QFI PM Model Solutions
Fall 2023

1.   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
- Commodities
- Hedge Funds
- 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, and implementation.

Sources:
Anson, M, *Handbook of Alternative Assets*, 2nd Edition, Chapter 16

Commentary on Question:
This question tested the candidates' understanding of venture capital.

Solution:
(a)   Explain why venture capitalists are not passive investors.

Commentary on Question:
The candidates performed below average on this section. While most candidates correctly noted that venture capitalists take an active role in the company, many of them did not provide any additional explanation.

1. Continued

Venture capitalists are not passive investors because:
- Once they invest in a company, they take an active role either in an advisory capacity or as a Director on the Board
- They monitor the progress of the company, implement incentive plans for the entrepreneurs and management, and establish financial goals for the company
- They provide management insight
- They usually have the right to hire and fire key managers, including the original entrepreneur
- They provide access to consultants, accountants, lawyers, investment bankers, and other business that may acquire the startup company's product

(b) Calculate the total compensation the venture capitalist will receive at the end of the first year.

Commentary on Question:
The candidates performed brilliantly on this section. Most candidates received full credit. A common mistake for those that did not receive full credit was to calculate the management fee using the $30m of invested capital instead of the $50m of committed capital. Partial credit was awarded in cases where candidates stated the correct formulas but made a calculation error.

Total Compensation = Management Fee + Incentive Fee
Management Fee = Management Fee Rate * Committed Capital = 2% * $50m = $1m
Incentive Fee = Max[20% * Profits, 0] = 20% * $6m = $1.2m
Total Compensation = $1m + $1.2m = $2.2m

(c)

   (i) Assess which option is more likely to be chosen by the venture capitalist.

   (ii) Assess whether the venture capitalist's selection benefits ABC or is optimal for ABC.

Commentary on Question:
The candidates performed below average on this section. Many candidates correctly identified Option 2 as the strategy most likely to be chosen by the venture capitalist in (i). Some candidates did not provide any supporting calculations and thus received partial credit. Some candidates incorrectly concluded that the venture capitalist would most likely choose Option 1 solely due to its higher expected return, which doesn't consider the "free" call option on the profits. Partial credit was awarded in such instances, provided the underlying expected return calculations were correct. Additionally, many candidates noted that Option 2 was not beneficial to ABC in (ii), but again, some candidates did not provide any supporting calculations and thus received partial credit.

1. Continued

(i) Option 2 is more likely to be chosen by the venture capitalist because:
- *They will earn a 20% incentive fee on any profit the investment generates. The first option is expected to generate an incentive fee of $50m * 5% * 90% * 20% = $0.45m, while the second option is expected to generate a greater incentive fee of $50m * 50% * 20% * 20% = $1m.*
- *The venture capitalist's incentive fee income is similar to the payout of a call option on the profits. This means that the venture capitalist is encouraged to make riskier investments. The venture capitalist will not be penalized if the investment incurs losses (i.e. the call option is free).*

(ii) The venture capitalist's choice of Option 2 is not beneficial to ABC because it has a lower expected return.
- Option 2 has an expected return of $50m * 50% * 20% + $50m * -20% * 80% = -$3m, while Option 1 has an expected return of $50m * 5% * 90% + $50m * -5% * 10% = $2m.

(d) Recommend covenants that ABC should include in the venture capital partnership agreements given the answer to part (c).

Commentary on Question:
The candidates performed below average on this section. Many candidates listed only one covenant, with the most common response being the clawback covenant.

Examples of recommended covenants are:
- Clawback: Previously paid incentive fees can be recouped at the end/liquidation of the fund if investors have not earned a profit.
- Escrow Agreement: Agreement where a portion of the incentive fees are held in a segregated account until the fund is liquidated. This ensures the venture capitalist does not walk away with profits unless the limited partners also receive profits.
- Prohibition on distribution of profit-sharing fees to the venture capitalist until all committed capital is paid back to the limited partners: The limited partners must be paid back their invested capital before profits are shared with the venture fund. A covenant such as this could also be extended to ensure that the limited partners receive all management fees before the venture capitalist can collect incentive fees.

2. **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
    - Commodities
    - Hedge Funds
    - 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.

(3c) Explain the basic active equity selection strategies including value, growth and combination approaches, and compare techniques for characterizing investment style of an asset manager.

Sources:

Handbook of Alternative Assets, Mark Anson, 2nd Edition, 2006, Ch. 3: Introduction to Hedge Funds

Commentary on Question:

This question tested candidates' understanding of hedge fund characteristics and strategies. Generally, candidates performed below average for this question, primarily due to not attempting the question and not providing sufficient details to earn full credit.

Solution:

(c) Calculate the beta of the short-selling hedge fund.

Commentary on Question:

Candidates performed poorly on this section. Some candidates were able to correctly calculate the beta and earn full credit. Several candidates either left the question blank or provided the total return instead of the beta of the fund.

Under exam conditions, it was acceptable to use both the Greek subset symbols as well as the written form below.

For 20XX (subscript A below):
Beta(weightedA) = Beta-wA = 3/8 * Beta-marketA + 5/8 * Beta-HF = 3/8*1 + (5/8* Beta-HF)
r-A = rfa + Beta-wA * (rma – rfa) = 3.2% + Beta-wA (8% - 3.2%) = 0.05 + 0.03*Beta-HF

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2. **Continued**

Similarly, for 20YY (subscript B below):
Beta(weightedB) = Beta-wB = 8/20 * Beta-marketB + 12/20 * Beta-HF = 0.4 + (0.6* Beta-HF)
r-B = rfb + Beta-wB * (rmb – rfb) = 4% + 6% * (0.4 + (0.6* Beta-HF)) = 0.064 + (0.036* Beta-HF)

rA = rB implies:
0.05 + 0.03*Beta-HF = 0.064 + 0.036*Beta-HF
Beta-HF = -2.33
Note Excel goal-seek may have been used to solve for the final value as well for full credit.

(d) Recommend the most suitable hedge fund strategy for each investor.

Commentary on Question:
Candidates performed below average on this section. Some candidates deduced the optimal strategy using the investor details provided. Many candidates did not attempt this question or ignored some of these details, and recommended strategies that were inappropriate and/or inconsistent.

Investor A:
Global macro HF strategy meets all goals
- Lower fees than, for example, fund of funds, within the opportunistic HF strategy group
- Avoids idiosyncratic risk as in corporate restructuring strategies, and avoid event risk, as in convergence trading strategies
- Minimal leverage and broad market investing good in bull market, vs. arbitrage strategies

Investor B:
Equity long/short (in market-directional) or Market neutral (in convergence) HF strategy would work
- Directed investing can avoid international exposure and limit market exposure
- Directional view on sectors vs. individual stocks is obtained, unlike in other arbitrage strategies, such as relative value
- Net long position, vs. strictly short-selling

2.   Continued

Investor C:
Market neutral HF strategy meets all goals
- Limited to alpha but not beta risk (found in market-directional strategies) and relies on manager skill instead
- Optimal with the convergence trading strategies, as it removes reliance on regression which statistical arbitrage applies
- Limits credit risk found in fixed income strategies
- Avoids opportunistic strategies since in a bear market

3. **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
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- Commodities
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- 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, and implementation.

(3d)   Recommend and justify an optimal portfolio allocation in a risk-return framework.

Sources:

Anson, Handbook of Alternative Assets, 2nd Edition, Chapter 1, p.4-5

Anson, Handbook of Alternative Assets, 2nd Edition, Chapter 20, p.501 - 502.

Anson, Handbook of Alternative Assets, 2nd Edition, Chapter 1, p.10

Anson, Handbook of Alternative Assets, 2nd Edition, Chapter 20, p.508

Commentary on Question:
This question tests the candidate's understanding of private equity and its role in formulating an optimal portfolio allocation in a risk-return framework.

Solution:

(a)   Define each of the above super asset classes, including an asset example for each class in your answer.

