QFI PM Model Solutions
Spring 2025

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.

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

Sources:

Anson, M, *Handbook of Alternative Assets*, 2nd Edition

Commentary on Question:

This question tests candidates' understanding of hedge fund strategies, particularly long/short equity and convertible bond arbitrage. The question incorporates both theoretical concepts and numerical calculations, requiring candidates to demonstrate an understanding of portfolio construction, CAPM, and the comparison of different investment strategies.

Solution:

(a)   List four key elements of hedge funds that distinguish them from mutual funds.

1. Continued

Commentary on Question:
Candidates performed above average on this question. Many candidates were able to identify at least four of the key elements below.

First, hedge funds are private investment vehicles that pool the resources of sophisticated investors.

Second, hedge funds tend to have portfolios that are much more concentrated than their mutual fund brethren.

Third, hedge funds tend to use derivative strategies much more predominately than mutual funds.

Fourth, hedge funds may go both long and short securities.

Fifth, many hedge fund strategies invest in nonpublic securities, that is, securities that have been issued to investors without the support of a prospectus and a public offering.

Finally, hedge funds use leverage, sometimes, large amounts.

(b) Calculate the expected return of the long/short strategy according to the CAPM model.

Commentary on Question:
Candidates performed above average on this question. Many candidates received full credit for their responses. Some candidates miscalculated the expected returns of the two stocks. A few candidates didn't include the risk-free interest rate in the CAPM model.

The portfolio beta is: $(1.5)(0.85) + (-0.5)(1.4) = 0.58$

The expected rate of return according to CAPM is: $5\% + (0.58)(8\%-5\%) = 6.74\%$, or $(13.5)(6.74\%)=0.91$ million.

Alternative Solution:

The expected rate of return for Stock X is: $5\%+(0.85)(8\%-5\%) = 7.55\%$.

The expected rate of return for Stock Y is: $5\%+(1.4)(8\%-5\%) = 9.2\%$.

The expected rate of return for the portfolio is $(1.5)7.55\% + (-0.5)9.2\% = 6.725\%$, or $(13.5)(6.725\%)=0.91$ million.

1. Continued

(c) Calculate the realized return of the long/short strategy.

Commentary on Question:
Candidates performed above average on this question. Many candidates receive full credit for their responses. A common mistake was not applying the long-short position correctly.

The return of Stock Y is (30-40)/40 = -25%. The return of Stock X is (47-45)/45 = 4.44%.

The realized rate of return is (1.5)(4.44%)+ (-0.5)(-25%) = 19.17%. Alternatively, the dollar amount of return is: (13.5)(19.17%)=2.59 million.

(d) Describe limitations of applying the CAPM model to a long/short strategy involving just two stocks.

Commentary on Question:
Candidates performed above average on this question. Many candidates received at least partial credit for identifying that CAPM does not work well with long-short positions. A common error was not mentioning that the CAPM assumes a well-diversified portfolio.

The ability to fully implement a strategy not only about stocks and sectors that are expected to increase in value but also stocks and sectors that are expected to decrease in value allows the hedge fund manager to maximize the value of her market insights.

The long/short nature of the portfolio can be misleading with respect to the risk exposure. This strategy is 100% net long. The beta of the combined portfolio underestimates the risk of this strategy. This strategy makes two explicit bets: that Stock X will appreciate in value and that Stock Y will decline in value.

The CAPM assumes that investors hold a well-diversified portfolio. That is not the case with this hedge fund manager. Most hedge fund managers build concentrated rather than broad portfolios. Consequently, traditional metrics such as the CAPM may not apply to hedge fund managers.

(e) Jessie claims a one-year convertible bond arbitrage strategy would have earned a higher return than the long/short strategy, had it been implemented on January 1, 2023. Leverage is not allowed for any of the investment strategies. Note the full initial investment is used to buy bonds, and that the proceeds from the short sale should not be considered in determining the initial investment.

Assess the validity of Jessie's claim.

1. Continued

Commentary on Question:
Candidates performed below average on this question. A few candidates received full credit for their responses. A common error was incorrectly calculating the shares of stock X shorted and the short rebate.

The convertible bond arbitrage is as follows:

On January 1, 2023:
Quantity of bonds purchased: Initial investment / Market price of bond
= $13.5m/$900 = 15,000 bonds

Shares of Stock X shorted: Conversion ratio x Bond delta x Quantity of bonds purchased
= (20)(0.5)(15,000) = 150,000

On December 31, 2023, the realized return for this arbitrage would be:
Appreciation of bond price: (15,000)($964 - $900) = $960,000

Appreciation of stock price: (150,000)($45 - $47) = -$300,000

Interest on bonds: (15,000)($1,000)(8%) = $1,200,000

Short rebate: (150,000)($45)(5.5%) = $371,250

Total absolute return: $960,000 - $300,000 + $1,200,000 + $371,250= $2,231,250
Total rate of return: $2,231,250/ $13.5m = 16.53%

Therefore, Jessie's claim is not correct. The convertible bond arbitrage would lead to a lower return (16.53% or 2.23 million) than the long/short strategy (19.17% or 2.59 million).

Alternative Solution:

Shares of Stock X shorted per bond: Conversion ratio x Bond delta
= (20)(0.5) = 10

On December 31, 2023, the realized return for this arbitrage per bond would be:
Appreciation of bond price: ($964 - $900) = $64

Appreciation of stock price: (10)($45 - $47) = -$20

Interest on bonds: ($1,000)(8%) = $80

1. Continued

Short rebate: $(10)(\$45)(5.5\%) = \$24.75$

Total absolute return: $\$64 - \$20 + \$80 + \$24.75 = \$148.75$

Total rate of return: $\$148.75 / \$900 = 16.53\%$

Therefore, Jessie's claim is not correct. The convertible bond arbitrage would lead to a lower return (16.53%) than the long/short strategy (19.17%).

(f)   Your manager prefers to retain some systematic stock market exposure in your fund's portfolio and claims that convertible bond arbitrage should be implemented instead of the long/short strategy.

Critique your manager's claim.

