

Exam QFIPM

Date: Friday, October 28, 2022

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 17 questions numbered 1 through 17 with a total of 100 points.

The points for each question are indicated at the beginning of the question.
2. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions provided in this document.

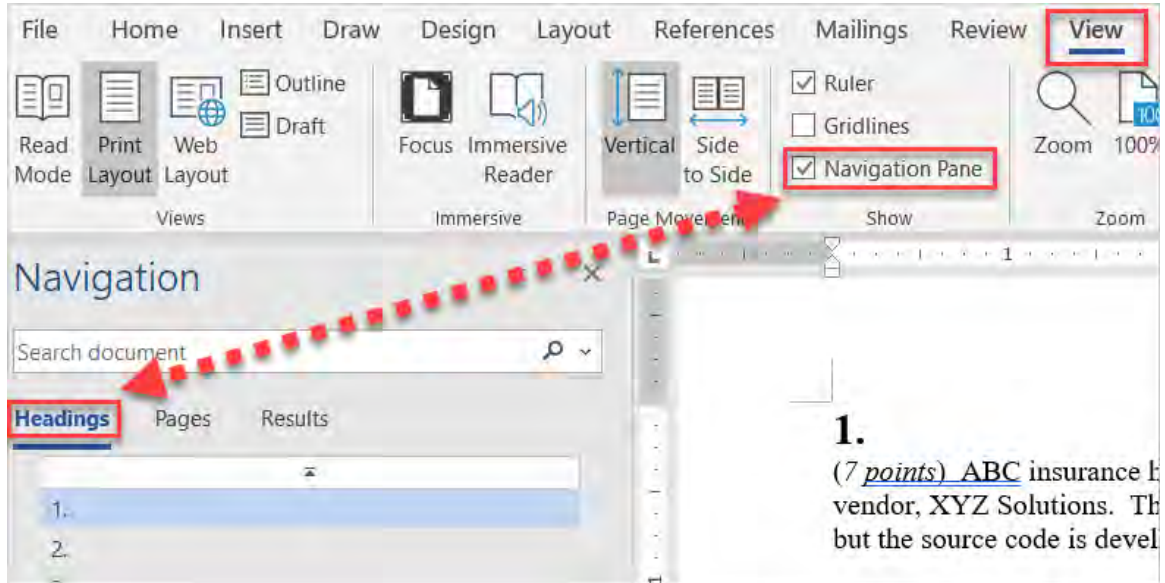
Written-Answer Instructions

1. Each question part or subpart should be answered either in the Word document or the Excel file as directed. Graders will only look at work in the indicated file.
 - a) In the Word document, answers should be entered in the box marked ANSWER. The box will expand as lines of text are added. There is no need to use special characters or subscripts (though they may be used). For example, β_1 can be typed as beta_1 (and ^ used to indicate a superscript).
 - b) In the Excel document formulas should be entered. Performing calculations on scratch paper or with a calculator and then entering the answer in the cell will not earn full credit. Formatting of cells or rounding is not required for credit.
 - c) Individual exams may provide additional directions that apply throughout the exam or to individual items.
2. When you are asked to calculate, show all your work including any applicable formulas. When you are asked to recommend, provide proper justification supporting your recommendation.
3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your five-digit candidate number in the filename.
4. The Word and Excel files that contain your answers must be uploaded before time expires.

Navigation Instructions

Open the Navigation Pane to jump to questions.

Press Ctrl+F, or click View > Navigation Pane:



1.

(6 points) You are an Asset Liability Management officer at ABC life insurance company. Most of your company's products are life insurance with limited cash surrender value options, term annuities, and life annuities.

Some characteristics of ABC's approach to their business:

- Competitive products with minimalistic approach to underwriting and competitively low premium rates relative to their competition.
- Prides themselves in ensuring an efficient use of capital by targeting just above the regulatory minimum,
- A dynamic investment approach that varies ensuring they are doing everything they can to maximize the yield on their asset portfolio.
- Maximizing profits through ensuring all mortality risk is held in house.

