Canadian Institute of Actuaries EDUCATION
Institut canadien des actuaires ÉDUCATION

FCIA SYLLABUS

Finance, investments and ERM track with option in banking

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FCIA exams syllabuses overview

Background

In June 2021, the CIA Board approved new qualification pathways to ACIA (Associate, CIA) and FCIA (Fellow, CIA) designations, including CIA-drafted examinations and modules. Five FCIA-level education tracks are available to candidates. All FCIA tracks include three exams and two modules. This document outlines the finance, investments, and enterprise risk management (FIE)–track exams and modules syllabuses with option in banking.

Exams are administered as an open-book, four-hour exam requiring analysis in the context of a problem and written responses to specific questions. Candidates will complete the exam through the CIA learning management system. The range of weights (expressed in parentheses) attached to the examination topics further below apply to most of the exams administered. Candidates should recognize that questions often cover multiple learning objectives, including communication.

Education tracks

For information, the table below outlines the FCIA-level exams applicable to each track:

Track	Exams
Individual life and annuities (ILA)	F1ILA: Finance and Valuation F2ILA: Product Design F3ILA: Risk Management
Property and casualty (PC)	F1PC: Pricing F2PC: Estimating unpaid claims and financial reporting under IFRS 17 – *Insurance Contracts* F3PC: ERM, Economic Capital Modeling and Stress and Scenario Testing
Group benefits (GB)	F1GB: Product Design and Group Benefits Environment F2GB: Group Benefits Product Pricing F3GB: Group Benefits Reserving
Finance, investments and ERM (FIE) with option in banking	F1FIE: Financial Products F2FIE: Valuation and Financial Considerations F3FIE: Risk Management *or* F3BNK: Banking Applications
Retirement benefits (RET)	F1RET: Pension Funding and Regulation F2RET: Financial Reporting F3RET: Pension Risk Management

Bloom's taxonomy description

The CIA exam syllabuses set out the depth of knowledge and application required, using revised Bloom's taxonomy of education objectives. For comparison purposes, the development of the IAA Education Syllabus is also based on the revised Bloom's taxonomy. This model reflects two dimensions: the knowledge dimension and the cognitive process dimension. This framework is widely used and respected by educators worldwide.

Revised Bloom's Taxonomy (RBT)
Cognitive Process Dimension

Verbs → / Objects ↓	1. REMEMBER Recognize, Recall	2. UNDERSTAND Interpret, Exemplify, Classify, Summarize, Infer, Compare, Explain	3. APPLY Execute, Implement	4. ANALYZE Differentiate, Organize, Attribute	5. EVALUATE Check, Critique	6. CREATE Generate, Plan, Produce
A. Factual Knowledge	A1	A2	A3	A4	A5	A6
B. Conceptual Knowledge	B1	B2	B3	B4	B5	B6
C. Procedural Knowledge	C1	C2	C3	C4	C5	C6
D. Metacognitive Knowledge	D1	D2	D3	D4	D5	D6

Factual knowledge: Basic information; includes relevant information such as terminology and knowledge of applicable details of the subject matter.

Conceptual knowledge: The relationships between topics of a broader structure that make them function together. Consists of systems of information, such as classifications and categories.

Procedural knowledge: How to apply knowledge; includes algorithms, heuristics (rules of thumb), techniques, and methods, as well as knowledge about when to use these procedures.

Metacognitive knowledge: Knowledge of thinking in general and in particular. Refers to knowledge of thinking processes and information about how to manipulate these processes effectively.

Given the open book nature of the exams, it was established that the exams syllabuses would reflect higher levels learning, according to the following guidelines. Basic knowledge serves to lay the foundation of the exam questions.

	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual	A1	A2	A3	A4	A5	A6
Conceptual	B1	B2	B3	B4	B5	B6
Procedural	C1	C2	C3	C4	C5	C6
Metacognitive	D1	D2	D3	D4	D5	D6

First level	A1, A2, B1, B2
Second level	A3, A4, B3, B4, C1, C2, C3, D1, D2, D3
Third level	A5, A6, B5, B6, C4, C5, C6, D4, D5, D6

Finance, investments and ERM track exams with option in banking

Exam F1FIE: Financial Products

The aim of this exam is for candidates to develop the following skills:

1. Understand different types of financial products and their uses.
2. Understand the main principles and techniques of pricing that are relevant to investments.
3. Apply these principles and techniques within the context of investing.
4. Understand how pricing links to wider business processes (e.g., business planning and capital setting).
5. Create and evaluate hypothetical scenarios, including using judgment to assess the implications of actions and to develop appropriate proposals or recommendations relating to investment products.

1. Principal terms
1. Define principal terms used in financial products and securities. (A1)

2. Mathematics, statistics and stochastic calculus (15%)
1. Understand and apply concepts of probability and statistics important in mathematical finance. (C3) 2. Understand the importance of the no-arbitrage condition in asset pricing. (B2) 3. Apply the concept of martingale in asset pricing. (C3) 4. Understand and apply Itô's integral and stochastic differential equations. (B3) 5. Understand and apply Itô's lemma. (C3) 6. Understand and apply Jensen's inequality. (C3) 7. Assess mathematical considerations for analyzing financial time series. (C5) 8. Understand the importance of the Feynman-Kac theorem to diffusion processes. (C3)

3. Introduction to option pricing theory (20%)
1. Understand and apply various techniques for analyzing conditional heteroscedastic models, including ARCH (autoregressive conditionally heteroscedastic) and GARCH (generalized autoregressive conditionally heteroscedastic). (C3) 2. Perform calculations and evaluate results of option-pricing techniques and theory for equity and interest rate derivatives. (C6) 3. Apply the basic concepts of currency markets (purchase-price parity, law of one price, etc.). (B3) 4. Identify differences and implications of real-world versus risk-neutral probability measures. (B4) 5. Understand and apply Girsanov's theorem in changing measures. (C3) 6. Understand and apply the Black-Scholes-Merton PDE (partial differential equation). (C3) 7. Identify limitations of the Black-Scholes pricing formula. 8. Describe and apply approaches for relaxing the assumptions used in the Black-Scholes formula. (C3) 9. Apply and assess alternatives to the Black-Scholes-Merton model or alternative techniques that can be used to deal with option-pricing technique limitations. (B6)