Commentary on Question:
Candidates performed as expected on this question. Many candidates received partial credit for mentioning either long/short strategies would retain stock market exposure, or the convertible bond arbitrage portfolio should have no stock market exposure, but not both.

Your manager's claim is not correct.

Equity long/short strategies would retain stock market exposure in the portfolio.

The long/short strategy considered in this question has a 100% net long position in stocks.

With the proper delta or hedge ratio in place, the convertible bond arbitrage portfolio should be insulated from movements in the underlying stock price so that the expected return should be the same regardless of whether the stock price goes up or goes down.

The return of the convertible bond arbitrage portfolio considered in this question only depends on the coupon and short rebate.

2. **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:
Bouteille, Handbook of Credit Risk Management Chapter 13

Bouteille, Handbook of Credit Risk Management Chapter 20

Commentary on Question:
This question tested candidates' ability to recognize how to calculate the spread on a CDS, how it is different from insurance, and its settlement structures.

Solution:
(a)   Recommend a contract choice.

        Commentary on Question:
        The candidates performed as expected on this section. Many candidates receied at least partial credit for correctly calculating the spreads on each contract, and recommending the contract with the lowest cost. A common error was recommending A due to the lower coupon.

        The spreads on contracts A, B, and C are 165, 160, and 155 basis points, respectively. This equals $85 + 4\%/5$ in basis points for A, $100 + 3\%/5$ for B, and $115 + 2\%/5$ for C.

(b)   Describe the differences between a CDS contract and an insurance contract.

        Commentary on Question:
        The candidates performed as expected on this section. Most candidates received partial credit for identifying the difference between a CDS and an insurance contract. A common error was not noting how the payment terms for a CDS are undefined.

2. **Continued**

A CDS contract does not qualify as insurance because it is possible to receive payment when a credit event occurs without experiencing a loss. Payment terms are undefined and depend on loss recovery ratio and delivery method.

(c)   Calculate the upfront put value on the recommended contract if the running spread increases to 500 bps.

Commentary on Question:
The candidates performed below average on this section. Some candidates incorrectly used the result of part a to increase the spread. Another common error was not recognizing the corresponding increase in upfront cost.

The spread is going to increase by 500 – 115 or 385 basis points upon selection of contract C, with the upfront cost increasing by the same amount in basis points.

(d)   Recommend a settlement method to include in the contract upon a credit event triggering.

Commentary on Question:
The candidates performed as expected on this section. Most candidates received partial credit for correctly recommending cash settlement. A common error was not elaborating on the history and challenges of physical delivery.

Cash settlement is meant to make the bondholders whole and is preferred. Physical delivery was common in the past, but it required a potentially challenging bond purchase (bond squeeze).

3. **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:
(5e) Demonstrate an understanding of asset allocation approaches and techniques, including the concept of risk factor investing.

Sources:
QFIP-155-21 Fundamental of Efficient Factor investing pg 14 and pg 15

QFIP-155-21 Fundamental of Efficient Factor investing pg 20

Commentary on Question:
The question tests the concept of efficient factor investing, focusing on key metrics of a factor-based investment portfolio. The question tests the candidates' ability to calculate Sharpe ratios for several portfolios and list factors that impact the reduction in expected Sharpe ratio.

Solution:
(a) Calculate:

(i) the maximum possible Sharpe ratio for this portfolio

(ii) the weights for sub portfolio A and B to achieve the maximum Sharpe ratio

Commentary on Question:
Candidates performed above average on this section. The majority of candidates received most of the credit. Unsuccessful candidates generally did not identify the correct formula to calculate the maximum Sharpe ratio and weights for portfolio F.

(i) Sharpe ratio M = (6/15=0.4)
Information ratio A and B = (1/5=0.2)
Sharpe ratio F = ((0.4)^2 + (0.2)^2 + (0.2)^2)^0.5 =0.490

(ii) Weight A and B= (15*0.2)/(0.4*5) = 150%

(b) Calculate the Sharpe ratio for the optimal solution of portfolio F.

3. **Continued**

Commentary on Question:
Candidates performed below average on this section. While a few candidates understood that the weights for the optimal solution of portfolio F needed to be calculated, many unsuccessful candidates did not recognize this. As a consequence, these candidates did not calculate risk and return using the correct weights. Partial credit was awarded if candidates used the correct formulas for the return, risk and Sharpe ratio but had the wrong numeric solution.

Weights of optimal solution for long portfolio is 50% in A and 50% in B
Return = 6% + 50%*1% + 50%*1% = 7%
Risk = (15%^2+(50%*5%) ^2+(50%*5%) ^2)^0.5= 15.411%
Sharpe Ratio = 7/15.411=0.454

(c) Calculate the maximum possible Sharpe ratio for the portfolio.

Commentary on Question:
Candidates performed as expected on this question. Successful candidates applied the formula correctly. Unsuccessful candidates frequently used (1-corrAB) in the denominator instead of (1+corrAB).

Sharpe Ratio F = (Sharpe Ratio M^2 + (Information Ratio A^2 + Information Ratio B^2)/(1+corrAB))^0.5
Sharpe Ratio F = (0.4^2 + (0.2^2+0.2^2)/(1+0.2))^0.5 = 0.476

(d) List five factors that would increase the reduction in the expected Sharpe ratio of the portfolio.

Commentary on Question:
Candidates performed below average on this section. Very few candidates listed all five factors correctly. Most candidates did not correctly recall any of the factors or focused only the numerical components of the formula, which comprised one of the five factors.

- The number of nonmarket factors
- The magnitude of factor information ratios
- Lower levels of nonmarket factor risk
- Negative correlations between nonmarket factor returns
- Negative correlations between nonmarket factor exposure

3. **Continued**

(e)   Show that the small cap sub portfolio is a well-diversified portfolio.

   Commentary on Question:
   Candidates performed poorly on this section. Many candidates earned partial credit by calculating idiosyncratic risk, but then assessed that it is not large and concluded that the portfolio is well-diversified, which was insufficient. Additionally, some candidates omitted this part of the question.

