2014

FRM Examination AIM Statements

GARP | Global Association of Risk Professionals

FRM Examination Approach

The FRM Exam is a comprehensive, practice-oriented, examination with questions derived from a combination of theory and "real-world" work experience. Candidates are expected to understand risk management concepts and approaches and how they would apply to a risk manager's day-to-day activities.

It is rare that a risk manager will be faced with an issue that can immediately be siloed into one category and he or she must be able to identify any number of risk-related issues and be able to deal with them effectively. Therefore, the FRM Examination is also comprehensive, testing a risk professional on a number of risk management concepts and approaches.

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FRM AIM Statements

The AIM Statements contain all of the suggested reading and Key Concept information that is in the Study Guide as well as more detailed knowledge points that form the basis for FRM Exam questions. Candidates who compare the Key Concepts to the knowledge points will note that in most cases several knowledge points are related to each broader Key Concept.

On the following pages, an asterisk after a reading title indicates that the reading is freely available on the GARP website.

Readings

To facilitate a candidate's preparation, each knowledge point in the AIM Statements is associated with a suggested reading from the Study Guide which supports and explains it.

These readings were selected by the FRM Committee to assist candidates in their review of the subjects covered by the exam. Questions for the FRM Examination are related to and supported by the readings listed under each topic outline and it is strongly suggested that candidates review these readings in depth prior to sitting for the exam. All of the readings listed in the FRM Study Guide are available through GARP. Further information can be found on the GARP website.

FRM Study Guide

The Study Guide sets forth primary topics and subtopics covered in the FRM Exam. The topics were selected by the FRM Committee as ones that risk managers who work in practice today have to master. The topics and their respective weightings are reviewed yearly to ensure the FRM Exam is kept timely and relevant. Key Concepts appear as bullet points at the beginning of each section of the Study Guide and are intended to help candidates identify the major themes and knowledge areas associated with that section. The Study Guide also contains a full listing of all of the readings that are recommended as preparation for the FRM Examination.

2014 FRM Examination

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Part I AIM Statements

Part II AIM Statements

FRM PART I—TOPICS AND READINGS

FOUNDATIONS OF RISK MANAGEMENT—Part I Exam Weight | **20%**

- The role of risk management in corporate governance
- Basic risk types, measurement and management tools
- Creating value with risk management
- The Capital Asset Pricing Model (CAPM)
- Multi-factor models
- Risk-adjusted performance measurement
- Enterprise Risk Management (ERM)
- Information risk and data quality management
- Financial disasters and risk management failures
- Ethics and the GARP Code of Conduct

Readings for Foundations of Risk Management

1. "Risk Taking: A Corporate Governance Perspective," (International Finance Corporation, World Bank Group, June 2012).*

2. Edwin J. Elton, Martin J. Gruber, Stephen J. Brown and William N. Goetzmann, *Modern Portfolio Theory and Investment Analysis, 8th Edition* (Hoboken, NJ: John Wiley & Sons, 2009).
   - Chapter 13.....The Standard Capital Asset Pricing Model

3. Zvi Bodie, Alex Kane, and Alan J. Marcus, *Investments, 9th Edition* (New York: McGraw-Hill, 2010).
   - Chapter 10 .....Arbitrage Pricing Theory and Multifactor Models of Risk and Return

4. Noel Amenc and Veronique Le Sourd, *Portfolio Theory and Performance Analysis* (West Sussex, England: John Wiley & Sons, 2003).
   - Chapter 4, Section 4.2 only.....Applying the CAPM to Performance Measurement: Single-Index Performance Measurement Indicators

5. "Understanding and Communicating Risk Appetite," (COSO, Dr. Larry Rittenberg and Frank Martens, January 2012).

6. Anthony Tarantino and Deborah Cernauskas, *Risk Management in Finance: Six Sigma and Other Next Generation Techniques* (Hoboken, NJ: John Wiley & Sons, 2009).
   - Chapter 3 .....Information Risk and Data Quality Management

7. Steve Allen, *Financial Risk Management: A Practitioner's Guide to Managing Market and Credit Risk, 2nd Edition* (New York: John Wiley & Sons, 2013).
   - Chapter 4.....Financial Disasters

8. René Stulz, "Risk Management Failures: What are They and When Do They Happen?" Fisher College of Business Working Paper Series, October 2008.*

9. GARP Code of Conduct.*

AIMS:

"Risk Taking: A Corporate Governance Perspective," (International Finance Corporation, World Bank Group, June 2012).*

Candidates, after completing this reading, should be able to:

- Define risk and describe how risks can be classified.
- Explain the role played by risk management in value creation.
- Describe a risk profile and describe the role of risk governance in an organization.
- Describe the Enterprise Risk Management (ERM) approach, describe the stages of the ERM process and explain the risk management approaches that can be used in each stage of the process.
- Construct a risk-adjusted discount rate for an asset or project and apply that rate to estimate the value of the asset or project.
- Describe the impact of leverage and taxes in the calculation of an equity beta for a firm.
- Explain problems which arise when using historical betas and equity risk premiums as inputs into a valuation model.
- Compare purely qualitative, semi-quantitative and purely quantitative methods used to estimate risks and describe examples of each.
- Describe different probabilistic approaches used in estimating risks.
- Identify four risk treatment strategies a firm can use to manage its risks.
- Define hedging, explain the tradeoff between the costs and benefits of hedging, and explain how a firm can add value through hedging.
- Identify the methods a firm can use to exploit risk better than its competitors, and explain how an organization can create a culture of prudent risk-taking among its employees.
- Summarize the basic steps in building an effective risk management system.

Edwin J. Elton, Martin J. Gruber, Stephen J. Brown and William N. Goetzmann, *Modern Portfolio Theory and Investment Analysis, 8th Edition* (Hoboken, NJ: John Wiley & Sons, 2009).

Chapter 13 .....The Standard Capital Asset Pricing Model

Candidates, after completing this reading, should be able to:

- Understand the derivation and components of the CAPM.
- Describe the assumptions underlying the CAPM.
- Describe the capital market line.
- Use the CAPM to calculate the expected return on an asset.
- Define beta and calculate the beta of a single asset or portfolio.

Zvi Bodie, Alex Kane, and Alan J. Marcus, Investments, 9th Edition (New York: McGraw-Hill, 2010).

Chapter 10 .....Arbitrage Pricing Theory and Multifactor Models of Risk and Return

Candidates, after completing this reading, should be able to:

- Describe the inputs, including factor betas, to a multi factor model.
- Calculate the expected return of an asset using a single-factor and a multi-factor model.
- Describe the Law of One Price and assess whether an arbitrage situation exists using a multi-factor model.
- Construct the Security Market Line for a well-diversified portfolio using a single-factor model.
- Explain how to construct a portfolio to hedge exposure to multiple factors.
- Describe the Arbitrage Pricing Theory (APT) and the Fama-French three-factor model, and explain the underlying assumptions of each.

Noel Amenc and Veronique Le Sourd, *Portfolio Theory and Performance Analysis* (West Sussex, England: John Wiley & Sons, 2003).

Chapter 4, Section 4.2 only .....Applying the CAPM to Performance Measurement: Single-Index Performance Measurement Indicators

Candidates, after completing this reading, should be able to:

- Calculate, compare, and evaluate the Treynor measure, the Sharpe measure, and Jensen's alpha.
- Compute and interpret tracking error, the information ratio, and the Sortino ratio.

"Understanding and Communicating Risk Appetite," (COSO, Dr. Larry Rittenberg and Frank Martens, January 2012).

Candidates, after completing this reading, should be able to:

- Define risk appetite and explain the role of risk appetite in corporate governance.
- Describe considerations a firm must make in determining its risk appetite, and explain how an organization's risk appetite can differ for various risk factors.
- Describe the objective and characteristics of an effective risk appetite statement.
- Differentiate between risk appetite and risk tolerance, and explain how an organization can align its risk tolerance to its risk appetite.
- Explain how an organization can develop, communicate, monitor and update its risk appetite.
- Explain the role of the Board of Directors in overseeing an organization's risk appetite.

Anthony Tarantino and Deborah Cernauskas, *Risk Management in Finance: Six Sigma and Other Next Generation Techniques* (Hoboken, NJ: John Wiley & Sons, 2009).

Chapter 3 .....Information Risk and Data Quality Management

Candidates, after completing this reading, should be able to:

- Describe ways in which a business can be negatively impacted by poor quality data.
- Identify the most common issues which result in data errors.
- Identify some key dimensions of data quality.
- Describe the operational data governance process and differentiate between data quality inspection and data validation.
- Describe the process of creating a data quality scorecard and compare three different viewpoints for reporting data via a data quality scorecard.

Steve Allen, *Financial Risk Management: A Practitioner's Guide to Managing Market and Credit Risk, 2nd Edition* (New York: John Wiley & Sons, 2013).

Chapter 4 .....Financial Disasters

Candidates, after completing this reading, should be able to:

- Describe the key factors that led to and the lessons learned from the following risk management case studies:
  - Chase Manhattan and their involvement with Drysdale Securities
  - Kidder Peabody
  - Barings
  - Allied Irish Bank
  - Union Bank of Switzerland (UBS)
  - Société Générale
  - Long Term Capital Management (LTCM)
  - Metallgesellschaft
  - Bankers Trust
  - JPMorgan, Citigroup, and Enron

René Stulz, "Risk Management Failures: What are They and When Do They Happen?" Fisher College of Business Working Paper Series, (Oct 2008).*

Candidates, after completing this reading, should be able to:

- Define the role of risk management and explain why a large financial loss is not necessarily a failure of risk management.
- Describe how risk management can fail.
- Describe how risk can be mismeasured.
- Explain how a firm can fail to take known and unknown risks into account in making strategic decisions.
- Explain the importance of communication in effective risk management.
- Describe how firms can fail to correctly monitor and manage risk on an ongoing basis.
- Explain the role of risk metrics and describe the shortcomings of existing risk metrics.

GARP Code of Conduct.*

Candidates, after completing this reading, should be able to:

- Describe the responsibility of each GARP member with respect to professional integrity, ethical conduct, conflicts of interest, confidentiality of information and adherence to generally accepted practices in risk management.
- Describe the potential consequences of violating the GARP Code of Conduct.

QUANTITATIVE ANALYSIS—Part I Exam Weight | **20%**

- **Discrete and continuous probability distributions**
- **Population and sample statistics**
- **Statistical inference and hypothesis testing**
- **Estimating the parameters of distributions**
- **Graphical representation of statistical relationships**
- **Linear regression with single and multiple regressors**
  - **The Ordinary Least Squares (OLS) method**
  - **Interpreting and using regression coefficients, the t-statistic, and other output**
  - **Hypothesis testing and confidence intervals**
  - **Heteroskedasticity and multicollinearity**
- **Simulation methods**
- **Estimating correlation and volatility using EWMA and GARCH models**
- **Volatility term structures**

Readings for Quantitative Analysis

10. **Michael Miller, *Mathematics and Statistics for Financial Risk Management* (Hoboken, NJ: John Wiley & Sons, 2012).**
- Chapter 2 .....Probabilities
- Chapter 3 .....Basic Statistics
- Chapter 4 .....Distributions
- Chapter 5 .....Hypothesis Testing and Confidence Intervals

11. **James Stock and Mark Watson, *Introduction to Econometrics, Brief Edition* (Boston: Pearson Education, 2008).**
- Chapter 4 .....Linear Regression with One Regressor
- Chapter 5 .....Regression with a Single Regressor
- Chapter 6 .....Linear Regression with Multiple Regressors
- Chapter 7 .....Hypothesis Tests and Confidence Intervals in Multiple Regression

12. **Dessislava Pachamanova and Frank Fabozzi, *Simulation and Optimization in Finance* (Hoboken, NJ: John Wiley & Sons, 2010).**
- Chapter 4 .....Simulation Modeling

13. **John Hull, *Options, Futures, and Other Derivatives, 8th Edition* (New York: Pearson Prentice Hall, 2012).**
- Chapter 22.....Estimating Volatilities and Correlations

AIMS:

Michael Miller, *Mathematics and Statistics for Financial Risk Management* (Hoboken, NJ: John Wiley & Sons, 2012).

Chapter 2 .....Probabilities

Candidates, after completing this reading, should be able to:

- Describe and distinguish between continuous and discrete random variables.
- Define and distinguish between the probability density function, the cumulative distribution function, and the inverse cumulative distribution function.
- Calculate the probability of an event given a discrete probability function.
- Distinguish between independent and mutually exclusive events.
- Define joint probability, describe a probability matrix, and calculate joint probabilities using probability matrices.
- Define and calculate a conditional probability, and distinguish between conditional and unconditional probabilities.
- Describe Bayes' theorem and apply this theorem in the calculation of conditional probabilities.

Chapter 3 .....Basic Statistics

Candidates, after completing this reading, should be able to:

- Define and interpret the mean, standard deviation, and variance of a random variable.
- Define, calculate and interpret the covariance and correlation between two random variables.
- Calculate the mean and variance of sums of variables.
- Describe the four central moments of a statistical variable or distribution: mean, variance, skewness and kurtosis.
- Interpret the skewness and kurtosis of a statistical distribution, and interpret the concepts of coskewness and cokurtosis.
- Describe and interpret the best linear unbiased estimator.

Chapter 4 .....Distributions

Candidates, after completing this reading, should be able to:

- Define and distinguish between parametric and nonparametric distributions.
- Describe the key properties of the following distributions: uniform distribution, Bernoulli distribution, Binomial distribution, Poisson distribution, normal distribution, lognormal distribution, Chi-squared distribution, Student's t, and F-distributions, and identify common occurrences of each distribution.
- Describe and apply the Central Limit Theorem.
- Describe the properties of independent and identically distributed (i.i.d.) random variables.
- Describe a mixture distribution and explain the creation and characteristics of mixture distributions.

