

ILA Sample CBT Questions and Solutions

NOTE: The solutions presented here are not the full model solutions as published. There is no commentary and where there is more than one correct response, only one such response is presented.

ILALPM Sample CBT Question

(9 points) AJZ Life's asset portfolio backing its single premium deferred annuity products have the following characteristics:

The current average liability portfolio duration is the same as the current average asset portfolio duration (6.4 years).

The current asset portfolio is comprised of 100% fixed income assets.

- (a) (3 points) Describe risks AJZ could face in a rapidly rising interest rate environment.

ANSWER:

- (b) (3 points) Critique the following recommendation:

After discussion with the Investment and Risk Officers, we recommend using a strategic asset allocation based on AJZ's long term exposure to systematic risk. The asset allocation should be reviewed and adjusted quarterly to ensure the allocation meets AJZ's risk and investment return objectives. We strongly recommend an asset-only approach to determine the asset allocation strategy. Asset-only should be adequate to achieve AJZ's needs.

ANSWER:

- (c) (3 points) Below is a subset of bond issuers that comprises AJZ's fixed income asset portfolio.

Issuer	Rating	Market Value in Fixed Income Portfolio (millions)	Average Duration (in years)	Par value
Airline public company	A	100	6.5	105
Financial public company	AA	100	10	120
Technology public company	BBB	100	3	110
Other issuers	Various	200	5	90
Total		500		

The investment team foresees a downgrade of the technology public company from BBB to BB and has recommended a replacement issuer with average duration of 6.5 years which is sold at a 98% discount relative to the bond's par value.

Calculate the amount of replacement bond to purchase without changing the duration profile of the asset portfolio.

Show all work, including writing out relevant formulas used in any calculations.

<i>The response for this part is to be provided in the Excel document.</i>
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ILALPM Sample Solution – Parts Answered in Word

- (a) (3 points) Describe risks AJZ could face in a rapidly rising interest rate environment.

ANSWER:

- Rising interest rate can introduce disintermediation risk, where policyholders surrender their policy with AJZ to purchase a new policy elsewhere with more favorable rates.
- If AJZ's asset duration exceeds the liability duration, the duration mismatch can create a net loss since the portfolio is made up of 100% fixed assets. Duration matching is only intended for small changes in interest rates, and the portfolio would likely need to be rebalanced.
- If surrender rates increase materially, it may be difficult to predict the mortality rates of the remaining cohort.
- AJZ would need to increase the credited rate for the remaining policyholders to entice them not to surrender their policies. This would lead to lower interest spreads.

(b) (3 points) Critique the following recommendation:

After discussion with the Investment and Risk Officers, we recommend using a strategic asset allocation based on AJZ's long term exposure to systematic risk. The asset allocation should be reviewed and adjusted quarterly to ensure the allocation meets AJZ's risk and investment return objectives. We strongly recommend an asset-only approach to determine the asset allocation strategy. Asset-only should be adequate to achieve AJZ's needs.

ANSWER:

Strategic asset allocation (SAA) specifies an investor's desired exposure to systematic risk in alignment with return objectives, risk tolerance, and long-term capital market expectations. SAA is appropriate for AJZ because systematic risk is rewarded by the market in the form of higher returns.

Quarterly review is too frequent for SAA. SAA should be reviewed annually, or when AJZ's needs and circumstances change significantly.

Tactical asset allocation (TAA) rebalancing on a quarterly basis is recommended to ensure the asset portfolio tracks closely to the SAA.

An asset-only (AO) approach is not recommended for AJZ and an asset-liability management (ALM) approach should be used instead. ALM is a more appropriate strategy for the following reasons

- Liability duration needs to be considered when setting the SAA to help reduce sensitivity to short-term interest rate movements
- AJZ has below average risk tolerance and has minimal diversification across other product types (AJZ only sells fixed annuities)
- The penalties for not meeting liabilities are very high
- AJZ's liabilities are interest sensitive
- Insurance regulators favor holding fixed-income securities

ILALFMU/C Sample CBT Question

(9 points) ABC Insurance Group is a US-based corporation that sells only nonparticipating whole life and accident policies. ABC reports GAAP financials based on FAS 60. ABC is being acquired by an insurance group based in the European Union and will report financials on both an IFRS and US GAAP basis.

- (a) (2 points) Compare the methodology and assumptions used to calculate ABC's liabilities under IFRS 17 and ASU 2018-12.