   First determine portfolio's idiosyncratic risk
   =0.2402/(800)^0.5 = 0.85%
   Total risk = (16.30%^2+0.85%^2)^0.5= 16.32%
   Sharpe ratio before idiosyncratic risk = 727/1630=0.446
   Total Sharpe ratio = 727/1632=0.4454

   Since the total risk barely changes and idiosyncratic risk has an immaterial impact on Sharpe ratio, the given portfolio is a well-diversified portfolio.

4. **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:
Handbook of Fixed Income Securities, Fabozzi, F.J., 9th Edition, 2021, Chapter 10

Commentary on Question:
This question tested candidates' understanding of the characteristics of callable bonds.

Solution:
(a)   Explain why callable bonds might be preferable to straight bonds from an issuer perspective and from a buyer perspective, respectively.

Commentary on Question:
The candidates performed above average on this section. The majority of candidates received full credit on this section. The most common responses provided by the candidates were the lower cost for borrowers and higher yields/lower prices as compensation for the bondholders.

- Borrowers can lower borrowing cost and substitute with new bonds in a declining interest rate environment.
- Bond issuers can retire their debt to eliminate restrictive covenants, alter capital structure, increase shareholder value, or improve financial/managerial flexibility.
- Bondholders can receive higher yields and/or lower prices as compensation for giving the borrower the ability to call the bonds.

(b)   Compare a make-whole callable bond with a fixed-price callable bond.

Commentary on Question:
The candidates performed below average on this section. Many candidates accurately compared the price of the make-whole and fixed-price callable bonds. Additionally, many candidates accurately stated the formula for the make-whole redemption price. Very few candidates discussed the exercise time of the callable bonds, or the fact the make-whole calls are typically cheaper.

- Make-whole strike price (redemption price) is the max of (100% of principal amount + accrued interest, make-whole redemption price), while the fixed-price callable does not change

4. **Continued**

- Make-whole redemption price is equal to the present value of remaining coupon and principal payments discounted at the Treasury rate plus make-whole premium.
- The exercise time is any time before the maturity date.
- Lower cost is the primary reason companies issue make-whole calls instead of fixed-price calls.

(c)   Calculate the market price range at which it is optimal for the bond issuer to call Bond 2 on April 1, 2024.

Commentary on Question:
The candidates performed below average on this section. Very few candidates received full credit. Many candidates simply added the 50bps spread onto the Treasury rates provided in the table instead of interpolating between the 1-year and 2-year rates to arrive at the 1.5-year CMT rate and then adding the 50bps premium on top of that CMT rate to discount each of the cashflows. Additionally, many candidates did not consider that the notional plus accrued interest exceeded the make-whole redemption when determining the market price that makes it optimal for the bond issuer to call Bond 2. Some candidates omitted this part of the question.

See Excel file

(d)   Describe two other alternative methods a company may use to retire bonds prior to maturity.

Commentary on Question:
The candidates performed above average on this section. The most common responses from the candidates were the sinking fund provision and the tender offer. Some candidates simply listed alternative methods without providing any description, and these responses received no credit.

- Sinking fund provision: Money is applied periodically to redemption of bonds before maturity.
- Maintenance and replacement (M&R) fund provisions: M&R fund is used to secure the debt as well as to retire the debt through cash payments.
- Redemption through the sale of assets: Bonds can be retired through sales of assets specified by the release-of-property and substitution-of-property clauses.
- Tender offer: A firm may execute a tender offer and buy back specified debt issues.

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
  - 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.

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

Sources:

Anson, Mark, *Handbook of Alternative Assets, 2nd edition*, Section 6

Anson, Mark, *Handbook of Alternative Assets, 2nd edition*, Section 7

Commentary on Question:

This question tests the understanding of hedge fund strategies and the challenges they present with traditional risk analysis. The candidates performed below average on this question.

Solution:

(c)   Critique the use of the Sharpe ratio to evaluate hedge fund instruments.

   Commentary on Question:
   The candidates performed as expected on this section. Many candidates recognized that the underlying assumption of the Sharpe ratio, in which returns are normally distributed, does not hold for hedge funds. Other candidates failed to provide a concise conclusion of the Sharpe ratio's appropriateness for hedge funds.

5. **Continued**

Sharpe ratios are not an effective tool to evaluate hedge fund instruments compared to other asset classes. Hedge funds may pursue investment strategies that have nonlinear payoffs or are exposed to significant event risk. The distributions associated with hedge funds may demonstrate properties that cannot be fully captured by mean and variance. Higher-order moments, namely skewness and kurtosis, must be captured to fully characterize the return distributions of hedge funds. Since the Sharpe ratio is a comparison of the first two moments only, it is not an effective tool for measuring hedge fund performance.

(d)   Explain how three potential biases arise in the performance metrics reported in hedge fund databases.

Commentary on Question:
The candidates performed below average on this section. Many candidates were able to identify at least two biases, but few described their directional impact on return and risk explicitly.

The biases are:
- Survivorship bias: arises when a database of hedge funds includes only surviving hedge funds and not ones that have ceased to operate. This creates an upward bias in performance reporting because, presumably, hedge funds that have ceased operations perform poorly, and a downward bias in relative risk because those hedge funds that have ceased operations may have had more volatile returns as well
- Selection bias: hedge funds that are performing well have an incentive to report their results to a database in order to attract new investors into the fund, creating an upward bias in returns and downward bias in relative risk
- Catastrophe or Liquidation bias: this bias arises from the fact that hedge funds that are performing poorly and likely to cease operations stop reporting their performance before they actually close shop. This bias results in an upward bias in returns and a downward bias in risk because poor performance history is excluded from the data bias
- Self-selection bias: an offset to survivorship bias, this arises because some hedge funds stop reporting their information because they become so successful that it is no longer in their best interests to publicly report their performance; this creates a downward bias in the returns and upward bias in the relative risk

- Alternative to Selection bias: Backfill bias: when a database adds a hedge fund's historical performance to its pool of funds, it backfills the hedge fund performance to the date it began operations. Because a hedge fund manager holds the option of when to reveal their historical performance, it is reasonable to expect that they will disclose their performance when their results look most favorable, biasing the returns upward and relative risk downward

5. Continued

(c)   Calculate the S&P500 index level on December 31, 2023 that would have reduced SVS Co.'s Sharpe ratio to 0.