Chapter 5 .....Hypothesis Testing and Confidence Intervals

Candidates, after completing this reading, should be able to:

- Calculate and interpret the sample mean and sample variance.
- Define and construct a confidence interval.
- Define and construct an appropriate null and alternative hypothesis, and calculate an appropriate test statistic.
- Differentiate between a one-tailed and a two-tailed test and explain the circumstances in which to use each test.
- Interpret the results of hypothesis tests with a specific level of confidence.
- Describe and apply the principle of Chebyshev's inequality.

James Stock and Mark Watson, *Introduction to Econometrics, Brief Edition* (Boston: Pearson Education, 2008).

Chapter 4 .....Linear Regression with One Regressor

Candidates, after completing this reading, should be able to:

- Explain how regression analysis in econometrics measures the relationship between dependent and independent variables.
- Define and interpret a population regression function, regression coefficients, parameters, slope, intercept, and the error term.
- Define and interpret a sample regression function, regression coefficients, parameters, slope, intercept, and the error term.
- Describe the key properties of a linear regression.
- Define an ordinary least squares (OLS) regression and calculate the intercept and slope of the regression.
- Describe the method and three key assumptions of OLS for estimation of parameters.
- Summarize the benefits of using OLS estimators.
- Describe the properties of OLS estimators and their sampling distributions, and explain the properties of consistent estimators in general.
- Define and interpret the explained sum of squares, the total sum of squares, the residual sum of squares, the standard error of the regression, and the regression R^2.
- Interpret the results of an OLS regression.

Chapter 5 .....Regression with a Single Regressor: Hypothesis Tests and Confidence Intervals

Candidates, after completing this reading, should be able to:

- Define, calculate, and interpret confidence intervals for regression coefficients.
- Define and interpret the p-value.
- Define and interpret hypothesis tests about regression coefficients.
- Define and describe the implications of homoskedasticity and heteroskedasticity.
- Describe the conditions under which the OLS is the best linear conditionally unbiased estimator.
- Explain the Gauss-Markov Theorem and its limitations, and alternatives to the OLS.
- Define, describe, apply, and interpret the t-statistic when the sample size is small.

Chapter 6 .....Linear Regression with Multiple Regressors

Candidates, after completing this reading, should be able to:

- Define and interpret omitted variable bias, and describe the methods for addressing this bias.
- Distinguish between single and multiple regression.
- Define and interpret the slope coefficient in a multiple regression.
- Describe homoskedasticity and heterosckedasticity in a multiple regression.
- Describe the OLS estimator in a multiple regression.
- Define, calculate, and interpret measures of fit in multiple regression.
- Explain the assumptions of the multiple linear regression model.
- Explain the concept of imperfect and perfect multicollinearity and their implications.

Chapter 7 .....Hypothesis Tests and Confidence Intervals in Multiple Regression

Candidates, after completing this reading, should be able to:

- Construct, apply, and interpret hypothesis tests and confidence intervals for a single coefficient in a multiple regression.
- Construct, apply, and interpret hypothesis tests and confidence intervals for multiple coefficients in a multiple regression.
- Define and interpret the F-statistic.
- Describe and interpret tests of single restrictions involving multiple coefficients.
- Define and interpret confidence sets for multiple coefficients.
- Define and describe omitted variable bias in multiple regressions.
- Interpret the R^2 and adjusted-R^2 in a multiple regression.

Dessislava Pachamanova and Frank Fabozzi, *Simulation and Optimization in Finance* (Hoboken, NJ: John Wiley & Sons, 2010).

Chapter 4 .....Simulation Modeling

Candidates, after completing this reading, should be able to:

- Describe different ways of choosing probability distributions in creating simulation models.
- Understand and interpret the results generated by Monte Carlo simulation.
- Describe the advantages of simulation modeling when multiple input variables and compounding distributions are involved.
- Describe how correlations can be incorporated into simulation modeling.
- Describe the relationship between the accuracy of a simulation model and the number of scenarios run in the simulation.
- Interpret discretization error bias and describe how to identify an efficient estimator.
- Describe the inverse transform method and its implementation in discrete and continuous distributions.
- Describe standards for an effective pseudorandom number generator and explain midsquare technique and congruential pseudorandom number generators.
- Describe quasi-random (low-discrepancy) sequences and explain how they work in simulations.
- Explain the mechanics and characteristics of the stratified sampling method and describe the Latin Hypercube Sampling method.

John Hull, *Options, Futures, and Other Derivatives, 8th Edition* (New York: Pearson Prentice Hall, 2012).

Chapter 22 .....Estimating Volatilities and Correlations

Candidates, after completing this reading, should be able to:

- Explain how historical data and various weighting schemes can be used in estimating volatility.
- Describe the exponentially weighted moving average (EWMA) model for estimating volatility and its properties, and estimate volatility using the EWMA model.
- Describe the generalized auto regressive conditional heteroskedasticity (GARCH(p,q)) model for estimating volatility and its properties:
  - Calculate volatility using the GARCH(1,1) model
  - Explain mean reversion and how it is captured in the GARCH(1,1) model
- Explain how the parameters of the GARCH(1,1) and the EWMA models are estimated using maximum likelihood methods.
- Explain how GARCH models perform in volatility forecasting.
- Describe the volatility term structure and the impact of volatility changes.
- Describe how correlations and covariances are calculated, and explain the consistency condition for covariances.

FINANCIAL MARKETS AND PRODUCTS—Part I Exam Weight | **30%**

- **Mechanics of OTC and exchange markets**
- **Forwards, futures, swaps and options**
  - **Mechanics**
  - **Pricing and factors that affect it**
  - **Uses in hedging and hedging strategies**
  - **Delivery options**
- **Interest rates and measures of interest rate sensitivity**
- **Derivatives on fixed income securities, interest rates, foreign exchange, futures, commodities, and equities**
- **Foreign exchange risk**
- **Corporate bonds**
- **Rating agencies**

Readings for Financial Markets and Products

14. **The Institute for Financial Markets, *Futures and Options* (Washington, DC: The Institute for Financial Markets, 2011).**
- Chapter 1 .....Introduction: Futures and Options Markets
- Chapter 2 .....Futures Industry Institutions and Professionals
- Chapter 7 .....Hedging with Futures and Options

15. **Hull, *Options, Futures, and Other Derivatives, 8th Edition*.**
- Chapter 1 .....Introduction
- Chapter 2 .....Mechanics of Futures Markets
- Chapter 3 .....Hedging Strategies Using Futures
- Chapter 4 .....Interest Rates
- Chapter 5 .....Determination of Forward and Futures Prices
- Chapter 6 .....Interest Rate Futures
- Chapter 7 .....Swaps
- Chapter 10 .....Properties of Stock Options
- Chapter 11.....Trading Strategies Involving Options

16. **Robert McDonald, *Derivatives Markets, 3rd Edition* (Boston: Addison-Wesley, 2013).**
- Chapter 6 .....Commodity Forwards and Futures

17. **Helyette Geman, *Commodities and Commodity Derivatives: Modeling and Pricing for Agriculturals, Metals and Energy* (West Sussex, England: John Wiley & Sons, 2005).**
- Chapter 1 .....Fundamentals of Commodity Spot and Futures Markets: Instruments, Exchanges and Strategies

18. **Anthony Saunders and Marcia Millon Cornett, *Financial Institutions Management: A Risk Management Approach, 7th Edition* (New York: McGraw-Hill, 2011).**
- Chapter 14.....Foreign Exchange Risk

19. **Frank Fabozzi (editor), *The Handbook of Fixed Income Securities, 8th Edition* (New York: McGraw-Hill, 2012).**

- Chapter 12.....Corporate Bonds, by Frank Fabozzi, Steven Mann and Adam Cohen

20. **John B. Caouette, Edward I. Altman, Paul Narayanan, and Robert W.J. Nimmo, *Managing Credit Risk, 2nd Edition* (New York: John Wiley & Sons, 2008).**

- Chapter 6 .....The Rating Agencies

AIMS:

The Institute for Financial Markets, *Futures and Options* (Washington, DC: The Institute for Financial Markets, 2011).

Chapter 1 .....Introduction: Futures and Options Markets

Candidates, after completing this reading, should be able to:

- Describe the risks in the commodities business that are addressed by the use of futures contracts.
- Describe the key features and terms of a futures contract.
- Differentiate between equity securities and futures contracts.
- Define and interpret volume and open interest.
- Explain the requisites for a successful futures market.

Chapter 2 .....Futures Industry Institutions and Professionals

Candidates, after completing this reading, should be able to:

- Describe the features of a modern futures exchange and identify typical contract terms and trading rules.
- Explain the organization and administration of an exchange and clearinghouse.
- Describe exchange membership, the different types of exchange members, and the exchange rules for member trading.
- Explain original and variation margin, daily settlement, the guaranty deposit, and the clearing process.
- Describe the steps that are taken when a clearinghouse member is unable to meet its financial obligations on its open contracts.
- Describe the mechanics of futures delivery and the roles of the clearinghouse, buyers, and sellers in this process.
- Explain the role of futures commission merchants, introducing brokers, account executives, commodity trading advisors, commodity pool operators, and customers.

Chapter 7 .....Hedging with Futures and Options

Candidates, after completing this reading, should be able to:

- Define the terms “long the basis” and “short the basis”.
- Explain exchange for physical (EFP) transactions and their role in the energy and financial futures markets.
- Describe and calculate the payoffs on the various scenarios for hedging with options on futures.

Hull, *Options, Futures, and Other Derivatives, 8th Edition.*

Chapter 1 .....Introduction

Candidates, after completing this reading, should be able to:

- Differentiate between an open outcry system and electronic trading.
- Describe the over-the-counter market, how it differs from trading on an exchange, and its advantages and disadvantages.
- Differentiate between options, forwards, and futures contracts.
- Identify and calculate option and forward contract payoffs.
- Describe, contrast, and calculate the payoffs from hedging strategies involving forward contracts and options.
- Describe, contrast, and calculate the payoffs from speculative strategies involving futures and options.
- Calculate an arbitrage payoff and describe how arbitrage opportunities are temporary.
- Describe some of the risks that can arise from the use of derivatives.

Chapter 2 .....Mechanics of Futures Markets

Candidates, after completing this reading, should be able to:

- Define and describe the key features of a futures contract, including the asset, the contract price and size, delivery and limits.
- Explain the convergence of futures and spot prices.
- Describe the rationale for margin requirements and explain how they work.
- Describe the role of a clearinghouse in futures and over-the-counter market transactions.
- Describe the role of collateralization in the over-the-counter market and compare it to the margining system.
- Identify and describe the differences between a normal and inverted futures market.
- Describe the mechanics of the delivery process and contrast it with cash settlement.
- Describe and explain the impact of different trading order types.
- Compare and contrast forward and futures contracts.

Chapter 3 .....Hedging Strategies Using Futures

Candidates, after completing this reading, should be able to:

- Define and differentiate between short and long hedges and identify their appropriate uses.
- Describe the arguments for and against hedging and the potential impact of hedging on firm profitability.
- Define the basis and explain the various sources of basis risk, and explain how basis risks arise when hedging with futures.
- Define cross hedging, and compute and interpret the minimum variance hedge ratio and hedge effectiveness.
- Compute the optimal number of futures contracts needed to hedge an exposure, and explain and calculate the "tailing the hedge" adjustment.
- Explain how to use stock index futures contracts to change a stock portfolio's beta.
- Explain the term "rolling the hedge forward" and describe some of the risks that arise from this strategy.

Chapter 4 .....Interest Rates

Candidates, after completing this reading, should be able to:

- Describe Treasury rates, LIBOR, and repo rates, and explain what is meant by the "risk-free" rate.
- Calculate the value of an investment using different compounding frequencies
- Convert interest rates based on different compounding frequencies.
- Calculate the theoretical price of a bond using spot rates.
- Calculate forward interest rates from a set of spot rates.
- Calculate the value of the cash flows from a forward rate agreement (FRA).
- Calculate the duration, modified duration and dollar duration of a bond.
- Describe the limitations of duration and explain how convexity addresses some of them.
- Calculate the change in a bond's price given its duration, its convexity, and a change in interest rates.
- Describe the major theories of the term structure of interest rates.

Chapter 5 .....Determination of Forward and Futures Prices

Candidates, after completing this reading, should be able to:

- Differentiate between investment and consumption assets.
- Define short-selling and calculate the net profit of a short sale of a dividend-paying stock.
- Describe the differences between forward and futures contracts and explain the relationship between forward and spot prices.
- Calculate the forward price given the underlying asset's spot price, and describe an arbitrage argument between spot and forward prices.
- Explain the relationship between forward and futures prices.
- Calculate a forward foreign exchange rate using the interest rate parity relationship.
- Define income, storage costs, and convenience yield.
- Calculate the futures price on commodities incorporating income/storage costs and/or convenience yields.
- Define and calculate, using the cost-of-carry model, forward prices where the underlying asset either does or does not have interim cash flows.
- Describe the various delivery options available in the futures markets and how they can influence futures prices.
- Explain the relationship between current futures prices and expected future spot prices, including the impact of systematic and nonsystematic risk.
- Define and interpret contango and backwardation, and explain how they relate to the cost-of-carry model.

