

QFI PM Model Solutions

Fall 2022

1. Learning Objectives:

6. The candidate will understand:
- Investment dimensions of designing product offerings and managing inforce product liabilities.
 - Managing investment portfolios in the context of financial institution liabilities (asset liability management).
 - The theory and techniques of portfolio asset allocation.

Learning Outcomes:

- (6a) Demonstrate an understanding of how the behavioral characteristics of individuals and firms influence liability design, management, and ALM
- (6b) Develop and critique asset allocation strategies appropriate to underlying liability profiles such as pension plans and long tail insurance liabilities

Sources:

QFIP-154-20: The Evolution of Insurer Portfolio Investment Strategies For Long-Term Investing

Commentary on Question:

This question aims to test candidates' knowledge on insurer portfolio investment strategies, including risk taking, asset and liability management strategies, and long-term investing.

Solution:

- (a) Critique ABC's approach to the business from a risk and investment perspective.

Commentary on Question:

The candidates performed above average on this section. This question aims to test the candidates' knowledge on the four main ways in which insurers may be taking excessive risks. The majority of candidates correctly identified that the four statements were all incorrect.

First, the risk of an insurer's liabilities can increase if the insurer charges insufficient premiums or has an imprudent underwriting policy, both activities having the potential to rapidly expand an insurer's volume of business.

1. Continued

Second, after collecting premiums from their policyholders, insurers can change their asset allocation toward a riskier investment portfolio.

Third, insurers can reduce their equity capital endowment to the minimum regulatory capital required, which leads to a higher probability of insolvency.

Finally, an insurer may fail to sufficiently manage risks through reinsurance arrangements.

- (b) Critique each of Tim's comments, providing a more appropriate argument to each point above if needed.

Commentary on Question:

The candidates performed above average on this section. Many candidates did not identify the typical asset and liability management strategies for life insurers.

Comment 1 is not correct.

Life insurers usually have a long planning horizon for their asset investment, and thus interest rate risks are of bigger concern than liquidity risks.

Comment 2 is not correct.

DFA is more suitable for non-life insurers, whose claim distributions are more volatile, making the management of their liquidity risks more important.

Life insurers generally engage in immunisation strategies, optimisation strategies and scenario analyses.

Comment 3 is correct.

Predicting mortality rates is of great importance for assessing future cash outflows.

Comment 4 is not correct.

Life insurers and pension funds use derivatives extensively as a tool for hedging risks.

Life insurance contracts with guaranteed returns and pension funds with defined benefits especially use derivatives to build up investments so as to mirror these promised guarantees.

Life insurers and pension funds invest a large portion of their assets in fixed income securities. The time value of life insurers' and pension funds' liabilities are calculated by the discounted, expected future cash flows, which is also subject to interest rate risk, which swaps can be used to hedge.

- (c) Explain how long-lasting low interest rates could impact both the assets and liabilities of ABC.

1. Continued

Commentary on Question:

The candidates performed as expected on this section. This question aims to test candidates' knowledge on macroeconomic environment and its influence on an insurer's asset liability management. Few candidates identified that ABC is particularly vulnerable to long-lasting low interest rate because of its current asset composition.

On the asset side, low interest rates constrain profits by generating insufficient investment returns.

This is particularly the case for ABC, which invests many of its assets in long-term, fixed income securities.

The value of insurers' liabilities increases when applying the reduced rate for discounting.

Therefore, the low interest rate environment can cause financial distress for ABC.

- (d) Evaluate the potential impacts of shifting to a higher equity mix on ABC's asset liability management.

Commentary on Question:

The candidates performed below average on this section. This question aims to test candidates' knowledge on the role of insurers in long-term investment financing. Few candidates identified the tax efficiency and the board position and the lockup period of equities.

Advantages:

In a challenging environment of low fixed-income returns, equities could offer higher, long-term returns.

Equities allow insurers to hedge against inflation and are tax-efficient.

Disadvantages:

The capital charge for investing in equities is substantially higher than that for high quality bonds.

The duration mismatch resulting from equity investments produce additional regulatory challenges in terms of cash flow and stress testing.

Strategic stake holding in public companies may be associated with a board position and a potential lockup period.

- (e) Define two classes of green investments.

Commentary on Question:

The candidates performed below average on this section. Many candidates did not identify the correct classes of green investments.

1. Continued

Green Equity, especially stocks of environmentally friendly undertakings
Green Bonds, usually issued by governmentally-qualified organisations to raise capital to salvage environmental problems

Investments in Alternative Green Asset Classes – which include real estate, infrastructure and private equity.

2. Learning Objectives:

7. The candidate will understand the need for and goals of assessing the performance of a portfolio, and the methods and limitations of performance attribution.

Learning Outcomes:

- (7b) Apply performance measurement methodologies to various asset portfolios
- (7d) Assess and interpret performance attribution metrics for a given asset or portfolio

Sources:

Maginn and Tuttle Ch 12

Commentary on Question:

This question aims to test candidates' knowledge on apply performance measurement methodologies to various asset portfolios, and assess and interpret performance attribution metrics for a given asset or portfolio. In general, the candidates performed as expected on this question.

Solution:

- (c) Critique your supervisor's assessment.

Commentary on Question:

The candidates performed below average on this section. This question aims to test candidates' knowledge on apply performance measurement methodologies to fixed income portfolio. Most candidates correctly identified that the manager's assessment is not correct, but very few candidates pointed out the correct missing components.

I do not agree with the manager's assessment.

The total return of a fixed-income portfolio can be attributed to the external interest rate effect, on one hand, and the management effect, on the other. The manager's assessment is missing the components attributable to external interest rate effect which include return on the benchmark assuming no change in the forward rates and return due to changes in forward rates.

- (d) Derive a micro attribution analysis by calculating the value-added returns due to section allocation, within-section selection, and allocation/selection interaction.

2. Continued

Commentary on Question:

The candidates performed as expected on this section. This question aims to test candidates' knowledge of assessing and interpreting performance attribution metrics for a given asset or portfolio. Many candidates did the correct calculation but got the decimal place wrong. For example, some candidates calculated Pure Sector Allocation as 0.0818% instead of the correct 8.18%.

Pure Sector Allocation = $\text{SUMPRODUCT}(\text{Weight Diff}, \text{Index Sector Return} - \text{Total Index Return})/100 = 8.18\%$

Allocation/Selection Interaction = $\text{SUMPRODUCT}(\text{Weight Diff}, \text{Port Sector Return} - \text{Index Sector Return})/100 = 0.89\%$

Within-Sector Selection = $\text{SUMPRODUCT}(\text{Index Weight} (\%), \text{Port Sector Return} - \text{Index Sector Return})/100 = -8.45\%$

Port Return - Index Return = Weighted Average Portfolio Return - Weighted Average Index Return = 0.62%

Show your work here:

Sector	Portfolio Weight (%)	Index Weight (%)	Portfolio Return (%)	Index Return (%)	Weight Diff	Index Sector Return - Total Index Sector Return	Port Sector Return - Index Sector Return
Government bonds	50.8	54.5	2.4	2.4	-3.7	-0.715	0
Corporate bonds	40.2	39	3.5	3.8	1.2	0.685	-0.3
Mortgaged backed securities	9	6.5	5.5	5	2.5	1.885	0.5
	Weighted Average		3.1212	3.115			

- (e)
- (i) Calculate active returns due to timing, security selection, and other items.
 - (ii) Calculate how much total active management by the investment has benefited or cost the plan over the 15-year period.

Commentary on Question:

The candidates performed above average on this section. This question aims to test candidates' knowledge of the determinants of portfolio performance. The candidates performed better on the first section than the second section. Some candidates got the correct numbers during their calculation, but did not map them to the correct category.

2. Continued

- (i) $\text{Timing} = \text{II} - \text{I} = 11.12\% - 12.25\% = -1.13\%$
 $\text{Selection} = \text{III} - \text{I} = 11.5\% - 12.25\% = -.75\%$
 $\text{Other} = \text{IV} - \text{III} - \text{II} + \text{I} = 8\% - 11.5\% - 11.12\% + 12.25\% = -2.37\%$
- (ii) $\text{Total} = \text{IV} - \text{I} = 8\% - 12.25\% = -4.25\%$

3. Learning Objectives:

6. The candidate will understand:
- Investment dimensions of designing product offerings and managing inforce product liabilities.
 - Managing investment portfolios in the context of financial institution liabilities (asset liability management).
 - The theory and techniques of portfolio asset allocation.

Learning Outcomes:

- (6b) Develop and critique asset allocation strategies appropriate to underlying liability profiles such as pension plans and long tail insurance liabilities
- (6c) Evaluate the difficulties of investing for long tail liabilities (i.e. beyond 30 years) such as inflation indexed pension plans and secondary guarantee universal life insurance

Sources:

Managing Investment Portfolios: A Dynamic Process, Maginn & Tuttle, 3rd Edition, 2007, Ch. 7: Equity Portfolio Management

QFIA-128-18 “The Evolution of LDI & Role of a Completion Manager”

QFIP-144-19 “Risk Parity is All about Balance”

Commentary on Question:

The question tests the evaluation and management of equity portfolios in a pension fund and asset allocation in a shifting economic environment.

Solution:

- (f) Assess the relative performance of the three managers A, B, and C.

Commentary on Question:

The candidates performed above average on this section. Most candidates used the information ratio to evaluate manager performance. Most errors occurred in determining the correct return benchmark or the correct method to adjust for risk. To receive full credits, candidates needed to define the information ratio.

Information Ratio = True Active Return / True Active Risk

Manager true active return = Manager return – Benchmark return

Benchmarks are based on manager orientation. Manager A uses Index Y.

Manager B uses Index Y Value. Manager C uses Index Y Momentum.