Commentary on Question:
The candidates performed poorly on this section. Some candidates successfully used the Sharpe ratio to determine SVS Co.'s return and identified that a Sharpe ratio of 0 implied the risk free rate was earned. Few candidates were able to determine the option premiums received by SVS Co.

See Excel.

(d)   Your colleague performs a portfolio mean-variance optimization algorithm to determine an appropriate allocation to SVS Co. within your company's portfolio.

Critique your colleague's approach.

Commentary on Question:
The candidates performed poorly on this section. Some candidates earned credit for providing reasonable alternatives to mean-variance optimization. However, very few candidates identified the short volatility position taken by SVS Co. and that the risk in this position had not manifested itself in the time period considered.

An allocation determined by mean-variance optimization will exhibit "short volatility bias". SVS Co. was able to boost their short-term risk-adjusted performance by increasing their exposure to a volatility event. SVS Co.'s allocation will reflect their high total return and Sharpe ratio, but really the risk inherent in their short position in volatility did not manifest itself, so algorithm will over-allocate to SVS Co. Incorporating higher-order moments into the optimization, e.g., multi-moment optimization, would eliminate the short volatility bias.

6. **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:

(7a)   Explain the use of segmented asset portfolios for supporting different investment objectives.

(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

Commentary on Question:
This question tests performance valuation and benchmark selection.

Solution:

(a)   Explain how an investment manager can outperform their benchmark.

   Commentary on Question:
   Candidates performed above average on this section. Most were able to list at least one of the two items. Full points were given if candidates explained both items.

   Impact equals (active) weight times return. A manager's decisions can affect the weight or the return.
   A manager can have a positive impact on an account's return relative to a benchmark through two basic avenues:
   (1) selecting superior (or avoiding inferior) performing assets and
   (2) owning the superior (inferior) performing assets in greater (lesser) proportions than are held in the benchmark.

(b)   Analyze the performance of the four managers by considering returns due to style and active management.

   Commentary on Question:
   Candidates performed as expected on this part. Most candidates were able to conduct some analysis of active management; however, many did not correctly calculate the returns due to style. Points were also given to candidates who performed a thorough qualitative analysis.

6. Continued

Breaking down the returns of each manager by style and active management:

Manager	Style = Benchmark – Market Index	Active Management = Actual Return - Benchmark
A	7.00% - 7.50% = -0.50%	7.00% - 7.00% = 0.00%
B	8.00% - 7.50% = 0.50%	6.00% - 8.00% = -2.00%
C	2.00% - 2.50% = -0.50%	1.00% - 2.00% = -1.00%
D	3.00% - 2.50% = 0.50%	4.00% - 3.00% = 1.00%

Analysis of the results
- Style: Reflects the manager's area of specialization. The investment styles of A and C had fallen out of favor over the year, while the styles of B and D were in favor.
- Active Management: Reflects the manager's ability to make decisions within their area of expertise. Managers B and C produced a negative outcome, Manager A had a neutral outcome, and Manager D had a positive outcome.

(c) Describe two ways to test the quality of the benchmark.

Commentary on Question:
Candidates performed above average on this section. Most candidates were able to list at least one relevant item. Full points were given for describing two from the below list.

Two of the following:
- Systematic biases: A manager's ability to identify investment opportunities should be uncorrelated with whether the manager's style is in or out of favor relative to the overall market. Over time, there should be minimal systematic biases in the benchmark relative to the account. The historical beta of the account relative to the benchmark should be close to 1.0 on average.
- Tracking error: The volatility of an account's returns relative to a good benchmark should be less than the volatility of the account's returns versus a market index or other alternative benchmarks. Such a result indicates that the benchmark is capturing important aspects of the manager's investment style.
- Risk characteristics: The objective of a good benchmark is to reflect but not to replicate the manager's investment process. Because an active manager is constantly making bets against the benchmark, a good benchmark will exhibit risk exposures at times greater than those of the managed portfolio and at times smaller. If the account's risk characteristics are always greater or smaller than those of the benchmark, a systematic bias exists.

6. **Continued**

- Coverage: Benchmark coverage is defined as the proportion of a portfolio's market value that is contained in the benchmark. High coverage indicates a strong correspondence between the manager's universe of potential securities and the benchmark. Low coverage indicates that the benchmark has little relationship, on a security level, with the opportunity set generated by the manager's investment process.
- Turnover: Because the benchmark should be an investable alternative to holding the manager's actual portfolio, the benchmark turnover should not be so excessive as to preclude the successful implementation of a passively managed portfolio.
- Positive active positions: An active position is an account's allocation to a security minus the corresponding weight of the same security in the benchmark. When a good custom security-based benchmark has been built, the manager should be expected to hold largely positive active positions for actively managed long-only accounts. A high proportion of negative active positions is indicative of a benchmark that is poorly representative of the manager's investment approach.

(d) Evaluate the performance of Company ABC's overall portfolio using macro attribution return metrics in the following levels:

(i) Asset Category

(ii) Investment Managers

Commentary on Question:
Candidates performed below average on this section. Many candidates were able to calculate the incremental return due to investment manager strategy, but many used the wrong returns when calculating the same for the asset category strategy.

Asset category strategy
Asset category incremental return
= Sum of [Category weight x (Category return – Risk-free return)]
= 0.75*(0.062-0.01) + 0.25*(0.028-0.01)
= 4.35%
The company's investment policy, or its asset allocation strategy, has a positive effect on the returns of the portfolio.

Investment manager strategy
Investment manager incremental return
= Sum of [Category weight x Manager weight x (Manager return – Benchmark return)]
= 0.75*[(0.2*0) + (0.8*0.02)] +0.25[(0.4*-0.01) + (0.6*0.01)]
= -1.15%

6. Continued

The company's investment managers made decisions that negatively impacted the portfolio return.

(e) Describe four levels for investment policy decision making in addition to Asset Category and Investment Managers.