Chapter 6 .....Interest Rate Futures

Candidates, after completing this reading, should be able to:

- Identify the most commonly used day count conventions, describe the markets that each one is typically used in, and apply each to an interest calculation.
- Calculate the conversion of a discount rate to a price for a US Treasury bill.
- Differentiate between the clean and dirty price for a US Treasury bond; calculate the accrued interest and dirty price on a US Treasury bond.
- Explain and calculate a US Treasury bond futures contract conversion factor.
- Calculate the cost of delivering a bond into a Treasury bond futures contract.
- Describe the impact of the level and shape of the yield curve on the cheapest-to-deliver Treasury bond decision.
- Calculate the theoretical futures price for a Treasury bond futures contract.
- Calculate the final contract price on a Eurodollar futures contract.
- Describe and compute the Eurodollar futures contract convexity adjustment.
- Explain how Eurodollar futures can be used to extend the LIBOR zero curve.
- Calculate the duration-based hedge ratio and describe a duration-based hedging strategy using interest rate futures.
- Explain the limitations of using a duration-based hedging strategy.

Chapter 7 .....Swaps

Candidates, after completing this reading, should be able to:

- Explain the mechanics of a plain vanilla interest rate swap and compute its cash flows.
- Explain how a plain vanilla interest rate swap can be used to transform an asset or a liability and calculate the resulting cash flows.
- Explain the role of financial intermediaries in the swaps market.
- Describe the role of the confirmation in a swap transaction.
- Describe the comparative advantage argument for the existence of interest rate swaps and explain some of the criticisms of this argument.
- Explain how the discount rates in a plain vanilla interest rate swap are computed.
- Calculate the value of a plain vanilla interest rate swap based on two simultaneous bond positions.
- Calculate the value of a plain vanilla interest rate swap from a sequence of forward rate agreements (FRAs).
- Explain the mechanics of a currency swap and compute its cash flows.
- Explain how a currency swap can be used to transform an asset or liability and calculate the resulting cash flows.
- Calculate the value of a currency swap based on two simultaneous bond positions.
- Calculate the value of a currency swap based on a sequence of FRAs.
- Describe the credit risk exposure in a swap position.
- Identify and describe other types of swaps, including commodity, volatility and exotic swaps.

Chapter 10.....Properties of Stock Options

Candidates, after completing this reading, should be able to:

- Identify the six factors that affect an option's price and describe how these six factors affect the price for both European and American options.
- Identify and compute upper and lower bounds for option prices.
- Explain put-call parity and apply it to the valuation of European and American stock options.
- Explain the early exercise features of American call and put options.

Chapter 11.....Trading Strategies Involving Options

Candidates, after completing this reading, should be able to:

- Explain the motivation to initiate a covered call or a protective put strategy.
- Describe the use and calculate the payoffs of various spread strategies.
- Describe the use and explain the payoff functions of combination strategies.

Robert McDonald, *Derivatives Markets, 3rd Edition* (Boston: Addison-Wesley, 2013).

Chapter 6 .....Commodity Forwards and Futures

Candidates, after completing this reading, should be able to:

- Define commodity terminology such as storage costs, carry markets, lease rate, and convenience yield.
- Explain the basic equilibrium formula for pricing commodity forwards.
- Describe an arbitrage transaction in commodity forwards, and compute the potential arbitrage profit.
- Define the lease rate and explain how it determines the no-arbitrage values for commodity forwards and futures.
- Define carry markets, and explain the impact of storage costs and convenience yields on commodity forward prices and no-arbitrage bounds.
- Compute the forward price of a commodity with storage costs.
- Compare the lease rate with the convenience yield.
- Identify factors that impact gold, corn, electricity, natural gas, and oil forward prices.
- Define and compute a commodity spread.
- Explain how basis risk can occur when hedging commodity price exposure.
- Evaluate the differences between a strip hedge and a stack hedge and explain how these differences impact risk management.
- Describe examples of cross-hedging, specifically the process of hedging jet fuel with crude oil and using weather derivatives.
- Explain how to create a synthetic commodity position, and use it to explain the relationship between the forward price and the expected future spot price.

Helyette Geman, *Commodities and Commodity Derivatives: Modeling and Pricing for Agriculturals, Metals and Energy* (West Sussex, England: John Wiley & Sons, 2005).

Chapter 1 .....Fundamentals of Commodity Spot and Futures Markets: Instruments, Exchanges and Strategies

Candidates, after completing this reading, should be able to:

- Define the major risks involved with commodity spot transactions.
- Differentiate between ordinary and extraordinary transportation risks.
- Explain the major differences between spot, forward, and futures transactions, markets, and contracts.
- Describe the basic characteristics and differences between hedgers, speculators, and arbitrageurs.
- Describe an “arbitrage portfolio” and explain the conditions for a market to be arbitrage-free.
- Describe the structure of the futures market.
- Define basis risk and the variance of the basis.
- Assess the effectiveness of hedging a spot position with a specific futures contract, and compute and compare the effectiveness of different potential alternatives in hedging.
- Define and differentiate between an Exchange for Physical agreement and an Alternative Delivery Procedure.
- Explain how volume and open interest relate to liquidity and market depth.

Anthony Saunders and Marcia Millon Cornett, *Financial Institutions Management: A Risk Management Approach, 7th Edition* (New York: McGraw-Hill, 2011).

Chapter 14.....Foreign Exchange Risk

Candidates, after completing this reading, should be able to:

- Calculate a financial institution's overall foreign exchange exposure.
- Explain how a financial institution could alter its net position exposure to reduce foreign exchange risk.
- Calculate a financial institution's potential dollar gain or loss exposure to a particular currency.
- Identify and describe the different types of foreign exchange trading activities.
- Identify the sources of foreign exchange trading gains and losses.
- Calculate the potential gain or loss from a foreign currency denominated investment.
- Explain balance-sheet hedging with forwards.
- Describe how a non-arbitrage assumption in the foreign exchange markets leads to the interest rate parity theorem, and use this theorem to calculate forward foreign exchange rates.
- Explain why diversification in multicurrency asset-liability positions could reduce portfolio risk.
- Describe the relationship between nominal and real interest rates.

Frank Fabozzi, *The Handbook of Fixed Income Securities, 8th Edition* (New York: McGraw-Hill, 2012).

Chapter 12.....Corporate Bonds, by Frank Fabozzi, Steven Mann and Adam Cohen

Candidates, after completing this reading, should be able to:

- Describe a bond indenture and explain the role of the corporate trustee in a bond indenture.
- Explain a bond's maturity date and how it impacts bond retirements.
- Describe the main types of interest payment classifications.
- Describe zero-coupon bonds and explain the relationship between original-issue discount and reinvestment risk.
- Describe the following security types relevant for corporate bonds: mortgage bonds, collateral trust bonds, equipment trust certificates, subordinated and convertible debenture bonds, and guaranteed bonds.
- Describe the mechanisms by which corporate bonds can be retired before maturity.
- Describe and differentiate between credit default risk and credit spread risk.
- Describe event risk and explain what may cause it in corporate bonds.
- Define high-yield bonds, and describe types of high-yield bond issuers and some of the payment features unique to high yield bonds.
- Define and differentiate between an issuer default rate and a dollar default rate.
- Define recovery rates and describe the relationship between recovery rates and seniority.

John B. Caouette, Edward I. Altman, Paul Narayanan, and Robert W.J. Nimmo, *Managing Credit Risk, 2nd Edition* (New York: John Wiley & Sons, 2008).

Chapter 6 .....The Rating Agencies

Candidates, after completing this reading, should be able to:

- Describe the role of rating agencies in the financial markets.
- Explain market and regulatory forces that have played a role in the growth of the rating agencies.
- Describe a rating scale, define credit outlooks, and explain the difference between solicited and unsolicited ratings.
- Describe Standard and Poor's and Moody's rating scales and distinguish between investment and noninvestment grade ratings.
- Describe the difference between an issuer-pay and a subscriber-pay model and describe concerns regarding the issuer-pay model.
- Describe and contrast the process for rating corporate and sovereign debt and describe how the distributions of these ratings may differ.
- Describe the relationship between the rating agencies and regulators and identify key regulations that impact the rating agencies and the use of ratings in the market.
- Describe some of the trends and issues emerging from the recent credit crisis relevant to the rating agencies and the use of ratings in the market.

VALUATION AND RISK MODELS—Part I Exam Weight | 30%

- Value-at-Risk (VaR)
  - Applied to stocks, currencies, and commodities
  - Applied to linear and non-linear derivatives, and securities with embedded options
  - Structured Monte Carlo, stress testing, and scenario analysis
  - Limitations as a risk measure
  - Coherent risk measures
  - Volatility models
- Option valuation
  - Pricing options using binomial trees
  - The Black-Scholes-Merton Model
  - The "Greeks"
- Fixed income valuation
  - Discount factors, spot rates, forward rates, and yield to maturity
  - Arbitrage and the Law of One Price
  - One-factor measures of price sensitivity
  - Key rate exposures and multi-factor measures of price sensitivity
  - Hedging and immunization
- Country and sovereign risk models and management
- External and internal credit ratings
- Expected and unexpected losses
- Operational risk
- Stress testing and scenario analysis

Readings for Valuation and Risk Models

21. Linda Allen, Jacob Boudoukh and Anthony Saunders, *Understanding Market, Credit and Operational Risk: The Value at Risk Approach* (Oxford: Blackwell Publishing, 2004).
- Chapter 2 .....Quantifying Volatility in VaR Models
- Chapter 3 .....Putting VaR to Work

22. Hull, *Options, Futures, and Other Derivatives, 8th Edition.*
- Chapter 12.....Binomial Trees
- Chapter 14.....The Black-Scholes-Merton Model
- Chapter 18.....The Greek Letters

23. Bruce Tuckman, *Fixed Income Securities, 3rd Edition* (Hoboken, NJ: John Wiley & Sons, 2011).
- Chapter 1 .....Prices, Discount Factors, and Arbitrage
- Chapter 2 .....Spot, Forward and Par Rates
- Chapter 3 .....Returns, Spreads and Yields
- Chapter 4 .....One-Factor Risk Metrics and Hedges
- Chapter 5 .....Multi-Factor Risk Metrics and Hedges
- Chapter 6 .....Empirical Approaches to Risk Metrics and Hedges

24. **Daniel Wagner, *Managing Country Risk: A Practitioner's Guide to Effective Cross-Border Risk Analysis* (Boca Raton, FL: Taylor & Francis Group, 2012).**

- Chapter 3 .....Assessing Country Risk
- Chapter 4 .....Country Risk Assessment in Practice

25. **Arnaud de Servigny and Olivier Renault, *Measuring and Managing Credit Risk* (New York: McGraw-Hill, 2004).**

- Chapter 2 .....External and Internal Ratings

26. **Michael Ong, *Internal Credit Risk Models: Capital Allocation and Performance Measurement* (London: Risk Books, 2003).**

- Chapter 4 .....Loan Portfolios and Expected Loss
- Chapter 5 .....Unexpected Loss

27. **Kevin Dowd, *Measuring Market Risk, 2nd Edition* (West Sussex, England: John Wiley & Sons, 2005).**

- Chapter 2 .....Measures of Financial Risk

28. **John Hull, *Risk Management and Financial Institutions, 3rd Edition* (Boston: Pearson Prentice Hall, 2012).**

- Chapter 18.....Operational Risk

29. **Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition* (New York: McGraw Hill, 2007).**

- Chapter 14.....Stress Testing

30. **"Principles for Sound Stress Testing Practices and Supervision" (Basel Committee on Banking Supervision Publication, May 2009).***

AIMS:

Linda Allen, Jacob Boudoukh and Anthony Saunders, *Understanding Market, Credit and Operational Risk: The Value at Risk Approach* (Oxford: Blackwell Publishing, 2004).

Chapter 2 .....Quantifying Volatility in VaR Models

Candidates, after completing this reading, should be able to:

- Explain how asset return distributions tend to deviate from the normal distribution.
- Explain reasons for fat tails in a return distribution and describe their implications.
- Distinguish between conditional and unconditional distributions.
- Describe the implications of regime switching on quantifying volatility.
- Explain the various approaches for estimating VaR.
- Compare and contrast different parametric and non-parametric approaches for estimating conditional volatility.
- Calculate conditional volatility using parametric and non-parametric approaches.
- Explain the process of return aggregation in the context of volatility forecasting methods.
- Describe implied volatility as a predictor of future volatility and its shortcomings.
- Explain long horizon volatility/VaR and the process of mean reversion according to an AR(1) model.

Chapter 3 .....Putting VaR to Work

Candidates, after completing this reading, should be able to:

- Explain and give examples of linear and non-linear derivatives.
- Describe and calculate VaR for linear derivatives.
- Describe the delta-normal approach to calculating VaR for non-linear derivatives.
- Describe the limitations of the delta-normal method.
- Explain the full revaluation method for computing VaR.
- Compare delta-normal and full revaluation approaches for computing VaR.
- Explain structural Monte Carlo, stress testing and scenario analysis methods for computing VaR, identifying strengths and weaknesses of each approach.
- Describe the implications of correlation breakdown for scenario analysis.
- Describe worst-case scenario (WCS) analysis and compare WCS to VaR.

Hull, *Options, Futures, and Other Derivatives, 8th Edition.*

Chapter 12.....Binomial Trees

Candidates, after completing this reading, should be able to:

- Calculate the value of an American and a European call or put option using a one-step and two-step binomial model.
- Describe how volatility is captured in the binomial model.
- Describe how the value calculated using a binomial model converges as time periods are added.
- Explain how the binomial model can be altered to price options on: stocks with dividends, stock indices, currencies, and futures.

Chapter 14.....The Black-Scholes-Merton Model

Candidates, after completing this reading, should be able to:

- Explain the lognormal property of stock prices, the distribution of rates of return, and the calculation of expected return.
- Compute the realized return and historical volatility of a stock.
- Describe the assumptions underlying the Black-Scholes-Merton option pricing model.
- Compute the value of a European option using the Black-Scholes-Merton model on a non-dividend-paying stock.
- Identify the complications involving the valuation of warrants.
- Define implied volatilities and describe how to compute implied volatilities from market prices of options using the Black-Scholes-Merton model.
- Explain how dividends affect the early decision for American call and put options.
- Compute the value of a European option using the Black-Scholes-Merton model on a dividend-paying stock.
- Describe the use of Black's Approximation in calculating the value of an American call option on a dividend-paying stock.