(a) (1 point) Critique ABC's approach to the business from a risk and investment perspective.

ANSWER:

Tim, an analyst on your team, makes the following comments regarding ABC's asset liability management framework:

- Primary risk: Liquidity risk should be the primary focus for ABC because future claims are hard to predict.
- Asset liability management model: Stochastic models such as Dynamic Financial Analysis (DFA) should be used in ABC's asset and liability.
- Mortality rates: Predicting mortality rates is of great importance to ABC.
- Usage of derivatives: Derivatives are not effective in hedging ABC's insurance risks, so ABC should use derivatives primarily as a means to generate higher investment returns.

(b) (2 points) Critique each of Tim's comments, providing a more appropriate argument to each point above if needed.

ANSWER:

1. Continued

Historically, ABC has invested a large portion of its assets in fixed income securities. There are concerns that the environment in which ABC operates, that being a period of persistent low interest rates may negatively affect the company, ABC has recently shifted a portion of its investments from fixed income securities to equities.

- (c) (1 point) Explain how long-lasting low interest rates could impact both the assets and liabilities of ABC.

ANSWER:

- (d) (1 point) Evaluate the potential impacts of shifting to a higher equity mix on ABC's asset liability management.

ANSWER:

To hedge against risks of investments associated with climate change, you are considering to include green investments in your asset liability management framework.

- (e) (1 point) Define two classes of green investments.

ANSWER:

2.

(5 points) In evaluating the performance of a fixed-income investment manager, your supervisor suggested that the fixed income total return should consist of the following four components:

- Return from interest rate management
- Return from sector/quality management
- Return from selection of specific securities
- Return from trading activities

(a) (1 point) Critique your supervisor's assessment.

ANSWER:

To evaluate the manager's value-added return, you compared the portfolio's recent sector weighting and bond selection to a benchmark bond index:

Sector	Portfolio Weight (%)	Index Weight (%)	Portfolio Return (%)	Index Return (%)
Government bonds	50.8	54.5	2.4	2.4
Corporate bonds	40.2	39.0	3.5	3.8
Mortgaged backed securities	9.0	6.5	5.5	5.0

(b) (2 points) Derive a micro attribution analysis by calculating the value-added returns due to sector allocation, within-sector selection, and allocation/selection interaction.

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

Your supervisor asks you to look at a simplified framework for Return Accountability, that is divided into quadrants I, II, III, and IV. You have been provided with the following matrix with quadrants identified which contains mean annualized returns by activity for the investment manager over the last 15 years.

		Selection	
		Actual	Passive
Timing	Actual	(IV) 8%	(II) 11.12%
	Passive	(III) 11.5%	(I) 12.25%

2. Continued

(c) (2 points)

- (i) (1.5 points) Calculate active returns due to timing, security selection, and other items.

ANSWER:

- (ii) (0.5 points) Calculate how much total active management by the manager investment has benefited or cost the plan over the 15-year period.

ANSWER:

3.

(5 points) Company ABC manages pension funds using a collection of several portfolios.

Below is information about the equity portfolios under three different active managers. Index Y is a broad market index.

Manager	Amount	Return	Total active risk with respect to Index Y	Misfit risk	Manager's orientation
A	200	11%	2%	1%	Market
B	100	14%	3%	2%	Value
C	100	14%	4%	3%	Momentum

In addition to the broad market index, there are two component indices associated with Y.

Index	Return
Y	10%
Y Value	12%
Y Momentum	13%

Manager performance is evaluated based on the information ratio.

Recently, Company ABC has become concerned about the ability of its portfolios to meet future obligations in a shifting economic environment. Specifically, senior management has become concerned about the long-term performance of ABC's traditional equity-centric asset allocation approach as inflation and growth change.

- (a) (2 points) Assess the relative performance of the three managers A, B, and C.

ANSWER:

- (b) (2 points) Describe the benefits of implementing a completion portfolio for Company ABC.