    Commentary on Question:
    The candidates performed as expected on this section. Some candidates provided correct examples for each asset class but did not provide the correct definition.

3. **Continued**

- Capital assets: capital assets are defined by their claim on future cash flows of an enterprise and provide a source of on-going value.
  - Stocks, bonds, financial derivatives
- Assets used in economic inputs: physical assets that are consumed as part of the production cycle (i.e. consumable or transformable assets that can be converted to another asset).
  - Grains, metals, energy products, livestock
- Assets that store value: assets that are not associated with their claim on future cash flows and is a finished product.
  - Art, gold and precious metals not used in the production of other goods

(b)   Explain the sources of risk premium that allow venture capital investors to earn returns in excess of public market investors.

Commentary on Question:
The candidates performed above average on this question. Most candidates were able to correctly identify additional sources of risk and how they translate to higher risk premiums for the investor.

- Venture capital investors take on business risk before a company has the ability to fully implement its business plan and therefore expect additional compensation compared to investing in public corporations.
- Liquidity is lacking for venture capital investments. There is no secondary market for trading venture capital interests. What secondary market exists is limited to other private equity investors.

(c)   Describe the common legal structures of typical U.S. private equity funds and their implications for defined benefit pension plan investments.

Commentary on Question:
Candidates performed poorly on this question. Many candidates confused the legal structure associated with private equity funds with the underlying strategy (e.g., leveraged buyout). Most candidates also did not comment on the impact the legal structure has for defined benefit pension plans.

Private equity funds usually funneled through a financial intermediary and are commonly structured as limited partnerships, limited liability companies or special purpose vehicles.

Investments in private equity funds are less liquid than their public counterparts, and therefore cannot be reliably used to fund benefit payments.

3. Continued

(d) Recommend which portfolio to use.

Commentary on Question:

The candidates performed above average on this question. Most candidates were able to identify that both portfolios met the expected return objective. Some candidates were able to identify distressed debt has potential exposure to equity risk.

- Expected return of portfolio A = 20% x 3.5% + 80% x 5.0% = 4.7%
- Expected return of portfolio B = 20% x 3.5% + 60% x 5.0% + 20% x 7.0% = 5.1%
- Both portfolios generate sufficient returns to keep pace with the liabilities.
- Distressed debt investors seek to invest in debt securities of distressed companies, with the objective of converting the cheap debt holdings to equity, turn the company around, and benefit from stock appreciation.
- Given the potential exposure to equity through distressed debt conversion, portfolio B is does not achieve the second objective.
- Since only portfolio A achieves both objectives, it is recommended despite a lower Sharpe ratio overall.

4.

Learning Objectives:

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   - 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.

Sources:
Geltner Miller - CRE Analysis and Investment, Ch 14.

Commentary on Question:
This question tests the candidate's understanding of real estate investment analysis. For ease of illustration, the full Excel solution for the entire question is shown under part (c).

Solution:

(a) Calculate total tax payment in each of the next 10 years for the marginal investor under the two scenarios.

> **Commentary on Question**:
> *The candidates performed as expected on this section. Many candidates attempted part (a) and some answered the part correctly. Common errors included:*
> o *Setting annual loan interest expense for all years as the initial loan amount * loan interest rate, ignoring the fact that the loan amount decreases each year due to annual loan principal repayment.*
> o *Treating total purchase price, which included land value, as depreciable. Only the structure value (= purchase price – land value) is depreciable for computing the taxable income.*
> o *Treating loan principal payment as being tax deductible (it is not tax deductible)*
> o *Not adding capital gains tax and recapture tax at the end of year 10 Partial credit was given when the correct formula was applied in the Excel sheet even though the variable values used in the formula were derived incorrectly from prior steps.*
>
> See Excel exhibit in part (c)

4.   Continued

(b)   Calculate the after-tax IRR for the marginal investor under the two scenarios.

Commentary on Question:
The candidates performed below average on this section. Many candidates attempted the calculation but only a small portion answered it correctly. Common errors included:
- o   *Deriving "after-tax cash flow" from "pre-tax income – tax payment", not recognizing that the loan principal payment (a cash flow item) was not in the pre-tax income.*
- o   *Not deducting the initial loan amount from the current market value (purchase price) to obtain the correct initial investment amount.*

Partial or full credit was given when the correct formula was applied in the Excel sheet even though the variable values used in the formula were derived incorrectly from prior steps.

   See Excel exhibit in part (c)

(c)   Calculate the maximum price the pension fund should be willing to pay for this property considering the marginal investor's IRR.

Commentary on Question:
The candidates performed poorly on this section. Few candidates attempted part (c) and answered it correctly. Common errors included:
- o   *Deriving the pension fund's cash flows incorrectly.*
- o   *Not adding the initial loan amount to arrive at the total purchase price the pension fund can offer.*

Partial or full credit was given when the correct formula was applied in the Excel sheet even though the variable values used in the formula were derived incorrectly from prior steps.

4. Continued

	Year	0	1	2	...	9	10
14	Year	0	1	2	...	9	10
15	a. Pre-tax NOI		$700,000	$710,500	...	$788,545	$800,373
16	b. Projected property's selling price						$11,000,000
17	c. Total PBTCF (= a + b)		$700,000	$710,500	...	$788,545	$11,800,373
18	d. Property's current market value (purchase price)	$10,810,532					
19	e. Depreciable value (= purchase price - land value)	$7,810,532					
20	f. Annual depreciation expense (= e/50)		$156,211	$156,211	...	$156,211	$156,211
21	g. Annual loan principal payback		$30,000	$30,000	...	$30,000	$7,730,000
22	h. Remaing loan balance [h(t) = h(t-1) - g(t)]	$8,000,000	$7,970,000	$7,940,000	...	$7,730,000	$0
23	i. Annual loan interest expense [i(t) = h(t-1) * loan interest rate of 6.75%]		$540,000	$537,975	...	$523,800	$521,775
24	j. Captial gains tax [= Capital gains tax rate of 25% * (selling price - purchase price)						$47,367
25	k. Recapture tax (= Recapture tax rate of 35% * total claimed depreciation)						$546,737
26	**a(i) Total tax cash flows for scenario (i) [claiming depreciation expense]**						
27	l. Total tax cash flow [= Income tax rate of 25% * (a - f - i) + j + k]		$947	$4,079	...	$27,134	$624,701
28	**a(ii) Total tax cash flows for scenario (ii) [not claiming depreciation expense]**						
29	m. Total tax cash flow [= Income tax rate of 25% * (a - i) + j]		$40,000	$43,131	...	$66,186	$117,017
30	**b) Find marginal investor's after-tax IRR:**						
31	n. Equity after-tax cash flow for scenario (i) [for year 0: =loan amount - purchase price; for years >0: = c - g - i - l]	($2,810,532)	$129,053	$138,446	...	$207,611	$2,923,897
32	o. IRR for scenario (i)		5.70% <-- IRR(D31:O31)				
33	p. Equity after-tax cash flow for scenario (ii) [for year 0: =loan amount - purchase price; for years >0: =c - g - i - m]	($2,810,532)	$90,000	$99,394	...	$168,559	$3,431,582
34	q. IRR for scenario (ii)		5.80% <-- IRR(D33:O33)				
35	**c) Find the maximum price the pension fund should pay, using $8 million loan to finance the property purchase**						
36	Since the pension fund is tax-exmpt, it can use a taxble investor's after-tax IRR to set the maximum price it can pay for the property when other buyers are present .						
37	It's clear that a rational taxable investor can achive higher IRR (5.80%) by not claiming the depreciation expense						
38	Therefore, the pension fund should use 5.80% to set the maximum price it should pay						
39	r. Pension fund's PBTCF [= c - g - i]		$130,000	$142,525	...	$234,745	$3,548,598
40	s. PV of Pension fund's PBTCF at 5.80%	$3,231,686	<-- NPV(D34,E39:O39)				
41	t. Max price pension fund can offer is (= s + $8 million loan]	$11,231,686					

QFI PM Soluitons Fall 2023 Question4.xlsx

5.

