *writer* is responsible for regularly posting collateral to the counterparty; in this scenario, the pension plan would be the swaption purchaser.

(Choice C) Interest rate swaps typically exhibit *less* spread risk compared with Treasury futures contracts since Treasuries have risk-free rates, whereas interest rate

swaps are based on corporate rates. Therefore, movements in interest rate swap rates are usually highly correlated with other market interest rates, resulting in lower spread risk.

Things to remember:
Counterparty risk in a swaption collar arises from potential default by the counterparty. Interest rate swaps mitigate spread risk more effectively than Treasury futures contracts as such swaps are based on corporate rates. In the case of a collateralized receiver swaption, the writer is responsible for regularly posting cash collateral or marketable securities to the counterparty.