10. Demonstrate an understanding of interest rate models. (B2)
11. Understand and apply the concept of calibration and describe the issues related to calibration. (B6)
12. Understand and assess the Heath-Jarrow-Morton (HJM) model and the HJM no-arbitrage condition. (B6)

4. Introduction to credit and liquidity risk (20%)

1. Understand events and causes of the 2008 global credit crisis relating to mortgage-backed securities (MBS) and credit-default swaps (CDS). (B2)
2. Understand the basic concepts of credit risk modelling such as probability of default, loss given default, exposure at default, and expected loss. (B3)
3. Apply and assess credit-valuation models. (B6)
4. Apply and assess the Merton asset-value models in the context of credit risk. (B6)
5. Understand and apply credit-default swaps. (C3)
6. Apply and assess mortgage-default models in the valuation of mortgage-backed securities (B6)
7. Measure and perform marking-to-market counterparty credit risk in credit derivatives. (C5)
8. Understand the rationale, markets, and risks of structured finance. (B4)
9. Compare the use of credit-spread measures in portfolio construction. (C2)
10. Describe risk considerations in investment-grade versus high-yield bond portfolios. (C2)
11. Understand the concept of liquidity risk and the threat it represents to financial intermediaries and markets. (B2)
12. Measure and monitor liquidity risk, using various liquidity-measurement tools and ratios. (C5)
13. Understand liability-termination provisions such as book-value surrender and the impact on a company's overall liquidity risk. (B3)
14. Apply liquidity risk models, including modelling cash flow of various types of assets under various scenario analysis and time horizons. (D6)
15. Create liquidity risk management plans and procedures, including addressing appropriate product design, investment guidelines, and reporting given a desired liquidity risk level. (C6)
16. Be familiar with rating agency expectations for liquidity and the implications for company ratings. (D4)

5. Derivatives and hedging (10%)

1. Compare and contrast the various kinds of volatility. (C4)
2. Compare and contrast various approaches for setting volatility assumptions in hedging. (C4)
3. Compare and contrast different approaches to hedging. (C4)
4. Perform delta hedging and understand the interplay between hedging assumptions and hedging outcomes. (B3)
5. Describe and understand economic scenarios where hedging strategies may be ineffective for certain portfolios. (B2)
6. Demonstrate how interest rate swaps, forwards, and futures can be used to modify a portfolio's risk and return. (C3)
7. Utilize derivatives to achieve targeted equity and interest rate risk exposures. (C3)
8. Discuss methods of forecasting volatility and understand the applications of volatility and variance swaps. (C5)

6. Fixed-income securities (20%)

1. Explain the cash-flow characteristics and pricing of government securities. (B2)
2. Analyze par yield curves, spot curves, and forward curves and their relationship to traded security prices. (B4)
3. Analyze the different characteristics of securities issued by government agencies. (B4)
4. Evaluate features of provincial and municipal bonds, and the role of rating agencies in pricing them. (C5)
5. Describe the cash flow of various corporate bonds considering underlying risks such as interest rate, credit, and event risks. (A2)
6. Analyze cash-flow patterns and underlying drivers and risks of mortgage-backed securities and collateralized mortgage obligations. (D4)
7. Construct portfolios of fixed-income securities using the following broad categories: (D6)
8. Managing funds against a target return; and
9. Evaluate strategies for managing funds and immunizing funds against single and multiple liabilities.
10. Understand and discuss approaches to setting expectations for fixed-income returns. (D5)
11. Evaluate the effects of capital markets expectations on the yield curve. (C5)
12. Perform calculations of modified duration, convexity, and duration times spread (DTS) and its applications towards various fixed-income strategies (D5)
13. Apply the model to price common interest sensitive instruments, including callable bonds, bond options, caps, floors and swaptions. (C3)

7. Guaranteed investment products and annuities (15%)

1. Identify and evaluate the impact of embedded options in liabilities, specifically variable annuities guaranteed riders (guaranteed minimum accumulation benefit [GMAB], guaranteed minimum death benefit [GMDB], guaranteed minimum withdrawal benefit [GMWB], and guaranteed minimum income benefit [GMIB]). (C5)
2. Understand risks associated with guaranteed riders, including market, insurance, policyholder behaviour, basis, credit, regulatory, and accounting. (B2)
3. Perform risk management and dynamic hedging for existing GMxB and its embedded options. (D6)
4. Analyze hedgeable components that are equity, interest rate, volatility, and cross Greeks. (C4)
5. Analyze partially hedgeable or unhedgeable components that are policyholder behaviour, mortality and lapse, basis risk, counterparty exposure, foreign bonds and equities, correlation, and operation failures. (C2)
6. Compare and contrast static vs. dynamic hedging. (C4)
7. Analyze how differences between modeled and actual outcomes for guarantees affect financial results over time. (D4)

Exam F2FIE: Valuation and Financial Considerations

The aim of the Valuation and Financial Considerations exam is to develop a candidate's expertise to a level that allows for analysis in major areas of the investment practice. It builds on material covered in the Financial Products exam and earlier subjects and seeks to equip a student with the skills and broad working understanding of financial and investment markets.