Chapter 18 .....The Greek Letters

Candidates, after completing this reading, should be able to:

- Describe and assess the risks associated with naked and covered option positions.
- Explain how naked and covered option positions generate a stop loss trading strategy.
- Describe delta hedging for an option, forward, and futures contracts.
- Compute the delta of an option.
- Describe the dynamic aspects of delta hedging.
- Define the delta of a portfolio.
- Define and describe theta, gamma, vega, and rho for option positions.
- Explain how to implement and maintain a gamma neutral position.
- Describe the relationship between delta, theta, and gamma.
- Describe how hedging activities take place in practice, and describe how scenario analysis can be used to formulate expected gains and losses with option positions.
- Describe how portfolio insurance can be created through option instruments and stock index futures.

Bruce Tuckman, *Fixed Income Securities, 3rd Edition* (Hoboken, NJ: John Wiley & Sons, 2011).

Chapter 1 .....Prices, Discount Factors, and Arbitrage

Candidates, after completing this reading, should be able to:

- Define discount factor and use a discount function to compute present and future values.
- Define the “law of one price,” explain it using an arbitrage argument, and describe how it can be applied to bond pricing.
- Identify the components of a U.S. Treasury coupon bond, and compare and contrast the structure to Treasury STRIPS, including the difference between P-STRIPS and C-STRIPS.
- Construct a replicating portfolio using multiple fixed income securities to match the cash flows of a given fixed income security.
- Identify arbitrage opportunities for fixed income securities with certain cash flows.
- Differentiate between "clean" and "dirty" bond pricing and explain the implications of accrued interest with respect to bond pricing.
- Describe the common day-count conventions used in bond pricing.

Chapter 2 .....Spot, Forward and Par Rates

Candidates, after completing this reading, should be able to:

- Calculate and describe the impact of different compounding frequencies on a bond’s value.
- Calculate discount factors given interest rate swap rates.
- Compute spot rates given discount factors.
- Define and interpret the forward rate, and compute forward rates given spot rates.
- Define par rate and describe the equation for the par rate of a bond.
- Interpret the relationship between spot, forward and par rates.
- Assess the impact of maturity on the price of a bond and the returns generated by bonds.
- Define the "flattening" and "steepening" of rate curves and describe a trade to reflect expectations that a curve will flatten or steepen.

Chapter 3 .....Returns, Spreads and Yields

Candidates, after completing this reading, should be able to:

- Distinguish between gross and net realized returns, and calculate the realized return for a bond over a holding period including reinvestments.
- Define and interpret the spread of a bond, and explain how a spread is derived from a bond price and a term structure of rates.
- Define, interpret, and apply a bond's yield-to-maturity (YTM) to bond pricing.
- Compute a bond's YTM given a bond structure and price.
- Calculate the price of an annuity and a perpetuity.
- Explain the relationship between spot rates and YTM.
- Define the coupon effect and explain the relationship between coupon rate, YTM, and bond prices.
- Explain the decomposition of P&L for a bond into separate factors including carry roll-down, rate change and spread change effects.
- Identify the most common assumptions in carry roll-down scenarios, including realized forwards, unchanged term structure, and unchanged yields.

Chapter 4 .....One-Factor Risk Metrics and Hedges

Candidates, after completing this reading, should be able to:

- Describe an interest rate factor and identify common examples of interest rate factors.
- Define and compute the DV01 of a fixed income security given a change in yield and the resulting change in price.
- Calculate the face amount of bonds required to hedge an option position given the DV01 of each.
- Define, compute, and interpret the effective duration of a fixed income security given a change in yield and the resulting change in price.
- Compare and contrast DV01 and effective duration as measures of price sensitivity.
- Define, compute, and interpret the convexity of a fixed income security given a change in yield and the resulting change in price.
- Explain the process of calculating the effective duration and convexity of a portfolio of fixed income securities.
- Explain the impact of negative convexity on the hedging of fixed income securities.
- Construct a barbell portfolio to match the cost and duration of a given bullet investment, and explain the advantages and disadvantages of bullet versus barbell portfolios.

Chapter 5 .....Multi-Factor Risk Metrics and Hedges

Candidates, after completing this reading, should be able to:

- Describe and assess the major weakness attributable to single-factor approaches when hedging portfolios or implementing asset liability techniques.
- Define key rate exposures and know the characteristics of key rate exposure factors including partial '01s and forward-bucket '01s.
- Describe key-rate shift analysis.
- Define, calculate, and interpret key rate '01 and key rate duration.
- Describe the key rate exposure technique in multi-factor hedging applications; summarize its advantages/disadvantages.
- Calculate the key rate exposures for a given security, and compute the appropriate hedging positions given a specific key rate exposure profile.
- Describe the relationship between key rates, partial '01s and forward-bucket '01s, and calculate the forward-bucket '01 for a shift in rates in one or more buckets.
- Construct an appropriate hedge for a position across its entire range of forward bucket exposures.
- Explain how key rate and multi-factor analysis may be applied in estimating portfolio volatility.

Chapter 6 .....Empirical Approaches to Risk Metrics and Hedging

Candidates, after completing this reading, should be able to:

- Explain the drawbacks to using a DV01-neutral hedge for a bond position.
- Describe a regression hedge and explain how it can improve a standard DV01-neutral hedge.
- Calculate the regression hedge adjustment factor, beta.
- Calculate the face value of an offsetting position needed to carry out a regression hedge.
- Calculate the face value of multiple offsetting swap positions needed to carry out a two-variable regression hedge.
- Compare and contrast between level and change regressions.
- Describe principal component analysis and explain how it is applied in constructing a hedging portfolio.

Daniel Wagner, *Managing Country Risk: A Practitioner's Guide to Effective Cross-Border Risk Analysis* (Boca Raton, FL: Taylor & Francis Group, 2012).

Chapter 3 .....Assessing Country Risk

Candidates, after completing this reading, should be able to:

- Identify characteristics and guidelines leading to effective country risk analysis.
- Identify key indicators used by rating agencies to analyze a country's debt and political risk, and describe challenges faced by country risk analysts in using external agency ratings.
- Describe factors which are likely to influence the political stability and economic openness within a country.
- Apply basic country risk analysis in comparing two countries as illustrated in the case study.

Chapter 4 .....Country Risk Assessment in Practice

Candidates, after completing this reading, should be able to:

- Explain key considerations when developing and using analytical tools to assess country risk.
- Describe a process for generating a ranking system and selecting risk management tools to compare the risk among countries.
- Describe qualitative and quantitative factors that can be used to assess country risk.
- Describe alternative measures and indices that can be useful in assessing country risk.

Arnaud de Servigny and Olivier Renault, *Measuring and Managing Credit Risk* (New York: McGraw-Hill, 2004).

Chapter 2 .....External and Internal Ratings

Candidates, after completing this reading, should be able to:

- Describe external rating scales, the rating process, and the link between ratings and default.
- Describe the impact of time horizon, economic cycle, industry, and geography on external ratings.
- Explain the potential impact of ratings changes on bond and stock prices.
- Compare external and internal ratings approaches.
- Explain and compare the through-the-cycle and at-the-point internal ratings approaches.
- Describe a ratings transition matrix and explain its uses.
- Describe the process for and issues with building, calibrating and backtesting an internal rating system.
- Identify and describe the biases that may affect a rating system.

Michael Ong, *Internal Credit Risk Models: Capital Allocation and Performance Measurement* (London: Risk Books, 2003).

Chapter 4 .....Loan Portfolios and Expected Loss

Candidates, after completing this reading, should be able to:

- Describe the objectives of measuring credit risk for a bank's loan portfolio.
- Define, calculate and interpret the expected loss for an individual credit instrument.
- Explain how a credit downgrade or loan default affects the return of a loan.
- Distinguish between expected and unexpected loss.
- Define exposures, adjusted exposures, commitments, covenants, and outstandings.
- Explain how drawn and undrawn portions of a commitment affect exposure, and explain how covenants impact exposures.
- Define usage given default and how it impacts expected and unexpected loss.
- Explain the concept of credit optionality.
- Describe the process of parameterizing credit risk models and its challenges.

Chapter 5 .....Unexpected Loss

Candidates, after completing this reading, should be able to:

- Explain the objective of quantifying both expected and unexpected loss.
- Describe factors contributing to expected and unexpected loss.
- Define, calculate and interpret the unexpected loss of an asset.
- Explain the relationship between economic capital, expected loss and unexpected loss.

Kevin Dowd, *Measuring Market Risk, 2nd Edition* (West Sussex, England: John Wiley & Sons, 2005).

Chapter 2 .....Measures of Financial Risk

Candidates, after completing this reading, should be able to:

- Describe the mean-variance framework and the efficient frontier.
- Explain the limitations of the mean-variance framework with respect to assumptions about the return distributions.
- Define the Value-at-Risk (VaR) measure of risk, describe assumptions about return distributions and holding period, and explain the limitations of VaR.
- Define the properties of a coherent risk measure and explain the meaning of each property.
- Explain why VaR is not a coherent risk measure.
- Explain and calculate expected shortfall (ES), and compare and contrast VaR and ES.
- Describe spectral risk measures, and explain how VaR and ES are special cases of spectral risk measures.
- Describe how the results of scenario analysis can be interpreted as coherent risk measures.

John Hull, *Risk Management and Financial Institutions, 3rd Edition* (Boston: Pearson Prentice Hall, 2012).
Chapter 20 .....Operational Risk

Candidates, after completing this reading, should be able to:

- Explain three approaches for calculating regulatory capital.
- Describe the Basel Committee's seven categories of operational risk.
- Explain how to derive a loss distribution from the loss frequency distribution and the loss severity distribution using Monte Carlo simulations.
- Describe the common data issues that can introduce inaccuracies and biases in the estimation of loss frequency and severity distributions.
- Describe how to use scenario analysis in instances when data is scarce.
- Describe how to identify causal relationships and how to use risk and control self assessment (RCSA) and key risk indicators (KRIs) to measure and manage operational risks.
- Describe the allocation of operational risk capital and the use of scorecards.
- Explain how to use the power law to measure operational risk.
- Explain the risks of moral hazard and adverse selection when using insurance to mitigate operational risks.

Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition* (New York: McGraw Hill, 2007).
Chapter 14.....Stress Testing

Candidates, after completing this reading, should be able to:

- Describe the purposes of stress testing and the process of implementing a stress testing scenario.
- Contrast between event-driven scenarios and portfolio-driven scenarios.
- Identify common one-variable sensitivity tests.
- Describe drawbacks to scenario analysis.
- Explain the difference between unidimensional and multidimensional scenarios.
- Compare and contrast various approaches to multidimensional scenario analysis.
- Define and distinguish between sensitivity analysis and stress testing model parameters.
- Explain how the results of a stress test can be used to improve risk analysis and risk management systems.

"Principles for Sound Stress Testing Practices and Supervision" (Basel Committee on Banking Supervision Publication, May 2009).*

Candidates, after completing this reading, should be able to:

- Describe the rationale for the use of stress testing as a risk management tool.
- Describe weaknesses identified and recommendations for improvement in:
  - The use of stress testing and integration in risk governance
  - Stress testing methodologies
  - Stress testing scenarios
  - Stress testing handling of specific risks and products
- Describe stress testing principles for banks regarding the use of stress testing and integration in risk governance, stress testing methodology and scenario selection, and principles for supervisors.

FRM PART II—TOPICS AND READINGS

MARKET RISK MEASUREMENT AND MANAGEMENT—Part II Exam Weight | 25%

- VaR and other risk measures
  - Parametric and non-parametric methods of estimation
  - VaR mapping
  - Backtesting VaR
  - Expected shortfall (ES) and other coherent risk measures
  - Modeling dependence: correlations and copulas
  - Extreme value theory (EVT)
- Term structure models of interest rates
- Volatility: smiles and term structures
- Discount rate selection
- Exotic options
- Mortgages and mortgage-backed securities (MBS)
  - Structure, markets, and valuation

Readings for Market Risk Measurement and Management

31. Kevin Dowd, *Measuring Market Risk, 2nd Edition* (West Sussex, England: John Wiley & Sons, 2005).
- Chapter 3 .....Estimating Market Risk Measures
- Chapter 4 .....Non-parametric Approaches
- Chapter 5 .....Appendix—Modeling Dependence: Correlations and Copulas
- Chapter 7 .....Parametric Approaches (II): Extreme Value

32. Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition* (New York: McGraw Hill, 2007).
- Chapter 6 .....Backtesting VaR
- Chapter 11.....VaR Mapping

33. Jacob Boudoukh, Matthew Richardson and Robert F. Whitelaw, "The Best of Both Worlds: A Hybrid Approach to Calculating Value at Risk," Stern School of Business, NYU.

34. John Hull and Alan White, "Incorporating Volatility Updating into the Historical Simulation Method for Value at Risk," Journal of Risk, October 1998.

35. "Messages from the Academic Literature on Risk Measurement for the Trading Book," Basel Committee on Banking Supervision, Working Paper No. 19, Jan 2011.

36. John Hull and Alan White, "LIBOR vs. OIS: The Derivatives Discounting Dilemma," April 2013. Forthcoming in the Journal of Investment Management.