Manager true active return calculations:

Manager A true active return = 11% - 10% = 1%

Manager B true active return = 14% - 12% = 2%

Manager C true active return = 14% - 13% = 1%

3. Continued

$$\text{Total active risk} = [(\text{True active risk})^2 + (\text{Misfit active risk})^2]^{0.5}$$

Solve the equation for true active risk.

$$\text{True active risk} = [(\text{Total active risk})^2 - (\text{Misfit active risk})^2]^{0.5}$$

True active risk calculations:

$$\text{Manager A true active risk} = [0.02^2 - (0.01)^2]^{0.5} = 1.73\%$$

$$\text{Manager B true active risk} = [0.03^2 - (0.02)^2]^{0.5} = 2.24\%$$

$$\text{Manager C true active risk} = [0.04^2 - (0.03)^2]^{0.5} = 2.65\%$$

Information ratio calculations:

$$\text{Manager A Information Ratio} = 1\% / 1.73\% = 0.58$$

$$\text{Manager B Information Ratio} = 2\% / 2.24\% = 0.89$$

$$\text{Manager C Information Ratio} = 1\% / 2.65\% = 0.38$$

Manager B is best performing due to highest information ratio, followed by a and c.

- (g) Describe the benefits of implementing a completion portfolio for Company ABC.

Commentary on Question:

The candidates performed poorly on this section. Many candidates pointed out that a completion portfolio helps with asset liability matching or risk reduction. However, most did not bring up all the advantages or did not explain them adequately.

- Improved asset liability match: The completion portfolio is designed to reduce the risk of mismatches between existing assets and liabilities.
 - Capital efficiency: The completion portfolio can use leverage to hedge liability risks, reducing overall funded-status volatility while preserving the return potential of existing allocations
 - Opportunistic de-risking: Plans can use the completion portfolio to make nimble, opportunistic adjustments to duration, credit, or other risks
 - Endgame management: The completion portfolio can be a vehicle for managing the overall plan toward lump-sum offerings and annuitizations
 - A completeness fund adjusts for risk exposures from the aggregate portfolio of active managers (sector over/under-weighting or industry concentrations)
- (c) Recommend an investment approach that can help alleviate the concerns of Company ABC's senior management.

3. Continued

Commentary on Question:

The candidates performed as expected on this section. Many recommended the All Weather approach. Candidates also received points for describing alternative approaches, such as hedging mechanisms and derivatives. However, many did not adequately explain how their recommendations would address ABC's concerns. Also note that simply investing in assets with higher returns does not address concerns of a changing economic environment.

The All Weather approach is recommended. Hold similar risk exposure to assets that do well when growth/inflation rises/falls (25% risk exposure in each).

Advantages of the All Weather approach in addressing ABC's concerns:

- Creates balanced portfolio based on the relationship of assets to environmental drivers.
- Avoids heavy concentration in a single type of asset (equities), which can affect long-term performance when the economic environment changes.
- Focus on growth and inflation as the most important drivers of economic change.
- Environmentally balanced portfolio offers a higher ratio of return-to-risk than a concentrated one.

4. Learning Objectives:

6. The candidate will understand:
- Investment dimensions of designing product offerings and managing inforce product liabilities.
 - Managing investment portfolios in the context of financial institution liabilities (asset liability management).
 - The theory and techniques of portfolio asset allocation.

Learning Outcomes:

- (6b) Develop and critique asset allocation strategies appropriate to underlying liability profiles such as pension plans and long tail insurance liabilities
- (6c) Evaluate the difficulties of investing for long tail liabilities (i.e. beyond 30 years) such as inflation indexed pension plans and secondary guarantee universal life insurance

Sources:

Managing Investment Portfolios: A Dynamic Process, Maginn & Tuttle, 3rd Edition, 2007, Ch. 5

Commentary on Question:

This question tests candidates' ability to evaluate alternate investment assets from both a performance and risk characteristic perspective.

Solution:

- (h) List two reasons why it may be appropriate to use an ALM approach for the pension plan.

Commentary on Question:

The candidates performed above average on this section. Most candidates were able to list that the liabilities are interest rate sensitive. Candidates often missed that the penalties for not meeting liability obligations are high.

The following items would be considered acceptable reasons for why it is more appropriate to use ALM:

- Liabilities are interest rate sensitive
 - There are high penalties for not meeting obligations
- (i) For each of the alternative asset classes:
- (i) Calculate the Sharpe ratio, assuming a 3% risk-free rate.
- (ii) Assess whether adding the asset class to the portfolio achieves a mean-variance improvement.

4. Continued

Commentary on Question:

The candidates performed above average on this section. Candidates calculated the Sharpe ratios for each portfolio correctly. Several candidates lost marks for either failing to state the criteria for including an asset class in a portfolio or incorrectly calculating the standard deviation of returns.

The definition of the Sharpe ratio is $Sharpe\ Ratio = \frac{E(R_p) - R_F}{\sigma_p}$, where $E(R_p)$ is the expected return on portfolio/asset, σ_p is the standard deviation of the return on portfolio/asset, and R_F is the risk free rate.

Based on the above definition, the Sharpe ratios for each asset class is:

	Current Portfolio	TIPS	Real Estate	Private Equity
Expected total return (annual)	6%	8%	7%	10%
Standard deviation (annual)	10%	20%	18%	30%
Correlation with current portfolio	1	0.7	0.6	0.8
Duration	20	19	N/A	N/A
Sharpe Ratio	0.300	0.250	0.222	0.233

A new asset class should be added to a portfolio when the following condition is met:

$\frac{E(R_{New}) - R_F}{\sigma_{New}} > \frac{E(R_p) - R_F}{\sigma_p} \times Corr(R_{New}, R_p)$, where R_{New} is the returns on the new asset, R_p is the return on the existing portfolio, and $Corr(R_{New}, R_p)$ is the correlation between the two series.

The TIPS asset class and real estate asset class meets the risk-adjusted returns requirement. Private equity does not meet the risk-adjusted return requirement.

4. Continued

- (c) Evaluate how well each asset class addresses the above-mentioned concerns.

Commentary on Question:

The candidates performed brilliantly on this section. Most candidates correctly identified the underlying risks that management was concerned about, as well as provide adequate assessments on if each asset class meets those requirements. Candidates lost marks for incorrectly indicating that private equity and direct real estate investments are liquid assets. Another common mistake was candidates incorrectly stating that private equity returns are not correlated with inflation.

With a large number of plan members coming close to retirement, there is an increased liquidity concern due to the cash value option of the portfolio. Real estate (direct ownership) and private equity are highly illiquid assets, so investing in these asset classes may be risky. TIPS trade in a liquid market. As a result, TIPS satisfy the first risk criteria.

Indexed benefits grow with time – will need assets that are correlated with inflation to help manage inflation risk. All three asset classes are correlated with inflation rates, which would make them suitable.

- (d) Recommend an asset class in which to invest.

Commentary on Question:

The candidates performed as expected on this section. Most candidates correctly identified that TIPS were the appropriate asset class to invest in. Candidates received points for describing alternate investment approaches such as derivatives to address the pension's risk concerns. Many candidates did not elaborate enough on why TIPS address the portfolio management team's concerns, as opposed to real estate and private equity.

Based on analysis in parts (b) and (c), the TIPS asset class successfully meets the criteria needed by the pension fund – risk-adjusted returns, liquidity, and correlation with inflation are all addressed. The real estate asset class does not have sufficient liquidity to support the pension plan, so it should be avoided. The private equity asset class does not have liquidity or risk-adjusted returns that are sufficient to meet the needs of the pension plan.

5. Learning Objectives:

3. The candidate will understand the variety and assess the role of equities in investment portfolios. The candidate will demonstrate an understanding of the distinguishing investment characteristics and potential contributions to investment portfolios of the following major asset groups:
 - Real Estate
 - Public Equity
 - Private Equity
 - Infrastructure
 - Commodities
 - Hedge Funds
 - Timber and Farmland Investments
 - Distressed debts

Learning Outcomes:

- (3a) Demonstrate an understanding of the investment strategies and portfolio roles that are characteristic of various types of equity and alternative investments
- (3b) Use different types of equity and alternative investments available for an investor's growth allocation in portfolio construction, considering portfolio design, risk management, liquidity management, manager selection, implementation, taxation, and benchmarking

Sources:

Anson, M., Handbook of Alternative Assets, 2nd Edition, Chapter 3 – Introduction to Hedge Funds

Anson, M., Handbook of Alternative Assets, 2nd Edition, Chapter 6 – Risk Management Part I: Hedge Fund Return Distributions

Anson, M., Handbook of Alternative Assets, 2nd Edition, Chapter 7 – Risk Management Part II: Additional Hedge Fund Risks

Commentary on Question:

This question tests the understanding of common hedge fund strategies, their historical risk-return profiles, and the associated implications for investment portfolio risk management.

Solution:

- (a) Describe three hedge fund strategies adopted by market directional hedge funds.

Commentary on Question:

The candidates performed as expected on this section. Many candidates listed and explained well the three market directional fund strategies as required, while a number of candidates provided fund strategies not under the market directional category.

5. Continued

Three strategies adopted by market directional funds are: Equity long/short, Market timers, Short selling

- Equity long/short: hedge funds that build their portfolios by combining a core group of long stock positions with short sales of stock or stock index options/futures, usually with a net long market exposure
- Market timers: hedge funds that attempt to time the market so that they are fully invested during bull markets and strictly in cash during bear markets.
- Short selling: hedge funds that maintain a net short exposure to the stock market, often with some form of market timing.

Candidates need to provide a reasonable description of the key features of each fund strategy to get full credits.

- (b) Identify the strategy that gives the least emphasis to security selection from the three hedge fund strategies in part (a).

Commentary on Question:

The candidates performed below average on this section. Many candidates identified the right strategy but without giving a rationale, which was needed for full credit.

Market timers places the least emphasis to stock selection. They analyze fiscal and monetary policy as well as key macroeconomic indicators to determine whether the economy is gathering.

To get full credits, elaboration must be provided indicating that market timers rely on analyzing macroeconomic data to predict desirable market entry/exit points with limited focus on security selection.

- (c) Assess the hedge fund strategy most likely adopted by each of the four funds based on your knowledge of the strategies' historical return.

Commentary on Question:

The candidates performed below average on this section. While many candidates demonstrated a solid understanding of the material in providing nearly perfect answers, a number of candidates left it blank.