ANSWER:

- (c) (1 point) Recommend an investment approach that can help alleviate the concerns of Company ABC's senior management.

ANSWER:

4.

(6 points) You have recently been hired by a pension plan to assist with designing and implementing a de-risking strategy for the plan. The plan is currently overfunded and uses an asset-only approach for managing the investment portfolio. A colleague has proposed moving to an asset liability management (ALM) approach to better manage the pension plan's overall risk.

- (a) (0.5 points) List two reasons why it may be appropriate to use an ALM approach for the pension plan.

ANSWER:

In order to help improve the risk-adjusted performance of the pension plan, the portfolio management team is investigating the use of the following three alternative assets classes:

- TIPS
- Real estate (direct ownership)
- Private equity

Based on their analysis, the current portfolio and proposed asset classes have the following return characteristics.

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

4. Continued

(b) (2.5 points) For each of the alternative asset classes:

(i) (1 point) Calculate the Sharpe ratio, assuming a 3% risk-free rate.

ANSWER:

(ii) (1.5 points) Assess whether adding the asset class to the portfolio achieves a mean-variance improvement.

ANSWER:

While the primary goal of the alternative assets would be to improve the risk-adjusted expected return of the portfolio, the portfolio management team is also considering the plan's key features. In particular:

- The pension benefits are indexed to inflation
- A large proportion of members are at or near retirement age
- Plan members have the option to take the cash value of their pension at termination or retirement

(c) (2 points) Evaluate how well each asset class addresses the above-mentioned concerns.

ANSWER:

(d) (1 point) Recommend an asset class in which to invest.

ANSWER:

5.

(6 points) You are working for an investment fund that is expanding its investment portfolio exposure to the hedge fund market.

- (a) (1 point) Describe three hedge fund strategies adopted by market directional hedge funds.

ANSWER:

- (b) (0.5 points) Identify the strategy that gives the least emphasis to security selection from the three hedge fund strategies in part (a).

ANSWER:

Your colleague provided the historical risk-return profiles of four selected hedge funds in the past 15 years using monthly return data. The funds all adopt different strategies. Three of them use market directional strategies and one specializes in merger arbitrage. The results are summarized in the table below, which nonetheless misses the fund strategy field.

Fund	Average Return	Standard Deviation	Skewness	Excess Kurtosis	Sharpe Ratio
Market index	1.01%	4.40%	-0.61	0.58	0.14
A	0.32%	6.10%	0.14	1.56	-0.01
B	1.36%	2.55%	0.19	1.41	0.39
C	0.82%	1.22%	-2.63	11.61	0.34
D	1.03%	1.95%	0.10	-0.52	0.32

- (c) (2 points) Assess the hedge fund strategy most likely adopted by each of the four funds based on your knowledge of the strategies' historical return.

ANSWER:

5. Continued

After consideration, you have narrowed down the potential investment targets to two hedge funds, whose historical monthly return statistics over the past 10 years are summarized below.

Fund	Average Return	Standard Deviation	Skewness	Excess Kurtosis	Sharpe Ratio
E	1.38%	2.59%	?	2.55	0.41
F	1.27%	2.51%	0.11	2.41	?

The third moment of fund E monthly return is:

$$E(R_E^3) = 0.0035\%$$

- (d) (1 point) Calculate the missing values in the table.

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

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

ANSWER:

Investment risk is currently quantified using the Value-at-Risk (VaR) measure assuming normally distributed asset returns. Fund E has a market value of \$1 million.

- (e) (1 point) Calculate the quarterly VaR at 95% level for Fund E.

ANSWER:

- (f) (0.5 points) Assess if the normality assumption used in calculating VaR is appropriate for capturing the investment risk of Fund E and Fund F.

ANSWER:

6.

(6 points) The Chief Investment Officer of your company has asked you to evaluate a new core-plus fixed-income fund. As you read through the fund's prospectus, you notice that the manager is able to allocate a portion of the fund to emerging markets sovereign debt and that the fund utilizes leverage by use of the repurchase agreements. In the "Risk Factors" section of the document, it lists the repo rate as a potential risk to its return.