Learning Objectives:

2.   The candidate will understand the credit risk aspects of individual securities, portfolios, and sectors and be able to apply a variety of credit risk theories and models to the investment management process.

Learning Outcomes:

(2a)   Demonstrate an understanding of credit analysis.

(2b)   Demonstrate an understanding of and the ability to apply both the concepts and techniques used in the measurement of default risk of individual securities.

(2c)   Understand and apply various approaches for managing credit risk in a portfolio setting, including the use of Credit Default Swaps.

Sources:

Handbook of Credit Risk Management, Bouteillé & Craig-Pushner, Ch 13 pages 213-214

Handbook of Credit Risk Management, Bouteillé & Craig-Pushner, Ch 13 page 215

Handbook of Credit Risk Management, Bouteillé & Craig-Pushner, Ch 13 pages 224-226

Handbook of Credit Risk Management, Bouteillé & Craig-Pushner, pages Ch 20 354-356

Commentary on Question:
This question is intended to test the candidate's understanding of the Credit Portfolio Management process, along with the use of Credit Default Swaps in hedging a credit exposure. Overall, candidates performed below average on this question, especially on question (a) and (b).

Solution:

(a)   Explain the two key activities in an active CPM strategy (as defined in Bouteille).

   Commentary on Question:
   The candidates performed below average on this section. Most candidates were able to identify the two key activities in active CPM strategy but failed to provide the correct explanation. No credit was given for key activities not in active CPM.strategy (level 3). Partial credits were given for correct key activities but not appropriate explanation.

5. **Continued**

- **Transfer Pricing:** Transfer pricing traditionally refers to intracompany transactions like the allocation of expenses for shared services or charges associated with the purchase of a product or a service from an affiliate. In the risk-management context, the key idea of transfer pricing is to dispossess business units of their exposure immediately after closing a transaction. The ownership is transferred to the CPM group by selling the exposure via a funds-transfer price such that the originator can recognize income, which then shifts the performance burden to the CPM group, which has the responsibility to manage the portfolio it owns. The acquisition of the exposure by CPM is executed at market price, irrespective of the amount that the business units obtained from the client.
- **Acquisitions or Swaps of Exposures:** The amount of capital dedicated to credit risk can be reduced by adding diversification to the portfolio. Active CPM can involve the acquisition of exposures that the business is not able to generate. For instance, a bank may not have any presence in the food sector, whereas analytical studies reveal that it would provide diversification to the portfolio. The CPM group can be proactive and purposefully acquire exposures in the sector. A straight acquisition via credit-default swap or purchase of participations in commercial loans can be executed.

(b)   Recommend an active CPM strategy to manage the risk that Company Y defaults on its obligations to Company X.

Commentary on Question:
The candidates performed below average on this section. Most candidates were able to recommend CDS or another active CPM strategy but failed to provide the appropriate explanation and therefore received partial credit. No credit was given to candidates who recommended a non-active CPM strategy.

One possible strategy will focus on the Acquisition of Exposures concept. In this context, we should have Company X increase its credit exposure to sectors that benefit from larger rainfall. A possible strategy would be to issue a commercial loan to a farmer who benefits from extra rainfall. In this case, we have acquired additional credit exposure from the farmer, but in the case of extra rainfall (where Company Y is less likely to pay Company X given the weather's impact on its financial strength), we are more likely to receive payment from the farmer.

Other possible strategies are purchasing CDS on Y or entering into weather derivatives as other potential hedges.

5. Continued

(c)   Your manager makes the following statements about CPM:

     I.   Credit Risk Assessment and CPM are essentially the same discipline, requiring the exact same skill set and providing similar insights into a company's credit risk position. Both areas focus on analyzing individual transactions rather than the portfolio at-large.

     II.   Advances in liquidity and analytical tools have led to evolution of the CPM process. In particular, it has become more difficult in the last 20 years to buy/sell exposures to execute rebalancing transactions, which has turned CPM into a purely academic exercise.

     III.   Basic CPM can and should be viewed as the absolute minimum amount of activities that should be performed by any firm exposed to credit risk. It does not require sophisticated modelling in order to add value to an enterprise.

Critique each statement.

Commentary on Question:
The candidates performed as expected on this section. Most candidates were able to identify that statement III is accurate and point out of some of the inaccurate parts in statement I and II therefore were given partial credit.

I: Credit risk assessment and CPM are two complementary disciplines, staffed with people having different background and skills. The former focuses on individual deals, and the latter concentrates on the entire portfolio. Credit portfolio management is more strategic in nature, and, based on the firm's risk appetite, it sets the vision for the portfolio it wants to create and the direction that the originators should follow.

II: Credit portfolio management has evolved significantly over the last 20 years. Once reserved to large banks with large portfolios, it is now implemented by most institutions that actively generate credit exposures. Two main factors contributed to this phenomenon: analytical tools and liquidity(1gp). Mathematical advancements have made data easier to collect & analyze. In addition, it has become easier to buy/sell exposures when needed (particularly with the development of the Credit Default Swap and Credit Securitization). The statement regarding liquidity is therefore misguided.

III: This statement is accurate. Any firm exposed to any sort of credit risk should (at a minimum) be executing Level 1 (Basic) CPM in order to assist with managing its portfolio. There is no need for sophisticated analytical tools in order to effectively execute and gain value from Level 1 CPM.

5. Continued

(d)   Your colleague observes that the same 10-year CDS is trading at 1.50% per annum and claims that the Mark-to-Market (MTM) value of the CDS is 0.50% per annum.

Explain whether or not your colleague's claim is correct.

Commentary on Question:
The candidates performed as expected on this section. Most candidates were able to identify the tenor needs to be adjusted and calculate the correct MTM. However, only a few candidates were able to comment on the sign of the MTM. Full credits were only given to candidates who were able to identify the tenor, calculate the MTM and identify the sign of MTM.

My colleague has failed to appropriately adjust for the remaining tenor of the CDS in computing the Mark-to-Market (MTM) value of the derivative. In particular, given that 5 years have now passed, the appropriate CDS to compare against when computing the MTM should be the 5-year CDS.

MTM = 1.20% - 1.00% = 0.20% per annum of the notional amount.

The MTM is positive from the buyer's (Company X's) perspective because the prevailing market rate for a CDS (after adjusting for the remaining tenor) is higher than at the time of entrance into the CDS contract.

6. **Learning Objectives:**
4. 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.

Learning Outcomes:
(4d) 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

(4f) Demonstrate an understanding of issues related to incorporating ESG criteria into the investment process

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

QFIP-160-F23: Principles for Responsible Investment

Commentary on Question:
This question tests the candidates' understanding of constraints in investment strategy and portfolio constructions for banks and endowments. It also tests candidates' knowledge of ESG policies and applying ESG criteria to investment strategy.

Solution:
(a) Compare the approach of Bank ORD and the endowment fund to managing three of the following:

   (i) Liquidity risk

   (ii) Tax concerns

   (iii) Return objectives

   (iv) Time horizon

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6. Continued

Commentary on Question:
Overall, candidates performed as expected for this part of the question Most candidates answered all 4 categories, however, they were given grading points for the 3 parts that gave them the highest score.
For liquidity risk, most candidates were able to recognize that the endowment had lower liquidity risk; however, most candidates were did not recognize that liquidity poses a regulatory concern for the bank. They also did not recognize that endowments could invest in illiquid assets.

For tax concerns, most candidates recognized that endowments were tax exempt. However, very few candidates explained the implications on accounting treatment due to taxable status.

For return objectives, most candidates received a partial score, but very few performed the endowment's target return calculation correctly.
For time horizon, most candidates recognized that the endowment had a long-time horizon, but very few candidates recognized the annual draw needs for endowments.

