Investment & Financial Markets Exam—November 2019

The Investment and Financial Markets Exam is a three-hour exam that consists of 30 multiple-choice questions. Also, a normal distribution calculator will be available during the test by clicking a link on the item screen. Details are available on the Prometric Web Site.

The purpose of the syllabus is to develop the candidate's knowledge of the theoretical basis of certain actuarial models and the application of those models to insurance and other financial risks. A thorough knowledge of calculus, probability, basic corporate finance, and interest theory is assumed.

Formulas are provided for the density and distribution functions for the standard normal and lognormal random variables. Formulas are also provided for the six option Greeks for both call and put options (as given in Appendix 12.B on p.379-380 of McDonald (2013). For paper and pencil examinations, tables of the standard normal distribution function are provided. Since the tables will be provided to the candidate at the examination, candidates will not be allowed to bring copies of the tables into the examination room. For CBT candidates, a normal distribution calculator is provided. See the link above for more information.

Note: It is anticipated that candidates will have done the relevant exercises in the textbooks.

Check the Updates section of the web site for any changes to the exam or syllabus.

The ranges of weights shown are intended to apply to the large majority of exams administered. On occasion, the weights of topics on an individual exam may fall outside the published range. Note that some questions may cover multiple learning outcomes.

Each multiple-choice problem includes 5 answer choices identified by A, B, C, D, and E, only 1 of which is correct. Candidates must indicate responses to each question on the computer. As part of the computer-based testing process, a few pilot questions will be randomly placed in the exam (paper and pencil and computer-based forms). These pilot questions are included to judge their effectiveness for future exams, but they will NOT be used in the scoring of this exam. All other questions will be considered in the scoring. All unanswered questions are scored incorrect. Therefore, candidates should answer every question on the exam. There is no set requirement for the distribution of correct answers for the SOA/CIA multiple-choice preliminary examinations. It is possible that a particular answer choice could appear many times on an examination or not at all. Candidates are advised to answer each question to the best of their ability, independently from how they have answered other questions on the examination.

Since the CBT exam will be offered over a period of a few days, each candidate will receive a test form composed of questions selected from a pool of questions. Statistical scaling methods are used to ensure within reasonable and practical limits that, during the same testing period of a few days, all forms of the test are comparable in content and passing criteria. The methodology that has been adopted is used by many credentialing programs that give multiple forms of an exam.

Recognized by the Canadian Institute of Actuaries.

LEARNING OUTCOMES

1. **Topic: Mean-Variance Portfolio Theory (10-15%)**
Learning Objectives
The Candidate will understand the assumptions of mean-variance portfolio theory and its principal results.
Learning Outcomes
The Candidate will be able to: a) Explain the mathematics and summary statistics of portfolios. o Calculate the risk and return of an asset, given appropriate inputs. o Calculate the risk and expected return of a portfolio of many risky assets, given the expected return, volatility and correlation of returns of the individual assets. b) Perform mean-variance analysis. o Understand the mean-standard deviation diagram and the resulting efficient market frontier. o Calculate the optimal portfolio and determine the location of the capital market line. o Understand how portfolio risk can be reduced through diversification across multiple securities or across multiple asset classes.

2. **Topic: Asset Pricing Models (5-10%)**

Learning Objectives

The Candidate will understand different methods for the valuation of asset portfolios and explain their appropriateness in different situations.

Learning Outcomes

The Candidate will be able to:

a) Explain the Capital Asset Pricing Model (CAPM).
   - Recognize the assumptions and properties of CAPM.
   - Calculate the required return on a particular asset, a portfolio or a project using CAPM.

b) Explain factor models.
   - Recognize the assumptions of a factor model for security returns.
   - Identify the expected return, factors, factor betas, and firm-specific components of a security from its factor equation.
   - Calculate the required return on a particular asset, a portfolio or a project using a single-factor and a multi-factor model.

3. **Topic: Market Efficiency and Behavioral Finance (5-10%)**

Learning Objectives

The Candidate will understand the notion of efficient markets and explain why market participants may make irrational systematic errors, leading to market inefficiencies.

Learning Outcomes

The Candidate will be able to:

a) Explain the three forms of the efficient market hypothesis (EMH).
   - Understand the definition of efficient markets, and distinguish between the strong, semi-strong, and weak versions of the EMH.
   - Identify empirical evidence for or against each form of the EMH.

b) Explain the main findings of behavioral finance.
   - Identify empirical examples of market anomalies that show results contrary to the EMH.
   - Understand how asset prices, especially in times of uncertainty and high volatility, can deviate significantly from their fundamental values.

4. **Topic: Investment Risk and Project Analysis (10-15%)**

Learning Objectives

The Candidate will understand different ways to measure investment risk and conduct project analysis using advanced techniques used in capital budgeting.