- (a) (1.5 points) Identify two advantages and four disadvantages of investing in emerging market debt.

ANSWER:

- (b) (1 point) Explain three factors that can drive the repo rate to be a drag on the fund's return.

ANSWER:

You examine the performance metrics of the fund, and notice:

- The fund returned 8% over the previous year.
- Estimated return from the underlying bond holdings is 3.5%.
- The fund is leveraged at a borrowing rate of 2%.

You assume the leverage ratio remains constant over the previous year.

- (c) (2 points) Calculate the return on the bond holdings that would have resulted in the complete exhaustion of the fund over the past year.

ANSWER:

Recently, your company sold a Guaranteed Investment Contract (GIC) to a large institutional client. The terms of the transaction are:

- The client pays \$100 million premium at the beginning of year 1 (the contract inception date), and \$60 million premium at the beginning of year 2.
- The contract matures at the end of year 2 with guaranteed maturity value of \$166 million.

6. Continued

The yield curve is flat at 2.40% at the contract inception.

- (d) *(1.5 points)* Design an immunization strategy to manage the investment portfolio for this GIC contract.

ANSWER:

7.

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

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

(a) (2 points) Critique the above analysis.

ANSWER:

The Company elects to present insurance finance income and expense in profit or loss and uses the fair value option for backing assets. The management believes this policy decision may reduce the accounting mismatch.

(b) (1 point) Describe how this policy decision may reduce the accounting mismatch.

ANSWER:

(c) (1 point) Explain two advantages and two limitations of this policy decision.

ANSWER:

You receive the following information about the insurance contracts and the backing assets.

- Liability duration is 14 years.
- The backing asset is mainly a corporate bond portfolio with a duration of 7 years.

7. Continued

- (d) *(1 point)* Analyze how the above information affects your assessment of the policy decision.

ANSWER:

8.

(6 points) Company XYZ is considering issuing a bond, expected to be rated BBB. The company has an option of issuing the bond with either a make-whole call provision or a fixed-price call.

- (a) (1 point) Contrast a make-whole call provision and a fixed-price call.

ANSWER:

XYZ issued a 10-year bond with a make whole call provision until year 7.5 as follows:

- (i) Par value = \$100,000.
- (ii) Annual Coupon = \$6,000, payable at the end of the year.

Selected constant-maturity Treasury (CMT) published by the Treasury at the end of 7.5 years are as follows:

Duration	6 Mo	1 Yr	3 Yr	7 Yr	10 Yr
CMT	CMT	CMT	CMT	CMT	CMT
Current Rate	0.48	1.00	1.20	2.40	3.00

8. Continued

PV factors which discount future cashflows to yr 7.5 are provided below:

Year	End of year 8	End of year 9	End of year 10
Cashflow	1	1	1
Discount rate	PV of cashflows to yr 7.5		
	1.00	2.956	
	1.05	2.953	
	1.10	2.951	
	1.15	2.949	
	1.20	2.947	
	1.25	2.945	
	1.30	2.943	
	2.40	2.896	
	2.50	2.892	
	2.60	2.887	
	2.70	2.883	
	2.80	2.879	
	2.90	2.875	
	3.00	2.871	

7.5 years after the issue of the bond with a make-whole call provision, XYZ is considering exercising their option to redeem their bond.

(b) (1.5 points) Calculate the call price.

ANSWER:

XYZ allowed the option to expire and immediately declares a tender offer lasting 6 months using a fixed spread of 12bps. At the end of the 6-month period, selected CMTs published by the treasury are as follows:

Duration	6 Mo	1 Yr	3 Yr	7 Yr	10 Yr
	CMT	CMT	CMT	CMT	CMT
Current Rate	0.48	0.80	0.96	1.86	1.92

8. Continued

(c) (1.5 points)

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

ANSWER:

- (ii) Describe the advantages of using a tender offer.