1. Principal terms

1. Define principal terms used in the investment and financial reporting environments. (A1)

2. Investment policy and governance (10%)

1. Compare and differentiate the interests of key stakeholders. (B4)
2. Identify and analyze principal versus agent conflict. (B4)
3. Describe and analyze sources of unethical conduct and explain the role of a fiduciary. (B4)
4. Describe and evaluate governance mechanisms that attempt to address these conflicts. (B5)
5. Understand and evaluate the importance of an organization's culture in effectuating governance. (B5)
6. Explain and demonstrate how governance may be structured to gain competitive advantages and efficiencies. (C5)
7. Understand how ethics relate to business decision-making and relate ethics in business to personal ethics. (D5)
8. Demonstrate an understanding of the concept of investment beliefs, including their application, in the following areas: (D5)
9. Establishment of an investment policy.
10. Diversification and rebalancing.
11. Strategic vs. tactical allocation.
12. Geographic and sector allocation.
13. Currency management.
14. Liquidity management.
15. Credit policy.
16. Active vs. passive management.
17. Alternatives and derivatives limits.
18. Demonstrate understanding of regulators' guidance and context for different approaches to responsible investment and specifically, the integration of environmental, social, and governance (ESG) factors in the investment process. (C3)
19. Demonstrate an understanding of and analyze the underlying issues that constitute factors within each of the ESG areas. (C4)
20. Demonstrate an understanding of and evaluate the ESG market: relevance, size, scope, key drivers and challenges, and risks and opportunities. (C5)

3. Asset allocation (15%)

1. Explain the impact of asset allocation relative to various investor goals and constraints, including the impact due to liability calculation, funding rules and regulations, and their results on the investor goals and attractiveness of different asset classes. (C2)
2. Propose and critique asset-allocation strategies. (D5)
3. Evaluate the significance of liabilities in the allocation of assets. (D5)
4. Explain the purpose and impact of financing and leverage in the allocation of assets. (C2)
5. Incorporate risk management principles in investment policy and strategy, including asset allocation. (C6)
6. Discuss strategic-implementation choices in asset allocation, including passive/active choices and vehicles for implementing passive and active mandates. (C3)
7. Discuss strategic considerations in rebalancing asset allocations. (D5)
8. Describe and critique the use of mean-variance optimization in asset allocation. (D5)

4. Equities (20%)

1. Explain the nature and role of equity investments within portfolios that may include other asset classes. (A2)
2. Understand and critique the basic concepts surrounding passive, active, and semi-active enhanced index equity investing as well as factor-based investing, including managing exposures. (B5)
3. Explain and critique the basic active equity selection strategies including value, growth, and combination approaches. (B5)
4. Understand and calculate equity indices and their construction, including distinguishing among the weighting schemes and their biases. (C3)
5. Identify and evaluate methods for establishing passive exposure to an equity market. (B5)
6. Compare and critique techniques for characterizing the investment style of an investor. (C5)
7. Recommend and justify, in a risk-return framework, the optimal portfolio allocations to a group of investment managers. (C5)
8. Describe and critique the core-satellite approach to portfolio construction with a completeness fund to control overall risk exposures. (B5)
9. Explain and critique alpha and beta separation as an approach to active management and demonstrate the use of portable alpha. (B5)
10. Describe and critique the process of identifying, selecting, contracting with, and overseeing equity managers. (B5)
11. Distinguish between active share and active risk and discuss how each measure relates to a manager's investment strategy. (C5)

5. Advanced option pricing (20%)

1. Identify and differentiate the features of the classic short-rate models including the Vasicek and the Cox-Ingersoll-Ross models. (C4)
2. Understand and explain the terms "time-homogeneous models," "affine-term structure models," and "affine-coefficient models," and explain their significance in the context of short-rate interest models. (D2)
3. Explain the dynamics of and motivation for the Hull-White extension of the Vasicek model. (D5)
4. Explain the features of the Black-Karasinski model. (B2)
5. Understand and explain the relationship between market-quoted caplet volatilities and model volatilities. (B2)

6. Explain how deterministic shifts can be used to fit any given interest rate term structure and demonstrate an understanding of the Cox-Ingersoll-Ross++ model. (C2)
7. Understand and explain the features of the G2++ model, including the motivation for more than one factor, calibration approaches, the pricing of bonds and options, and the model's relationship to the two-factor Hull-White model. (C3)
8. Describe and apply models that account for negative interest rates, such as Black's model and shifted log-normal. (C3)
9. Explain the concept of volatility smile and some arguments for its existence. (B5)
10. Calculate the hedge ratio for a call option given the dependency of the Black-Scholes volatility on the underlying asset. (C3)
11. Compare and contrast "floating" and "sticky" volatility smiles. (C4)
12. Calculate the risk-neutral density given call option prices. (C3)
13. Identify several stylized empirical facts about smiles in a variety of options markets. (B2)
14. Describe and contrast several approaches for modelling smiles, including stochastic volatility, local volatility, jump diffusions, variance gamma, and mixture models. (C4)
15. Describe and compare various issues and approaches for fitting a volatility surface. (C4)

6. Alternative assets (10%)

1. Understand and evaluate the types of alternative investments available in each market and their most important differences for an investor, like: (D5)
    a. Real estate and infrastructure.
    b. Agriculture and timberland.
    c. Green assets.
    d. Longevity bonds.
    e. Insurance-linked securities (contingent convertibles, catastrophe bonds).
    f. Hedge funds.
    g. Venture capital.
    h. Derivative contracts.
    i. Private equity.
    j. Private debt/credit.
2. Understand and calculate benchmarks available to evaluate the performance of alternative investment managers. (C3)
3. Describe the limitations of the benchmarks and evaluate how to circumvent these limitations. (B5)
4. Understand and evaluate investment strategies and portfolio roles as well as their specific construction/implementation nuances that are characteristic of each alternative investment. (D5)
5. Perform a due diligence and oversight processes and the impact of negotiated covenants on the risk-return profile for alternative investments. (C3)
6. Discuss how hedge-fund strategies may be classified and evaluate the impact of an allocation to a hedge-fund strategy in an investment portfolio. (C5)