- Fund A likely follows a short-seller strategy, as characterized by large the negative Sharpe Ratio with high standard deviation in return distribution.
- Fund B likely follows an equity long-short strategy, as characterized by the positive skew (from skill based trading) and positive kurtosis in return distribution.

5. Continued

- Fund C likely follows the merger arbitrage strategy, as characterized by the large negative skewness, accompanied by a large kurtosis in return distribution representing significant exposure to outlier events.
- Fund D likely follows the market timer strategy, as characterized by the negative kurtosis yet positive skewness in return distribution.

To get full marks, reference to at least one distinguishing characteristics above (volatility, skewness, excess kurtosis, etc.) must be made for each fund strategy.

- (d) Calculate the missing values in the table.

Hint: the skewness of a random variable X with mean μ and standard deviation σ follows:

$$\text{skew}(X) = \frac{E(X^3) - 3\mu\sigma^2 - \mu^3}{\sigma^3}$$

Commentary on Question:

The candidates performed above average on this section. Most candidates utilized the given information and formula to derive the metrics as required. One common mistake made by some candidates was using the market index return from the previous section for the calculation of Sharpe Ratio.

Derive monthly risk free rate first:

$$r_f = 1.38\% - 0.41 \times 2.59\% = 0.318\%$$

Calculate the Sharpe Ratio for fund F

$$SR_F = \frac{1.27\% - 0.318\%}{2.51\%} = 0.38$$

$$\text{Skew}_E = \frac{0.0035\% - 3 \times 0.0138 \times 0.0259^2 - 0.0138^3}{0.0259^3} = 0.26$$

- (e) Calculate the quarterly VaR at 95% level for Fund E.

Commentary on Question:

The candidates performed below average on this section. While many candidates identified the need to convert the given return metric from monthly to quarterly, most candidates showed a general lack of understanding of the VaR metric and its calculation.

5. Continued

Quarterly returns

$$\mu_E = 1.38\% \times 3 = 4.14\%$$

Quarterly volatilities

$$\sigma_E = 2.59\% \times \sqrt{3} = 4.486\%$$

Quarterly VaR at 95%

$$VaR_E = -1M \times (4.14\% - 1.65 * 4.486\%) = 32619$$

- (f) Assess if the normality assumption used in calculating VaR is appropriate for capturing the investment risk of Fund E and Fund F.

Commentary on Question:

The candidates performed as expected on this section. Most of the candidates gave the correct assessment that VaR is inappropriate here observing the excess kurtosis in the funds' returns. However, very few candidates elaborated on the associated implications: VaR will understate the risk in this case.

From the excess kurtosis values in the table, both hedge funds have leptokurtic return distributions exhibiting heavier tails than a normal distribution. As a result, a VaR metric assuming normally distributed asset return tends to understate the risk, and is hence inadequate.

To get full marks, both the assessment and negative consequence of using VaR in capturing investment risk in the given funds must be correctly provided.

6. Learning Objectives:

1. The candidate will understand how to work with the variety of fixed income instruments and evaluate fixed income portfolios.
7. The candidate will understand the need for and goals of assessing the performance of a portfolio, and the methods and limitations of performance attribution.

Learning Outcomes:

- (1a) Describe the cash flow of various fixed income securities considering underlying risks such as interest rate, credit and event risks
- (1b) Demonstrate an understanding of common techniques to enhance yield and manage liquidity in fixed income portfolios
- (1d) Construct and manage portfolios of fixed income securities using the following broad categories:
 - Managing funds against a target return
 - Managing funds against liabilities
- (7b) Apply performance measurement methodologies to various asset portfolios
- (7d) Assess and interpret performance attribution metrics for a given asset or portfolio

Sources:

Maginn & Tuttle, *Managing Investment Portfolios: A Dynamic Process* 3rd Edition, Ch 6

Commentary on Question:

The question tests the candidates' knowledge of risk factors of a bond fund and immunization strategies. The candidates performed below average on this question.

Solution:

- (a) Identify two advantages and four disadvantages of investing in emerging market debt.

Commentary on Question:

The candidates performed as expected on this section. Most candidates identified two advantages of emerging market debt. Many candidates also identified some disadvantages. Points were not awarded for generic answers that are not specific to emerging market debt (e.g. legal risk).

Advantages:

- Potential for consistent, attractive returns.
- Emerging market sovereigns have advantage over private corporations which can reverse an adverse situation (e.g. can cut spending or raise taxes).

6. Continued

Disadvantages:

- Volatility can be high.
- Returns can be negatively skewed.
- Lower transparency, court-tested law or regulations.
- Non-standard covenants.

- (b) Explain three factors that can drive the repo rate to be a drag on the fund's return.

Commentary on Question:

The candidates performed as expected on this section. Most candidates identified some of the points that influence the repo rate, and subsequently the impact on the fund's return.

The repo rate will be a drag on the funds return if the repo rate increases. The repo rate can be affected negatively (increase) by the following factors:

- Decrease in the quality of securities of the fund.
- Using repos with longer maturity.
- Interest rates rise generally.

- (c) Calculate the return on the bond holdings that would have resulted in the complete exhaustion of the fund over the past year.

Commentary on Question:

The candidates performed below average on this section. While many candidates correctly calculated the leverage ratio of the fund, a common mistake was to interpret "complete exhaustion of the fund" as the fund generating a return of 0% instead of fully depleting its market value (i.e. returning -100%).

First we find the leverage of the fund (B/E):

$$R_p = r_f + B/E(r_f - k)$$

We need to solve for B/E:

$$\frac{B}{E} = \frac{(R_p - r_f)}{(r_f - k)} = \frac{8\% - 3.5\%}{3.5\% - 2\%} = 3$$

i.e. the fund borrowed \$3 for every \$1 of equity.

The fund would become 0 when $R_p = -100\%$. We solve for r_f :

$$\begin{aligned} -1 &= 4r_f - 3k \\ r_f &= (3k - 1)/4 \\ r_f &= -23.5\% \end{aligned}$$

6. Continued

- (d) Design an immunization strategy to manage the investment portfolio for this GIC contract.

Commentary on Question:

The candidates performed poorly on this section. Most candidates failed to provide a strategy that immunizes the portfolio against changes in the yield curve. Partial credits were awarded to candidates whose solution involved using derivative strategies to hedge the liability interest rate exposure.

The proposed strategy is:

Find the implied guaranteed interest rate offered in the GIC contract:

$$100*(1+i)^2 + 60*(1+i) = 166$$
$$i = 2.29\%$$

Since the initial yield curve is 2.40%, it's feasible to create an immunized portfolio.

We can split the initial \$100 million into two components:

- (I) Invest \$40 million of the initial premium to create an asset with duration of 2 years to match a portion of the GIC maturity requirement. This eliminates interest rate risk for a portion of the liability.
- (II) Invest \$60 million of the initial premium to create an asset with duration of 3 years. At the end of the first year, any decline (rise) in the interest rates at which the “year 2 premium” is to be invested will be offset by a corresponding increase (decrease) in the value of the initial holdings. This part of the portfolio is rebalanced at that time by selling the actual holdings and investing the proceeds, together with the “year 2 premium”, in a portfolio with a duration of 1 year to match the GIC maturity date.

The combined effect of (I) and (II) immunizes the total investment portfolio against the interest rate risk.

7. Learning Objectives:

5. The candidate will:
- Demonstrate an understanding of regulatory and accounting frameworks around investment governance.
 - Understand how to develop an investment policy including governance for institutional investors and financial intermediaries within regulatory and accounting constraints.
 - Understand how rating agency frameworks affect portfolio construction and management.

Learning Outcomes:

- (5f) Analyze international accounting treatment for insurance liabilities and the investments and hedging that supports them

Sources:

QFIP-148-20: IFRS 17 Insurance Contracts - IFRS Standards Effects Analysis, May 2017, IASB (sections 1, 2, 4, 6.1-2, and 7.1 only)

QFIP-156-21: Minimising Accounting Mismatches Relating to Financial Risk for Insurers

QFIP-150-20: IFRS 9 For Insurers

Commentary on Question:

This question tests the concept of investment policy statement, its key components, and its application to pension plan.

Solution:

- (a) You work for XYZ Life Insurance Company and help with its IFRS 9 and IFRS 17 implementation. Your colleague presents the following IFRS 9 classification and measurement analysis to the team.

“After reviewing the relevant requirements, we believe the adoption of IFRS 9 and IFRS 17 will create some accounting mismatches. Under IFRS 9, there are two bases to measure financial assets, fair value through OCI (FVOCI) and fair value through profit or loss (FVTPL). Debt instruments will be measured on either of the two bases depending on if the contractual cash flows pass the “Solely Payments of Principal and Interest” (SPPI) test. The new impairment model may have significant impact on the debt instrument. For equity instruments, if the asset is held for trading, then it has to be measured with FVTPL. Lastly, it is required to adopt IFRS 9’s hedge accounting requirements now.”

Critique the above analysis.

7. Continued

Commentary on Question:

Candidates performed as expected on this part of the question. Most candidates received credit for identifying that amortized cost is the third base for measuring financial assets. Very few candidates identified that business model test also must be passed for the measurement of a debt instrument.

Critique the above analysis.

“After reviewing the relevant requirements, we believe the adaption of IFRS 9 and IFRS 17 will create some accounting mismatches” – correct, IFRS 9 and 17 may create mismatches

“Under IFRS 9, there are two bases to measure financial assets, fair value through OCI (FVOCI) and fair value through profit or loss (FVTPL)” – not accurate, amortized cost is the third base.

“Debt instrument will be measured on any of the two bases depending on if the contractual cash flows pass the SPPI test.” – not accurate, has to pass business model test too.

“The new impairment model may have significant impact on the debt instrument.” – correct, in particular for AC or FVOCI debts.

“For equity instrument, if the asset is held for trading, then it has to be measured with FVTPL.” – not accurate, company has the OCI option.

“At last, it is required to adopt IFRS 9’s hedge accounting requirements now” – not accurate, hedge accounting is not mandatory now.

- (b) Describe how this policy decision may reduce the accounting mismatch.