37. **Bruce Tuckman, *Fixed Income Securities, 3rd Edition* (Hoboken, NJ: John Wiley & Sons, 2011).**

- Chapter 7 .....The Science of Term Structure Models
- Chapter 8 .....The Evolution of Short Rates and the Shape of the Term Structure
- Chapter 9 .....The Art of Term Structure Models: Drift
- Chapter 10 .....The Art of Term Structure Models: Volatility and Distribution

38. **Hull, *Options, Futures, and Other Derivatives, 8th Edition.***

- Chapter 19.....Volatility Smiles
- Chapter 25.....Exotic Options

39. **Pietro Veronesi, *Fixed Income Securities* (Hoboken, NJ: John Wiley & Sons, 2010).**

- Chapter 8 .....Basics of Residential Mortgage Backed Securities

40. **Frank Fabozzi, Anand Bhattacharya, William Berliner, *Mortgage-Backed Securities, 3rd Edition* (Hoboken, NJ: John Wiley & Sons, 2011).**

- Chapter 1 .....Overview of Mortgages and the Consumer Mortgage Market
- Chapter 2 .....Overview of the Mortgage-Backed Securities Market
- Chapter 10 .....Techniques for Valuing MBS

AIMS:

Kevin Dowd, *Measuring Market Risk, 2nd Edition.*

Chapter 3 .....Estimating Market Risk Measures

Candidates, after completing this reading, should be able to:

- Calculate VaR using a historical simulation approach.
- Calculate VaR using a parametric estimation approach assuming that the return distribution is either normal or lognormal.
- Calculate the expected shortfall given P/L or return data.
- Define coherent risk measures.
- Describe the method of estimating coherent risk measures by estimating quantiles.
- Describe the method of estimating standard errors for estimators of coherent risk measures.
- Describe the use of QQ plots for identifying the distribution of data.

Chapter 4 .....Non-parametric Approaches

Candidates, after completing this reading, should be able to:

- Describe the bootstrap historical simulation approach to estimating coherent risk measures.
- Describe historical simulation using non-parametric density estimation.
- Describe the age-weighted, the volatility-weighted, the correlation-weighted and the filtered historical simulation approaches.
- Describe the advantages and disadvantages of non-parametric estimation methods.

Chapter 5 .....Appendix—Modeling Dependence: Correlations and Copulas

Candidates, after completing this reading, should be able to:

- Explain the drawbacks of using correlation to measure dependence.
- Describe how copulas provide an alternative measure of dependence.
- Identify basic examples of copulas.
- Explain how tail dependence can be investigated using copulas.

Chapter 7 .....Parametric Approaches (II): Extreme Value

Candidates, after completing this reading, should be able to:

- Explain the importance and challenges of extreme values in risk management.
- Describe extreme value theory (EVT) and its use in risk management.
- Describe the peaks-over-threshold (POT) approach.
- Compare generalized extreme value and POT.
- Describe the parameters of a generalized Pareto (GP) distribution.
- Explain the tradeoffs involved in setting the threshold level when applying the GP distribution.
- Explain the importance of multivariate EVT for risk management.

Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition.* (New York: McGraw Hill, 2007).

Chapter 6 .....Backtesting VaR

Candidates, after completing this reading, should be able to:

- Define backtesting and exceptions and explain the importance of backtesting VaR models.
- Explain the significant difficulties in backtesting a VaR model.
- Describe the process of model verification based on exceptions or failure rates.
- Define and identify type I and type II errors.
- Explain why it is necessary to consider conditional coverage in the backtesting framework.
- Describe the Basel rules for backtesting.

Chapter 11.....VaR Mapping

Candidates, after completing this reading, should be able to:

- Explain the principles underlying VaR mapping, and describe the mapping process.
- Explain how the mapping process captures general and specific risks.
- List and describe the three methods of mapping portfolios of fixed income securities.
- Map a fixed income portfolio into positions of standard instruments.
- Describe how mapping of risk factors can support stress testing.
- Explain how VaR can be used as a performance benchmark.
- Describe the method of mapping forwards, forward rate agreements, interest rate swaps, and options.

Jacob Boudoukh, Matthew Richardson and Robert F. Whitelaw, "The Best of Both Worlds: A Hybrid Approach to Calculating Value at Risk," Stern School of Business, NYU.

Candidates, after completing this reading, should be able to:

- Describe the existing approaches to VaR measurement and their advantages and disadvantages.
- Describe the process of implementing the hybrid approach.
- Calculate VaR using the historical simulation and hybrid approaches on the same data set.
- Explain the characteristics that are desirable for VaR estimates.
- Summarize the study results using the various VaR measurement approaches.

John Hull and Alan White, "Incorporating Volatility Updating into the Historical Simulation Method for Value at Risk," Journal of Risk, October 1998.

Candidates, after completing this reading, should be able to:

- Explain the model building approach to calculating VaR.
- Describe the Hull and White (HW) and the Boudoukh, Richardson and Whitelaw (BRW) approaches and their advantages and disadvantages.
- Describe the mean absolute percentage error (MAPE) measure and capital utilization ratio.
- Summarize the study results using the historical simulation, BRW, and HW VaR approaches.

"Messages from the Academic Literature on Risk Measurement for the Trading Book," Basel Committee on Banking Supervision, Working Paper, No. 19, Jan 2011.

Candidates, after completing this reading, should be able to:

- Explain the following lessons on VaR implementation: time horizon over which VaR is estimated, the recognition of time varying volatility in VaR risk factors, and VaR backtesting.
- Describe exogenous and endogenous liquidity risk and explain how they might be integrated into VaR models.
- Compare VaR, expected shortfall, and other relevant risk measures.
- Summarize the recent state of stress testing research and practice.
- Compare unified and compartmentalized risk measurement.
- Describe the results of research on "top-down" and "bottom-up" risk aggregation methods.
- Explain intermediary balance sheet management and the cyclical feedback loop caused by VaR constraints on leveraged investors.

John Hull and Alan White, "LIBOR vs. OIS: The Derivatives Discounting Dilemma," April 2013. Forthcoming in the Journal of Investment Management.

Candidates, after completing this reading, should be able to:

- Describe Overnight Indexed Swaps (OIS) and explain the characteristics of the OIS rate which could make it preferable to use as a "risk-free" rate.
- Describe the relationship between the OIS rate, the federal funds rate, and LIBOR.
- Explain criticisms of the use of LIBOR as a risk free rate for valuing non-collateralized portfolios.
- Describe the Collateral Rate Adjustment (CRA) in a collateralized portfolio and explain how the CRA is calculated when cash and non-cash collateral are present.
- Compare the use of the OIS rate and LIBOR as a risk free rate in valuing collateralized portfolios.

Bruce Tuckman, *Fixed Income Securities, 3rd Edition* (Hoboken, NJ: John Wiley & Sons, 2011).

Chapter 7 .....The Science of Term Structure Models

Candidates, after completing this reading, should be able to:

- Calculate the expected discounted value of a zero-coupon security using a binomial tree.
- Construct and apply an arbitrage argument to price a call option on a zero-coupon security using replicating portfolios.
- Explain why a call option on a zero-coupon security cannot be properly priced using expected discounted values.
- Explain the role of up-state and down-state probabilities in the valuation of a call option on a zero-coupon security.
- Define risk-neutral pricing and explain how it is used in option pricing.
- Explain the difference between true and risk-neutral probabilities, and apply this difference to interest rate drift.
- Explain how the principles of arbitrage pricing of derivatives on fixed income securities can be extended over multiple periods.
- Describe the rationale behind the use of recombining trees in option pricing.
- Calculate the value of a constant maturity Treasury swap, given an interest rate tree and the risk–neutral probabilities.
- Describe the advantages and disadvantages of reducing the size of the time steps on the pricing of derivatives on fixed income securities.
- Explain why the Black–Scholes–Merton model is not appropriate to value derivatives on fixed income securities.
- Describe the impact of embedded options on the value of fixed income securities.

Chapter 8 .....The Evolution of Short Rates and the Shape of the Term Structure

Candidates, after completing this reading, should be able to:

- Explain the role of interest rate expectations in determining the shape of the term structure.
- Apply a risk-neutral interest rate tree to assess the effect of volatility on the shape of the term structure.
- Calculate the convexity effect using Jensen's inequality.
- Calculate the price and return of a zero coupon bond incorporating a risk premium.

Chapter 9 .....The Art of Term Structure Models: Drift

Candidates, after completing this reading, should be able to:

- Construct and describe the effectiveness of a short term interest rate tree assuming normally distributed rates, both with and without drift.
- Calculate the short-term rate change and standard deviation of the rate change using a model with normally distributed rates and no drift.
- Describe methods for addressing the possibility of negative short-term rates in term structure models.
- Describe the process of and construct a short-term rate tree under the Ho-Lee Model with time-dependent drift.
- Describe uses and benefits of the arbitrage-free models and assess the issue of fitting models to market prices.
- Describe the process of constructing a simple and recombining tree for a short-term rate under the Vasicek Model with mean reversion.
- Calculate the Vasicek Model rate change, standard deviation of the rate change, expected rate in T years, and half life.
- Describe the effectiveness of the Vasicek Model.

Chapter 10.....The Art of Term Structure Models: Volatility and Distribution

Candidates, after completing this reading, should be able to:

- Describe the short-term rate process under a model with time-dependent volatility.
- Calculate the short-term rate change and describe the behavior of the standard deviation of the rate change using a model with time dependent volatility.
- Describe the effectiveness of time-dependent volatility models.
- Describe the short-term rate process under the Cox-Ingersoll-Ross (CIR) and lognormal models.
- Calculate the short-term rate change and describe the basis point volatility using the CIR and lognormal models.
- Describe lognormal models with deterministic drift and mean reversion.

Hull, *Options, Futures, and Other Derivatives, 8th Edition.*

Chapter 19.....Volatility Smiles

Candidates, after completing this reading, should be able to:

- Define volatility smile and volatility skew.
- Explain the implications of put-call parity on the implied volatility of call and put options.
- Compare the shape of the volatility smile (or skew) to the shape of the implied distribution of the underlying asset price and to the pricing of options on the underlying asset.
- Describe characteristics of foreign exchange rate distributions and their implications on option prices and implied volatility.
- Describe the volatility smile for equity options and foreign currency options and give possible explanations for its shape.
- Describe alternative ways of characterizing the volatility smile.
- Describe volatility term structures and volatility surfaces and how they may be used to price options.
- Explain the impact of the volatility smile on the calculation of the "Greeks."
- Explain the impact of asset price jumps on volatility smiles.

Chapter 25 .....Exotic Options

Candidates, after completing this reading, should be able to:

- Define and contrast exotic derivatives and plain vanilla derivatives.
- Describe some of the factors that drive the development of exotic products.
- Explain how any derivative can be converted into a zero-cost product.
- Describe how standard American options can be transformed into nonstandard American options.
- Identify and describe the characteristics and pay-off structure of the following exotic options: forward start, compound, chooser, barrier, binary, lookback, shout, Asian, exchange, rainbow, and basket options.
- Describe and contrast volatility and variance swaps.
- Explain the basic premise of static option replication and how it can be applied to hedging exotic options.

Pietro Veronesi, *Fixed Income Securities* (Hoboken, NJ: John Wiley & Sons, 2010).

Chapter 8 .....Basics of Residential Mortgage Backed Securities

Candidates, after completing this reading, should be able to:

- Summarize the securitization process of residential mortgage backed securities (MBS).
- Differentiate between agency and non-agency MBS and describe the major participants in the residential MBS market.
- Describe the mortgage prepayment option and the factors that influence prepayments.
- Describe the impact on a MBS of the weighted average maturity, the weighted average coupon, and the speed of prepayments of the mortgages underlying the MBS.
- Identify, describe, and contrast different standard prepayment measures.
- Describe the effective duration and effective convexity of standard MBS instruments and the factors that affect them.
- Describe collateralized mortgage obligations (CMOs) and contrast them with MBS.
- Describe and work through a simple cash flow example for the following types of MBS:
  - Pass-through securities
  - CMOs, both sequential and planned amortization class
  - Interest only and principal only strips

Frank Fabozzi, Anand Bhattacharya, William Berliner, *Mortgage-Backed Securities, 3rd Edition* (Hoboken, NJ: John Wiley & Sons, 2011).

Chapter 1 .....Overview of Mortgages and the Consumer Mortgage Market

Candidates, after completing this reading, should be able to:

- Describe the key characteristics of mortgages.
- Understand the allocation of loan principal and interest over time for various loan types.
- Define prepayment risk, reasons for prepayment, and the negative convexity of mortgages.
- Explain credit and default risk analysis of mortgages, including metrics for delinquencies, defaults, and loss severity.

Chapter 2 .....Overview of the Mortgage-Backed Securities Market

Candidates, after completing this reading, should be able to:

- Describe the evolution of the MBS market.
- Explain the creation of agency (fixed rate and adjustable rate) and private-label MBS pools, pass-throughs, CMOs, and mortgage strips.
- Explain how a loan progresses from application to agency pooling.
- Describe MBS market structure and the ways that fixed rate pass-through securities trade.
- Explain a dollar roll transaction, how to value a dollar roll, and what factors can cause a roll to trade "special."
- Compare the pricing of mortgage products to developments in MBS markets.
- Explain the purpose of cash flow structuring of mortgage backed securities.

Chapter 10.....Techniques for Valuing MBS

Candidates, after completing this reading, should be able to:

- Describe static cash flow yield analysis of MBS, including bond-equivalent yield, nominal spread and Z-spread.
- Calculate the static cash flow yield of a MBS using bond equivalent yield, as well as the nominal spread and Z-spread.
- Describe reinvestment risk.
- Describe the steps in valuing a mortgage security using binomial and Monte Carlo methodology.
- Define and interpret option-adjusted spread (OAS), zero-volatility OAS, and option cost.
- Describe considerations in selecting the number of interest rate paths in Monte Carlo analysis.
- Calculate total return, describe total return analysis, and understand factors present in simple and complex return models.
- Identify limitations of the nominal spread, Z-spread, OAS, and total return measures.