(i) **Liquidity:**
Endowment - Given the perpetual nature of the endowment, there is limited need for liquidity. It must have cash to make spending distributions, to meet capital requirements and to facilitate portfolio rebalancing transactions, In general, endowments are well suited to invest in illiquid, non-marketable securities given their limited need for liquidity
Bank - A bank's liquidity position is a key management and regulatory concern. ORD's liquidity requirements are determined by net outflows of deposits, if any, as well as demand for loans. Liquidity will be more important in managing the funds.

(ii) **Tax concerns:**
Endowment - Taxes are not a major consideration for endowments in general. Because this endowment is a not for profit, it is exempt from taxation on investment income derived from interest, dividends, capital gains, rents and royalties.
Bank - Banks' securities portfolios are fully taxable. Realized securities losses decrease reported operating income, while securities gains increase reported operating income. This accounting treatment might create an incentive not to sell securities showing unrealized losses, providing a mechanism by which earnings can be managed.

6. **Continued**

(iii)   **Return objectives:**
Endowment - The endowment's spending rate (including inflation and management expenses) must be lower than its expected rate of return in order to preserve purchasing power long term. Therefore, the portfolio must generate a long term return greater than spending rate (4.2%) plus management expenses *(3%) , which is 7.2% above the US CPI to be able to meet its obligations.
Bank - ORD's return objectives for its securities portfolio are driven by the need to earn a positive return on invested capital Management of the portfolio will try to earn a positive spread over the cost of funds.

(iv)   **Time horizon:**
The Endowment is a perpetual endowment, making the time horizon extremely long. However, annual draws for spending could present important short-term considerations, because endowments often use yearly market values to determine spending, and each annual withdrawal of capital has its specific time horizon. This would suggest multistage time horizons, in some cases.
Bank - ORD's time horizon for securities portfolio reflects its need to manage interest rate risk while earning a positive return on invested capital. Its liability structure typically reflects an overall shorter maturity than its loan portfolio, placing a constraint on the time horizon length for its securities portfolio.

(b)   Describe two actions to incorporate ESG for any two of the principles above (four actions in total).

Commentary on Question:
Overall candidates performed as expected for this part of the question.
Most candidates received partial credit for this question. Many candidates listed the actions correctly but assigned them to the incorrect principle. Credit was given for 2 actions for any two principles. The model solution below demonstrated a possible solution that would garner full credit. The full list of principles and related actions is located in the study note QFIP-136-19 page 6

Principle 1: We will incorporate ESG issues into investment analysis and decision-making processes.
Possible actions:
- Address ESG issues in investment policy statements
- Assess the capabilities of external investment managers to incorporate ESG issues.

6. **Continued**

Principle 4: We will promote acceptance and implementation of the principles within the investment industry.
Possible actions:
- Include Principles-related requirements in requests for proposals (RFPs)
- Revisit relationships with service providers that fail to meet ESG expectations

7.

Learning Objectives:
5.   The candidate will understand:
  • The design and management of asset portfolios in alignment with investment objectives and strategies, including investments in fixed income, equity and alternative assets.
  • The theory and techniques of portfolio asset allocation.

Learning Outcomes:
(5a)   Demonstrate an understanding of common techniques to enhance yield and manage liquidity in fixed income portfolios.

(5b)   Construct and manage portfolios of fixed income investments under various strategies, including indexing and target return.

(5d)   Develop asset allocation strategies in alignment with investment risk and return objectives.

Sources:
Maginn & Tuttle Chapter 6

QFIP-161-F23 Investment Perspectives "What are the inflation beating asset classes."

Commentary on Question:
Candidates did quite poorly on the question overall, largely because the answers provided were not for the questions as asked.

Solution:
(a)   Justify a ranking, from best (1) to worst (3), for each of the two clients separately for the following asset classes:

  • Nominal Bonds
  • Commodities
  • Materials Equity

Commentary on Question:
Candidates performed poorly on this section. The main issue was the question intended that the ranking was only on the inflation aspects of the asset classes per the stem above the question. Most candidates however did the ranking on some other aspect.

Client 1: Identify Short term inflation
Client 2: Identify Long Term Inflation
Chart of Page 28 supports the following rankings:
  Client 1: 1-Commodities, 2–Materials Equity, 3-Nominal Bonds
  Client 2: 1 Materials Equity, 2Commodities 3-Nominal Bonds

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7.   **Continued**

Properties of each asset class that indicate understanding:

Materials Equity (Pages 5-7)
- Both Energy and Materials have been pro-cyclical in the past, but react differently to stages of the cycle. p5
- "Provide reasonable hedge against rising inflation, in particular when volatility is high" (Materials not quite as good as Energy) p6
- "cash flow generating so even with lower short term beta, longer term will provide higher returns" p7
- Sector linked to commodities tend to do better with structural inflation. p7

Commodities (Pages 19-20)
- "Important part of the CPI basket" p19
- "good relationship of inflation over the short term (p19)
- Different subsector behave differently. Energy strong (p19)
- "link to growth for industrial" p20
- "cautious about consistently provide inflation plus returns due to lack of cash flow generating properties." p20

Nominal Bonds (pages 22-24)
- Corp Bond and US Treasuries tend to have similar relationship to inflation (generally negative in charts) p23
- Duration component has greatest effect on ability to hedge inflation. p24
- In absence of crises, we expect an inflation beta of near 0.
- Nominal bonds are susceptible to rising inflation & this is an issue for investors with a CPI plus target. p24
- (TIPS were created to behave differently during rising inflation)

(b)   Explain how the empirical evidence of REITs compares to the theory that REITS are a good inflation hedge.

Commentary on Question:
Candidates performed poorly on this section. Many candidates discussed properties of REITs but provided no commentary on the empirical evidence.

Discussion of reasons why theory and evidence are not in alignment:
- A lag period should theoretically exist between rents and overall property prices to adjust to change in the price level but it doesn't seem to come to fruition. P8
- Short-term REITS more corelated with equites, longer term with property returns. (and equities have a poor relationship with inflation) p10

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7. Continued

(c)   Assess whether REITs would be a better inflation hedge than Materials Equity.

Commentary on Question:
Candidates performed poorly on this section. Most candidates included very little explanation in their assessment. Partial credit was given for noting that Materials Equity would be the better inflation hedge.

Two statements for supporting an answer that REITs would not be a better inflation hedge:
- Short term nature of residential leases allows prices increases be incorporated into contracts with tenants. (keeping pace with longer term inflation.) p10
- REITS is not that directly related to direct property inflation as some rental income is not able to rise with inflation. p8
- There are broad subsectors of REITS that have better inflation hedging characteristics analogous to there being subsectors of Equity that provide inflation hedges. P10
- REITS hedge inflation similarly to Equity, but not necessarily better. P10

(d)   Describe two concerns that the portfolio managers might have, in applying a dedication strategy.

Commentary on Question:
Candidates performed below average on this section. Most candidates identified only 1 area of concern.

Maginn & Tuttle Chapter 6, p368-369:
1. Universe Considerations
    - Quality of securities as default is assumed to be zero, but is not in reality
    - Option such as call or prepayment options may prevent accurate measurement of cashflow
    - Liquidity will demand rebalancing
2. Optimization
    - Construction of the portfolio (minimizing the initial portfolio cost for cash flow matched subject to having sufficient cash to pay liability)
    - Accurate pricing is important as optimization is sensitive to the prices of securities
3. Monitoring
    - Need period performance measurement – how to do it Client 2 has a multiple liabilities with ties to CPI, so cashflows are not bullet payments
    - For a multiple liability immunized plan can compare market values
4. Transaction Costs –
    - important to consider when trying to meet the target rate for both the initial immunization and ongoing rebalancing necessary to avoid duration mismatch.

7. Continued

(e)   Explain how an active strategy could be used for Client 1.

Commentary on Question:
Candidates performed poorly on this section. Many candidates offered complex solutions without stating what the objective was trying to accomplish.