Commentary on Question:

Candidates performed below average on this part of the question. Most candidates received credit for identifying that changes in discount rates would be recognized in P&L. However, very few candidates mentioned changes in credit risk as being reflected in P&L.

- If the insurer includes insurance finance income or expenses for the period in profit or loss, the effect of any changes in discount rates and financial risk on the insurance contracts would be recognized in profit or loss as insurance finance income or expenses.
- That amount reflects both the effects of changes in interest rates and the effects of any changes in liquidity premiums.
- If the insurer also designates the bonds held as at FVPL, the effect of changes in discount rates and financial risk on the bond portfolio would also be recognized in profit or loss. That amount reflects both the effects of changes in interest rates and the effects of any changes in credit risk.
- There would be a natural offset relating to the effect of changes in interest rate risks.

7. Continued

- (c) Explain two advantages and two limitations of this policy decision.

Commentary on Question:

Candidates performed below average on this part of the question. Many candidates received credit for identifying the advantage of being operationally simple. However, very few candidates identified the level of aggregation needing to be granular as a disadvantage.

Advantages:

- Operationally simple, with no need for complex designation, tracking systems, effectiveness testing or measuring ineffectiveness.
- Although the financial income and expenses option for insurance contracts is applied at a portfolio level, the fair value option for assets is applied on an instrument-by-instrument level. This gives the insurer the ability to designate in a way that best fits.

Limitations:

- Will result in volatility in profit or loss to the extent of unmatched risk or, where the variable fee approach is applied, from the insurer's share of underlying items.
- The approach will only significantly reduce volatility in profit or loss for portfolios that are well matched. That could mean that the level of aggregation for the insurance contracts would need to be more granular than might otherwise be considered so as to identify portfolios that are well matched.

- (d) Explain two advantages and two limitations of this policy decision.

Commentary on Question:

Candidates performed below average on this part of the question. Most candidates received credit for noting that a duration mismatch was created. Very few candidates identified credit premium as a part of the liability discount rate, which was not hedged.

- In this case, liability duration is much longer than asset duration, which will create mismatch.
- In addition, the corporate bond value reflects credit premium, which is not part of the liability discount rate. This risk will not be hedged.
- This policy decision may not effectively offset volatility in P&L due to the above constraints.

8. Learning Objectives:

1. The candidate will understand how to work with the variety of fixed income instruments and evaluate fixed income portfolios.

Learning Outcomes:

- (1a) Describe the cash flow of various fixed income securities considering underlying risks such as interest rate, credit and event risks

Sources:

Handbook of Fixed Income Securities, Chapter 10,

QFIP-135-19 High Yield Bond Market Primer

Commentary on Question:

This question tests the concept of fixed price, make whole call provision, tender offers, deferred coupon structures, extendible reset bonds, medium term notes, high yield bonds, credit spread risk.

Solution:

- (a) Contrast a make-whole call provision and a fixed-price call.

Commentary on Question:

The candidates performed above average for this part of the question. Most candidates did well listing the “fixed” vs “interest rate dependent” pieces, but almost no candidate brought up the fact that make whole call provisions are used on investment grade.

- Fixed price call allows a company to call a bond at a fixed price. Make whole call provision call price varies inversely with interest rates
- Fixed calls are usually used on non-investment grade bonds, Make whole call provisions are primarily used on investment grade.
- Fixed price call are generally require more upfront compensation as risk of call is when interest rates fall and issuer will be incented to call to refinance debt when interest rates fall thus harming the investor.
- Make whole call provision requires less compensation up front as call price increases when interest rates fall, thus investor has some level of protection against falling rates.

- (b) Calculate the call price.

Commentary on Question:

The candidates performed as expected for this part of the question. Almost all candidates identified the cashflows correctly. However, very few candidates performed the interpolation on the appropriate discount rates correctly.

8. Continued

- Discount rate is determined by the remaining time to maturity. Thus it is interpolated rate between 1 year and 3 year CMTs. $(0.25*1.00)+(0.75*1.20)=1.15\%$ plus make whole call premium of 10bp = 1.25%
- Cash flow is 6,000 at the end of years 8,9 and 10, and 100,000 at the end of year 10. Therefore, annuity factor for coupon cashflows = 2.945
- Compare discounted cashflows to principal plus accrued interest = 1/2 year coupon.
- Make whole provision call price = $\max[(100,000+3,000), 2.945 * 6,000+100,000 * (1/(1+1.25/100)^2.5)]=\max(103,000,114,611)= \114.611

(c)

- (i) Calculate the tender offer price, at the end of year 8, after the coupon payment has been made.
- (ii) Describe the advantages of using a tender offer.

Commentary on Question:

The candidates performed as expected for this part of the question. Many candidates did get the correct tender offer price, but very few candidates were able to provide more than one benefit of tender offers

(i) Cashflows after year 8 are only counted as PV calculation is as of the end of the tender offer period. Discount rate is interpolated treasury rate for remaining maturity, need to include fixed spread.

Discount rate = $(0.80*.5 + 0.96*.5) + 12 \text{ bps} = 1.00/100 + 0.0012 = 1.00\%$ [1 pts]

Tender offer price = PV of yr 9 coupon, PV of yr 10 coupon, and PV par amount.
 $6,000*(1/1.01) + 106,000 / (1/1.01)^2 = \$109,852$

(ii) Advantages of fixed spread tender offers:

- Fixed spread tender offers eliminate the exposure to interest rate risk for both bondholders and the issuer during the tender offer window.
- Firms employ tender offers to eliminate restrictive covenants or to refund debt
- The offer can be or “any or all” of the targeted issue, but it can also be for a fixed dollar amount that is less than the outstanding face value.
- If the firm perceives that the participation is too low, the firm can increase the tender offer price and extend the window.

- (d) Describe three different kinds of bonds with deferred coupon structures that XYZ can issue to reduce their debt burden.

8. Continued

Commentary on Question:

The candidates performed brilliantly on this part of the question, with many candidates getting full marks. Some candidates did not provide the names, but provided descriptions, and were given partial credit.

- **Deferred Interest bonds:** The most common kind; they sell at a deep discount and do not pay interest for an initial period, typically from 3-7 years. (sometimes referred to as zero coupon bonds)
- **Step up bonds:** These do pay coupon interest, but the rate is low for an initial period and then increases to a higher coupon rate.
- **Payment in kind bonds** give the issuers an option to pay cash at a coupon payment date or give the bondholder a similar bond. The period during which the issuer can make this choice varies from 5 to 10 years.

(e) Revise the following incorrect statements:

- (i) An extendible reset bond allows the issuer to reset the bond at a fixed spread over the reference rate, with the index spread being specified in the indenture.
- (ii) In modern practice, if a term bond maybe be paid off by a sinking fund, that means that the issuer accumulates a fund in cash or in assets readily sold for cash, that is used to pay bonds at maturity.
- (iii) High yield bonds are debt instruments coupled with a derivative position, such as options, forwards, swaps, caps and floors.
- (iv) Credit spread is due exclusively to the corporate bond's exposure to credit risk.

Commentary on Question:

The candidates performed above average for this part of the question. Most candidates were able to correct the description of the sinking fund, while fewer candidates were able to correct the statement about credit spread.

- (i) An extendible reset bond allows the issuer to reset the bond at a fixed spread over the reference rate, with the index spread being specified in the indenture.
Correct statement is:
An extendible reset bond allows the issuer to reset the coupon rate so that the bond will trade at a predetermined price.

8. Continued

OR

The structure defined in the statement is a typical floating rate issue.
(Either of the above two is acceptable for full credit)

- (ii) In modern practice, if a term bond maybe be paid off by a sinking fund, that means that the issuer accumulates a fund in cash or in assets readily sold for cash, that is used to pay bonds at maturity.
Correct statement is:

In modern practice, “sinking” means that the money is applied periodically to redemption of bonds before maturity.

OR

The above statement above was the meaning of sinking fund many years ago, not in modern practice. (Either of the above two is acceptable for full credit)

- (iii) High yield bonds are debt instruments coupled with a derivative position, such as options, forwards, swaps, caps and floors.
Correct statement is:

High yield bonds are debt securities issued by corporations with lower than investment grade ratings. Issuing companies are usually looking for money for growth, working capital or other cash flow purposes.

OR

The statement above describes structured notes. (Either of the above two is acceptable for full credit)

- (iv) Credit spread is due primarily to the corporate bond’s exposure to credit risk.
Correct statement is: The above statement is misleading because the risk profile of corporate bonds differs from treasuries on other dimensions; namely, corporate bonds are less liquid and often have embedded options.

OR

Credit spread is the difference between a corporate bond’s yield and the yield on a comparable maturity benchmark treasury security or swap rate.
(Either of the above two is acceptable for full credit)

9. Learning Objectives:

1. The candidate will understand how to work with the variety of fixed income instruments and evaluate fixed income portfolios.

Learning Outcomes:

- (1c) Demonstrate an understanding of the cash flow patterns and risks of whole loan commercial mortgages

Sources:

Handbook of Fixed Income Securities, Fabozzi, F.J., 9th Edition, 2021, Ch. 21: An Overview of Mortgages and the Mortgage Market

Handbook of Fixed Income Securities, Fabozzi, F.J., 9th Edition, 2021, Ch. 25: Nonagency Residential Mortgage-Backed Securities: Legacy, RMBS 2.0, and Non-QM

Commentary on Question:

This question tests the candidates' understanding of the mortgage market and structures of non-agency Residential Backed Mortgage Securities. Overall, the candidates performed below average on this question. While some candidates demonstrated a basic understanding of the mortgage market, many struggled to analyze features of non-agency residential mortgage backed securities.

Solution:

- (a) Explain four factors that are considered in the evaluation of the creditworthiness of a potential borrower.

Commentary on Question:

The candidates performed as expected on this section. Some candidates only identified factors and did not explain them, which earned only partial points.

Credit scores – a numerical grade of the credit history of the borrower. Helps to predict credit and prepayment performance. Higher score is better.