ANSWER:

The rating agencies downgrade the bond to “B” and XYZ would like to issue additional bonds.

- (d) (1 point) Describe three different kinds of bonds with deferred coupon structures that XYZ can issue to reduce their debt burden.

ANSWER:

(e) (1 point) Revise the following incorrect statements:

- (i) An extendible reset bond allows the issuer to reset the bond at a fixed spread over the reference rate, with the index spread being specified in the indenture.

ANSWER:

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

ANSWER:

8. Continued

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

ANSWER:

- (iv) Credit spread is due exclusively to the corporate bond's exposure to credit risk.

ANSWER:

9.

(6 points) You work at a bank that originates residential mortgage loans. You have been asked by your manager to analyze the feasibility of issuing non-agency Residential Mortgage-Backed Securities (RMBS).

- (a) (1 point) Explain four factors that are considered in the evaluation of the creditworthiness of a potential borrower.

ANSWER:

Five years ago the bank issued a large number of option adjustable-rate mortgage (OARM) loans that are similar to each other and are still outstanding. You would like to package these loans together to issue a non-agency RMBS.

- (b) (2 points) Describe four capital structure features that can be utilized to manage the risks of this non-agency RMBS.

ANSWER:

- (c) (2 points)

- (i) Recommend an internal credit enhancement structure.

ANSWER:

- (ii) Explain the mechanics of your recommended structure.

ANSWER:

- (d) (1 point) Describe four reasons which would explain why prepayments slowed down.

ANSWER:

10.

(5 points) You are an actuary working for ABC Life Insurance Company, which is domiciled in Country S. ABC currently holds US\$100M in assets backing its liabilities, and these assets solely consist of sovereign bonds issued by Country S.

ABC uses a simplified internal rating system where A* includes all S&P ratings from A to AAA, similarly B* and C* includes all S&P ratings B to BBB, CC to CCC respectively. D means defaulted.

Country S sovereign bonds are currently rated BBB by S&P.

The one-year transition rates of the sovereign bonds are assumed to be the following:

From/To	A*	B*	C*	D
A*	97.0%	2.5%	0.5%	0.0%
B*	4.0%	93.0%	2.5%	0.5%
C*	0.0%	33.0%	50.0%	17.0%
D	0.0%	0.0%	0.0%	100.0%

You make the following simplified assumptions for the sovereign bonds:

At the end of each year,

- If the rating is upgraded to A*, the bond price will increase by 10%.
- If the rating is downgraded to C*, the bond price will decrease by 20%.
- If the rating is unchanged, the bond price will remain unchanged.
- The recovery rate in the event of default is 30%.

(a) (1 point) Identify the credit risk exposures of ABC Life Insurance.

ANSWER:

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

ANSWER:

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

ANSWER:

10. Continued

- (d) (1 point) Recommend a strategy to reduce the credit risk of ABC Life.

ANSWER:

11.

(8 points) A defined benefit pension plan of company XYZ invests mainly in long-term bonds and public stocks because the company has mostly young workers.

The pension committee wishes to test out an allocation to private equity investments. Your expertise will guide the decisions for this experiment.

A committee member suggests that younger venture capital firms offer an attractive return to investors because they pursue the goal of rapid IPOs of start-up companies; however, some studies suggested that this approach may negatively impact the returns of private equity.

- (a) (1 point) Describe two concerns about young venture capital funds that focus on rapid IPOs with respect to the returns of private equity.

ANSWER:

Senior management wants to learn more about the characteristics of venture capital investments.

- (b) (1 point) Describe the J-curve effect.

ANSWER:

Senior management is concerned about the high fees general partners charge for venture capital investments. You are asked to prepare a response.

- (c) (1.5 points) Justify the contribution of the general partner to the investment process.

ANSWER:

11. Continued

You are analyzing venture capital investments from the following perspectives:

- investment return
- time horizon
- liquidity
- diversification

(d) (3.5 points)

- (i) (2 points) Describe two characteristics of venture capital investments for each perspective.