Learning Outcomes

The Candidate will be able to:

a) Discuss the advantages and disadvantages of different measures of investment risk.
   - Understand the properties, advantages, and disadvantages of the following investment risk measures: variance, semi-variance, Value-at-Risk (VaR), and Tail Value-at-Risk (TVaR).
   - Calculate the risk measures listed above in order to compare investment opportunities.

b) Conduct risk analysis.
   - Understand the following methods to conduct risk analysis: sensitivity analysis, break-even analysis, scenario analysis, and Monte-Carlo simulation.
   - Use a decision tree to model future outcomes and analyze real options embedded in a project.

5. **Topic: Capital Structure (10%)**

Learning Objectives

The Candidate will understand the factors that a company has to consider when deciding its capital structure.

Learning Outcomes

The Candidate will be able to:

a) Explain different methods to raise capital.

- Understand the two main forms of financing: equity issues and debt issues.
- Understand the process by which a company raises capital including venture capital, IPOs, additional issues, and private placement.

b) Describe the effect of capital structure on a company.

- Calculate the effect from changes in capital structure on a company's overall value, equity beta, cost of debt, cost of equity, and weighted-average cost of capital, assuming the two Modigliani and Miller propositions hold.
- Understand the effect of corporate tax and costs of financial distress, including the threat of bankruptcy, on the capital structure of a company.
- Understand the role of agency costs and asymmetric information in affecting a company's array of financing choices.

6. **Topic: Introductory Derivatives – Forwards and Futures (5-10%)**

Learning Objectives

The Candidate will understand how forward contracts and futures contracts can be used in conjunction with the underlying asset in a risk management context.

Learning Outcomes

The Candidate will be able to:

a) Describe the characteristics and terms of the main derivatives instruments (including forwards and futures).
   - Distinguish between long and short positions for both assets (including short selling of stocks) and derivatives on assets.
   - Recognize the transaction costs affecting profit calculations for both assets and derivatives on assets (including commissions and bid-ask spread).

b) Describe the characteristics and terms relating to both forward contracts and prepaid forward contracts.
   - Define and recognize the following terms relating to the timing of stock purchases: outright purchase, fully leveraged purchase, prepaid forward contract, and forward contract.
   - Determine payoffs and profits for both long and short positions on forward contracts.
   - Calculate prices for both forward contracts and prepaid forward contracts on stocks with no dividends, continuous dividends, and discrete dividends.
   - Construct a synthetic forward from the underlying stock and a risk-free asset and identify arbitrage opportunities when the synthetic forward price is different from the market forward price.

c) Describe the characteristics and terms relating to both futures contracts and the associated margin accounts.
   - Define and recognize the following terms relating to the mark-to-market process: Marking to market, margin balance, maintenance margin, and margin call.
   - Evaluate an investor's margin balance based on changes in asset values.

7. **Topic: General Properties of Options (10-15%)**

Learning Objectives

The Candidate will understand how call options and put options can be used in conjunction with the underlying asset in a risk management context.

Learning Outcomes

The Candidate will be able to:

a) Explain the cash flow characteristics and terms relating to various options.

- Define and recognize the following terms relating to option classification: call and put options, expiration date, strike price, moneyness, and option style.
- Calculate the payoff and profit on both long and short positions with respect to both call and put options.
- Calculate the payoffs on exotic options: Asian (arithmetic and geometric), barrier, compound, gap, and exchange.
- Calculate the payoffs on exotic options: lookback, chooser, shout, rainbow, and forward start.

b) Apply option strategies in a risk management context.

- Recognize that a long put can be used as an insurance strategy for a long stock position and a long call can be used as an insurance strategy for a short stock position.
- Understand how the following option strategies can be used as tools to manage financial risk or speculate on price or volatility: option spreads (bull, bear, ratio), collar, straddle, strangle, and butterfly spread.
- Evaluate the payoff and profit of the option strategies described above.

c) Explain the general properties of options that affect option prices.

- Apply put-call parity to European options on stocks with no dividends, stocks with continuous dividends, stocks with discrete dividends, currencies, and bonds.
- Compare options with respect to term-to-maturity and strike price.
- Identify factors affecting the early exercise of American options and the situations where the values of European and American options are the same.

8. **Topic: Binomial Pricing Models (10%)**

Learning Objectives

The Candidate will understand how binomial trees can be used to approximate the prices of both European and American call and put options on various underlying assets.

Learning Outcomes

The Candidate will be able to:

a) Explain the concept of no arbitrage and the risk-neutral approach to valuing derivatives securities.

- Understand the concept of no arbitrage when comparing actual and synthetic calls, or when comparing actual and synthetic puts.
- Understand the concepts underlying the risk-neutral approach to valuing derivatives securities in the context of the Binomial Option Pricing Model.

b) Use the Binomial Option Pricing Model to calculate the value of European and American call and put options, along with the value of Asian and barrier options.

- Price options under a one-period binomial model on a stock with no dividends.
- Extend the binomial model to multi-period settings for pricing both European and American call and put options.
- Extend the binomial model to other underlying assets, including stock indices with continuous dividends, currencies, and futures contracts.