ANSWER:

You are given:

Present value of cash flows	1,000
Risk Adjustment	250
Contractual Service Margin	100
Liability for Incurred Claims	475
Incurred But Not Reported (IBNR)	500
Other Assets	2,000
Liability for future policyholder benefits	1,280
GAAP - DAC	100

- (b) (3 points) Calculate ABC's equity under both ASU 2018-12 and IFRS 17. Assume that the basis of Other Assets is the same under both regimes. Show all work, including writing out relevant formulas used in any calculations.

The response for this part is to be provided in the Excel document.

- (c) (4 points) Critique the following statements regarding the Insurance Capital Standard (ICS) guided by International Association of Insurance Supervisors (IAIS).

A. *The main objectives of the ICS are protection of shareholders and to contribute to financial growth.*

ANSWER:

B. *The ICS reflects only insurance and investment risks to which an International Active Insurance Group (IAIG) is exposed.*

ANSWER:

C. *The capital requirement in the ICS is intended to represent a three-year 95 percentile Conditional Tail Expectation (CTE) level of risk.*

ANSWER:

D. Currently, the only approach being considered to estimate margin over current estimates (MOCE) is the Cost of Capital MOCE approach, which is based on an assumed cost of holding ICS required capital.

ANSWER:

ILALFMU/C Sample Solution – Parts Answered in Word

- (a) (2 points) Compare the methodology and assumptions used to calculate ABC's liabilities under IFRS 17 and ASU 2018-12.

ANSWER:

Calculation of Liability:

IFRS 17: Fulfillment Cash Flows + Contractual Service Margins, where Fulfillment of Cash Flows = Present Value of Future Cash Flows + Risk Adjustment.

ASU 2018-12: Present Value of Future Benefits and Expenses less (Net Premium Ratio x Present Value of Future Gross Premiums), where Net Premium Ratio = minimum (100%, Present Value of Benefits and Expenses / Present Value of Gross Premiums).

Discount Rates:

IFRS 17: Reflects the characteristic of the cash flows arising from the insurance contracts using either the Top-Down or Bottom-Up Approach, where:

Top-Down Approach: the insurer reflects the characteristics of the cash flows by starting with the expected current market return on assets and deducting from that expected current market return the premium that market participants require for bearing the risks, including credit risk, that are associated with those asset returns but are not present in the liability (or are excluded from the measurement of the liability);

Bottom-Up Approach: the insurer captures the characteristics of the cash flows by starting from a risk-free discount rate and adding to that rate an adjustment to reflect the extent of illiquidity present in the group of insurance contracts.

ASU 2018-12: Based on high-quality fixed-income instrument.

Disclosure Requirements: For both IFRS 17 and ASU 2018-12, similar enhanced disclosures are required.

Assumptions: Both IFRS 17 and ASU 2018-12 require current up-to-date assumptions that are reviewed and revised often.

Margins:

IFRS 17: Margins are provided in the risk adjustment and the contractual service margins. The risk adjustment are the adjustments to fulfillment cash flows for the uncertainty of such cash flows. The contractual service margins represent the profit that the company expects to earn as it provides insurance coverage and is recognized in profit or loss over the coverage period as the company provides insurance coverage.

ASU 2018-12: Implicit in the setting of assumptions due to their uncertainty.

Display of Premiums in Income Statements:

IFRS 17: Premiums are not considered to be income and are not reflected in income statements for all lines of business.

ASU 2018-12: Premiums are not considered to be income for some lines of business, like universal life insurance, and are not reflected in income statements, and are considered to be income for other lines of business, like non-participating whole life and accident insurance, and are reflected in income statements.

Treatment of Acquisition Expenses:

IFRS 17: Acquisition expenses are included in the measurement of fulfillment cash flows and implicitly amortized in the contractual service margin.

ASU 2018-12: Acquisition expenses are capitalized and amortized in the DAC (Deferred Acquisition Cost) asset.

(c) (4 points) Critique the following statements regarding the Insurance Capital Standard (ICS) guided by International Association of Insurance Supervisors (IAIS).

A. *The main objectives of the ICS are protection of shareholders and to contribute to financial growth.*

ANSWER:

The correct statement should be: "The main objectives of the ICS are protection of policyholders, not shareholders, and to contribute to financial stability, not financial growth."

B. *The ICS reflects only insurance and investment risks to which an International Active Insurance Group (IAIG) is exposed.*

ANSWER:

The correct statement should be: "The ICS reflects all material risks, such as insurance, investment/credit, marketing, and operational risks, to which an International Active Insurance Group (IAIG) is exposed."