Maginn & Tuttle Chapter 6, p332, 344-46:
1. As the company has a strong view of market conditions – this would lean towards moving to larger mismatches
2. Identifying what types of moves would be appropriate in this situation: Some Examples:
   a. Overweight in less risky bonds, such as governments vs. corporates and/or increase credit ratings (More AAA vs. AA, etc)
   b. Overweight in shorter bonds

(f)   Describe three additional ways that the Enhanced Indexing strategy can enhance the portfolio return.

Commentary on Question:
Candidates performed below average on this section. A decent number of candidates mistakenly described different ways Enhanced Indexing may be implemented. Points were often lost for no description beyond a category name.

Points for any 3 of the following 5, with descriptions related to higher interest rates and defaults. (Maginn & Tuttle Chapter 6, p342 – 343):

1. Lower Cost Enhancements: Tight control on trading costs and management fees. Although already low, expenses do vary widely on indexed funds. Also consider purchasing representative bonds vs. the entire index.
2. Issue Selection Enhancements: identify and select undervalued securities. (Own Credit Analysis) beat upgrades, avoid downgrades
3. Yield Curve Positioning – some places on the curve seem to be consistently over or undervalued. Overweight the undervalued areas and underweight the overvalued.
4. Sector & Quality positioning – Two forms
a. maintain a yield tilt toward short duration corporates
b. Overweight to periodic over or under weighting of sectors or qualities.
5. Call exposure positioning - With rising rates callable bonds may be more out of the money, consider increasing exposure.

8.   **Learning Objectives:**
5.   The candidate will understand:
   - The design and management of asset portfolios in alignment with investment objectives and strategies, including investments in fixed income, equity and alternative assets.
   - The theory and techniques of portfolio asset allocation.

Learning Outcomes:
(5d)   Develop asset allocation strategies in alignment with investment risk and return objectives.

(5e)   Demonstrate an understanding of asset allocation approaches and techniques, including the concept of risk factor investing.

Sources:
Maginn & Tuttle Chapter 5

Commentary on Question:
This question tests the candidates understanding of asset allocation and the associated risks.

Solution:
(a)
   (i)   Calculate the minimum expected return required to satisfy the risk objectives.

   (ii)   Explain how ABC's risk objectives would be impacted if ABC's risk tolerance increased.

   Commentary on Question:
   Candidates performed as expected on this section. For part (i), some candidates only calculated the minimum expected return for one of the risk objectives, and they only received partial points. For part (ii), many candidates simply commented that higher risk tolerance means taking more risks without explaining the implication to ABC's risk objectives, and they received no points.

   (i)   Using formula 5-1 $U_m = E(R_m) - 0.5 R_A \sigma^2_m$ to get 5% = X - 0.5*4*0.16^2, where X is the expected minimum return. X = 10.12% for the expected utility risk objective.

   Using formula 5-2, safety-first ratio = $(E(R_m) - R_L)/\sigma_m$ to get 0.4 = (Y-4%)/0.16, where Y is the expected minimum return. Y= 10.4% for the safety-first ratio objective.

   10.4% is minimum return needed to meet both objectives.

8. **Continued**

   (ii)   Higher risk tolerance implies a lower risk aversion scale hence a higher expected utility. It is more likely to meet the first criteria. It has no impact on safety-first ratio.

(b)   Explain how real estate meets two of the criteria of being categorized as a separate asset class.

Commentary on Question:
Candidates performed as expected on this section. Most candidates identified and explained the diversification criteria properly. Only identifying the criteria without any explanation received no points. Candidates only needed to properly explain two criteria in order to receive full points.

(1) Assets within an asset class should be relatively homogeneous. Real estate and equities/bonds are not homogeneous because they do not have similar attributes.
(2) Asset classes should be mutually exclusive. Real estate and the other assets are exclusive in that there are different markets for each one.
(3) Asset classes should be diversifying. Real estate and equities/bonds are diversifying. Real estate has almost a 0 correlation with Equities and Bonds.
(4) Asset classes should have the capacity to absorb a significant fraction of the investor's portfolio without seriously affecting the portfolio's liquidity. There is more real estate than could be invested by ABC.

(c)   Explain whether P1 and P2 could potentially be corner portfolios.

Commentary on Question:
Candidates performed below average on this section. Many candidates failed to point out P1 is a linear combination of two existing corner portfolios and hence not a corner portfolio itself. A few candidates correctly identified and explained P2 as a potential corner portfolio and received partial points.

P1 can be constructed by 25% of CP1 and 75% of CP2. It can be constructed by corner portfolios, so it is not a corner portfolio.

As the minimum-variance frontier passes through a corner portfolio, an asset weight either changes from zero to positive or from positive to zero. Bonds weight goes from 0 to positive and equities weight goes from positive to 0. P2 could potentially be a CP.

8. **Continued**

(d)   Explain why using Monte Carlo simulation in the asset allocating process would be beneficial to ABC.

Commentary on Question:
Candidates performed below average on this section. Most candidates identified that UL portfolio has inflow and outflow but fail to properly articulate other points. Other reasonable answers were given points too.

ABC's UL liabilities have cash inflow and outflow over time. Future wealth incorporates the interaction of risk and return, and terminal wealth will be path dependent. Also, UL liabilities are long term. In a multiperiod world, the portfolio will predictably be rebalanced, triggering the realization of capital gains and losses. As ABC is a taxable investor, given a specific rebalancing rule, different strategic asset allocations will result in different patterns of tax payments (and different transaction costs too). These can be easily incorporated in a Monte Carlo simulation. Other reasonable answers were given points.

9.

Learning Objectives:

2.   The candidate will understand the credit risk aspects of individual securities, portfolios, and sectors and be able to apply a variety of credit risk theories and models to the investment management process.

Learning Outcomes:

(2c)   Understand and apply various approaches for managing credit risk in a portfolio setting, including the use of Credit Default Swaps

Sources:

Handbook of Credit Risk Management Ch 20.

Commentary on Question:

This question focuses on testing the candidates understanding of Credit Default Swaps.

Solution:

(e)   Compare and contrast credit default swaps (CDS) and credit insurance.

Commentary on Question:

The candidates performed as expected on this section. Most candidates were able to point out the similarities between CDS and credit insurance as providing protection upon credit events. Many candidates were also able to point out the purchaser of credit insurance has credit exposure to the underlying instrument, while CDS does not have to. However, few candidates stated that CDS is an option in this case. Some candidates explained the difference in settlement, regulation, etc, which credit was given if the statement is correct.

Both CDS and insurance are transactions between a protection buyer and protection seller. In the case the insurance is protection on a credit event, they would similar in nature. However, CDS is an option rather than swap or insurance. The protection buyers can receive money even though they do not suffer a loss, unlike insurance.

(f)   Calculate spread of this CDS (ignore the time value of money).

Commentary on Question:

The candidates performed poorly on this section. Most candidates did not treat the upfront point is quoted as % of notional over the tenor of the CDS. Some candidates also did not specify the upfront point being negative.

spread = coupon + upfront point/tenor: 100 bp+ (-3.0%*10000)/5=100-60=40bp

(c)   Calculate the Mark To Market (MTM) value of this CDS (ignore the time value of money).

9. Continued

Commentary on Question:
The candidates performed as expected on this section. Most of the candidates identified it is a market value increase. Some candidates did not apply the remaining period as part of the MTM calculation. Other candidates incorrectly considered the original spread in the calculation.

Current spread is 60bp wider. Ignoring time value of money, the MTM value = spread chg * notional * # of remaining years
$$= (60)bp /10000 * 100M * 3yr$$
$$=1.8M$$

(d) Recommend an approach to realize the profit on the CDS taking into account the CFO's concern.

Commentary on Question:
The candidates performed below average on this section. Most candidates recommended to sell CDS in the market. However most candidates did not understand the difference between unwinding (net with original seller) and netting (sell opposite position). Many candidates did mention using Clearing house to reduce counterparty risk. Few candidates made the connection of their recommendation and addressing CFO's concern.