ANSWER:

- (ii) (1.5 points) Evaluate whether the venture capital investments are appropriate for the pension plan for each perspective.

ANSWER:

Senior management has asked you to consider two venture capital investment vehicles: limited partnership and limited liability companies.

- (e) (1 point) Recommend a vehicle for the pension plan.

ANSWER:

12.

(5 points) You are the CFO of JKL, a securities firm. JKL's balance sheet has 100 million shares outstanding and maintains an asset level of \$1 billion with \$100 million of total equity. A market event triggers 60% percent of the company's 250,000 preferred shares with a par of \$30 to convert and the subordinate debt of \$10 million doubles due to bond covenants.

- (a) (1 point) Calculate the leverage ratio on common equity for JKL before and just after the market event.

ANSWER:

- (b) (1.5 points) Describe the potential impact of an increase in haircuts on a highly leveraged borrower holding illiquid assets.

ANSWER:

- (c) (1.5 points) Critique the use of hypothetical data in stress testing.

ANSWER:

Management decides to perform stress testing on the firm's liquidity using hypothetical assumptions.

- (d) (1 point) Describe the principles of deterministic liquidity scenario testing.

ANSWER:

13.

(7 points) You are given the task of selecting and monitoring asset managers for an equity portfolio investing in stocks listed on the XYZ stock exchange. You are given six different fund managers to allocate shares of the portfolio to with the following statistics:

Style	mean return	active risk
A: Invest in stocks with low P/E ratios	9%	3%
B: Looks for stocks with high P/E ratios	7%	1%
C: Looks for opportunity among stocks whose price recently went down	10%	5%
D: Buy companies with market capitalization below \$50 million	12%	4%
E: Specialized in non-fossil energy	7%	2%
F: Specialized in agrochemical and agricultural companies	10%	2.5%

The active risk measure is calculated based on the XYZ broad market index, whose mean annual return is 8%. Manager B and manager C are 12.5% correlated.

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

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

You are also given the following sub-indices that can be used as benchmark for the different managers:

- (b) (1.5 points) Recommend an appropriate benchmark for each manager.

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

	mean return	standard deviation from XYZ index
1. XYZ mining	9%	2%
2. XYZ commodity	8%	2%
3. XYZ energy	9%	1.5%
4. XYZ small capitalization	12%	3%
5. XYZ value	9%	2%
6. XYZ growth	6%	0.5%

- (c) (1.5 points) Analyze whether it is worth hiring manager C compared to index investing.

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

13. Continued

A colleague suggested that you invest more with manager E and less with manager F. You agreed with her and decided not to invest with manager F and increased your allocation to manager E.

- (d) (2 points) Justify your decision. (Hint: Explain how manager F may represent more risk than the statistics are telling and how manager E may represent more opportunity.)

ANSWER:

14.

(7 points)

- (a) (2 points) Describe how the measures developed by regulators after the global financial crisis helped to reduce the counterparty and liquidity risks of financial institutions.

ANSWER:

- (b) (1 point) Explain how the mitigation of counterparty risk could introduce other risks.

ANSWER:

The Credit Union ABC has done research on default probabilities for bonds of similar terms for a number of companies. The results were illustrated in the table below.

Default Probabilities, in basis points				
Company	Credit Rating	Real-world	Risk-neutral	Ratio
Alpha	Aaa	4	67	16.8
Beta	Aa	6	78	13.0
Gamma	A	13	128	9.8
Delta	Baa	47	238	5.1
Sigma	Ba	168	214	1.3
Omega	B	749	602	0.8

- (c) (2 points)
- (i) (1 point) Compare briefly how real-world and risk-neutral measures of default probabilities are typically determined.

ANSWER:

- (ii) (1 point) Describe two potential issues with the data shown in the table above.

ANSWER:

14. Continued

Company Beta Plus, a subsidiary of company Beta, recently issued a new 5-year corporate bond.