7. Machine learning, neural networks, application of blockchain on insurance (10%)

1. Understand the defining features of blockchain technology, smart contracts, and components of blockchain. (B2)

2. Discuss the applications of cryptocurrency and blockchain for insurance use cases such as claims processing, reinsurance and swaps, tokenisations of insurance risk, and the decentralized use of data. (B5)
3. Describe and evaluate the stages, risks, and challenges to blockchain adoption. (C5)
4. Discuss examples and understand the characteristics of various supervised and unsupervised machine learning methods. (B4)
5. Describe and evaluate various key areas of machine learning practice for actuarial tasks - including model evaluation, generalisation error and model validation, feature scaling, regularisation, and feature engineering. (A5)
6. Distinguish between neural network, deep learning methods, and reinforcement learning. (B4)
7. Identify the steps required to process and analyze big data in relation to the Actuarial Control Cycle (ACC). (C2)
8. Discuss and understand the steps and objectives of data collection, data cleaning, and model validation. (C2)
9. Understand the application of data science considerations in the actuarial context. (D4).
10. Evaluate the fit of a machine learning algorithm and discuss the problem of model overfitting. (B4)

8. Financial reporting (15%)

1. Describe the basic features of a financial-reporting conceptual framework. (B2)
2. Explain and critique the key concepts in determining fair value. (B5)
3. Describe International Financial Reporting Standards (IFRS) 17. (B2)
4. Explain and apply the general concepts underlying specific U.S. accounting standards for asset reporting, valuing deferred acquisition cost assets, and valuing liabilities. (C6)
5. Apply the IFRS 17 general method approach, variable fee approach, or premium allocation approach to appropriately value liabilities for remaining coverage and for incurred claims. (C6)
6. Explain how liabilities are calculated under U.S. statutory reporting. (C6)
7. Explain the objectives and features of regulatory risk-based capital requirements. (B2)
8. Perform risk-based capital RBC calculations required by C3 Phase II. (C6)
9. Apply Life Insurance Capital Adequacy Test (LICAT) calculations and understand the components that form the LICAT ratio. (C6)

Exam F3FIE: Risk Management

The aim of this exam is for candidates to develop the following skills:

1. Understand the main principles and techniques of enterprise risk management (ERM) and economic capital modelling that are relevant to life insurance.
2. Apply these principles and techniques within the context of investments.
3. Understand how ERM and economic capital modelling links to wider business processes (e.g., business planning, pricing, and capital setting).
4. Create and evaluate hypothetical scenarios, including using judgement to assess the implications of possible actions and to develop appropriate investment proposals or recommendations.

1. Principal terms

1. Define principal terms used in enterprise risk management, economic capital modelling, and stress and scenario testing. (A1)

2. ERM concept, framework, and process (10%)

1. Apply the concept of ERM. (D3)
2. Apply the framework for risk management and control within an insurer. (D3)
3. Describe regulatory requirements related to ERM including own-risk and solvency assessment. (A2)
4. Describe the perspectives of credit-rating agencies. (B2)
5. Reflect data issues in general and special considerations with respect to ERM. (C3)
6. Demonstrate how to determine and articulate: (C3)
    a. Risk appetite.
    b. Risk identification.
    c. Risk assessment.
    d. Risk monitoring.
    e. Risk limits.
    f. Risk mitigation.
    g. Risk capacity.
    h. Risk tolerances.
    i. Desired risk profile.
    j. Risk objectives.
    k. Risk reporting.
7. Assess the implications of financial and other risks and opportunities for strategic planning. (C4)
8. Describe the risk management control cycle, including the relevance of external influences and emerging risks. (C2)
9. Utilize methods to identify risks and their causes and implications. (D4)

3. Risk categories and risk identification (10%)

1. Explain what is meant by risk and uncertainty, including different definitions and concepts of risk. (B2)
2. Describe risk taxonomy, including an awareness of how individual risks might be categorized in different ways. (B1)
3. Describe and assess common risks faced by life insurers, including: (B2)
    a. market risk,
    b. currency risk,
    c. credit risk,
    d. spread risk,
    e. liquidity risk,
    f. interest rate risk,
    g. prepayment risk,
    h. reinvestment risk,
    i. equity risk,
    j. hazard/insurance risk,
    k. inflationary risk,
    l. ESG and climate-related risk,
    m. pricing risk,
    n. foreign exchange risk, and
    o. country and sovereign credit risk.
4. Analyze the relationship between systemic risk vs. non-systemic and specific risk vs. concentration of risk. (B4)

4. Economic capital modelling and aggregation of risks (25%)

1. Describe the extent to which each of the risks in 3.3 can be amenable to quantitative analysis. (B2)
2. Demonstrate an understanding of the use of correlation measures.
    a. Describe enterprise-wide risk aggregation techniques that incorporate the use of correlation. (C2)
    b. Apply different correlation measures based on their relative merits and implications. (C4)
3. Apply copulas as part of the process of modelling multivariate risks and evaluate different types of copulas for a given situation. (C5)
4. Reflect the importance of the tails of distributions and tail correlations. (C4)
5. Describe how extreme-value theory can be used to help model risks that have a low probability. (C2)
6. Demonstrate how model and parameter risk can be incorporated into an economic capital model. (C4)
7. Use economic capital models in the overall ERM decision-making process. (C4)
    a. Describe the development and use of models for decision-making purposes in ERM. (B2)
    b. Demonstrate how the decision-making process considers the organization's risk appetite and corporate governance, and builds on the results of stochastic modelling, scenario analysis, stress testing, and analysis of model and parameter risk. (D4)
    c. Evaluate different types of models for a given purpose. (D5)