Two ways to take profit off the table: 1) unwind the trade with the original dealer, most dealer routinely agree to unwind a trade. 2) enter into an opposite trade at current price, which will cancel out the current position. Both approach will provide similar MTM payoff ignoring transaction fees, etc. However the second approach results multiple positions which poses greater credit exposure to counterparties, use of credit lines, and the possible cost of posting collateral. Given the management is concerned with the credit limit, it is preferred to use approach 1.

10.

Learning Objectives:

6. 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:

(6a) Construct and manage portfolios of fixed income investments relative to the liabilities that they support.

(6d) Demonstrate an understanding of and apply tools and techniques of measuring and managing interest rate risk in an ALM context, including duration and convexity.

Sources:

Maginn, J. and Tuttle, D., *Managing Investment Portfolios*, Ch.5.6

Maginn, J. and Tuttle, D., *Managing Investment Portfolios*, Ch.6.4

Veronesi, P., *Fixed Income Securities*, Ch.3.2

Veronesi, P., *Fixed Income Securities*, Ch.3.7

Commentary on Question:
This question tests the candidate's understanding of duration and contingent immunization techniques and practical considerations for optimization of portfolios that support liabilities.

Solution:

(a) Your manager asks you to consider the following statements with respect to ALM strategy for your company:

(i) If ABC wishes to take high levels of risk, the efficient frontier may provide useful insights into portfolios that optimize surplus risk

(ii) The duration of an asset cannot exceed its time to maturity

(iii) Modified Duration can be used to compare the relative sensitivity of two bonds to parallel changes in the yield curve

Critique each of your manager's statements.

10. Continued

Commentary on Question:
The candidates performed below average on this section. For (i), candidates did not recognize that high-risk portfolios on the surplus efficient frontier are driven by the risk-return tradeoff of assets only. For (ii), candidates that recognized asset duration could exceed maturity referenced inverse floaters or derivative instruments with leveraged cashflows as counterexamples. Partial credit was awarded to candidates who recognized this statement as true for plain-vanilla fixed-coupon or zero-coupon bonds. For (iii), most candidates failed to recognize that modified duration is relative to the asset's yield-to-maturity. Partial credit was awarded for candidates that noted this was true for fixed- or zero-coupon bonds where small changes in the yield curve approximated the change in yield-to-maturity.

(i)   This is true. At high levels of risk, the asset allocations on the surplus often resemble high-risk asset-only efficient portfolios.

(ii)   This is false. This relation does not hold for inverse floaters, which exhibit leveraged behavior.

(iii) This is false. Strictly speaking, the modified duration of a bond traditionally is calculated as the price sensitivity with respect to a change in yield-to-maturity. However, the yield to maturity is bond-specific and depends on the coupon rate, which may differ between bonds. Furthermore, the yield-to-maturity may not be well-defined for bonds that have floating coupon rates or embedded options.

(b)   Calculate the initial dollar duration of the liability.

Commentary on Question:
The candidates performed below average on this section. Many candidates incorrectly scaled the duration by the cashflow instead of the market value.

Since the liability consists of a single, fixed cashflow at time 10 its duration is 10.
$Dollar\ Duration = Duration\ \times Market\ Value$
$Market\ Value\ of\ Liability = \$100M\ \times e^{-3.50\% \times 10} = \$70.46881M$
$Dollar\ Duration = 10\ \times 70.46881M = \$704.68809M$

(c)   Calculate the initial dollar safety margin.

Commentary on Question:
The candidates performed as expected on this section.

10. Continued

The initial dollar safety margin is the excess premiums over the market value of the liability.

$Initial\ Dollar\ Safety\ Margin = \$74M - \$70.46881M = \$3.53119M$

(d) Calculate the initial investment in each of Bond A and Bond B that will dollar duration-match the liability.

Commentary on Question:
The candidates performed as expected on this section. Many were able to identify the key conditions that needed to be satisfied to dollar-duration match the liability. Candidates that presented a method that was not tractable received little credit.

By dollar-duration matching, we have
$$DD_A + DD_B = \$704.68809M$$
Because A and B are zero-coupon bonds, their durations are their times to maturity:
$$DD_A = 5A$$
$$DD_B = 30B$$
Putting the above together we have
$$5A + 30B = \$704.68809M \ \ (1)$$
Since the premium is used to purchase the bonds, we also know
$$A + B = \$74M,$$
or, equivalently:
$$B = \$74M - A \ \ (2)$$
Substituting (2) into (1):
$$5A + 30(\$74M - A) = \$704.68809M$$
Solving for A we get:
$$A = \frac{30 \times \$74M - \$704.68809M}{30 - 5} = \$60.61248M$$
And
$$B = \$74M - \$60.61248M = \$13.38752M$$

We verify the dollar-duration matching:
$$DD_A + DD_B = 5 \times \$60.61248M + 30 \times \$13.38752M = \$704.68809M$$

(e) Calculate the new positions in each bond that will restore the dollar duration-matching.

Commentary on Question:
The candidates performed below average on this section with few achieving full credit. Most failed to recognize that both asset and liability market values had changed. A common error was to assume that the asset values were rebalanced to the initial premium rather than the asset values under the new yield curve.

10. Continued

We use our formulas from above to recalculate the market value and dollar duration of the liability:

$$Market\ Value = \$100M \times e^{-3.10\% \times 10} = \$73.34470M$$
$$Dollar\ Duration = 10 \times \$73.34470M = \$733.44696M$$

We also need to revalue the liabilities for the change in yield curve:

$$A = \$60.61248M \times \frac{e^{-2.75\% \times 5}}{e^{-3.25\% \times 5}} = \$62.14689M$$

Since the 30-year yields remained unchanged, the value of B does not change, $B = \$13.38572M$.

To rebalance the assets so that they dollar-duration match the liabilities, we need
$$DD_A + DD_B = \$733.44696M,$$
subject to the constraint:
$$A + B = \$62.14689M + \$13.38572M = \$75.53441M$$

Solving:
$$A = \frac{30 \times \$75.53441M - \$733.44696M}{30 - 5} = \$61.30342M$$

$$B = \$75.53441M - \$61.30342M = \$14.23100M$$

We verify the dollar-duration matching:
$$DD_A + DD_B = 5 \times \$61.30342M + 30 \times \$14.23100M = \$733.44696M$$

(f) Calculate the new dollar safety margin.

Commentary on Question:
The candidates performed below average on this section. Many candidates did not use the market value of the asset they had previously calculated in part (e).

The dollar safety margin has reduced to:
$$\$75.52441M - \$73.34470M = \$2.18972M$$

(g) Approximate the further decrease in 10-year rates that would require immediate immunization of the portfolio (no change to the 5-year and 30-year rates).

Commentary on Question:
The candidates performed below average on this section. A variety of reasonable approximations were used by candidates. Many left this section blank.

10. Continued

A shift in the 10-year rates will change the liability market value; if it reaches the asset market value the dollar safety margin will be reduced to $0, triggering immediate immunization. We solve:

$$\$75.53441M = \$100M \times e^{-r \times 10} \rightarrow r = -\frac{1}{10}\ln\left(\frac{\$75.53441M}{\$100M}\right) = 2.80582\%$$

This implies a rate decrease of
$$3.10\% - 2.80582\% = 0.29855\%$$
will trigger immediate immunization.

(h) Describe the advantages of adding Monte Carlo simulation to your ALM program.

Commentary on Question:
The candidates performed as expected on this section. Most candidates were able to earn partial credit with a few earning full credit. The ability of Monte Carlo simulation to provide information on the risk distribution was commonly cited.

Surplus optimization (e.g. mean-variance optimization) is essentially a one-period model. Advantages of Monte Carlo simulation over surplus optimization include:
- Monte Carlo simulation is a multi-period model, making it particularly useful for investors with long time horizons
- Can help confirm that recommended allocations provide sufficient diversification
- Can help evaluate the probability of funding shortfalls (requiring contributions)
- Can help evaluate the probability of breaching thresholds
- Can help evaluate the growth of assets with and without disbursements from the portfolio

11.