9. **Topic: Black-Scholes Option Pricing Model (10-15%)**

Learning Objectives

The Candidate will understand how the Black-Scholes Formula can be used to form the prices of European call and put options on various underlying assets.

Learning Outcomes

The Candidate will be able to:

a) Explain the properties of the lognormal distribution and its applicability to option pricing.

- Calculate lognormal-based probabilities and percentiles for stock prices.
- Calculate lognormal-based means and variances of stock prices.
- Calculate lognormal-based conditional expectations of stock prices given that options expire in-the-money.

b) Explain the Black-Scholes Formula.

- Recognize the assumptions underlying the Black-Scholes model.
- Estimate a stock's historical volatility from past stock price data.
- Use the Black-Scholes Formula to value European calls and puts on stocks with no dividends, stock indices with continuous dividends, stocks with discrete dividends, currencies, and futures contracts.
- Generalize the Black-Scholes Formula to value gap calls, gap puts, and exchange options, chooser options, and forward start options.

10. **Topic: Option Greeks and Risk Management (5-10%)**

Learning Objectives

The Candidate will understand the importance of Option Greeks and risk management techniques in forming hedged asset portfolios that include positions in both options and the underlying asset.

Learning Outcomes

The Candidate will be able to:

a) Explain the calculation and use of option price partial derivatives.
   - Compute and interpret Option Greeks, including Delta, Gamma, Theta, Vega, Rho, and Psi.
   - Compute the elasticity, Sharpe ratio, and risk premium for both an individual option (call or put) and a portfolio consisting of both options of multiple types and the underlying stock.
   - Approximate option prices using Delta, Gamma, and Theta.

b) Explain how to control risk by using options in a hedging context.
   - Perform delta hedging by calculating the quantities of option units and stock shares to hold, and whether those positions should be long or short.
   - Perform gamma hedging by calculating the quantities of option units (of various types) and stock shares to hold, and whether those positions should be long or short.

c) Apply options and other derivatives in the context of actuarial-specific risk management.
   - Understand how life insurers use derivatives to hedge long-term risks from the asset portfolio.
   - Understand how P&C insurers use derivatives to hedge short-term risks from the liability portfolio.
   - Understand how investment guarantees can be formed from equity-linked insurance & annuities.
   - Understand how options are employed in both pension funding and asset/liability management.

Note: Concepts, principles and techniques needed for Exam IFM are covered in the references listed below.

TEXTS

Derivatives Markets (Third Edition), 2013, by McDonald, R.L., Pearson Education, ISBN: 978-0-32154-308-0

Chapter 1, Sections 1, 2, 4, 5
Chapter 2, Sections 1-4
Chapter 3, Sections 1-4
Chapter 5, Sections 1, 2, 3 (through the middle of p. 136), 4 (through the top of p. 143),
Chapter 9, Sections 1 (through the bottom of p.269), 3
Chapter 10, Sections 1-5, 6 (through the middle of p. 315),
Chapter 11, Section 1
Chapter 12, Sections 1-3, Appendices A, B
Chapter 13, Sections 1-4, 5 (beginning at the bottom of p.398), 6
Chapter 14, Sections 1, 2 (through the bottom of p.413), 3 (through the bottom of p.416), 4 (through the bottom of p. 419), 5 (through Figure 14.4 on p.423), 6, Exercises 14.20 and 14.21 on p.429
Chapter 18, Sections 1-4, Appendix A,
Appendices B.1, C

Unless otherwise stated, chapter appendices are not included in the required readings from this text.

Errata are available here:
http://derivatives.kellogg.northwestern.edu/errata/errata3e.html

Corporate Finance (Fourth Edition), 2017, by Berk, J. and DeMarzo, P., Pearson, ISBN: 978-0-13408-327-8.

Chapter 8, Section 5
Chapter 9, Section 5
Chapters 10-13 (all sections)
Chapter 14, Sections 1-3
Chapter 15, Sections 1-2
Chapter 16 (all sections)
Chapter 22, Sections 1-4
Chapter 23, Sections 1-3
Chapter 24, Sections 1-2

None of the appendices are included in the required readings.

ADDITIONAL REFERENCES

There are two study notes that are required reading for this examination.

Supplementary Material for Investment & Finance:

- IFM-21-18: Measures of Investment Risk, Monte Carlo Simulation, and Empirical Evidence on the Efficient Markets Hypothesis.

Supplementary Material for Derivatives:

- IFM-22-18: Actuarial Applications of Options and Other Financial Derivatives

OTHER RESOURCES

Exam IFM Formulas and Tables for paper/pencil

Formulas and Tables for CBT:

- A normal distribution calculator will be available during the test by clicking buttons on the item screen.
- Formula document

All released exam papers, since 2000 can be found here.

As this is a new exam, there are no prior exam questions.

- IFM-01-18 Questions and Solutions from past MFE exams. Only questions that still apply to the IFM curriculum remain
- IFM-02-18 Questions and Solutions on Finance and Investment. These questions were developed independently of the examination process, but were reviewed by the examination committee for general applicability.