C. *The capital requirement in the ICS is intended to represent a three-year 95 percentile Conditional Tail Expectation (CTE) level of risk.*

ANSWER:

The correct statement should be: "The capital requirement in the ICS is intended to represent a one-year 99.5% VaR, not a three-year 95% CTE level of risk."

D. *Currently, the only approach being considered to estimate margin over current estimates (MOCE) is the Cost of Capital MOCE approach, which is based on an assumed cost of holding ICS required capital.*

ANSWER:

The correct statement should be: "Currently, the two approaches being considered to estimate margin over current estimates (MOCE) is the Cost of Capital MOCE (CoC-MOCE) approach; which is based on an assumed cost of holding ICS required capital, and a Prudence MOCE (P-MOCE) approach, which determines a conservative buffer at the 75th percentile of an assumed loss distribution, assuming a normal distribution of losses between current estimate of liabilities (50th percentile) and capital requirements (99.5th percentile)."

ILALAM Sample CBT Question

(10 points) BDK Insurance is designing a variable annuity with a Guaranteed Minimum Accumulation Benefit (GMAB). The GMAB is a 3-year annual ratchet based on a managed equity fund.

- (a) (2 points) Describe two methods to model this GMAB guarantee.

ANSWER:

Management proposes hedging the GMAB guarantee by purchasing 1-year at-the-money (ATM) S&P500 put options with notional value equal to fund value. The hedge will be rebalanced each year when the ratchet value is calculated.

- (b) (3 points) Evaluate the proposed strategy on the following:

- i. Risks mitigated

ANSWER:

- ii. Risks not mitigated

ANSWER:

- iii. Risks created

ANSWER:

1. Continued

BDK decides to sell the new product and use the hedging strategy proposed in part (b). They collect an annual fee equal to 2% of fund value at the beginning of each year. After 3 years, BDK has experienced the following:

Values as of End-Of-Year	Year 0	Year 1	Year 2	Year 3
Fund Unit Price	100	95	105	85
S&P500 Level	1,000	900	1,100	1050
Deposits	10,000	0	0	0
Withdrawals		0	1,000	0
Expenses		100	50	50
1-Year ATM Put Option Price (per 100 notional)	1.0	1.2	0.8	1.4
Cost of Hedging		100	112	x
Hedge Option Payout		1,000	0	y

Surrenders occur at end-of-year.

(c) (5 points) Perform the following:

(i) Calculate earnings without hedging in year 3.

The response for this part is to be provided in the Excel document.

(ii) Calculate the hedging gain or loss in year 3.

The response for this part is to be provided in the Excel document.

(iii) Assess the effectiveness of the hedging strategy.

The response for this part is to be provided in the Excel document.

Show all work, including writing out relevant formulas used in any calculations.

ILALAM Sample Solution – Parts Answered in Word

- (a) (2 points) Describe two methods to model this GMAB guarantee.

ANSWER:

Method #1: Monte Carlo Simulation

- Take average value of guarantee under thousands of scenarios.
- This approach can provide a distribution of possible pay-offs of the guarantee.
- Usually modelling is done assuming a risk-neutral distribution of equity returns.
- Able to reflect complex policyholder behaviours and product features with no closed form.

Method #2: Closed Form Solution

- GMAB can be modelled as a put option.
- Black-Scholes formula provides the closed form solution.
- Formula/solution is much more complex than simpler guarantees because of ratchet.
- This approach cannot easily reflect dynamic policyholder behaviours.

- (b) (3 points) Evaluate the proposed strategy on the following:

- (i) Risks mitigated

ANSWER:

The hedging strategy should help to mitigate some market risk because it should provide returns directionally consistent with the guarantee pay-offs. Rebalancing will help to mitigate some policyholder behavior risk

- (ii) Risks not mitigated

ANSWER:

Policyholder Behavior Risk - If a fixed amount of put options is bought once per year, there is a risk that a different number of policyholders will lapse or die each year than estimated in which case the guarantee will be over-/under-hedged for that year.

- (iii) Risks created

ANSWER:

Directional Risk - The charge for the guarantee will not be zero so the guarantee will pay out even on fund return of 0; strike price of put should be

higher than ATM (based on management fee). This will lead to an incorrect amount of hedging and potential losses in a down-market.

Basis Risk - Since put option is based on S&P500 and not fund, fund may perform worse than the S&P500 leading to bigger payout on guarantee than put. (the term basis risk is not used in source material - naming/description of this risk may vary)

Volatility Risk - Put options must be purchased at future dates; if market volatility increases then put option prices will increase causing the hedging strategy to cost more than anticipated (the term volatility risk is not used in source material - naming/description of this risk may vary)