Commentary on Question:
Candidates performed as expected on this section. Most candidates were able to list at least one relevant item. Full points were given if candidates list all four levels.

Net contributions - net inflows into the portfolio
Risk-free asset – assuming funds are invested at risk-free rate
Benchmark – impact of the managers' investment styles
Allocation effects - a reconciling factor accounting for fund sponsor deviation from their policy allocations

7.

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

Chapter 4: Collateralized Loan Obligations

Commentary on Question:
This question tests candidates' understanding of collateralized loan obligations (from concept to actual generation of cash flows).

Solution:
(a)   Calculate the total cash flows to Class A, B, C, and E, respectively, at the end of the first year.

   Commentary on Question:
   Candidates performed as expected. Many candidates received at least partial credit for recognizing the appropriate formulas to use.

   See the Excel sheet for detailed calculations

(b)   Calculate the principal payment to Class A at the end of the second year.

   Commentary on Question:
   Candidates performed below expectations. Those candidates that recognized that Class C failed the par coverage test which therefore triggered a principal payment to Class A from the available cash which is less than the required principal payment received full credit. Many candidates received partial credit for completing at least some of the steps.

   See Excel sheet for detailed calculations.

7. Continued

(c) Calculate the interest payment to Class B at the end of the fourth year.

Commentary on Question:
Candidates performed below expectations. Those candidates that recognized that the lower par amount after the principal payment in prior years and the failure of Class B to pass its par coverage test at the end of year 3 received full credit for their responses. Many candidates received partial credit for completing at least some of the steps.

See the Excel sheet for detailed calculations.

(d) Explain what is meant by "the CLO is bankrupt remote."

Commentary on Question:
Candidates performed below expectations. Many candidates received at least partial credit for each of the four elements that was addressed.

Special purposes entities like CLOs are said to be "bankrupt remote." One aspect of the term is that they are new entities without previous business activities. They therefore cannot have any legal liability for sins of the past.

Another aspect of their "remoteness from bankruptcy" is that the CLO will not be caught up in the bankruptcy of any other entity, such as the manager of the CLO's assets, or a party that sold assets to the CLO, or the banker that structured the CLO.

But another, very important aspect of a CLO's bankruptcy remoteness, is the absolute seniority and subordination of the CLO's debt tranches to one another. Even if it is a certainty that some holders of the CLO's debt will not receive their full principal and interest, cash flows from the CLO's assets are still distributed according to the original game plan dictated by seniority.

The CLO cannot go into bankruptcy, either voluntarily or through the action of an aggrieved creditor. In fact, the need for bankruptcy is obviated because the distribution of the CLO's cash flows, even if the CLO is insolvent, has already been determined in detail at the origination of the CLO.

8. **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:
(4a) Describe the regulatory and rating agency contexts in which various institutions operate and how those contexts affect portfolio strategy.

(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

Sources:
Maginn & Tuttle Ch 3

Commentary on Question:
This question tested candidates' knowledge of regulatory and rating agency requirements for risk management, in addition to market and interest rate risk management. Candidates performed below average for the question as a whole.

Solution:
(a) Describe

    (i)   Valuation concerns

    (ii)   Reinvestment risk

Commentary on Question:
Candidates performed below average for this question. Some candidates identified asset liability duration mismatch as a concern, but very few candidates mentioned the impact on surplus. Also, many candidates described reinvestment risk correctly, but did not mention the impact on profitability.

8. Continued

Valuation concerns: In a period of changing interest rates, a mismatch between the duration of an insurance company's assets and that of its liabilities can lead to erosion of surplus. The existence of valuation reserves alone may be insufficient to prevent a write-down of surplus, possibly creating a capital adequacy problem. Consequently, valuation concerns tend to limit insurers' risk tolerance.

Reinvestment risk: Reinvestment risk is defined as the risk of reinvesting coupon income or principal at a rate less than the original coupon or purchase rate. If a company does not carefully manage its asset and liability durations, an unexpected decline in interest rates can jeopardize profitability. Thus controlling reinvestment risk is an important risk objective.

(b) Describe two other risks and how they impact ORD's risk objectives.

Commentary on Question:
Candidates performed as expected for this part of the question. Many candidates received credit for describing risks other than credit risk and cashflow volatility risk. Some candidates mentioned credit risk, but most candidates did not mention cashflow volatility risk.

Credit risk. Credit risk represents a potential source of income loss for insurance companies. Insurers seek to control this risk through broad diversification and seek adequate compensation for taking risk in terms of the expected return or interest rate spread when investing in various asset classes.

Cash-flow volatility. Loss of income or delays in collecting and reinvesting cash flow from investments is another key aspect of risk for which life insurance companies have low tolerance. Actuaries assume that investment income will be available for reinvestment at a rate at least equal to an assumed rate. Controlling cash-flow volatility is thus a risk objective.

Credit was given for describing other risks for life and annuity insurance companies.

(c)

(i) Define net interest spread.

(ii) Describe the consequences to ORD of not meeting the return objective.

(iii) State the strategies that ORD could use to meet the return objective.

8. Continued

(i)   The net interest spread is the difference between interest earned and interest credited to policyholders.

(ii)   If the insurer fails to earn the minimum return, its liabilities will increase faster than the assets, potentially leading to a decrease in surplus. This could lead to regulator concerns or solvency concerns.

(iii)   Some strategies that ORD could use to meet the return objective would be:
- Segmentation of insurance company portfolios and specifying return requirements by major line of business.
- Many life insurance companies are evaluating a variety of capital appreciation strategies to meet their return objectives.

(d)   Describe two risks that ORD must address.

Disintermediation: In a period of rising interest rates, a mismatch between the duration of an insurance company's assets and its liabilities can create a net loss if the assets' duration exceeds that of the liabilities. An asset/liability mismatch can exacerbate the effects of disintermediation.

Asset marketability risk. The marketability of investments is important to insure ample liquidity. Liquidity considerations are constraining the percentage invested in less liquid asset classes such as private placement bonds or real estate.

(e)   Describe three common regulatory and legal considerations that may impact ORD.