You are designing a CDS for this corporate bond and want to estimate the credit spread of this CDS. Below are three general approaches you are considering to obtain the credit spread:

- Direct observable
- Single-name proxies
- Generic proxies

(d) (1 point) Recommend which approach you should use.

ANSWER:

(e) (1 point) Compare the single-name proxies and generic proxies approaches.

ANSWER:

15.

(7 points) Bank ABC is constructing a new credit portfolio, which initially consists of two identical but independent obligors.

You are given the following:

- Total portfolio exposure-at-default is equal to the total portfolio value of \$200 million.
- Default probability and severity for the obligors are independent.
- Each obligor has equal initial exposure-at-default of \$100M.
- Annual default probability of each obligor $p_i = 0.05$
- Recovery rate following default $R_i = 0.3$

You define L as the loss on this credit portfolio over one year.

- (a) (1 point) Describe one advantage and one disadvantage of one-factor credit risk modeling.

ANSWER:

- (b) (1 point) Calculate the expectation and volatility of L .

ANSWER:

ABC plans to grow and diversify its portfolio by adding new obligors. All obligors are assumed to be identical but independent, and each has an initial value and exposure-at-default of \$100M.

ABC utilizes a risk metric S , which is defined as the volatility of credit portfolio losses over one year as a percentage of the portfolio exposure.

15. Continued

(c) (2 points)

- (i) Derive an expression for the volatility of L as a function of the number of obligors N .

ANSWER:

- (ii) Calculate the minimum number of obligors needed to reduce ABC's risk S below 5%.

ANSWER:

(d) (2 points)

- (i) Explain *the Law of Rare Events* as described in the Bolder reading.

ANSWER:

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

ANSWER:

ABC has grown its portfolio to a total value of \$5 billion.

(e) (1 point)

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

ANSWER:

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

ANSWER:

16.

(5 points) You work for a large insurance company in liquidity risk management.

Your coworker made the following comment:

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

- (a) (1 point) Critique the comment.

ANSWER:

Your company currently does not have any reinsurance agreements. Besides giving the company AAA rating, rating agencies also gave your company a stable outlook. Most products were sold through company's own distribution network.

- (b) (1 point) List four scenarios where your company may experience stress liquidity risk.

ANSWER:

Your company is considering launching a new life product. The product is targeted for wealthy individuals who usually purchase policies with large face amounts. To make it more attractive, it features a lower than usual surrender charge in the first seven policy years as well as allowing the policyholder to borrow against the policy.

- (c) (1 point) Explain how this new life product would impact liquidity for the company and how it can be managed.

ANSWER:

16. Continued

Your coworker also made the following comment:

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

- (d) (1 point) Critique the comment.

ANSWER:

Senior management would like to monitor liquidity risk closely and expressed interest in developing a metric.

- (e) (1 point) Explain how to construct a liquidity coverage ratio and how it can be used to manage liquidity risk.

ANSWER:

17.

(5 points) Your company sells variable annuity products with various guarantees and also has a closed block of universal life. Each product is backed by its own asset portfolio.

Recently you were asked to join a meeting with the investment committee.

You are presented with the following table of projected current period cash flows for the two products:

in \$millions	Product A	Product B
Liability Cash Flows		
Premium	100	0
Surrender	(10)	(15)
Benefits Payment	(5)	(20)
Commission	(20)	0
Expense	(5)	(4)
Asset Cash Flows		
Investment Income	5	10
Principal	10	24
Net Cash Flow	75	(5)

(a) (1.5 points)

(i) (0.5 points) Identify each product

ANSWER:

(ii) (1 point) Describe how each product would require portfolio construction differently.

ANSWER:

17. Continued

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

- (b) (1.5 points) Critique the proposal.

ANSWER:

During the meeting, management decided to develop an Investment Policy Statement (IPS).

- (c) (1 point) Describe typical constraints in an IPS.

ANSWER:

- (d) (1 point) Describe how an IPS would document governance.

ANSWER:

****END OF EXAMINATION****