5. Risk measurement and assessment (25%)

1. Using common risk measures (such as VAR, TVAR, and probability of ruin), determine risk exposures and tolerances using these measures. (C3)
2. Understand the key considerations in deriving and applying economic capital-modelling techniques using deterministic and stochastic models. (D2)
3. Recommend a specific choice of model based on the results of both quantitative and qualitative analysis of financial and insurance data. (D5)
4. Describe approaches, including parameterization and validation, for the assessment of capital requirements for the following risk types: (C2)
    a. Market.
    b. Credit.
    c. Liquidity.
    d. Regulatory.
    e. Operational.
    f. Climate related .
5. Explain the advantages and limitations of different risk metrics, including value at risk, sensitivities, Greeks, minor Greeks, etc. (C4)
6. Describe the practical considerations including data availability, parameterization, and validation procedures) that should be borne in mind when undertaking capital modelling. (D2)
7. Calculate regulatory capital requirement. (C3)

6. Stress and scenario testing (15%)

1. Describe the use of scenario analysis and stress testing in the risk-measurement process, including the advantages and disadvantages of each. (B2)
2. Describe the Appointed Actuary's responsibilities related to financial condition testing (FCT). (A2)
3. Explain the primary categories of risk associated with climate change from an investment perspective. (A2)
4. Describe the actuary's role with respect to climate-change risk. (B2)

7. Economic capital and ORSA (15%)

1. Describe the concept of economic measures of value (e.g., market-consistent embedded value) and demonstrate their uses in the risk management and corporate decision-making processes. (B6)
2. Determine and evaluate the key elements of own-risk and solvency assessment (ORSA) and FCT, specifically risk identification and assessment, quantification of risk to capital, board oversight and senior management responsibility, monitoring, reporting, and internal controls. (C5)
3. Demonstrate an understanding of capital calculations:
    a. Utilize the concept of economic measures of value and capital and their uses in corporate decision-making processes. (D5)
    b. Evaluate different risk measures and capital-assessment approaches. (D5)
    c. Demonstrate the ability to develop a capital model for a representative financial firm. (D6)
4. Compare techniques for allocating capital across an organization. (C4)

Exam F3BNK: Banking Applications

The aim of exam F3BNK is to expose candidates to key principles of risk management and banking practice and the application thereof, including governance and strategy setting and the principles of actuarial practice in solving problems, and to produce coherent advice and recommendations in the management of a banking operation.

1. Principal terms

1. Define principal terms used in the banking industry. (A1)

2. Operations of a banking institution (15%)

1. Discuss the role of banking institutions in economies: (C4)
    a. To facilitate loan-deposit transformation.
    b. To facilitate investments by firms and to enable growth and job creation.
    c. To facilitate local and international trade.
2. Discuss the implication of the different types of banks on the overall economic cycle, including: (D4)
    a. Central banks/reserve banks.
    b. Lending banks funded by customer deposits.
    c. Lending banks funded by wholesale deposits.
    d. Investment banks.
    e. Universal banks.
    f. Community banks/mutual banks.
    g. Development banks.
3. Demonstrate what constitutes the main risks for various activities carried out by banks, including: (C2)
    a. Retail banking activities and various products offered.
    b. Corporate banking activities and various products offered.
    c. Investment banking activities and various products offered.
    d. Features and pricing of banking products.
4. Demonstrate how to mitigate a bank's risks exposure regarding its different sources of revenue, including: (D3)
    a. Net interest income from banking book operations.
    b. Non-interest income from banking book operations.
    c. Trading income from trading book operations.
5. Quantify the impact of a bank's cost base on trading book and banking book product lines, including: (B5)
    a. Operational expenses.
    b. Cost of credit.
    c. Cost of capital.
    d. Cost of liquidity.
    e. Tax.
6. Produce a bank's financial statements and balance sheet. (C6)
7. Analyze the main types of capital that must be held by a bank, including: (B4)
    a. Capital requirements based on risk-weighted assets.
    b. Regulatory capital.
    c. Economic capital requirements.
    d. Available capital or book capital.

8. Determine and analyze the various sources of funds that banks use to fund their operations, including: (B4)
    a. Deposit taking.
    b. Wholesale markets funding.
    c. Central bank funding.
    d. Retained earnings.
9. Derive similarities and differences between the main types of financial and non-financial risks faced by a bank vs. a traditional actuarial practice area (i.e., pension, insurance, etc.). (D4)
10. Explain how actuaries can play a key role in a banking operation. (D5)

3. The banking regulatory framework (20%)

1. Describe the main provisions of the Canadian *Bank Act* and its regulations. (B2)
2. Describe a typical corporate governance structure of a banking operation, including: (C2)
    a. Board of directors, board committees, roles, and responsibilities.
    b. Executive committee and senior management, roles, and responsibilities.
    c. Various committees existing within a bank and their roles and responsibilities.
3. Outline the key elements of the Basel I framework and perceived shortcomings of the Basel I accord. (C2)
4. Understand the Basel II framework and discuss the implications of Basel II for banking operations. (D5)
5. Understand the Basel III framework and discuss the implications of Basel III for banking operations. (D5)
6. Outline the roles of central/reserve banks in managing and regulating banking operations. (B2)
7. Outline the evolution of the Basel regulations. (B2)
8. Discuss how failure to implement key principles for effective risk data aggregation and risk reporting under Basel framework may lead to major losses. (D4)
9. Understand the various international legislation, guidance notes, and accounting standards under which banks operate, including: (B2)
    a. Legislation governing companies.
    b. Legislation governing banks.
    c. Directives and guidance notes issued by the Basel Committee on Banking Supervision.
    d. Central/reserve banks and other local and international regulatory bodies.
    e. Canadian and international accounting standards.

4. Risk management in a banking operation (25%)

1. Discuss the role of high-level risk management in a banking operation (D4).
2. Discuss the role of an ERM risk management framework in banking. (D4)
3. Discuss the root cause of major financial failures of the past. (D4)
4. Discuss the impact on banking operations of an aggregation of risk, including (D4):
    a. Diversification.
    b. Concentration.
    c. Correlation.
5. Derive similarities and differences between the process of controlling risks in a banking operation vs. a traditional actuarial practice area (i.e., pension, insurance, etc.), including but not limited to: (D5)
    a. Setting loan-sanctioning criteria.
    b. Setting risk appetite, tolerance, and limits.

c. Allocation of risk-based capital.