8. **Continued**

Commentary on Question:
Candidates performed poorly on this part of the question.
Many candidates received partial credit for describing statutory or capital requirements. No candidate received credit for mentioning the Prudent Investor rule, or NAIC/International accounting standards for standard valuation methods.

Eligible investments. Insurance laws determine the classes of assets eligible for investment and may specify the quality standards for each asset class.

Prudent investor rule. Replacing traditional ''laundry lists'' of approved investments with prudent investor logic simplifies the regulatory process and allows life insurance companies much needed flexibility to keep up with the ever-changing array of investment alternatives.

Valuation methods. In the European Union, International Accounting Standards specify a set of valuation procedures. In the United States, uniform valuation methods are established and administered by the NAIC.
Partial credit was given for describing statutory capital requirements.

9. **Learning Objectives:**

6. The candidate will understand how to construct and manage investment portfolios relative to a portfolio of liabilities.

Learning Outcomes:

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

Sources:

Maginn & Tuttle, *Managing Investment Portfolios 3rd* Edition, Chapter 6, Section 4.1

Commentary on Question:
The objective of this question was to ascertain candidates' high-level understanding of the fixed-income portfolio management process by testing their conceptual knowledge of key ideas such as duration, immunization, and interest rate risk with supporting calculations as needed.

Solution:

(a) Explain whether each of the above statements is true or false.

Commentary on Question:
Candidates performed as expected on this section. With respect to the first statement, it was commonly recognized that liquidity is a key consideration for immunization. For the second statement, it was less common for candidates to critique the statement fully and provide the required context for a full credit true/false response.

The critiques for each statement are

- Liquidity is a key consideration for securities in an immunized portfolio.

This is a true statement, as liquidity impacts the ability and costs associated with rebalancing.

- Immunization achieves the objective of ensuring that the surplus will remain unchanged for small changes in interest rates.

This is a false statement, though is somewhat true as immunization is effective if interest rate shifts are both parallel and   small first order changes occur. Surplus value can increase due to second order effects/convexity.

(b) Calculate the new market value of each bond required to reestablish the dollar duration of the portfolio.

9. Continued

Commentary on Question:
Candidates performed above average on this section. Candidates were typically successful in understanding the methodology expected for calculating the Rebalancing Ratio and applying it correctly to determine the new values for the bonds in the portfolio. Most errors that did occur related to minor arithmetic issues in the spreadsheet calculations.

We need the dollar duration for each bond, found by the formula

Dollar duration = Duration x Portfolio Value x 0.01

followed by the average for the portfolio.

See Excel for the calculations.

(c)

(i) Identify which of the portfolios best represents a barbell portfolio and which best represents a bullet portfolio.

(ii) Justify which portfolio has greater risk exposure for non-parallel rate shifts.

Commentary on Question:
Candidates performed above average on this section. It was commonly the case that candidates correctly distinguished between the bullet and barbell structures and adequately discussed the lowered exposure to interest rate structure for the bullet portfolio. Deductions for this question typically occurred when candidates did not fully justify their reasoning with respect to how the barbell portfolio is affected by the non-parallel rate shift.

(i) Portfolio A is a bullet portfolio, while Portfolio B is a barbell portfolio.

(ii) The barbell portfolio experiences the lower reinvestment rates longer than the bullet portfolio does. Also, more of the barbell portfolio is still outstanding at the end of the investment horizon, which means that the same rate increase causes much more of a capital loss. In short, the bullet portfolio has less exposure to changes in the interest rate structure than the barbell portfolio.

10. **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:

1. Commercial Real Estate Analysis and Investments, Geltner & Miller, 3rd Edition, 2014, Ch. 12: Advanced Micro-Level Valuation (excluding Appendix 12B), p. 257-8

2. Commercial Real Estate Analysis and Investments, Geltner & Miller, 3rd Edition, 2014, Ch. 14: After-Tax Investment Analysis & Corporate Real Estate, p. 338

Commentary on Question:
This question tests the concept of investment value, market value, and how tax advantages and special management control would affect investment values.

Overall, the candidates' performance was below average, especially on part (b).

Solution:
(a)

(i)   Describe the concept of market value as it relates to real estate.

(ii)   Describe the concept of investment value as it relates to real estate.

(iii)   Describe two reasons why market value may differ from investment value for a real estate investor.

10. **Continued**

Commentary on Question:
Students performed above average in this part of the question, which was mostly a memorization and comprehension question. Most students understood the definition and differences between market value and investment value in a Real Estate setting. Candidates who earned less than full credit did not provide sufficient explanations.

(i) Market value
- expected price at which assets would sell currently in the private real estate market / what you can sell the asset for today
- Most likely price prior to a deal actually being done, or the ex ante expectation (mean of the probability distribution) of the possible prices
- Reflects current opportunity cost or opportunity value of the investment in the asset
- Objective value

(ii) Investment value
- represents the maximum amount a given person would be willing to pay for a good, OR value to a particular investor owning and operating the investment for a long period of time, and explicitly not planning to sell the asset for a long period of time
- defined with respect to a specified investor / subjective value

(iii)
- an investor will have unique characteristics that will differentiate them from other investors, such as income tax status, the potential of entrepreneurial profits, etc.
- the market value is the average and assumes a well-functioning market for the asset; this may not be the case
- the market value ignores investor-specific characteristics

(b)

(i) (*0.5 points*) Calculate the effective tax rate on mortgage interest income faced by marginal investors in the debt market.

(ii) (*1 point*) Calculate the investment value for investor A.

Investor C is a savvy investor and can negotiate a better market interest rate than what is currently offered.

(iii) (*2 points*) Calculate the pre-tax market interest rate that would produce the same investment value for investors B and C.

10. Continued

Commentary on Question:
Students performed poorly on question (b). Most students earned only partial credit for question(i). Only a few students earned full credit on part (ii), and many more earned only partial points because they failed to show their work. Part (iii) was answered quite poorly as well, as nearly all students failed to earn any credit and most left it blank.

See Excel

11. **Learning Objectives:**

6.   The candidate will understand how to construct and manage investment portfolios relative to a portfolio of liabilities.