CREDIT RISK MEASUREMENT AND MANAGEMENT—Part II Exam Weight | **25%**

- **Credit analysis**
- **Default risk: Quantitative methodologies and risk neutral valuations**
- **Expected and unexpected losses**
- **Credit VaR**
- **Counterparty risk**
  - **Mitigation techniques**
  - **Credit exposure profiles**
  - **Collateralization and netting effects**
  - **Pricing credit value adjustments (CVA)**
- **Credit derivatives**
  - **Mechanics and structure**
  - **Valuation and spreads**
- **Structured finance and securitization**
  - **The structuring and securitization process**
  - **Agency problems and moral hazard**
  - **Subprime mortgages and securitization**

Readings for Credit Risk Measurement and Management

41. **Jonathan Golin and Philippe Delhaise, *The Bank Credit Analysis Handbook* (Hoboken, NJ: John Wiley & Sons, 2013).**
- Chapter 1 .....The Credit Decision
- Chapter 2 .....The Credit Analyst

42. **de Servigny and Renault, *Measuring and Managing Credit Risk.***
- Chapter 3 .....Default Risk: Quantitative Methodologies

43. **René Stulz, *Risk Management & Derivatives* (Florence, KY: Thomson South-Western, 2002).**
- Chapter 18.....Credit Risks and Credit Derivatives

44. **Allan Malz, *Financial Risk Management: Models, History, and Institutions* (Hoboken, NJ: John Wiley & Sons, 2011).**
- Chapter 6 .....Credit and Counterparty Risk
- Chapter 7 .....Spread Risk and Default Intensity Models
- Chapter 8 .....Portfolio Credit Risk
- Chapter 9 .....Structured Credit Risk

45. **Jon Gregory, *Counterparty Credit Risk and Credit Value Adjustment: A Continuing Challenge for Global Financial Markets, 2nd Edition* (West Sussex, UK: John Wiley & Sons, 2012).**
- Chapter 3 .....Defining Counterparty Credit Risk
- Chapter 4 .....Netting, Compression, Resets, and Termination Features
- Chapter 5 .....Collateral
- Chapter 8 .....Credit Exposure
- Chapter 10 .....Default Probability, Credit Spreads, and Credit Derivatives
- Chapter 12.....Credit Value Adjustment
- Chapter 15.....Wrong Way Risk

46. Christopher Culp, *Structured Finance and Insurance: The Art of Managing Capital and Risk* (Hoboken, NJ: John Wiley & Sons, 2006).

- Chapter 12.....Credit Derivatives and Credit-Linked Notes
- Chapter 13.....The Structuring Process
- Chapter 16.....Securitization
- Chapter 17.....Cash Collateralized Debt Obligations

47. Adam Ashcraft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit," Federal Reserve Bank of New York Staff Reports, No. 318 (March 2008).*

AIMS:

Jonathan Golin and Philippe Delhaise, *The Bank Credit Analysis Handbook* (Hoboken, NJ: John Wiley & Sons, 2013).

Chapter 1.....The Credit Decision

Candidates, after completing this reading, should be able to:

- Define credit risk and explain how it arises using examples.
- Explain the components of credit risk evaluation.
- Compare and contrast quantitative and qualitative techniques of credit risk evaluation.
- Compare the credit analysis of consumers, corporations, financial institutions, and sovereigns.
- Describe quantitative measurements and factors of credit risk, including probability of default, loss given default, exposure at default, expected loss, and time horizon,
- Describe and compare bank failure and a bank insolvency.

Chapter 2.....The Credit Analyst

Candidates, after completing this reading, should be able to:

- Describe, compare and contrast various credit analyst roles.
- Describe common tasks performed by a banking credit analyst.
- Describe the quantitative, qualitative, and research skills a banking credit analyst is expected to have.
- Describe the various sources of information used by a credit analyst.

de Servigny and Renault, *Measuring and Managing Credit Risk.*

Chapter 3.....Default Risk: Quantitative Methodologies

Candidates, after completing this reading, should be able to:

- Describe the Merton model for corporate security pricing, including its assumptions, strengths and weaknesses:
  - Illustrate and interpret security-holder payoffs based on the Merton model
  - Using the Merton model, calculate the value of a firm's debt and equity and the volatility of firm value
  - Describe the results and practical implications of empirical studies that use the Merton model to value debt
- Describe key qualities of credit scoring models.
- Compare the following quantitative methodologies for credit analysis and scoring: linear discriminant analysis, parametric discrimination, K nearest neighbor approach, and support vector machines.
- Differentiate between the following decision rules: minimum error, minimum risk, Neyman-Pearson and Minimax.
- Identify the problems and tradeoffs between classification and prediction models of performance.
- Describe important factors in the choice of a particular class of model.

René Stulz, *Risk Management & Derivatives* (Florence, KY: Thomson South-Western, 2002).

Chapter 18.....Credit Risks and Credit Derivatives

Candidates, after completing this reading, should be able to:

- Explain the relationship between credit spreads, time to maturity, and interest rates.
- Explain the differences between valuing senior and subordinated debt using a contingent claim approach.
- Explain, from a contingent claim perspective, the impact of stochastic interest rates on the valuation of risky bonds, equity, and the risk of default.
- Assess the credit risks of derivatives.
- Describe a credit derivative, credit default swap, and total return swap.
- Explain how to account for credit risk exposure in valuing a swap.

Allan Malz, *Financial Risk Management: Models, History, and Institutions* (Hoboken, NJ: John Wiley & Sons, 2011).

Chapter 6 .....Credit and Counterparty Risk

Candidates, after completing this reading, should be able to:

- Describe the credit risks associated with different types of securities.
- Differentiate between book and market values in a firm's capital structure.
- Describe common frictions that arise with the use of credit contracts.
- Explain the following concepts related to default and recovery: default events, probability of default, credit exposure, and loss given default.
- Calculate expected loss from recovery rates, the loss given default, and the probability of default.
- Differentiate between a credit risk event and a market risk event for marketable securities.
- Summarize credit assessment techniques such as credit ratings and rating migrations, internal ratings, and risk models.
- Describe counterparty risk, compare counterparty risk to credit risk, and explain how counterparty risk can be mitigated.
- Describe the Merton Model, and use it to calculate the value of a firm, the values of a firm's debt and equity, and default probabilities.
- Explain the drawbacks of and assess possible improvements to the Merton Model.
- Describe credit factor models and evaluate an example of a single-factor model.
- Define and calculate Credit VaR.

Chapter 7 .....Spread Risk and Default Intensity Models

Candidates, after completing this reading, should be able to:

- Compare the different ways of representing credit spreads.
- Compute one credit spread given others when possible.
- Define and compute the Spread '01.
- Explain how default risk for a single company can be modeled as a Bernoulli trial.
- Explain the relationship between exponential and Poisson distributions.
- Define the hazard rate and use it to define probability functions for default time and conditional default probabilities.
- Calculate risk-neutral default rates from spreads.
- Describe advantages of using the CDS market to estimate hazard rates.
- Explain how a CDS spread can be used to derive a hazard rate curve.
- Explain how the default distribution is affected by the sloping of the spread curve.
- Define spread risk and its measurement using the mark-to-market and spread volatility.

Chapter 8 .....Portfolio Credit Risk

Candidates, after completing this reading, should be able to:

- Define default correlation for credit portfolios.
- Identify drawbacks in using the correlation-based credit portfolio framework.
- Assess the impact of correlation on a credit portfolio and its Credit VaR.
- Describe the use of a single factor model to measure portfolio credit risk, including the impact of correlation.
- Describe how Credit VaR can be calculated using a simulation of joint defaults with a copula.

Chapter 9 .....Structured Credit Risk

Candidates, after completing this reading, should be able to:

- Describe common types of structured products.
- Describe tranching and the distribution of credit losses in a securitization.
- Describe a waterfall structure in a securitization.
- Identify the key participants in the securitization process, and describe conflicts of interest that can arise in the process.
- Evaluate one or two iterations of interim cashflows in a three tiered securitization structure.
- Describe a simulation approach to calculating credit losses for different tranches in a securitization.
- Explain how the default probabilities and default correlations affect the credit risk in a securitization.
- Explain how default sensitivities for tranches are measured.
- Describe risk factors that impact structured products.
- Define implied correlation and describe how it can be measured.
- Identify the motivations for using structured credit products.

Jon Gregory, *Counterparty Credit Risk and Credit Value Adjustment: A Continuing Challenge for Global Financial Markets, 2nd Edition* (West Sussex, UK: John Wiley & Sons, 2012).

Chapter 3 .....Defining Counterparty Credit Risk

Candidates, after completing this reading, should be able to:

- Describe counterparty risk and explain how it differs from lending risk.
- Describe transactions that carry counterparty risk and explain how counterparty risk can arise in each transaction.
- Identify and describe institutions that take on significant counterparty risk.
- Describe credit exposure, credit migration, recovery, mark-to-market, replacement cost, default probability, loss given default and the recovery rate.
- Identify and describe the different ways institutions can manage and mitigate counterparty risk.

Chapter 4 .....Netting, Compression, Resets, and Termination Features

Candidates, after completing this reading, should be able to:

- Explain the purpose of an ISDA master agreement.
- Summarize netting and close-out procedures (including multilateral netting), explain their advantages and disadvantages, and describe how they fit into the framework of the ISDA master agreement.
- Describe the effectiveness of netting in reducing credit exposure under various scenarios.
- Describe the mechanics of termination provisions and explain their advantages and disadvantages.

Chapter 5 .....Collateral

Candidates, after completing this reading, should be able to:

- Describe features of a credit support annex (CSA) within the ISDA Master Agreement.
- Describe the role of a valuation agent.
- Describe types of collateral that are typically used.
- Explain the process for the reconciliation of collateral disputes.
- Explain the features of a collateralization agreement.
- Differentiate between a two-way and one-way CSA agreement and describe how collateral parameters can be linked to credit quality.
- Explain how market risk, operational risk, and liquidity risk (including funding liquidity risk) can arise through collateralization.

Chapter 8. .....Credit Exposure

Candidates, after completing this reading, should be able to:

- Describe and calculate the following metrics for credit exposure: expected mark-to-market, expected exposure, potential future exposure, expected positive exposure and negative exposure, effective exposure, and maximum exposure.
- Compare the characterization of credit exposure to VaR methods and describe additional considerations used in the determination of credit exposure.
- Identify factors that affect the calculation of the credit exposure profile and summarize the impact of collateral on exposure.
- Identify typical credit exposure profiles for various derivative contracts and combination profiles.
- Explain how payment frequencies and exercise dates affect the exposure profile of various securities.
- Explain the impact of netting on exposure, the benefit of correlation, and calculate the netting factor.
- Explain the impact of collateralization on exposure, and assess the risk associated with the remargining period.
- Explain the difference between risk-neutral and real-world parameters, and describe their use in assessing risk.

Chapter 10.....Default Probability, Credit Spreads, and Credit Derivatives

Candidates, after completing this reading, should be able to:

- Explain the difference between cumulative and marginal default probabilities.
- Calculate risk-neutral default probabilities, and compare the use of risk-neutral and real-world default probabilities in pricing derivative contracts.
- Explain the various approaches for estimating price: historical data approach, equity based approach, and risk neutral approach.
- Describe how recovery rates may be estimated.
- Describe credit default swaps (CDS) and their general underlying mechanics.
- Describe the credit spread curve and explain the motivation for curve mapping.
- Describe types of portfolio credit derivatives.
- Describe index tranches, super senior risk, and collateralized debt obligations (CDO).

Chapter 12.....Credit Value Adjustment

Candidates, after completing this reading, should be able to:

- Explain the motivation for and the challenges of pricing counterparty risk.
- Describe credit value adjustment (CVA).
- Calculate CVA and the CVA spread with no wrong-way risk, netting, or collateralization.
- Explain the impact of changes in the credit spread and recovery rate assumptions on CVA.
- Explain how netting can be incorporated into the CVA calculation.
- Define and calculate incremental CVA and marginal CVA, and explain how to convert CVA into a running spread.
- Explain the impact of incorporating collateralization into the CVA calculation.

Chapter 15.....Wrong Way Risk

Candidates, after completing this reading, should be able to:

- Describe wrong-way risk and contrast it with right-way risk.
- Identify examples of wrong-way risk and examples of right-way risk.

Christopher Culp, *Structured Finance and Insurance: The Art of Managing Capital and Risk* (Hoboken, NJ: John Wiley & Sons, 2006).

Chapter 12.....Credit Derivatives and Credit-Linked Notes

Candidates, after completing this reading, should be able to:

- Describe the mechanics and attributes of a single named credit default swap (CDS).
- Describe the mechanics and attributes of portfolio CDS.
- Describe the composition and use of CDS indices.
- Describe the mechanics and attributes of asset default swaps, equity default swaps, total return swaps and credit linked notes.

Chapter 13.....The Structuring Process

Candidates, after completing this reading, should be able to:

- Describe the objectives of structured finance and explain the motivations for asset securitization.
- Describe the process and benefits of ring-fencing assets.
- Describe the role of structured finance in venture capital formation, risk transfer, agency cost reduction, and satisfaction of specific investor demands.
- Explain the steps involved and the various participants in the structuring process.
- Describe the role of loss distributions and credit ratings in the structuring process.

Chapter 16.....Securitization

Candidates, after completing this reading, should be able to:

- Define securitization, describe the securitization process and explain the role of participants in the process.
- Analyze the differences in the mechanics of issuing securitized products using a trust versus a special purpose entity.
- Describe and assess the various types of internal and external credit enhancements.
- Explain the impact of liquidity, interest rate and currency risk on a securitized structure, and identify securities that hedge these exposures.
- Describe the securitization process for mortgage backed securities and asset backed commercial paper.