Loan-to-Value (LTV) Ratio – indicator of borrower's leverage. Compares the value of the desired loan to the market value of the property. Lower LTV is better.

Combined LTV (CLTV) – accounts for the existence of any second liens and are more indicative of the borrower's credit standing & indebtedness than LTVs.

Lower CLTV is better.

Income ratios – calculate debt-to-income (DTI) ratios that compare potential monthly payment on the loan to the borrower's monthly income. Lower DTI is better.

Front-end ratio – divide total monthly payments on the home by the borrower's pretax monthly income. Lower Front-end ratio is better.

Back-end ratio – similar to front-end but includes other debt payments and obligations to the total payments. Lower Back-end ratio is better.

9. Continued

Documentation – require potential borrowers to provide data on financial status with documentation. Typically, borrowers are required to report and document income, employment status, and financial resources.

- (b) Describe four capital structure features that can be utilized to manage the risks of this non-agency RMBS.

Commentary on Question:

The candidates performed poorly on this section. Most candidates identified or described a sequential structure and were unable to describe other capital structures or provisions to help manage risks. Virtually no candidates referenced the risks of Option Adjustable-Rate Mortgages.

Issue with floating coupon, since backed by ARM collateral, which is floating rate.

Should have a linear structure, since it has only one collateral group, and cash flows from this collateral group distributed to all bonds.

Sequential structure – senior class tranches paid principal sequentially with all principal going to one tranche until it's paid in full before the next senior tranche starts to receive payments.

Pro rata structure – make payments proportional to each tranche's unpaid principal balance.

Lockout period – subordinate bonds locked out of receiving prepayments for a period of time after settlement. At the end of the lockout period, if collateral performance meets or exceeds minimum credit conditions, prepayments can flow into junior classes.

Triggers – series of trigger tests to place limits on the amount and timing of any release of credit support to ensure credit support is still intact during the period when deals are most likely to experience losses

Common trigger tests include delinquency test, factor test, credit support level test, and cumulative loss trigger test.

Clean-up call provision – gives owner of the call the option to purchase the remaining bonds at a pre-specified price when the factor is at or below a certain threshold.

- (c)
- (i) Recommend an internal credit enhancement structure.
 - (ii) Explain the mechanics of your recommended structure.

9. Continued

Commentary on Question:

The candidates performed poorly on this section. Some candidates identified the overcollateralization/excess spread (OC/XS) structure did not describe the mechanics of the structure or justify the recommendation. Virtually no candidates referenced the risky nature of Option Adjustable-Rate Mortgage to justify their recommendation.

Recommend overcollateralization/excess spread (OC/XS) structure.
Structure typically used for collateral with greater loss concerns
Since Option ARMs have a large percentage of loans with little to no documentation, they have a higher likelihood of credit loss.

Under OC/XS structure, additional layers of support are added to the senior/sub structure through extra collateral principal and/or interest.
Uses the senior, mezzanine, and subordinate framework but adds extra collateral so that the collateral backing the deal is larger than the total balance of its bonds.
Since the collateral WAC (weighted average coupon) is expected to be higher than the WAC of the underlying bonds, there can be extra interest payments (excess spread) each month.
XS spread is the first line of defense, then OC, then the traditional subordinate tranches provide final protection before losses reach senior tranches.
If OC not fully funded at inception, XS (after covering losses) will be used to build up OC.
OC/XS deals typically pay floating rate.
There is typically a step-down date, which is when junior bonds can start to receive principal and the OC can start to be released.
Cashflows are much more volatile, due to having more trigger events. Small changes in performance can trigger large swings in the cash flow waterfall and have a major impact on a bond's valuation.

- (d) Describe four reasons which would explain why prepayments slowed down.

Commentary on Question:

The candidates performed below average on this section. Many candidates provided at least one explanation for why prepayments slowed.

Lower sales of property
Less fires and natural disasters
Less defaults on the part of the borrower
Less refinancings
Borrower mortgage interest rate below market rates ("low note rates")

10. Learning Objectives:

2. The candidate will understand:
 - The credit risk of fixed income portfolios, securities, and sectors and be able to apply a variety of credit risk theories and models.
 - How rating agencies rate corporate and sovereign bonds.

Learning Outcomes:

- (2a) Demonstrate an understanding of credit risk analysis and models
- (2b) Demonstrate an understanding of the basic concepts of credit risk modeling such as probability of default, loss given default, exposure at default, and expected loss
- (2d) Demonstrate an understanding of modeling approaches for correlated defaults
- (2e) Demonstrate an understanding of measuring and marking-to-market counterparty credit risk in credit derivatives

Sources:

Handbook of Credit Risk Management Ch 1 Bouteille

Handbook of Credit Risk Management Ch 4 Bouteille

Handbook of Credit Risk Management Ch 5 Bouteille

Handbook of Credit Risk Management Ch 13 Bouteille

Handbook of Credit Risk Management Ch 20 Bouteille

Commentary on Question:

This question tests the fundamentals of credit risk management. Overall, the candidates performed as expected on this question. Most candidates received at least partial marks.

Solution:

- (a) Identify the credit risk exposures of ABC Life Insurance.

Commentary on Question:

The candidates performed below average on this section. Less than half of the candidates pointed out the net exposure is \$100M.

ABC Life is exposed to the credit risks of holding the sovereign bonds of Country S. ABC Life's portfolio will incur loss when Country S's credit rating is downgraded or defaults. The net exposure of the credit risk is \$100M.

- (b) Calculate the expected loss of ABC Life Insurance at the end of 1 year.

10. Continued

Commentary on Question:

The candidates performed below average on this section. Some candidates correctly calculated $E[\text{Loss} \mid \text{Default}]$, but only a few candidates calculated the total expected loss correctly.

$$E[\text{Loss} \mid \text{Default}] = 0.5\% * 100\text{M} * (1 - 30\%) = 0.35\text{M}$$

$$E[\text{Loss} \mid \text{Downgrade to C}^*] = 2.5\% * 100\text{M} * 20\% = 0.5\text{M}$$

$$E[L] = E[L|D] + E[L|C^*] = 0.85\text{M}$$

- (c) Calculate the probability of bond defaulting at any point during the first 2 years.

Commentary on Question:

The candidates performed above average on this section. Most candidates calculated the correct cumulative probability.

In year 1:

Probability of A* = 4%, Probability of B* = 93%,

Probability of C* = 2.5%, Probability of D* = 0.5%

Cumulative, at end of the year 2:

$$\text{Probability of D}^* = 4\% * 0\% + 93\% * 0.5\% + 2.5\% * 17\% + 0.5\% * 100\% = 1.39\%$$

- (d) Recommend a strategy to reduce the credit risk of ABC Life.

Commentary on Question:

The candidates performed as expected on this section. Most candidates recommended the use of CDS, however only a few candidates recommended diversifying with other bonds or asset classes.

Use CDS to reduce the net exposure to the sovereign bonds

- Need to be aware of the credit risk of the counter party of the CDS

Diversify with bonds from other higher credit rating countries.

- Need to be mindful that even highly rated countries have credit risks

Invest in other asset classes such as equities or mortgages

- ABC Life need to weigh between market risk exposures vs credit risk exposure

11. Learning Objectives:

3. The candidate will understand the variety and assess the role of equities in investment portfolios. The candidate will demonstrate an understanding of the distinguishing investment characteristics and potential contributions to investment portfolios of the following major asset groups:
 - Real Estate
 - Public Equity
 - Private Equity
 - Infrastructure
 - Commodities
 - Hedge Funds
 - Timber and Farmland Investments
 - Distressed debts

Learning Outcomes:

- (3a) Demonstrate an understanding of the investment strategies and portfolio roles that are characteristic of various types of equity and alternative investments
- (3b) Use different types of equity and alternative investments available for an investor's growth allocation in portfolio construction, considering portfolio design, risk management, liquidity management, manager selection, implementation, taxation, and benchmarking
- (3d) Recommend and justify an optimal portfolio allocation in a risk-return framework

Sources:

Handbook of Alternative Assets, Mark Anson, 2nd Edition, Ch.16 and 20.

Commentary on Question:

This question tests the candidates' understanding of venture capital investments and their role in an institutional portfolio.

Solution:

- (a) Describe two concerns about young venture capital funds that focus on rapid IPOs with respect to the returns of private equity.

Commentary on Question:

The candidates performed below average on this section. The candidates were successful at identifying the negative impact on the return of a rapid IPO and its consequence for the investor. Almost none of the candidates considered the market condition as a contributor to the value of the company at the time of an IPO.

11. Continued

The focus on rapid IPO of a new venture capital might be due to the large inflows of capital in the market. With so much capital to invest in the market chasing for a good deal, this may result in overvaluation of the company which result in an IPO not based on real economic value of the company.

Usually, a start-up company needs time to grow after huge losses in the first few years. A rapid IPO may not encourage a good development of the real potential of the company. This may result in undervaluation and causes real wealth losses in the form of underpriced IPO and lower equity value.

- (b) Describe the J-curve effect.

Commentary on Question:

The candidates performed below average on this section. Very few candidates described the potential to realize a successful IPO and its impact for the investors. The majority explained only the shape of the curve relative to the rate of return. A few candidates explained the negative return associated with the loss in the first years.

This curve represents the life cycle value of the venture capital fund. During the first 4-5 years, the venture capital fund produces a pile of losses which generate a negative return. Such loss eventually will be financed by the profit of successful start-up companies in the fund, whose positive cash flows will overcome the initial losses and result a net profit for the fund. The last stage is the windup or liquidation of those companies and realization of the residual value of the fund. The risk of a complete loss of investment is higher as the risk of failure for new and young companies is high. In any industry there are always failures since not every start-up company makes it to the IPO stage.

- (c) Justify the contribution of the general partner to the investment process.

Commentary on Question:

The candidates performed below average on this section. A few candidates were successful at identifying the general partner (GP) as an expert to identify the opportunities and a key person for the success of the start-up. The majority of the candidates did not describe the role of the GP in attracting investors and identifying the timing for an IPO.