6. Demonstrate how risk modelling may be used to identify and measure the different types of risks in a banking operation, including: (C3)
    a. Frequency, severity, and exposure modelling for both credit and operational risk.
    b. Statistical modelling for portfolio management.
    c. Survival models for credit risk management.
    d. Market-implied probability of default and survival curves:
        i. Default and survival curves.
        ii. Closed-form analytical approximations vs. Monte Carlo simulation.
        iii. Emerging modelling techniques
    e. Asset/liability modelling for balance-sheet management.
    f. Control cycle for all models.
    g. Cash-flow models for budgeting and balance-sheet management.
7. Discuss the nature, impact, and risk-mitigation procedures relative to: (D4)
    a. Operational risk.
    b. Liquidity risk.
    c. Credit risk — standardized approach.
    d. Credit risk — internal ratings-based approach.
    e. Settlement and counterparty risk.
    f. Credit valuation adjustment (CVA) risk.
    g. Market risk.
    h. Climate-change risk.
8. Derive similarities and differences in how risks in a banking operation may be mitigated and/or managed vs. a traditional actuarial practice area (i.e., pension, insurance etc.), including but not limited to: (D5)
    a. Positions.
    b. Credit hedging.
    c. Securitization.
    d. Dealing with central counterparty clearing house (CCP).

5. Bank capital management framework (25%)

1. Understand and evaluate the banking model and capital, including: (D5)
    a. The difference between capital and liquidity.
    b. Bank balance sheet.
    c. Capital to cover possible losses.
    d. Expected (per IFRS 9) and unexpected losses.
    e. Capital regulation.
2. Discuss key capital considerations, including: (C5)
    a. Regulatory capital adequacy requirements (risk-weighted assets).
    b. Regulatory minimum leverage ratio (unweighted assets).
    c. Capital ratio, based on risk-weighted assets.
    d. Regulatory liquidity adequacy requirements.
    e. Credit rating considerations.
3. Understand and create a capital management policy. (C6)
4. Understand and create a liquidity management policy. (C6)
5. Understand a bank's dividend policy and its remuneration policy and assess their implications for capital management. (B4)

6. Understand and perform a reverse stress test. (C3)
7. Discuss the resulting risks of a poor implementation of a bank's recovery plan. (D4)

6. Banking strategies and problem solving (15%)

1. Analyze the implications of competing business lines on a bank's strategy and business model, including: (D4)
    a. Economic and competition outlook.
    b. Business strategy.
    c. Ability to support business strategy.
    d. Financial forecasts.
    e. Considerations of strategy and business plan.
    f. Possible acquisitions/disposals.
    g. Approval of strategy and business plan.
2. Discuss the implementation and evaluation of a bank's strategy and business plan and subsequent monitoring. (D2)
3. Through analysis, integration, and critically evaluating results, draw conclusions and make recommendations, particularly about a bank's optimal strategy. (D5)
4. Analyze a case study and solve complex problems associated with it. (C4)

Finance, investments, and ERM track modules with option in banking

FCIA modules syllabuses overview

Background

The CIA Fellow modules enable candidates to acquire and apply knowledge that is electronically administered. The learning management system serves as the overarching framework from which candidates obtain information on resources and activities required to complete the modules. Candidates will navigate through the materials by:

- Reading the screens;
- Linking to PDF files, Excel files, and published material;
- Reviewing examples;
- Visiting other websites, viewing demonstrations and graphical images;
- Making decisions and selections around targeted scenarios or case studies; and
- Completing specified assessments, where applicable.

Module participants are expected to come from a wide array of educational and career backgrounds. Some will be ACIAs, or have obtained a recognized Fellow-level designation, and have:

- Demonstrated knowledge of the fundamental concepts and techniques for modelling and managing risk.
- Learned the basic methods of applying fundamental concepts and techniques to common problems involving uncertain future events, especially those with financial implications.
- Completed a professionalism course covering the importance of adherence to recognized standards of practice and the CIA *Rules of Professional Conduct* or some other professional code of conduct.

The primary audience for the FCIA modules is individuals who desire to be admitted as Fellows of the CIA. Individuals seeking continuing professional development credit can also register for the FCIA modules.

Each FCIA candidate through Pathways 1 and 2 is required to complete both FCIA modules, while Pathway 3 candidates will have to complete the second module. It is anticipated that FCIA module candidates will have six months, from the date of module purchase, to complete each FCIA module. As a general guideline, candidates should expect to spend approximately 100 hours completing all activities included in a module.

FIE Module 1: Actuarial work, insurance, and investments applications

1. Introduction to risk and insurance

1. Describe risk, including insurable risk.
2. Provide examples of types of insurable risks and classes of life insurance that respond to insurable risk.
3. Describe and provide examples of perils and hazards.
4. Explain the conflicts that can arise in the objectives of risk management.
5. Identify and describe the five steps of the risk management process:
    a. Step 1 – Identifying and analyzing exposures.
    b. Step 2 – Formulating options.
    c. Step 3 – Selecting the best technique.
    d. Step 4 – Implementing the risk management plan.
    e. Step 5 – Monitoring results and modifying the plan.

2. Insurance categories and functions

1. Describe the basic insurance relationship of pooling funds to pay losses.
2. Explain the major functions of insurance:
    a. Spread of risk.
    b. Aid to security.
    c. Aid to credit.
    d. Loss prevention.
    e. Source of capital.
    f. Source of employment.
3. Identify and describe categories of insurance.
4. Identify and describe categories of retirement plans.
5. Describe the different forms of insurance companies (e.g., stock mutual, government insurers, captive insurance companies.)
6. Explain financial stability and returns for insurers including the differences for stock companies and mutuals.