Chapter 17 .....Cash Collateralized Debt Obligations

Candidates, after completing this reading, should be able to:

- Describe collateralized debt obligations (CDOs) and explain the motivations of CDO buyers and sellers.
- Describe the types of collateral used in CDOs.
- Explain the structure and benefits of balance sheet CDOs and arbitrage CDOs, and the motivations for using them.
- Compare cash flow and market value CDOs.
- Compare static and managed portfolios of CDOs.

Adam Ashcroft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit," Federal Reserve Bank of New York Staff Reports, no. 318, (March 2008).*

Candidates, after completing this reading, should be able to:

- Explain the subprime mortgage credit securitization process in the United States.
- Identify and describe key frictions in subprime mortgage securitization, and assess the relative contribution of each factor to the subprime mortgage problems.
- Describe the characteristics of the subprime mortgage market, including the creditworthiness of the typical borrower and the features and performance of a subprime loan.
- Describe the credit ratings process with respect to subprime mortgage backed securities.
- Explain the implications of credit ratings on the emergence of subprime related mortgage backed securities.
- Describe the relationship between the credit ratings cycle and the housing cycle.
- Explain the implications of the subprime mortgage meltdown on portfolio management.
- Compare predatory lending and borrowing.

OPERATIONAL AND INTEGRATED RISK MANAGEMENT—Part II Exam Weight | **25%**

- Calculating and applying risk-adjusted return on capital (RAROC)
- Liquidity risk
- Model risk
  - Model validation
- Evaluating the performance of risk management systems
- Validating VaR models
- Enterprise Risk Management (ERM)
- Economic capital
- Operational loss data
  - Frequency and severity distributions
  - Modeling and fitting distributions
- Failure mechanics of dealer banks
- Risk appetite frameworks
- Data aggregation and risk reporting
- Regulation and the Basel Accords
  - Minimum capital requirements
  - Methods for calculating credit, market, and operational risk
  - Liquidity risk management
  - Stress testing
  - Revisions to the Basel II Accord
  - The Basel III framework
  - Comparing Basel II/III to Solvency II

Readings for Operational Risk Measurement and Management

48. "Principles for the Sound Management of Operational Risk," (Basel Committee on Banking Supervision Publication, June 2011).*

49. Mo Chaudhury, "A Review of the Key Issues in Operational Risk Capital Modeling," *The Journal of Operational Risk*, Volume 5/Number 3, Fall 2010: pp. 37-66.

50. Eric Cope, Giulio Mignola, Gianluca Antonini and Roberto Ugoccioni, "Challenges and Pitfalls in Measuring Operational Risk from Loss Data," *The Journal of Operational Risk*, Volume 4/Number 4, Winter 2009/10: pp. 3-27.

51. Brian Nocco and René Stulz, "Enterprise Risk Management: Theory and Practice," *Journal of Applied Corporate Finance 18*, No. 4 (2006): 8–20.*

52. Michel Crouhy, Dan Galai and Robert Mark, *Risk Management* (New York: McGraw-Hill, 2001).
- Chapter 14.....Capital Allocation and Performance Measurement

53. "Range of Practices and Issues in Economic Capital Frameworks," (Basel Committee on Banking Supervision Publication, March 2009).*

54. Dowd, *Measuring Market Risk, 2nd Edition.*

- Chapter 14.....Estimating Liquidity Risks
- Chapter 16.....Model Risk

55. Malz, *Financial Risk Management: Models, History, and Institutions*.

- Chapter 11, Section 11.1 .....Assessing the Quality of Risk Measures
- Chapter 12.....Liquidity and Leverage

56. **"Observations on Developments in Risk Appetite Frameworks and IT Infrastructure," Senior Supervisors Group, December 2010.***

57. **"Principles for Effective Data Aggregation and Risk Reporting," (Basel Committee on Banking Supervision Publication, January 2013).**

58. **Til Schuermann. "Stress Testing Banks," April 2012.***

59. **Darrell Duffie, 2010. "Failure Mechanics of Dealer Banks," *Journal of Economic Perspectives* 24:1, 51-72.***

AIMS:

"Principles for the Sound Management of Operational Risk," (Basel Committee on Banking Supervision Publication, June 2011).*

Candidates, after completing this reading, should be able to:

- Describe the three "lines of defense" in the Basel model for operational risk governance.
- Define and describe the corporate operational risk function (CORF) and compare and contrast the structure and responsibilities of the CORF at smaller and larger banks.
- Summarize the fundamental principles of operational risk management as suggested by the Basel committee.
- Evaluate the role of the Board of Directors and senior management in implementing an effective operational risk structure per the Basel committee recommendations.
- Describe the elements of a framework for operational risk management.
- Identify examples of tools which can be used to identify and assess operational risk.
- Describe features of an effective control environment and identify specific controls which should be in place to address operational risk.
- Describe the Basel committee's suggestions for managing technology risk and outsourcing risk.

Mo Chaudhury, "A Review of the Key Issues in Operational Risk Capital Modeling," *The Journal of Operational Risk*, Volume 5/Number 3, Fall 2010: pp. 37-66.

Candidates, after completing this reading, should be able to:

- Describe the loss distribution approach to measuring operational risk.
- Identify issues related to external and internal operational loss data sets.
- Explain how frequency and severity distributions of operational losses are obtained, including commonly used distributions.
- Describe how a loss distribution is obtained from frequency and severity distributions.
- Explain how operational losses are aggregated across various types using dependence modeling.

Eric Cope, Giulio Mignola, Gianluca Antonini and Roberto Ugoccioni, "Challenges and Pitfalls in Measuring Operational Risk from Loss Data," *The Journal of Operational Risk*, Volume 4/Number 4, Winter 2009/10: pp. 3-27.

Candidates, after completing this reading, should be able to:

- Describe the nature of operational loss distributions.
- Explain the consequences of working with heavy tailed loss data.
- Determine the amount of data required to estimate percentiles of loss distributions.
- Describe methods of extrapolating beyond the data.
- Explain the loss distribution approach to modeling operational risk losses.
- Explain the challenges in validating capital models.

Brian Nocco and René Stulz, "Enterprise Risk Management: Theory and Practice," *Journal of Applied Corporate Finance* 18, No. 4 (2006): 8–20.*

Candidates, after completing this reading, should be able to:

- Define enterprise risk management (ERM).
- Explain how implementing ERM practices and policies can create shareholder value both at the macro and the micro level.
- Explain how an ERM program can be used to determine the right amount of risk.
- Describe the development and implementation of an ERM system.
- Explain the relationship between economic value and accounting performance.
- Describe the role of and issues with correlation in risk aggregation.
- Distinguish between regulatory and economic capital.
- Explain the use of economic capital in the corporate decision making process.

Michel Crouhy, Dan Galai and Robert Mark, Risk Management (New York: McGraw-Hill, 2001).

Chapter 14.....Capital Allocation and Performance Measurement

Candidates, after completing this reading, should be able to:

- Describe the RAROC (risk-adjusted return on capital) methodology and its benefits.
- Define, compare and contrast economic and regulatory capital.
- Compute and interpret the RAROC for a loan or loan portfolio, and use RAROC to compare business unit performance.
- Explain how capital is attributed to market, credit, and operational risk.
- Calculate the capital charge for market risk and credit risk.
- Explain the difficulties encountered in attributing economic capital to operational risk.
- Describe the Loan Equivalent Approach and use it to calculate RAROC capital.
- Explain how the second-generation RAROC approaches improve economic capital allocation decisions.
- Compute the adjusted RAROC for a project to determine its viability.

"Range of Practices and Issues in Economic Capital Frameworks," (Basel Committee on Banking Supervision Publication, March 2009).*

Candidates, after completing this reading, should be able to:

- Within the economic capital implementation framework describe the challenges that appear in:
  - Defining risk measures
  - Risk aggregation
  - Validation of models
  - Dependency modeling in credit risk
  - Evaluating counterparty credit risk
  - Assessing interest rate risk in the banking book
- Describe the BIS recommendations that supervisors should consider to make effective use of risk measures not designed for regulatory purposes.
- Describe the constraints imposed and the opportunities offered by economic capital within the following areas:
  - Credit portfolio management
  - Risk based pricing
  - Customer profitability analysis
  - Management incentives

Dowd, *Measuring Market Risk, 2nd Edition.*

Chapter 14.....Estimating Liquidity Risks

Candidates, after completing this reading, should be able to:

- Define liquidity risk and describe factors that influence liquidity.
- Explain the bid-ask spread as a measure of liquidity.
- Define exogenous and endogenous liquidity.
- Describe the challenges of estimating liquidity-adjusted VaR (LVaR).
- Describe and calculate LVaR using the constant spread approach and the exogenous spread approach.
- Describe endogenous price approaches to LVaR, their motivation and limitations.
- Explain the relationship between liquidation strategies, transaction costs and market price impact.
- Describe liquidity at risk (LaR) and describe the factors that affect future cash flows.
- Explain the role of liquidity in crisis situations and describe approaches to estimating crisis liquidity risk.

Chapter 16.....Model Risk

Candidates, after completing this reading, should be able to:

- Define model risk; identify and describe sources of model risk.
- Describe the challenges involved with quantifying model risk.
- Describe methods for estimating model risk, given an unknown component from a financial model.
- Identify ways risk managers can protect against model risk.
- Summarize the role of senior managers in managing model risk.
- Describe procedures for vetting and reviewing a model.
- Explain the function of an independent risk oversight (IRO) unit.

Malz, *Financial Risk Management: Models, History, and Institutions*.

Chapter 11, Section 1.1.....Assessing the Quality of Risk Measures

Candidates, after completing this reading, should be able to:

- Describe ways that errors can be introduced into models.
- Describe how horizon, computational and modeling decisions can impact VaR estimates.
- Identify challenges related to mapping of risk factors to positions in making VaR calculations.
- Identify reasons for the failure of the long-equity tranche, short-mezzanine credit trade in 2005 and describe how such modeling errors could have been avoided.
- Identify two major defects in model assumptions which led to the underestimation of systematic risk for residential mortgage backed securities (RMBS) during the 2008-2009 financial downturn.

Chapter 12.....Liquidity and Leverage

Candidates, after completing this reading, should be able to:

- Define and differentiate between sources of liquidity risk, including transactions liquidity risk, balance sheet/ funding liquidity risk and systemic risk.
- Summarize the process by which a fractional-reserve bank engages in asset liability management.
- Describe issues related to systematic funding liquidity risk with respect to leveraged buyouts, merger arbitrage hedge funds, and convertible arbitrage hedge funds.
- Explain specific liquidity issues faced by money market mutual funds.
- Describe the economics of the collateral market and explain the mechanics of the following transactions using collateral: margin lending, repos, securities lending, and total return swaps.
- Calculate a firm's leverage ratio, describe the formula for the leverage effect, and explain the relationship between leverage and a firm's return on equity.
- Explain the impact on a firm's leverage and its balance sheet of the following transactions: purchasing long equity positions on margin, entering into short sales, and trading in derivatives.
- Identify the main sources of transactions liquidity risk.
- Calculate the expected transactions cost and the 99 percent spread risk factor for a transaction.
- Calculate the liquidity-adjusted VaR for a position to be liquidated over a number of trading days.
- Define characteristics used to measure market liquidity, including tightness, depth and resiliency.
- Explain the challenges posed by liquidity constraints on hedge funds during times of financial distress.

"Observations on Developments in Risk Appetite Frameworks and IT Infrastructure," Senior Supervisors Group, December 2010.*

Candidates, after completing this reading, should be able to:

- Describe the concept of a risk appetite framework (RAF), identify the elements of a RAF and explain the benefits to a firm of having a well developed RAF.
- Describe best practices for a firm's Chief Risk Officer (CRO), Chief Executive Officer (CEO) and Board of Directors in the development and implementation of an effective RAF.
- Explain the role of a RAF in managing the risk of individual business lines within a firm.
- Describe the classes of risk metrics to be communicated to managers within the firm.
- Explain the benefits to a firm from having a robust risk data infrastructure, and describe key elements of an effective IT risk management policy at a firm.
- Describe factors which could lead to poor or fragmented IT infrastructure at an organization.
- Explain the challenges and best practices related to data aggregation at an organization.

"Principles for Effective Data Aggregation and Risk Reporting," (Basel Committee on Banking Supervision Publication, January 2013).

Candidates, after completing this reading, should be able to:

- Explain the potential benefits of having effective risk data aggregation and reporting.
- Describe key governance principles related to risk data aggregation and risk reporting practices.
- Identify the data architecture and IT infrastructure features that can contribute to effective risk data aggregation and risk reporting practices.
- Describe characteristics of a strong risk data aggregation capability and explain how these characteristics interact with one another.
- Describe characteristics of effective risk reporting practices.

Til Schuermann. "Stress Testing Banks," April 2012.*

Candidates, after completing this reading, should be able to:

- Explain the differences in the features and scope of stress tests before and after the Supervisory Capital Assessment Program (SCAP).
- Describe the problem of coherence in modeling risk factors during the stress testing of banks.
- Describe the challenges in mapping broader macroeconomic factors to specific intermediate risk factors to model losses.
- Explain the challenges in modeling a bank's balance sheet over a stress test horizon period.
- Compare and contrast the 2009 SCAP stress test, the 2011 and 2012 CCAR, and the 2011 EBA Irish and EBA European stress tests in their methodologies and key findings.