Learning Outcomes:

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

(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:

QFIP-158-23: A Guide to Duration, DV01, and Yield Curve Risk Transformations

QFIP-151-20: Ch. 5 Role of Asset Managers in ALM in Fin. Inst.'s of Asset Liability Management of Financial Institutions, Tilman, 2003

Commentary on Question:
This question tests candidates on constructing and managing portfolios of fixed income investments relative to the liabilities that they support. Overall candidates performed below average on this question.

Solution:

(a)   Calculate an estimate of the profit/loss given a 100bps parallel decrease in interest rates.

Commentary on Question:
Candidates performed as expected on the question, with most candidates able to get some of the calculation correct. When candidates successfully calculated the impact, they were able to correctly identify that the net impact is a loss from the parallel shift.

Weighted average duration of asset portfolio =
$(100*3+300*5+100*10)/500 = 5.6$

Impact of 100bps parallel decrease in interest rates =
-(asset duration * Asset MV * (100bps) – liability duration * Reserves * (100bps))
$= -((5.6 * 500 * -1\%) – (6* 500 * -1\%))$
$= -(-28 + 30)$
$= -2$ million
Loss of $2 million

11. Continued

(b)   Construct the portfolio allocation that gives the maximum yield on the assets while remaining within the company's risk tolerance.

Commentary on Question:
Candidates performed below average on the question. Most candidates were able to correctly identify that a shift to the 3-year and 10-year was required to maximize yield, but many struggled with identifying the correct formula needed to solve for the allocation needed.

The 5-year ZCB asset is the lowest yielding; to maximize total yield, we would allocate away from the 5-year ZCB and into the 3-year and 10-year.
Since the 3-year has a higher yield than the 10-year, we would allocate as much to the 3-year as possible without breaching the 0.5 duration mismatch tolerance.

$x\% * 3 + (1-x\%) * 10 = 6 – 0.5$
$x\% * 3 + (1-x\%) * 10 = 5.5$
$x = 64.3\%$

Therefore, allocation of maximum yielding risk-compliant portfolio is:
3-year = 64.3% * $500m = $321.43m
10-year = (1-64.3%) * $500m = $178.57m

(c)   The analyst makes a recommendation that the company should reallocate to the portfolio in part b), since it offers a higher yield while still remaining within the company's risk guidelines.

Critique the analyst's recommendation.

Commentary on Question:
Candidates performed as expected, with most candidates able to identify at least one critique of the analyst's recommendation.

While compliant with the duration risk tolerance, the recommendation ignores certain risk factors:

Key Rate Mismatch: The changed asset portfolio is bar belled to the 3 and 10 year tenors and would therefore be sensitive to a tilt in the yield curve, potentially increasing the level of interest rate risk in the portfolio
Credit Risk: Higher yield is achieved through allocating away from a AA rated bond and into BB and BBB bonds. This decreases the average credit rating of the portfolio and increases the exposure to credit risk.
Liquidity Risk: The 5-year asset is the most liquid and therefore serves an important purpose of providing liquidity

11. Continued

(d) Explain adverse selection bias in the context of benchmarking to a common fixed income index.

Commentary on Question:
Candidates performed poorly on this question. Candidates were most commonly able to identify the last point.

- Index securities tend to have a price premium attached to them due to the excess demand by passive managers
- Frequent regulation by authorities might force a larger than economically reasonable exposure to a sector or maturity.
- Forced purchase by passive managers to maintain index weights may create an asymmetric risk-reward profile in periods of market stress.
- Most indices are market value weighted, which leads to a higher concentration of large issuers and a consequent dilution in the credit quality of the index.

12. **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, J.L., Tuttle, D.L., Managing Investment Portfolios: A Dynamic Process, 3rd Edition Chapter 5

Commentary on Question:

This question tests the concept of evaluating a strategic allocation appropriate for a particular institutional investor.
Overall, candidates performed poorly on this question.

Solution:

(a)   Recommend two improvements to the IPS.

Commentary on Question:
The candidates performed poorly on this section. Only a few candidates were able to provide specific recommendations on the IPS regarding WOW Endowments. Candidates who received less than full credit tended to describe generic IPS objectives, vs. considering the unique aspects of this scenario.

- Endowments usually need a higher allocation to equity investments to keep up with inflationary costs. Having a large allocation for cash equivalents will likely make it difficult to keep up with long term inflationary pressures.
- Liquidity needs do not seem to be very high; Most spending seems fairly consistent year-over-year. Gifts spending usually ranges from 7-8m a year, and similarly admin expenses seem to hover around 0.5m and investment expenses around 2.5m. 2020-2021 data are likely skewed given macro environment.
- The IPS also focuses on short-to-mid term investments in general, which again does not align with long-term time horizon endowments usually focus on.

12. Continued

(b) Identify the optimal Asset among A through C to add to the portfolio if the key metric is:

(i) Maximizing Sharpe Ratio

(ii) Maximizing Utility Function

Commentary on Question:
The candidates performed below average on this section. Most candidates were able to calculate the utility function correctly, but only a few were able to calculate the correct risk-free rate and Sharpe Ratios. Partial credits were given to these candidates.

To calculate Sharpe Ratios, we will need to determine what the risk-free rate is. Because we know the corner portfolio including asset A is the same as the base portfolio, we can equate these two to determine risk-free rate, rf.

$(7.5\% - rf)/10.0\% = (6.0\% - rf)/6.67\%$
$.005 - .0667rf = .006 - .1rf$
$.333rf = .001$
$rf = 3\%$

We can now calculate the Sharpe ratio and utility functions for each corner portfolio:

A:
Sharpe Ratio: $(6\% - 3\%)/6.67\% = 45\%$
Utility function: $6\% - .5 * 4 * 6.67\%^2 = 6\% - .89\% = 5.11\%$

B:
Sharpe Ratio: $(9.3\% - 3\%)/12\% = 52.5\%$
Utility function: $9.3\% - .5 * 4 * 12\%^2 = 6.42\%$

C:
Sharpe ratio: $(8.5\% - 3\%)/11\% = 50\%$
Utility function: $8.5\% - 2 * 11\%^2 = 6.08\%$

B & C meet the minimum Sharpe Ratio required.
Maximizing Sharpe Ratio: Add asset B
Maximizing Utility function: Add asset B

See Excel model solution for details.