3. Regulatory framework

1. Describe the different roles of government in the regulation of insurance companies, including federal control and provincial and territorial control.
2. Describe the major laws and regulations impacting insurance in Canada, including:
    a. The Insurance Companies Act.
    b. Provincial and territorial insurance acts.
    c. Regulations.
3. Describe the role of privacy laws in life insurance, including the *Personal Information Protection and Electronic Documents Act*.
4. Describe how the United States and Canada monitor the insurance market and regulate it.
5. Describe why consumer protections are needed.

6. Explain the purposes of regulatory consumer laws and regulations.
7. Recognize the key points of a sample of regulations or laws relating to market regulation.

4. Insurance company operations

1. Describe the major functions of an insurance company, including:
    a. Finance, accounting, and investment.
    b. Actuarial.
    c. Marketing, agency, or production.
    d. Underwriting.
    e. Claims.
    f. Reinsurance.
    g. Risk management.
2. Describe basic insurance administration and how actuaries are involved.
3. Describe underwriting regimes, applications for insurance, preferred criteria, and screening tests and how they relate to selection of risk.
4. For reinsurance:
    a. Explain the purpose of reinsurance.
    b. Describe the primary methods and types of reinsurance.
    c. Describe the main reinsurance contract provisions.
5. Describe the roles and responsibilities of actuaries in insurance companies.

5. Insurance documents and processes

1. Explain insurance as a contract and describe the major components of an insurance policy.
2. Identify and explain key insurance documents, including:
    a. The policy.
    b. Certificates of insurance.
    c. Endorsements.
    d. Binders/cover notes.
3. Describe the major sections of an insurance policy, including:
    a. Coverage summary.
    b. Insuring agreements.
    c. Statutory conditions.
    d. Policy conditions.
    e. Signature clause.
4. Describe the process and requirements for assigning, terminating, and renewing an insurance contract.
5. Identify the stakeholders in an insurance policy (policyholder, insureds, including employees and dependents, etc.).
6. Describe insurance documentation and processes.

6. The insurance marketplace

1. Describe basic insurance products:
    a. Life insurance and annuities.
    b. Property and casualty (P&C).
    c. Health and group insurance.
    d. Government-sponsored and public plans:
        i. Employment Insurance.
        ii. Workers' compensation.
        iii. Health care.
        iv. Pension plans.
2. Describe key issues related to customers of insurance products.

7. Introduction to enterprise risk management (ERM)

1. Understand the set of risk taxonomies and apply it to different frameworks.
2. Explain the need for risk management in an operation-wide capacity.
3. Describe the implications of tail events on a firm's results.
4. Explain how banks, insurers, pension plans (or financial intermediaries) and rating agencies define risk.
5. Identify the drivers behind some well-publicized insolvencies.
6. Understand the role that related banking regulation has played in the development of insurance regulation for risk management.
7. Describe global regulatory initiatives as they relate to ERM.
8. Provide an overview of European, U.S., and Canadian ERM regulatory initiatives.
9. Describe rating-agency expectations for ERM.

8. Topics in corporate finance

1. Compare and contrast methods to determine the value of a business or project, including the impact on capital budgeting and allocation decisions.
2. Assess the impact of business strategies including acquisitions, divestitures, and/or restructurings.
3. Assess and recommend methods a company may use to allocate its costs and how these methods impact the perceived performance of a company or its component lines of business.
4. Apply fundamental techniques and frameworks of management science to make informed business decisions.
5. Apply linear optimization models to managerial decisions.
6. Develop decision trees, scenario tests, and simulation models.
7. Assess and apply methods and processes for quantifying and managing hedgeable and non-hedgeable risks within any business enterprise.
8. Evaluate complex systems and describe how these systems can mitigate risks and improve sustainability.

9. Quantitative techniques

1. Demonstrate an understanding of the mathematical considerations for analyzing financial time series.
2. Explain how to bootstrap a yield curve.
3. Understand and apply various techniques for analyzing conditional heteroscedastic models, including ARCH and GARCH.
4. Understand and apply various techniques for analyzing multivariate time series.
5. Apply various techniques for analyzing factor models, including principal component analysis and statistical factor analysis.
6. Understand and apply various regression techniques, including interpreting regression results such as F-statistic and R-squared.
7. Understand and interpret various supervised and unsupervised machine learning and advanced analytics algorithms.
8. Explain the steps of preparing, wrangling, and exploring big data for financial forecasting.
9. Evaluate the fit of a machine-learning algorithm.
10. Evaluate appropriateness and quality of data compiled with respect to its level of compliance with regulatory and quality assurance requirements.

10. Actuarial models

1. Apply the techniques of Monte Carlo simulation as it applies to financial risk models, option pricing, and economic scenario generation.
2. Understand the theories of four popular variance-reduction techniques: antithetic variates, control variates, stratified sampling, and importance sampling.
3. Identify options embedded in financial products and the risks they pose.
4. Describe derivative types and demonstrate the use of derivatives in risk management.
5. Explain how liabilities are calculated under Canadian and U.S. statutory reporting.
6. Explain the general concepts underlying specific U.S. accounting standards for asset reporting, valuing deferred acquisition cost assets, and valuing liabilities.
7. Produce and analyze the outcomes of various events and situations impacting an insurance product's reserves and cash-flow projections.
8. Understand the components of assets and liabilities of a bank.
9. Perform cash-flow projections of a bank, and how cash flows and key liquidity metrics change in response to stressed liquidity scenarios.
10. Understand and apply liability-driven investing, particularly in relation to insurance products and pensions (including de-risking strategies such as annuity buy-ins vs. buyouts).
11. Demonstrate an understanding of target volatility funds and their effect on guarantee cost and risk-control function.