The GP can contribute by:

- Recognizing business opportunities.
- Bringing expertise to the start-up company to make a profit.
- Assessing timing and likelihood of an exit strategy.
- Maintaining contact with companies able to acquire the start-up companies and investment bankers to facilitate an IPO or other venture capitalist for the second round of financing.

11. Continued

- (d)
- (i) Describe two characteristics of venture capital investments for each perspective.
 - (ii) Evaluate whether the venture capital investments are appropriate for the pension plan for each perspective.

Commentary on Question:

The candidates performed below average on part (i) of this section. Most candidates did not provide relevant descriptions of the specific characteristic of venture investments.

The candidates performed above average on part (ii) of this section. Almost all candidates were successful at justifying the venture capital investment due to the time horizon and recognized the VC as diversifier of the traditional assets. The candidates failed to consider the impact of negative returns in the first years and the need to maintain liquidity to meet the call commitment.

- (i)
- a. Investment return
 - Over a long-term horizon the returns of VC investments are expected to outperform the S&P 500.
 - The venture capital needs to be compensated for risks of failure of start-up company.
 - b. Time horizon
 - The venture capital fund is generally a long-term investment with a time horizon of 10 years or more.
 - Initial losses during the first 4 or 5 years will only be made up over a long time which requires the investors to be patient and long-term oriented.
 - c. Liquidity
 - There is no public market for trading investments in venture capital so it is highly illiquid.
 - Investors must commit capital investment in the fund-raising stage and expect to invest the capital later (4-5 years after the fund-raising).
 - d. Diversification
 - The regional concentration of a venture capital does not provide sufficient diversification.
 - Venture capital does not invest in any single investment but diversifies across several investments.

11. Continued

(ii)

a. Investment return

Acceptable if pension plan could accept negative returns on this investment especially at time of capital calls by venture capitalists when the venture capital fund is in deficit.

b. Time horizon

The pension plan currently supports a young workforce and has limited short term payout expectations. Given the long-term nature of the liabilities, long-term investments in venture capital is an appropriate way to increase the long-term expected return.

c. Liquidity

Liquidity requirements are acceptable since the pension plan has low immediate liquidity needs in terms of short term payout to retirees. However, the plan must manage the liquidity needs at the time of commitment calls by the general partner.

d. Diversification

Studies have shown that VC has a low correlation with traditional assets classes, and therefore VC investments could provide good diversification for a portfolio of bonds and stock of the current pension fund.

(e) Recommend a vehicle for the pension plan.

Commentary on Question:

The candidates performed below average on this section. Most candidates correctly recommended limited partnership as the proper investment vehicle. Only a minority of candidates explained more than two key elements for the justification.

Limited partnership is recommended for the pension plan because:

- Since VC investments is a small part of pension assets, it is not easy to justify recruiting or retaining experts or developing extensive expertise within the pension plan;
- The LLP vehicle requires less influence and interventions from the pension plan on the fund's operations than LLC;
- The LLP is an appropriate form to meet the objective to be a passive investor without knowledge and possibility with of a large group of small investors.

12. Learning Objectives:

4. The candidate will understand the nature, measurement and management of liquidity risk in financial institutions.

Learning Outcomes:

- (4c) Demonstrate an understanding of the levels of liquidity available with various asset types and the impact on a company's overall liquidity risk
- (4d) Apply liquidity risk models using scenario analysis with various time horizons
- (4e) Understand and apply techniques to manage stress liquidity risk

Sources:

QFIP-117-13: Reflections on Northern Rock

QFIP-106-20: Liquidity Risk: Measurement and Management

Commentary on Question:

Candidates were asked to perform a calculation on balance sheet leverage in part a and subsequent descriptions of liquidity considerations on parts b to d. Successful candidates identified the correct leverage ratio on the balance sheet and manipulated the capital changes to describe the ratio's change. Part b asks the candidates to further describe the implications of a leverage change, expressed in the form of haircut movements. The remaining parts required describing potential changes in the balance sheet through stress testing and liquidity scenarios.

Solution:

- (a) Calculate the leverage ratio on common equity for JKL before and just after the market event.

Commentary on Question:

The candidates performed as expected on this section. Many candidates recognized that leverage will increase after the conversion. Some candidates used the liability to equity ratio instead of asset to equity ratio.

Balance sheet leverage is the ratio of assets to common equity (total equity less preferred shares and subordinate debt). The leverage ratio moves from 10 ($1,000/80.25$) to 13.25 ($1,000 / 75.5$) after preferred shareholders convert.

- (b) Describe the potential impact of an increase in haircuts on a highly leveraged borrower holding illiquid assets.

Commentary on Question:

The candidates performed below average on this section. Candidates often identified the potential for a margin call but did not describe the causes leading up to it.

12. Continued

High leverage exposes a company to large shifts in funding when haircuts change, borrowing at a higher haircut will reduce leverage quickly. Asset sales would be required to meet a margin call.

- (c) Critique the use of hypothetical data in stress testing.

Commentary on Question:

The candidates performed as expected on this section. Most candidates identified a positive and a negative aspect of using hypothetical data. Listing multiple pros and cons of hypothetical data use achieved full credit.

Stress testing is helpful when is based on historical experience, is tailored to meet customized scenarios, and helps management identify the most important variables. It is often subjective, not always accurate, and usually provides data on the magnitude of potential losses and not their probability.

- (d) Describe the principles of deterministic liquidity scenario testing.

Commentary on Question:

The candidates performed as expected on section. Many candidates identified some principles of good liquidity scenarios, but not all available answers.

Liquidity scenarios should be coherent, reflect a worst-case scenario, last long enough to capture effects over time, and require multiple triggers to occur.

13. Learning Objectives:

3. The candidate will understand the variety and assess the role of equities in investment portfolios. The candidate will demonstrate an understanding of the distinguishing investment characteristics and potential contributions to investment portfolios of the following major asset groups:
 - Real Estate
 - Public Equity
 - Private Equity
 - Infrastructure
 - Commodities
 - Hedge Funds
 - Timber and Farmland Investments
 - Distressed debts

Learning Outcomes:

- (3a) Demonstrate an understanding of the investment strategies and portfolio roles that are characteristic of various types of equity and alternative investments
- (3d) Recommend and justify an optimal portfolio allocation in a risk-return framework
- (3e) Demonstrate an understanding of issues related to incorporating Environmental, Social, and Governance (ESG) criteria into the investment process

Sources:

Managing Investment Portfolios, Maginn & Tuttle, 3rd Edition, 2007 ,Ch. 7: Equity Portfolio Management

QFIP-133-19: Environmental, Social, and Governance Criteria: Why Investors Should Care

Commentary on Question:

This question tested the candidates' understanding of investment strategies and manager contribution to portfolio return, along with characteristics of different asset types and knowledge of ESG criteria in asset selection.

Solution:

- (a) Construct a portfolio with manager B and manager C that has an expected return above 8%, an active risk below 2% and an information ratio above 4.2, you can't "short" a manager.

13. Continued

Commentary on Question:

The candidates performed above average on this section. Candidates who attempted this problem or recognized that no feasible solution exists were awarded full or close-to full credit. A very small number of points were deducted from candidates that used an incorrect active risk formula or showed no work. Formulas within Excel did not need to be separately identified for full credit. If the formula could be determined by clicking on the cell and reading the formula bar, that was satisfactory.

Information Ratio (IR) = mean active return / active risk

The feasible solution does not exist using the parameters given.

- (b) Recommend an appropriate benchmark for each manager.

Commentary on Question:

The candidates performed brilliantly on this section. Most candidates correctly identified all six appropriate benchmarks, although some candidates lost credit for not providing additional justification for their recommendation.

A: XYZ Value – Low P/E is a substyle of value investing style, implies stock is cheap.

B: XYZ Growth – High P/E is usually linked to the growth style.

C: XYZ Value – This is a contrarian style, which is a substyle of value investing.

D: XYZ Small Cap – Focuses on stocks with very low market capitalizations.

E: XYZ Energy – Energy market oriented, specialized in the energy sector.

F: XYZ: Commodity – Commodity market oriented, specialized in agriculture firms.

- (c) Analyze whether it is worth hiring manager C compared to index investing.

Commentary on Question:

The candidates performed poorly on this section. Very few candidates calculated true active risk, true active return, or the true information ratio. While correctly calculating the true information ratio should have led candidates to recommend hiring manager C, partial credit was awarded to candidates who provided any recommendation and justified their answer in the context of added return vs added risk. Additionally, candidates were not penalized for using an information ratio formula that was based on the formula used in part (a).

In order to solve this problem, we should calculate the true information ratio = (true active return)/(true active risk).

13. Continued

True Active Return = $10\% - 9\% = 1\%$
Misfit Active Return = $9\% - 8\% = 1\%$
Misfit Active Risk = 2%
True Active Risk = $\sqrt{(5\%)^2 - (2\%)^2} = 4.58\%$

True Information Ratio = $1\% / 4.58\% = .218$

Because Manager C has a positive true active return and true information ratio, he is adding value and we should hire them.

- (d) Justify your decision. (Hint: Explain how manager F may represent more risk than the statistics are telling and how manager E may represent more opportunity.)

Commentary on Question:

The candidates performed as expected on this section. Most candidates recognized the importance of ESG criteria. Many candidates provided only a brief response to this question and were only awarded partial credit. A wide range of answers were also acceptable, provided the candidate justified their answers.

Some candidates provided quantitative answers in response to this question without expanding on the ESG components or the qualitative differences between E and F. While this was awarded partial credit, the Hint was written to point candidates in the direction of why F may represent “more risk than the statistics are telling and how manager E may represent more opportunity”. Thus, a more qualitative answer was expected.

Manager F may represent more risk because consumers and the public are continuing the question the role of agriculture in driving deforestation and climate change. Additionally, agrochemical companies could be involved in other controversial practices such as the use of GMO tech and pesticides. Agrochemical and agricultural companies could face the risk of:

- Adverse publicity
- Public protest
- Consumer boycott
- Government regulation

Comparatively, Manager E satisfies environmental, social, and governance (ESG) criteria that may benefit positively from future regulations and consumer tastes and behavior. This has additional benefits for a long-term oriented investment. For that reason, Manager E has substantially more opportunity for investment than Manager F, despite the higher return shown by current statistics.