12. Continued

(c)

        (i)   Define the capital allocation line.

        (ii)   Calculate the maximum risk aversion parameter for which the optimal corner portfolio would lie on the capital allocation line.

Commentary on Question:
The candidates performed below average on (i) and poorly on (ii).

Some candidates were able to define the capital allocation line correctly and received full credit. Others did not provide a sufficient definition.

Most candidates received no credit for (ii), as the large majority left this question blank.

The capital allocation line represents the expected return/standard deviation combinations that exist based on a combination of risk-free asset with the investor's optimal portfolio (the tangency portfolio that maximizes Sharpe Ratio)

The portfolio with asset B is the tangency portfolio. The question is asking how high the risk aversion parameter can be for this portfolio to remain the optimal portfolio based on the utility function.

When comparing this portfolio to the other 3, we will need the following inequality to hold:
9.3% - .5 * Ra*12%^2 > Rm - .5 * Ra * sigma^2

Re-arranging terms, we find that Ra must satisfy the following:
.5 * Ra *(12%^2 – sigma^2) < 9.3% - Rm
Ra < 2*(9.3%-Rm)/(12%^2-sigma^2)

Compared to Option A:
Ra < 2*(9.3% - 6%)/(12%^2 – 6.67%^2) = 6.63

Compared to Option C:
Ra < 2*(9.3% - 8.5%)/(12%^2 – 11%^2) = 6.96

The final inequality needs to be switched as we are dividing by a negative value in solving.

For all inequalities to hold, we find the risk aversion factor must be below 6.63.

See Excel model solution for details.

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13. **Learning Objectives:**
1. The candidate will understand how to work with the variety of fixed income instruments and evaluate fixed income portfolios.

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:
(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

(2a) Demonstrate an understanding of credit analysis.

Sources:
Handbook of Fixed Income Securities, Fabozzi, F.J., 9th Edition, 2021, Chapter 60

The Handbook of Credit Risk Management, Bouteille & Coogan-Pushner, 2nd Edition, 2022, Chapter 4

Commentary on Question:
This question tests the candidates understanding of repurchase agreements and the measurement of credit exposure. Overall, candidates performed below average on this question.

Solution:
(a) Describe the exchanges involved in the above repo transaction, including the timing of each exchange and the amounts exchanged. Round amounts to the nearest thousand dollars after the last calculation.

Commentary on Question:
The candidates performed poorly on this section. Most candidates failed to calculate the price of corporate bond at initiation. More than half of the candidates failed to convert the annual repo rates to 10-days interest rates. Partial credits were given if correct formula was presented.

At initiation, ABC would sell XYZ the corporate bond for $\frac{\$100M}{103\%} = \$97.087$
On day 10, ABC would buy back the corporate bond for $97.087M of cash plus interest of $\frac{10}{360} \times 0.12\% \times \$97.087M = .003236$

For a total purchase price of $97.091M

Reference: 1, p. 1485-1487

13. Continued

(b) Critique XYZ's expected UGD of 10%.

Commentary on Question:
The candidates performed below average on this section. Most candidates failed to provide adequate and complete critiques. Most candidates only mentioned that historical experience can be irrelevant. Candidates were expected to provide at least two critiques to receive full credits. Credits were awarded to candidates with other reasonable answers.

- This is consistent with typical practice, in which banks set the UGD based on historical experience.
- The borrower can draw the full amount of the revolver at any time.
- In the event of a default, the borrower may be more likely to try to draw on the line.
- In a systemic crisis, such as the COVID-19 pandemic, multiple clients may try to draw on their lines, which may make the historical experience irrelevant.

Reference: 2, p. 51-52.

(c) Calculate the Gross Exposure, Net Exposure, and Adjusted Exposure for each transaction (the repo and the revolver).

Commentary on Question:
The candidates performed below average on this section. Most candidates were able to provide correct exposure calculations for Revolver, but failed to provide correct calculation for Repo.

- Gross exposure (GE) is the absolute amount at risk
- Net exposure (NE) = GE less collateral pledged, where the collateral pledged has a 20% valuation haircut applied
- Adjusted exposure (AE) = NE times UGD (expected Usage Given Default)

	Repo	Revolver
Gross Exposure	$97.091M	$150M
Net Exposure	$17.091M	$150M
Adjusted Exposure	$17.091M	$15M

Reference: 2, p. 48-50.

(d) Identify three additional dimensions of a transaction other than Exposure that can be used to analyze and compare credit exposures.

13. Continued

Commentary on Question:
The candidates performed as expected on this section. Candidates were expected to provide all 3 dimensions as listed below to receive full credits.

- **The probability of default**: the likelihood that a counterparty will default.
- **The recovery rate**: the amount of money relative to the exposure that can be recovered in case of default.
- **The tenor**: the time period in which some or all of the money is at risk.

Reference: 2, p. 52-54

(e)   Recommend whether Bank XYZ should enter into either the repo or the revolver.

Commentary on Question:
The candidates performed poorly on this section. Candidates were expected to provide reasonable discussion on each credit dimension (exposure, tenor, recovery rate, probability of default) to receive full credits.
Either transaction may be recommended, as long as consistent supporting arguments were provided.

I would recommend XYZ enter into the repo transaction.
- The repo transaction has a much shorter tenor than the revolver (10 days versus 5 years). The likelihood of default is easier to predict over a shorter time horizon than a longer horizon.
- The repo has a lower gross and net exposure than the revolver, though it does have a higher adjusted exposure. Though the revolver has a lower adjusted exposure on paper, the realized exposure can be highly variable depending on how much ABC ultimately chooses to utilize in the case of default.
- Over the same horizon, the probability of default should be similar between the two transactions, since they are with the same counterparty (ABC), though the revolver is a longer tenor transaction, as mentioned above.
- I assume the repo and revolver have similar recovery rates (after accounting for the repo collateral in the exposure).
- Significant collateral on Repo, minimizes risk to the bank