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) Demonstrate an understanding of various fixed income investments considering:
- cash flow characteristics,
- markets in which they trade, and
- underlying risks such as interest rate, credit and event risks

Sources:

Commercial Real Estate and Investments Chapter 16

Commercial Real Estate and Investments Chapter 20

Handbook of Fixed Income Securities Chapter 21

Commentary on Question:

Candidates performed below average on this question. Most candidates exhibited limited knowledge of CMBS and RMBS. Many candidates responded with keywords without analyzing the specific situation presented in the question.

Solution:

(a) Identify the differences in characteristics between commercial and residential real estate mortgage (excluding the property type).

Commentary on Question:

Candidates performed as expected on this part. Many candidates recalled the categories of differences but did not identify the actual difference.

Loan diversification: Commercial mortgage tends to be more diverse in the type of the properties. Residential properties are more homogenous.

Credit worthiness: For CMBS, risk management might involve focusing on the property's cash flow, tenant mix, and occupancy rates, as well as monitoring the overall commercial real estate market. For RMBS, risk management could include assessing the borrower's credit history, debt-to-income ratios, and loan-to-value ratios, as well as keeping an eye on the residential housing market.

Prepayment risk: CMBS usually have prepayment restrictions such as penalties and lockout periods. RMBS generally have fewer restrictions.

11. Continued

CMBS and RMBS are affected by different economic factors. CMBS are more sensitive to changes in the business cycle, interest rates, and commercial real estate market conditions. On the other hand, RMBS are more influenced by changes in consumer credit, employment, and residential housing market conditions.

(b) Describe the credit quality of Tranches A and B relative to the underlying mortgages.

Commentary on Question:
Candidates performed poorly on this part. Most candidates responded correctly that Tranche A is safer, and Tranche B is more risky than the underlying mortgage. However, very few candidates provided an explanation on how this conclusion was reached.

Tranche A is a senior Tranche with 20% credit support.
Credit support = $5M * 100 * 20% = 100M.

Tranche A does not suffer any loss unless the total loss of the loan portfolio exceeds 100M. When a loan defaults, since the RR is 0.5, the LGD is $2.5M.

Therefore, Tranche A does not suffer any loss unless more than 40 out of the 100 loans defaults.

Given the PD is 1% and loans are considered independent, the probably of more than 40 out of 100 default is virtually zero.

Tranche A is much safer than the underlying commercial mortgage portfolio, i.e. much less probability to suffer any loss.

Tranche B is only worth 100M (same as the credit support for Tranche A)

Tranche B will suffer the same amount of loss as the underlying mortgage since all losses under 100M goes to Tranche B.

Tranche B is riskier than the underlying commercial mortgage since the size of the underlying mortgage is $500M.

(c) Describe the risk factors to the investors in XYZ's CMBS under the current economic environment.

Commentary on Question:
Candidates performed poorly on this part. Many candidates did not identify the risk factors associated with the rise in interest rates.

11. Continued

Risk factors:
Higher interest rate leads to lower value of the underlying fixed rate commercial mortgages, increases the chance of default.

Re-financing risks: when the underlying commercial mortgage re-financing costs are higher.

Economic declines with the higher interest might cause hardship to the commercial tenant, leading to decreased cashflow of rents. Thus increasing the probability of default.

(d)   Recommend changes in future CMBS issues to mitigate the risks.

Commentary on Question:
Candidates performed poorly on this part. Most candidates identified only 0 or 1 of the risk mitigation strategies below.

Mitigation strategies:
Diversify the commercial mortgage pool to reduce concentration risks
Enhance underwriting criteria for the underlying commercial mortgage, lower LTV and higher debt service ratio etc
Offer more tranches and higher credit support – This enhances the credit rating for the senior tranches, against potential loss.

12. **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)   Demonstrate an understanding of various fixed income investments considering:
   - cash flow characteristics,
   - markets in which they trade, and
   - underlying risks such as interest rate, credit and event risks

Sources:
Leveraged Finance, S. Antczak, D. Lucas, F. Fabozzi, 2009, Ch 2

Leveraged Finance, S. Antczak, D. Lucas, F. Fabozzi, 2009, Ch 4

FAJ 78:4, Private Debt Fund Returns, Persistence, and Market Conditions

Commentary on Question:
This question tests how an institution must deal with specific risks associated with the cash flow of high-yield bonds and Collateralized Loan Obligation (CLO).

Solution:
(a)   Describe two additional reasons for this increase in popularity.

Commentary on Question:
The candidates performed poorly on this section. Only a minority of candidates were able to describe the reasons associated with the reluctance of traditional lenders such as banks to lend due to more strict regulations and an increase in liquidity risk with the Global Financial Crisis. Almost all candidates focused only on the perception of risk reduction for liquidity, diversification and research of higher return for investors.

2 reasons other than yield-seeking institutional investors the increase in popularity for HY bonds and CLO are:

Liquidity risk in the short term affects the reluctance of banks to lend to corporates and motivate alternatives financing as High-Yield Bond and Collateralize Loan Obligations.

As banks retrenched after the Global Financial Crisis due to increased bank regulation and the reduction in risk appetite then greater demand for non-bank private debt.

12. Continued

(b)   Describe the cash flow structures of the following instruments and how they impact the issuer and the pension plan:

(i)   Deferred interest bonds

(ii)   Step-up bonds

(iii)   Payment-in-kind bonds

(iv)   CLOs

Commentary on Question:

The candidates performed above average on part (i) and part (ii) of this section. Most candidates were able to provide relevant explanations for the cash flow structures. However almost all candidates did not mention the impact on cash flow at issue. Partial credit was given to some candidates as they showed an understanding of the cash flow structures without correctly identifying the issuer or the pension plan.

The candidates performed above average on part (iii) of this section. Most candidates were able to provide relevant explanation for the cash flow structures. Almost all candidates failed to mention the favorable impact on liquidity for the issuer and the risk on liquidity for the pension plan. Some candidates successfully described the credit risk and liquidity risk associated with the increase in bond value of the issuer.

The candidates performed as expected on part (iv) of this section. Successful candidates identified a complete description of the cash flow from the pool of loans and the distribution that take account of the seniority. However, all missed the fact that the CLO can call for funding.

(i)   Deferred interest bonds
Issuers:
Receive less cash at issue since discounts.
Not pay coupons for an initial period of 3 to 7 years, after higher cash disbursements with a higher interest rate for coupons.
Investor:
Less cash needed at issue since discount.
No cash flow coupons for 3-7 years and higher coupons cash flow later.

12. Continued

    (ii)   Step-up bonds
        Issuer:
            Lower cash flows to pay since low initial coupon rate and higher cash outflows after an initial period.
        Investor:
            Lower cash flow from coupons for an initial period and higher after.
            Need more cash than deferred interest bonds since no discount.

    (iii)   Payment-in-kind (PIK)
        Issuer:
            Permit to keep its liquidity.
            Option to pay coupons in cash or as a new bond with the same coupon rate with value equal to the value of the coupon.
            Permit to keep its liquidity.
        Investor:
            For bond holders reduce projection of liquidity and increase bond value in the company and the credit risk associated with this company.

    (iv)   CLO:
        Issuer:
            CLO issue multiple debt tranches with equity and use the proceeds from the issuance to obtain a pool of loans.
            Interest and principal cash flows generated from the collateral pool of loans are distributed to debt tranches and equity.
            The cash flow distribution in prescribed ways that take into account the seniority of those debt tranche.
            The CLO can call for funding when ready to invest.
        Investor:
            Invest into a specific debt tranche which carries specific risk/return based on credit quality, risk of loss and priority of cash flow distributions.
            The debt holder received cash flow, according to seniority.
            CLO can call for funding within some specified time period.

(c)   As an investor considering that high-yield bonds may provide higher yield, the financial risk profile of the company is an important determinant.
The risk manager mentions that an investment into senior debt of a CLO with the same yield as that of a high-yield bond appears more attractive, when considering diversification, risk appetite and liquidity in the case of default.