14. Learning Objectives:

2. The candidate will understand:
 - The credit risk of fixed income portfolios, securities, and sectors and be able to apply a variety of credit risk theories and models.
 - How rating agencies rate corporate and sovereign bonds.

Learning Outcomes:

- (2a) Demonstrate an understanding of credit risk analysis and models
- (2b) Demonstrate an understanding of the basic concepts of credit risk modeling such as probability of default, loss given default, exposure at default, and expected loss
- (2e) Demonstrate an understanding of measuring and marking-to-market counterparty credit risk in credit derivatives
- (2g) Demonstrate an understanding of events and causes of the 2008 global financial crisis (GFC)

Sources:

The xVA Challenge: Counterparty Risk, Funding, Collateral, Capital and Initial Margin, Gregory, Jon, 4thEdition, 2020, Ch. 1

The xVA Challenge: Counterparty Risk, Funding, Collateral, Capital and Initial Margin, Gregory, Jon, 4thEdition, 2020, Ch. 2

The xVA Challenge: Counterparty Risk, Funding, Collateral, Capital and Initial Margin, Gregory, Jon, 4thEdition, 2020, Ch. 3

The xVA Challenge: Counterparty Risk, Funding, Collateral, Capital and Initial Margin, Gregory, Jon, 4thEdition, 2020, Ch. 12

Commentary on Question:

This question tests candidates' understanding of the 2008 global financial crisis as well as basic concepts of credit risk modeling and measuring of counterparty credit risk.

Solution:

- (a) Describe how the measures developed by regulators after the global financial crisis helped to reduce the counterparty and liquidity risks of financial institutions.

Commentary on Question:

The candidates performed poorly on this section. Many candidates did not identify the correct measures developed by regulators after the global financial crisis to reduce the counterparty and liquidity risks of financial institutions. Among the few candidates that did identify the correct measures, a description was not given.

14. Continued

Counterparty Risk:

- (1) Additional capital charges (CVA capital charge): financial institutions have done reappraisals of the assumptions they make when pricing and valuing OTC derivatives. When counterparty risk consideration has become more important, a significant value of credit value adjustment (CVA) needs to be reported.
- (2) Central clearing mandate: OTC derivatives transactions need to be operated via central clearing. This also led to new capital requirements for exposures to central counterparties which in turn required new bilateral capital methodology.

Liquidity Risk:

- (1) Liquidity coverage ratio: Basel III introduced liquidity coverage ratio requirements for banks and financial institutions. Banks were required to maintain higher level of capital to give them more of a financial cushion.
- (2) Net stable funding ratio: Basel III also introduced net stable funding ratio to guide banks and financial institutions to maintain enough available stable fundings over required stable fundings.

- (b) Explain how the mitigation of counterparty risk could introduce other risks.

Commentary on Question:

The candidates performed below average on this section. Many candidates only received partial credits by identifying which other risks were created due to the mitigation of counterparty risk without further explanations.

The mitigation of counterparty risk can create other types of risk, such as liquidity and operational risk. Mechanisms such as collateralization or central clearing, often comes at the potential increased funding liquidity risk, i.e., the inability to fund contractual payments or collateral requirements, which potentially forcing an early liquidation of assets and crystallization of losses.

- (c)
- (i) Compare briefly how real-world and risk-neutral measures of default probabilities are typically determined.
 - (ii) Describe two potential issues with the data shown in the table above.

Commentary on Question:

The candidates performed brilliantly on this section. Almost all candidates compared how real-world and risk-neutral measures of default probabilities are measured, and identified issues with the data in the table.

14. Continued

- (i) A real-world default probability is typically estimated from historical default data via some associated credit rating. A risk-neutral default probability is derived from market data using instruments such as bonds or CDS.
- (ii) (1) Rating B (Company Omega) has Real-world default probability higher than Risk-neutral probability. This is probably wrong because Risk-neutral DP is empirically higher than Real-world DP, since investors are risk-averse and demand a premium for accepting default risk.
- (2) Default probability should increase as credit rating deteriorates. Company Sigma (Ba rating) has lower Risk-neutral DP than Company Delta (Baa rating), which is questionable.
- (d) You are designing a CDS for this corporate bond and want to estimate the credit spread of this CDS. Below are three general approaches you are considering to obtain the credit spread:
- Direct observable
 - Single-name proxies
 - Generic proxies

Recommend which approach you should use.

Commentary on Question:

The candidates performed as expected on this section. Many candidates received full credit for recommending to use single-name proxies approach and provided reasons why. A few candidates did not get any credit for recommending the incorrect approach.

Recommend to use Single-name proxies.

The bond of Beta plus is recently issued, so its credit spread is not directly observable in the market.

Beta is the parent company of Beta plus, whose credit spread can be used as a good proxy of the corporate bond of Beta plus.

- (e) Compare the single-name proxies and generic proxies approaches.

Commentary on Question:

The candidates performed as expected on this section. Many candidates compared the single-name proxies and general proxies approaches. Candidates who received full credit also compared liquidity and capital relief under the two approaches.

14. Continued

Approach	Liquidity	Capital Relief
Single-name proxies	Medium	None
Generic proxies	Good	Partial

15. Learning Objectives:

2. The candidate will understand:
 - The credit risk of fixed income portfolios, securities, and sectors and be able to apply a variety of credit risk theories and models.
 - How rating agencies rate corporate and sovereign bonds.

Learning Outcomes:

- (2a) Demonstrate an understanding of credit risk analysis and models
- (2b) Demonstrate an understanding of the basic concepts of credit risk modeling such as probability of default, loss given default, exposure at default, and expected loss

Sources:

Credit Risk Modeling, Bolder, David, 2018 Chapters 1 & 2

Commentary on Question:

This question tested candidates understanding of credit risk analysis and models.

Solution:

- (a) Describe one advantage and one disadvantage of one-factor credit risk modeling.

Commentary on Question:

The candidates performed brilliantly on this section. A few candidates only listed one advantage or one disadvantage and thus received partial credit.

- Advantage: The availability of a broad range of analytical formulae for its solution and computation of ancillary model information.
- Disadvantage: May be too simple to describe more complex credit portfolios

- (b) Calculate the expectation and volatility of L .

Commentary on Question:

The candidates performed as expected on this section. Most candidates correctly calculated the expectation of L . Overall, candidates were less successful in correctly calculating the volatility of L . Partial credit was awarded for instances where candidates used correct formulas but made a calculation error.

$$E(L) = c_1 * p_1 * (1 - R_1) + c_2 * p_2 * (1 - R_2) = 2 * 100 * 0.05 * (1 - 0.3) = \$7$$

$$\sigma(L) = c_1 * (1 - R_1) * \sqrt{2 * p_1 * (1 - p_1)} = \$21.575$$

15. Continued

- (c)
- (i) Derive an expression for the volatility of L as a function of the number of obligors N .
 - (ii) Calculate the minimum number of obligors needed to reduce ABC's risk S below 5%.

Commentary on Question:

*The candidates performed below average on this section. Candidates who were successful on calculating the volatility of L in part (b), were generally more successful in deriving the expression in (c)i. For (c)ii, many candidates correctly noted that $S = L/(100 * N)$ and $\sigma(S) = \frac{\sigma(L)}{100*\sqrt{N}}$ however, some of these candidates calculated a different number of obligors due to not deriving the correct expression in (c)(i). Some candidates omitted this part of the question.*

- (i)
$$\text{var}(L) = N * c_1^2 * (1 - R_1)^2 * \sqrt{p_1 * (1 - p_1)}$$
$$\sigma(L) = \sqrt{N} * c_1 * (1 - R_1) * \sqrt{p_1 * (1 - p_1)}$$
$$= \sqrt{N} * 100 * (1 - 0.3) * \sqrt{0.05 * (1 - 0.05)} = 15.256 * \sqrt{N}$$
- (ii)
$$S = L/(100 * N)$$
$$\sigma(S) = \frac{\sigma(L)}{100*\sqrt{N}} = 0.1526/\sqrt{N}$$
$$\sigma(S) = 5\% \text{ implies } N=9.31; \text{ therefore at least 10 obligors are needed}$$

- (d)
- (i) Explain *the Law of Rare Events* as described in the Bolder reading.
 - (ii) Derive an approximation for the volatility of L based on *the Law of Rare Events* for large N , and considering $p = 0.05$ to be very small.

Commentary on Question:

The candidates performed poorly on this section. The candidates that accurately described the Law of Rare Events were generally successful in deriving the approximation in (d)ii. Many candidates omitted this part of the question.

- (i) When comparing loss distributions generated from a Binomial model $\text{Bin}(p, N)$, and a Poisson model (defined by $\lambda = Np$). If N is very large and p is very small, these two distributions will coincide with one another, i.e., experience a form of convergence.

15. Continued

(ii) Variance from Poisson distribution is by $\lambda = Np$
So approx. $\text{vol}(L) = \sqrt{N} * 100 * .7 * \sqrt{.05} = 70 * \sqrt{.05N}$

(e)

(i) Calculate the value of risk metric S using the approximation from (d)ii above.

(ii) Compare your estimate to the value obtained using an exact calculation.

Commentary on Question:

The candidates performed poorly on this section. Candidates who were successful on part (d) generally performed well on part (e). Many candidates omitted this part of the question.

(i) $N = 5000 / 100 = 50$

Using the approximation from (d)ii, $S = 70 * \sqrt{.05 * 50} / 5000 = 2.21\%$

(ii) Exact answer: $S = \frac{0.1526}{\sqrt{N}} = 2.16\%$. Answers are very similar, suggesting N is large and p is small.

16. Learning Objectives:

4. The candidate will understand the nature, measurement and management of liquidity risk in financial institutions.

Learning Outcomes:

- (4a) Demonstrate an understanding of liquidity risk and the threat it represents to financial intermediaries and markets
- (4e) Understand and apply techniques to manage stress liquidity risk
- (4f) Create liquidity risk management plans and procedures, including addressing appropriate product design, investment guidelines, and reporting given a desired liquidity risk level

Sources:

QFIP-123-16: Liquidity Risk Management: Best Risk Management Practices. CRO Forum, October 2008, p.4, 6-7,

QFIP-123-16: Liquidity Risk Management: Best Risk Management Practices. CRO Forum, October 2008, p.11-14.