11. Principles of actuarial evidence

1. Describe the role of actuaries in family law, including the valuation of pension plan benefits in marriage (relationship) breakdown.
2. Describe the role of actuaries in civil litigation, including damages in personal injuries, fatalities, wrongful termination, insurance and reinsurance disputes, pension disputes, and other litigation.
3. Describe the role conferred to actuaries by the Criminal Code of Canada in calculating the criminal rate of interest.
4. Describe and distinguish the roles of a fact witness, an expert witness, and a provider of litigation advice.
5. Describe the context provided by the common law, legislation, and the rules of civil procedure on actuarial evidence practice.
6. Describe the role of CIA *Rules of Professional Conduct* and the *Standards of Practice* (Part 1000, general, and Part 4000, actuarial evidence) in guiding the professionalism of actuarial evidence practice. Show awareness of the importance of professionalism for actuaries whose actuarial evidence practice is incidental to full-time practice in another actuarial practice area, such as insurance or pensions.
7. Describe the functions fulfilled by other professionals in the litigation area -- such as life-care planners, vocational experts, accountants, economists, engineers, personal financial planners, business valuators, appraisers, and structured settlement brokers -- and how these professionals complement and compete with the function of actuaries in actuarial evidence.

FIE Module 2: Professional considerations in the investment environment

1. Overview of the regulatory framework in Canada

1. Summarize the regulation applicable to the insurance market in Canada.
2. Summarize the regulation applicable to the investment market in Canada.
3. Summarize the regulation applicable to the retirement market in Canada.
4. Identify the major regulators of the insurance sector in Canada.
5. Identify the major regulators of the investment sector in Canada.
6. Identify the major regulators of the retirement sector in Canada.
7. Summarize the activities of insurance regulators.
8. Summarize the activities of investment regulators.
9. Summarize the activities of the retirement regulators.
10. Summarize the activities of banking regulators.
11. Describe the goals of regulation and laws in the investment and insurance sectors.
12. Explain how regulation protects consumers and investors.
13. Understand the compliance function in an investment management organization.

2. Canadian financial reporting

1. Understand the IFRS 17 framework and contrast the general measurement model and building-block approach with the variable fee approach for insurance contract liability measurement.
2. Calculate the components of insurance contract liabilities under IFRS 17.
3. Evaluate profit and losses, including the amortization of the contractual service margin (CSM) , under the IFRS 17 framework, with use of insurance cash flows that vary and do not vary with underlying items.
4. Discuss the methods of construction of discount rates and yield curve under IFRS 17 including the estimation of the illiquidity premium.
5. Describe how climate-related risks could impact the valuation assumptions for pricing and reserving.
6. Determine key actuarial components of IFRS 17 financial statements.
7. Calculate key financial metrics and evaluate an insurer's financial performance and strength based on such metrics.
8. Describe the Appointed Actuary's role with respect to IFRS 17 financial reporting.

3. Considerations in Canadian practice

1. Describe and explain the insurance market stakeholders, how they interact, and their needs.
2. Describe and explain the investment market stakeholders, how they interact, and their needs.
3. Describe and explain the banking market stakeholders, how they interact, and their needs.
4. Understand the implications of replacing LIBOR with alternative reference rates.
5. Understand and discuss the latest developments of environmental, social, and governance (ESG) investing in Canada.
6. Discuss the impacts and potential of insurtech.
7. Discuss the application of blockchain and cryptocurrencies on insurance.
8. Explain the basic properties of a smart contract.

9. Understand centralization versus decentralization and the concept of distributed consensus in the context of cryptocurrencies.
10. Understand the basics of climate science and its impact on the work of actuaries.
11. Describe the process to conduct climate-scenario analysis for financial institutions.

4. Strategic decision-making

1. Analyze an organization's external environment and internal organization.
2. Describe and apply strategic management models, including Porter's five forces and value-chain analysis.
3. Describe types of business-level strategies and recommend an appropriate business-level strategy for a given situation.
4. Explain the impact of competitive dynamics on strategic management.
5. Develop and apply causal loop diagrams that model the feedback structure of complex systems.
6. Apply stocks and flows to dynamic modelling.
7. Apply dynamic modelling to business decisions.
8. Understand what is meant by strategic thinking and management process.
9. Determine strategic questions related to business sustainability and corporate governance.
10. Develop a strategic plan.
11. Evaluate the impact of a strategic plan on the financial statement and capital resources of an entity.

5. Asset and portfolio management

1. Describe the portfolio management process, and the role of investment policy, the investment actuary, and external portfolio managers.
2. Describe and evaluate how a company's objectives, needs, and constraints affect investment strategy and portfolio construction.
3. Describe the role of and significant considerations related to the design and function of asset-allocation strategies.
4. Describe fixed-asset portfolio management methods, immunization (including derivatives), cash-matching strategies, and convexity.
5. Describe and assess alternative investment portfolios in the context of an insurance company portfolio.
6. Describe and apply methods and processes for evaluating portfolio performance, including performance attribution, sources of earnings analysis on investment income, benchmarks, metrics, and risk-adjusted performance appraisals.
7. Describe the principles of liquidity risk management.
8. Describe hedging against the cost of borrowing through forward rate, futures and perform related calculations.
9. Demonstrate understanding of regulator guidance and context for different approaches to responsible investment and, specifically, the integration of ESG factors in the investment process.
10. Demonstrate an understanding of the underlying issues that constitute factors within each of the ESG areas.
11. Demonstrate an understanding of the ESG market: relevance, size, scope, key drivers and challenges, and risks and opportunities.

6. Communication and organizational behaviour

1. Explain differences between good and poor communication techniques and their implications.
2. Apply techniques to structure ideas logically.
3. Develop clear, fact-based messages that can be communicated persuasively.
4. Explain the role of cognitive biases on making suboptimal individual decisions.
5. Evaluate the role of organizational behavior on organizational decision-making processes and efficacy.
6. Explain why communication is strategically important to organizations.
7. Describe how information is communicated within organizations.
8. Describe organizational and individual barriers to effective communication.
9. Identify the risks of ineffective communication.
10. Explain how to overcome communication barriers and minimize risks of ineffective communication.
11. Recognize the influence of culture and diversity on communication.
12. Apply the CIA Standards of Practice and Rules of Professional Conduct in business communication.

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