Justify the risk manager's statement.

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12. Continued

Commentary on Question:
Candidates performed poorly on this question.
Justifications for all three risks were required to receive full credit. Only a few candidates provided explanations for each aspect. The main element candidates did well on is identifying a pool of loans provides diversification. Almost all candidates failed to provide adequate justifications for the risk appetite and the liquidity in case of default. Some candidates received partial credit for 'liquidity' by mentioning the cash flow distribution priority associated with senior tranches and with the 'risk appetite' with the choice of the CLO tranche by the investor with its risk appetite.

Diversification:
CLO avoid concentration of risk into a single company since invest into multiple loans then provide a form of diversification.
The CLO structure allows inve.stors to purchase an interest in a diversified portfolio of loans.

Risk appetite:
The CLO provide a division and distribution of the risk of the CLO's assets to parties that have
different risk appetites.
High rating investors of CLO's and lower rating investors of CLO's share the same leveraged Loans with the same risk.

Liquidity in case of default:
The debt holder received cash flow, according to seniority.

In even of failure of the CLO, a par coverage test requires that cash be withheld from paying Interest on lower-ranking debt tranches. Instead, cash must be used to pay down the principal on the CLO's senior debt tranche.

The CLO provide subordination such junior tranches absorb losses before senior tranches.

(d) A member of the board states that CLOs have a high risk of bankruptcy.

Critique this statement.

12. Continued

Commentary on Question:
The candidates performed poorly on this section. Successful candidates were able to explain that CLO cannot go into bankruptcy or is 'bankrupt remote'. Unsuccessful candidates focused mainly on the seniority of tranches to reduce bankruptcy. No candidate were able to identify that insolvency of the CLO's can not result from sins of the past, action of other creditor or bankruptcy of any other entity.

CLO cannot go into bankruptcy, either voluntarily or through the action of an aggrieved creditor.
CLO will not be caught up in the bankruptcy of any other entity.
CLO Cannot have any legal liability for sins of the past.
If the CLO is insolvent, the conditions have already been determined in detail at the origination of the CLO.

13.

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.

(7c)   Describe and assess techniques to select or build an asset benchmark for a given investment objective.

(7d)   Assess and interpret performance attribution metrics for a given asset or portfolio.

Sources:

Managing Investment Portfolios: A Dynamic Process, Maginn & Tuttle, 3rd Edition, Ch 12 Evaluating Portfolio Performance

Commentary on Question:

This question tests creating benchmarks and measuring performance against them. Candidates are also tested on the flaws of certain benchmarks.

Solution:

(a)   List four properties of a valid benchmark for performance evaluation.

Commentary on Question:

The candidates performed brilliantly on this section. Most candidates named at least one property of a valid benchmark. Candidates who did not provide four were given partial credit.

The properties of a valid benchmark are:
- Unambiguous: The identities and weights of securities or factor exposures constituting the benchmark are clearly defined.
- Investable: It is possible to forgo active management and simply hold the benchmark.
- Measurable: The benchmark's return is readily calculable on a reasonably frequent basis.
- Appropriate: The benchmark is consistent with the manager's investment style or area of expertise.
- Reflective of current investment opinions: The manager has current investment knowledge of the securities or factor exposures within the benchmark.
- Specified in advance: The benchmark is specified prior to the start of an evaluation period and known to all interested parties.
- Owned: The investment manager should be aware of and accept accountability for the constituents and performance of the benchmark.

13. Continued

(b)   Describe how to construct a custom security-based benchmark.

Commentary on Question:
The candidates performed as expected on this section. Most candidates described at least one part of the process. Common issues included missing the final review and rebalance steps.

Development of a custom benchmark involves the following:
- Analyze the manager's past portfolios to identify prominent aspects of the manager's investment process.
- Select benchmark portfolio securities using screening criteria consistent with the manager's investment process.
- Devise a weighting scheme for the benchmark securities, including a cash position, using the manager's investment process and client restrictions.
- Review the preliminary benchmark and make modifications.
- Rebalance the benchmark portfolio on a predetermined schedule to keep the benchmark portfolio current with the manager's investment process.

(c)   Assess the portfolio performance using the following attribution breakdowns:

(i)   Pure selection allocation

(ii)   Allocation/selection interaction

(iii)   Within-sector selection

(iv)   Total value added

Commentary on Question:
The candidates performed as expected on this section. Most candidates were able to provide the correct calculations but lost points for not explaining what the results meant. Some candidates also switched items ii and iii.

(i) Pure sector allocation = Sum of [(Portfolio weight - Benchmark weight) x (Benchmark sector return - Total benchmark return)]

	Weight	Return
Basic Materials	-20%	-0.80%
Energy	20%	1.20%
	Attribution	0.40%

Positive effects from active overweighting (underweighting) the Energy (Basic materials) sector since it performed better (worse) than the overall benchmark.

(ii) Allocation/Selection Interaction = Sum of [(Portfolio weight - Benchmark weight) x (Portfolio sector return - Benchmark sector return)]

	Weight	Return
Basic Materials	-20%	1.00%
Energy	20%	0.00%
	Attribution	-0.20%

Negative effects from active underweighting the Basic materials sector due to the portfolio's positive performance in the Basic Materials sector relative to the benchmark's Basic Materials sector performance.

(iii) Within-Sector Selection = Sum of [Benchmark weight x (Portfolio sector return - Benchmark sector return)]

	Weight	Return
Basic Materials	60%	1.00%
Energy	40%	0.00%
	Attribution	0.60%

Positive effects from active security selection decisions within sectors.

iv) Total value Added = 0.80% = Sum of (Portfolio weights x Portfolio returns) - Total benchmark return OR = Pure sector allocation + Allocation/selection interaction + Within-sector selection

Overall positive effects from the active management of the portfolio.

(d) Calculate the following performance metrics for this portfolio:

(i) Jensen's alpha

(ii) Treynor ratio

Commentary on Question:
The candidates performed as expected on this section. Most candidates calculated the values correctly. Some candidates did not include the risk-free rate in the calculation for Jensen's alpha.

(i) Jensen's Alpha = (portfolio return – Current risk-free rate) – Beta x (Current market index return – Current risk-free rate) = (0.11 – 0.02) – 0.5 x (0.10 – 0.02) = 0.05

13. Continued

       (ii)   Treynor Measure = (Average portfolio return – Average risk-free rate) / Beta = (0.11- 0.02) / 0.5 = 0.18

(e)   You are considering the following performance evaluation options:

- Compare the manager's performance against the median manager return from a database of other account returns in similar institutions.
- Calculate a risk-adjusted performance metric to compare the manager's performance against the market using the CAPM model.

Assess these two performance evaluation options.

Commentary on Question:
The candidates performed as expected on this section. Most candidates were able to describe the issue of the median manager metric. However, many candidates did not fully explain the flaws of the CAPM metric.

Possible critiques of the median manager metric:
- The median account cannot be specified in advance. The manager nor the fund sponsor has any knowledge of who the median manager will be.
- The benchmark is not investable and cannot serve as a passive alternative to holding the account that is under analysis. The identity of the median manager typically remains unknown, so the account cannot be replicated.
- The ambiguity of the median manager account makes it impossible to verify its appropriateness by examining whether the investment style it represents adequately corresponds to the account being evaluated.
- Because fund sponsors terminate underperforming managers, performance data are subject to survivor bias.
- The only advantage is that performance is measurable.

Possible critiques the risk-adjusted metric:
- Metric depends on the validity of the CAPM, such as its assumptions and single index nature.
- The metric relies on a surrogate for the true market portfolio (such as the S&P 500).
- If assets are valued according to other equilibrium pricing models, CAPM may be inaccurate.
- It is difficult to replicate the market index due to transaction costs and reinvestment costs. Therefore, the index overstates possible returns.
- Issues with parameter stability and estimation errors