QFIP-105-13: Report of the Life Liquidity Work Group of the American Academy of Actuaries to the Life Liquidity Risk Working Group of the NAIC (final), p.6-7.

QFIP-105-13: Report of the Life Liquidity Work Group of the American Academy of Actuaries to the Life Liquidity Risk Working Group of the NAIC (final), p.8-13.

QFIP-123-16: Liquidity Risk Management: Best Risk Management Practices. CRO Forum, October 2008, p.9-10

QFIP-105-13: Report of the Life Liquidity Work Group of the American Academy of Actuaries to the Life Liquidity Risk Working Group of the NAIC (final), p.4.

QFIP-105-13: Report of the Life Liquidity Work Group of the American Academy of Actuaries to the Life Liquidity Risk Working Group of the NAIC (final), p.13-17

Commentary on Question:

This question tests liquidity risk concepts, measurement, and management. The candidate performed above average on this section. Many different answers were eligible for points so long as the candidates' responses were well-defended and consistent.

16. Continued

Solution:

- (a) Your coworker made the following comment:

“Our company is rated AAA by multiple rating agencies and has a strong capital position. In addition, we used very conservative assumptions in calculating our risk-based capital, which means we would have enough in reserve should additional capital be needed. Therefore, the liquidity risk is low”

Critique the comment.

Commentary on Question:

The candidates performed as expected on this section. Most candidates stated that strong capital position does not equate to low liquidity risk, as well as described what liquidity risk is. However, most candidates did not clearly explain why.

Liquidity risk can be defined as the risk that cash sources are insufficient to meet cash needs under either current condition or possible future environment. Liquidity risk is an asset/liability concern. It is neither solely an asset risk nor a liability risk.

A risk based capital approach is not workable in liquidity risk management because stress liquidity is not a problem with a specific asset or liability type, but rather with the interaction of assets, liability and company management. It is not true that the rating and financial strength (mainly the capital position) of a company are the only indicators of a company’s stress liquidity risk.

- (b) List four scenarios where your company may experience stress liquidity risk.

Commentary on Question:

The candidates performed above average on this section. Most candidates listed three to four scenarios.

Changing interest rate. Increase in interest rate causes lapses due to policyholders seek better returns.

Large claims resulting from a single or series of contagion events.

Liquidity needs arising from a large operational loss event.

Negative publicity on the company or negative event within the industry, which causes run-on-the-bank.

Impaired capital markets.

- (c) Explain how this new life product would impact liquidity for the company and how it can be managed.

16. Continued

Commentary on Question:

The candidates performed above average on this section. Most candidates recognized large face amount, reduced surrender charge and policy loan would all possibly cause liquidity issue, as well as provided product designs and financial tools that reduce and remedy liquidity risk.

The amount of money controlled by a single policy holder is very important and is a key contributor to failure with respect to stress liquidity. A large death claim could create large unexpected cash need. This could lead to stress liquidity risk. Liquidity risk increases as surrender charges drop. Ability for policy loan could also cause liquidity concern as in a stress scenario, people would borrow as much as they can against the policy.

Product design and pricing should take into consideration the potential cash need and liquidity risk, and assume worse than usual assumptions in surrender and policy loans under stress scenarios.

Reinsurance can be an effective way to manage liquidity risk from large single claims.

Liquidity can also be provided through external or contingent lines.

- (d) Your coworker also made the following comment:

“To manage liquidity risk, we need to invest in the most liquid assets in the financial markets, such as, treasury bonds and money market securities. This way the company is guaranteed the ability to raise cash quickly when needed.”

Critique the comment.

Commentary on Question:

The candidates performed as expected on this section. Most candidates pointed out liquidity premium hurts product profitability. Many candidates correctly stated that asset allocation should meet liability needs. Only some candidates pointed out that liquidity could also turn illiquid under market stress, and product design is the first place for liquidity risk management.

A company’s strategic asset allocation should directly reflect the liquidity needs of its liability. It is important to try to “match” liquidity needs on liability side with liquidity sources within asset portfolio.

If company’s products have predictable cash needs, there will be less challenges to construct asset portfolios and it may be ok to use less liquid asset to balance between liquidity and return.

Company investing totally in treasury bonds and money market may not have liquidity risk, but would have profitability issue and have challenge remaining in business. History has shown that asset classes traditionally viewed as quite liquid can turn illiquid.

16. Continued

- (e) Explain how to construct a liquidity coverage ratio and how it can be used to manage liquidity risk.

Commentary on Question:

The candidates performed as expected on this section. Most candidates defined the liquidity coverage ratio and when to intervene. Some candidates also pointed out liquidity coverage ratio should be considered by different time frame and under different (stressed) scenarios. Some candidates described the detail on asset and liability cash flow.

Liquidity Coverage Ratio is the ratio of cash source to cash needs (or market value of liquidity assets to value of liabilities).

Project future expected and unexpected asset principal and interest payments. Determine bid/ask spread on assets to calculate “haircut” and the realized asset value.

Project known future interest payments and liability maturities, including withdrawal, surrender, policy loans and others.

Using projected cash source and cash needs, calculate coverage ratio by time horizon and under base and stressed scenarios.

If the results of the analysis are generally poor (e.g, the results of liquidity coverage ratio is lower than one), corrective action should be considered.

17. Learning Objectives:

5. The candidate will:
- Demonstrate an understanding of regulatory and accounting frameworks around investment governance.
 - Understand how to develop an investment policy including governance for institutional investors and financial intermediaries within regulatory and accounting constraints.
 - Understand how rating agency frameworks affect portfolio construction and management.

Learning Outcomes:

- (5b) Explain how investment policies and strategies can manage risk and create value
- (5d) Determine how a client's objectives, needs and constraints affect investment strategy and portfolio construction. Considerations and constraints include:
- Capital and expected return on allocated capital
 - Risk appetite and risk-return trade-off
 - Tax
 - Accounting
 - Regulators
 - Rating agencies
 - Liquidity

Sources:

QFIP-137-19: Managing your Advisor: A Guide to Getting the Most Out of the Portfolio Management Process, P8-10

QFIP-137-19: Managing your Advisor: A Guide to Getting the Most Out of the Portfolio Management Process, P16-20

QFIP-136-19: Elements of an Investment Policy Statement for Institutional Investors, p7-9

QFIP-136-19: Elements of an Investment Policy Statement for Institutional Investors, p3-4

Commentary on Question:

This question tests candidates understanding of investment policies.

Solution:

- (a)
- (i) Identify each product
 - (ii) Describe how each product would require portfolio construction differently.

17. Continued

Commentary on Question:

The candidates performed above average on this section. Most candidates identified the two products. Candidates commented on the relative duration and liquidity need between the two portfolios, however often candidates did not meet both.

Product A is the active VA business since there is cash in-flow from premium and cash out-flow for commissions.

Product B is the legacy business since there is no premium payment and large benefit payments.

For the VA, premium inflow is heavily related to benefits and contracts are in earlier durations. The asset base is small with little investment income and few bonds maturing. Portfolio construction should be oriented towards a robust, diversified portfolio with durations to match future liabilities.

For the closed block UL product, contracts will be paid out in the near future.

Positive cash flow comes from investment income and maturity payments.

Investments should be oriented towards building an adequately liquid, high cash flow portfolio with relatively short duration.

- (b) The portfolio backing the legacy block of business contains several bonds with five years remaining until maturity with a book yield of 6%. The current market yield for a 5-year bond is 4%. It is estimated that the liability duration for this block is less than ten years. The portfolio manager thinks we can sell these bonds to harvest a capital gain.

Critique the proposal.

Commentary on Question:

The candidates performed below average on this section. Most candidates identified that the capital gain would result in a mismatched portfolio and reinvestment would be required in a lower rate environment. Some candidates identified the tax implications. Few candidates described the EV impact from the sale.

In general, selling these bonds could shorten the duration of the portfolio, depending on what is done with the proceeds, creating a potential duration mismatch.

The company may be constrained by EV/EVA, which means the present value of distributed earnings need to be intact when a security is sold.

When the bond is sold it would create a capital gain. The proceeds need to be invested to produce the future cash flows so the EV/EVA is intact.

If we sell the bond and replace it with a new 10 year bond for EV/EVA purpose, it will lengthen the duration of the portfolio

17. Continued

Capital gains are normally subject to tax, therefore the proceeds would be insufficient to produce the desired cash flow and EV/EVA will be decreased. However since tax is calculated on consolidated basis and gains and losses are netted against each other, it may be recommended to sell to realize the gain. The sale may also have a negative impact on credited rates. We should also be careful not to reduce a portfolio's credit quality, cash flow matching or maturity structure, or increase concentration risk in a single issuer.

- (c) Describe typical constraints in an IPS.

Commentary on Question:

The candidates performed brilliantly on the section. Most candidates identified the key constraints in the IPS. Candidates earned part marks for incomplete solutions.

Define an evaluation horizon for achievement of performance objectives.
Identify any requirements for maintaining liquidity.
Identify tax consideration that will affect investment decision making.
Specify any policies related to leverage.
Identify any restrictions on investment in foreign securities or investment.
Specify a policy on foreign currency management, if relevant

- (d) Describe how an IPS would document governance.

Commentary on Question:

The candidates performed brilliantly on this section. Most candidates identified components of the IPS governance with many candidates earning full marks.

An IPS can document governance in following ways:
Specify who is responsible for determining investment policy, executing investment policy, and monitoring the results of implementation of the policy.
Describe the process for reviewing and updating the IPS.
Describe the responsibility for engaging and discharging external advisers.
Describe the roles and responsibilities of board and staff.
Assign responsibility for determination of asset allocation, including inputs used and criteria for development of input assumptions.
Assign responsibility for risk management, monitoring and reporting.