Darrell Duffie, 2010. "Failure Mechanics of Dealer Banks." ***Journal of Economic Perspectives*** **24:1, 51-72.***

Candidates, after completing this reading, should be able to:

- Describe the major functions of large dealer banks and explain the firm-specific and systemic risk factors associated with each function.
- Describe the structure of the major markets in which large dealer banks operate.
- Explain how diseconomies of scope in risk management and corporate governance may arise in large dealer banks.
- Identify factors that can cause a liquidity crisis at a dealer bank and explain how to mitigate these risks.
- Compare a liquidity crisis at a dealer bank to a traditional bank run.
- Describe policy measures that can alleviate firm-specific and systemic risks related to large dealer banks.

Readings for Regulatory Reference

Candidates are expected to understand the objective and general structure of important international regulatory frameworks and general application of the various approaches for calculating minimum capital requirements.

60. **"Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework—Comprehensive Version," (Basel Committee on Banking Supervision Publication, June 2006).***

61. **"Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems—Revised Version," (Basel Committee on Banking Supervision Publication, June 2011).***

62. **"Basel III: The Liquidity Coverage Ratio and Liquidity Risk Monitoring Tools," (Basel Committee on Banking Supervision Publication, January 2013).***

63. **"Revisions to the Basel II Market Risk Framework—Updated as of 31 December 2010," (Basel Committee on Banking Supervision Publication, February 2011).***

64. **"Operational Risk—Supervisory Guidelines for the Advanced Measurement Approaches," (Basel Committee on Banking Supervision Publication, June 2011).***

65. **Nadine Gatzert, Hannah Wesker, "A Comparative Assessment of Basel II/III and Solvency II," Working Paper, Friedrich-Alexander-University of Erlangen-Nuremberg, Version: October 2011.***

AIMS:

"Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework—Comprehensive Version," (Basel Committee on Banking Supervision Publication, June 2006).*

Candidates, after completing this reading, should be able to:

- Describe the key elements of the three pillars of Basel II:
  - Minimum capital requirements
  - Supervisory review
  - Market discipline
- Describe the type of institutions that the Basel II Accord will be applied to.
- Describe the major risk categories covered by the Basel II Accord.
- Describe and contrast the major elements of the three options available for the calculation of credit risk:
  - Standardised Approach
  - Foundation IRB Approach
  - Advanced IRB Approach
- Describe and contrast the major elements of the three options available for the calculation of operational risk:
  - Basic Indicator Approach
  - Standardised Approach
  - Advanced Measurement Approach

- Describe and contrast the major elements—including a description of the risks covered—of the two options available for the calculation of market risk:
  - Standardised Measurement Method
  - Internal Models Approach
- Define in the context of Basel II and calculate where appropriate:
  - Capital ratio
  - Capital charge
  - Tier 1 capital and its components
  - Tier 2 capital and its components
  - Tier 3 capital and its components
  - Probability of default (PD)
  - Loss given default (LGD)
  - Exposure at default (EAD)
  - Maturity (M)
  - Stress tests
  - Concentration risk
  - Residual risk

"Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems—Revised Version," (Basel Committee on Banking Supervision Publication, June 2011).*

Candidates, after completing this reading, should be able to:

- Describe reasons for the changes implemented through the Basel III framework.
- Describe changes to the regulatory capital framework, including changes to:
  - The measurement, treatment, and calculation of Tier 1, Tier 2, and Tier 3 capital
  - Risk coverage, the use of stress tests, the treatment of counter-party risk with credit valuation adjustments, the use of external ratings, and the use of leverage ratios
- Explain changes designed to dampen the procyclical amplification of financial shocks and to promote counter-cyclical buffers.
- Describe changes intended to improve the handling of systemic risk.
- Describe changes intended to improve the management of liquidity risk including liquidity coverage ratios, net stable funding ratios, and the use of monitoring metrics.

"Basel III: The Liquidity Coverage Ratio and Liquidity Risk Monitoring Tools," (Basel Committee on Banking Supervision Publication, January 2013).*

Candidates, after completing this reading, should be able to:

- Define and describe the minimum liquidity coverage ratio.
- Describe the characteristics of high quality liquid assets (HQLA) and operational requirements for assets to qualify as HQLA.
- Differentiate between Level 1, Level 2A, and Level 2B assets, and define the respective cap for each asset class as a percentage of total HQLA.
- Define how total net cash outflows are calculated for the minimum liquidity coverage ratio.
- Describe additional metrics to be used by supervisors as monitoring tools when assessing the liquidity risk of a bank.

"Revisions to the Basel II Market Risk Framework—Updated as of 31 December 2010," (Basel Committee on Banking Supervision Publication, February 2011).*

Candidates, after completing this reading, should be able to:

- Describe the objectives for revising the Basel II market risk framework.
- Define the capital charge for specific risk and general market risk.
- Explain the relationship regulators require between market risk factors used for pricing versus those used for calculating value-at-risk and the risks captured by the value-at-risk model.
- Explain and calculate the stressed value-at-risk measure and the frequency which it must be calculated.
- Explain and calculate the market risk capital requirement.
- Describe the qualitative disclosures for the incremental risk capital charge.
- Describe the quantitative disclosures for trading portfolios under the internal models approach.
- Describe the regulatory guidance on prudent valuation of illiquid positions.

"Operational Risk—Supervisory Guidelines for the Advanced Measurement Approaches," (Basel Committee on Banking Supervision Publication, June 2011).*

Candidates, after completing this reading, should be able to:

- Define gross loss and net loss and identify which specific items should be included or excluded in gross loss computations per the Basel committee.
- Describe the process and considerations suggested by the Basel committee for a bank to use in determining a loss data threshold.
- Describe the four data elements which are required to compute a bank's operational risk capital charge per the Basel Committee's AMA framework.
- Define an operational risk management framework (ORMF) and an operational risk measurement system (ORMS) and explain the relationship between a bank's ORMF and its ORMS.
- Describe key guidelines for verification and validation of a bank's ORMF and ORMS.
- Describe key supervisory guidelines for the selection of a reference date for an internal loss.
- Describe key guidelines for the selection of a bank's Operational Risk Categories (ORCs).
- Explain key guidelines for modeling the distribution of individual ORCs, including the selection of thresholds, necessary adjustments, and selection of statistical tools and probability distributions.

Nadine Gatzert, Hannah Wesker, "A Comparative Assessment of Basel II/III and Solvency II," Working Paper, Friedrich-Alexander-University of Erlangen-Nuremberg, Version: October 2011.*

Candidates, after completing this reading, should be able to:

- Contrast the use of VaR parameters and confidence intervals in the Basel II/III and the Solvency II frameworks.
- Explain the difference between classes of risks taken into account in Basel II/III and Solvency II.
- Differentiate between solvency capital requirements (SCR) and minimum capital requirements (MCR), and describe the repercussions to an insurance company for breaching the SCR and MCR under the Solvency II framework.
- Explain the difference between the Basel II/III and the Solvency II frameworks for the capture of diversification benefits.
- Explain the difference between Basel II/III and the Solvency II frameworks with respect to: 1) risk classes and capital requirements, 2) risk measure and calibration, 3) time perspective, and 4) valuation.
- Compare and contrast the Basel II/III and Solvency II frameworks with respect to qualitative risk management aspects, including the internal risk management process, governance, and supervision.
- Describe the key differences between Basel II/III and Solvency II with respect to public disclosure.

RISK MANAGEMENT AND INVESTMENT MANAGEMENT—Part II Exam Weight | **15%**

- **Portfolio construction**
- **Portfolio risk measures**
- **Risk budgeting**
- **Risk monitoring and performance measurement**
- **Portfolio-based performance analysis**
- **Hedge funds**
  - **Hedge fund strategies**
  - **Due diligence and fraud detection**
  - **Liquidity**
  - **Risk management of hedge funds**

Readings for Risk Management and Investment Management

66. Richard Grinold and Ronald Kahn, *Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk, 2nd Edition* (New York: McGraw-Hill, 2000).
- Chapter 14.....Portfolio Construction

67. Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition*.
- Chapter 7 .....Portfolio Risk: Analytical Methods
- Chapter 17.....VaR and Risk Budgeting in Investment Management

68. Robert Litterman and the Quantitative Resources Group, *Modern Investment Management: An Equilibrium Approach* (Hoboken, NJ: John Wiley & Sons, 2003).
- Chapter 17.....Risk Monitoring and Performance Measurement

69 Zvi Bodie, Alex Kane, and Alan J. Marcus, *Investments, 9th Edition* (New York: McGraw-Hill, 2010).
- Chapter 24.....Portfolio Performance Evaluation

70. Kevin R. Mirabile, *Hedge Fund Investing: A Practical Approach to Understanding Investor Motivation, Manager Profits, and Fund Performance* (Hoboken, NJ: Wiley Finance, 2013).
- Chapter 11.....Performing Due Diligence on Specific Managers and Funds

71. G. Constantinides, M. Harris and R. Stulz, eds., *Handbook of the Economics of Finance, Volume 2B* (Oxford: Elsevier, 2013).
- Chapter 17.....Hedge Funds, by William Fung and David Hsieh

72. Andrew W. Lo, "Risk Management for Hedge Funds: Introduction and Overview," *Financial Analysts Journal*, Vol. 57, No. 6 (November-December 2001), pp. 16-33.*

AIMS:

Richard Grinold and Ronald Kahn, *Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk, 2nd Edition* (New York: McGraw-Hill, 2000).

Chapter 14.....Portfolio Construction

Candidates, after completing this reading, should be able to:

- Identify the inputs to the portfolio construction process.
- Describe the motivation and methods for refining alphas in the implementation process.
- Describe neutralization and methods for refining alphas to be neutral.
- Describe the implications of transaction costs on portfolio construction.
- Explain practical issues in portfolio construction such as determination of risk aversion, incorporation of specific risk aversion, and proper alpha coverage.
- Describe portfolio revisions and rebalancing and the tradeoffs between alpha, risk, transaction costs and time horizon.
- Describe the optimal no-trade region for rebalancing with transaction costs.
- Describe strengths and weaknesses of the following portfolio construction techniques:screens, stratification, linear programming, and quadratic programming.
- Describe dispersion, explain its causes and describe methods for controlling forms of dispersion.

Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition.*

Chapter 7 .....Portfolio Risk: Analytical Methods

Candidates, after completing this reading, should be able to:

- Define, calculate, and distinguish between the following portfolio VaR measures: individual VaR, incremental VaR, marginal VaR, component VaR, undiversified portfolio VaR, and diversified portfolio VaR.
- Explain the role of correlation on portfolio risk.
- Describe the challenges associated with VaR measurement as portfolio size increases.
- Apply the concept of marginal VaR to guide decisions about portfolio VaR.
- Explain the difference between risk management and portfolio management, and describe how to use marginal VaR in portfolio management.

Chapter 17.....VaR and Risk Budgeting in Investment Management

Candidates, after completing this reading, should be able to:

- Define risk budgeting.
- Describe the impact of horizon, turnover and leverage on the risk management process in the investment management industry.
- Describe the investment process of large investors such as pension funds.
- Describe the risk management challenges associated with investments in hedge funds.
- Define and describe the following types of risk: absolute risk, relative risk, policy-mix risk, active management risk, funding risk and sponsor risk.
- Describe how VaR can be used to check compliance, monitor risk budgets and reverse engineer sources of risk.
- Explain how VaR can be used in the investment process and the development of investment guidelines.
- Describe the risk budgeting process across asset classes and active managers.

Robert Litterman and the Quantitative Resources Group, *Modern Investment Management: An Equilibrium Approach* (Hoboken, NJ: John Wiley & Sons, 2003).

Chapter 17 .....Risk Monitoring and Performance Measurement

Candidates, after completing this reading, should be able to:

- Define, compare and contrast VaR and tracking error as risk measures.
- Describe risk planning, including its objectives, effects and the participants in its development.
- Describe risk budgeting and the role of quantitative methods in risk budgeting.
- Describe risk monitoring and its role in an internal control environment.
- Identify sources of risk consciousness within an organization.
- Describe the objectives and actions of a risk management unit in an investment management firm.
- Describe how risk monitoring can confirm that investment activities are consistent with expectations.
- Explain the importance of liquidity considerations for a portfolio.
- Describe the objectives of performance measurement.
- Describe the common features of performance measurement tools.

Zvi Bodie, Alex Kane, and Alan J. Marcus, *Investments, 9th Edition* (New York: McGraw-Hill, 2010).

Chapter 24 .....Portfolio Performance Evaluation

Candidates, after completing this reading, should be able to:

- Differentiate between time-weighted and dollar-weighted returns of a portfolio and describe their appropriate uses.
- Describe and distinguish between risk-adjusted performance measures, such as Sharpe's measure, Treynor's measure, Jensen's measure (Jensen's alpha), and information ratio.
- Describe the uses for the Modigliani-squared and Treynor's measure in comparing two portfolios, and the graphical representation of these measures.
- Determine the statistical significance of a performance measure using standard error and the t-statistic.
- Explain the difficulties in measuring the performance of hedge funds.
- Explain how changes in portfolio risk levels can affect the use of the Sharpe ratio to measure performance.
- Describe techniques to measure the market timing ability of fund managers with a regression and with a call option model.
- Describe style analysis.
- Describe and apply performance attribution procedures, including the asset allocation decision, sector and security selection decision and the aggregate contribution.

Kevin R. Mirabile, *Hedge Fund Investing: A Practical Approach to Understanding Investor Motivation, Manager Profits, and Fund Performance* (Hoboken, NJ: Wiley Finance, 2013).

Chapter 11.....Performing Due Diligence on Specific Managers and Funds

Candidates, after completing this reading, should be able to:

- Identify reasons for the failures of funds in the past.
- Explain elements of the due diligence process used to assess investment managers.
- Identify themes and questions investors can consider when evaluating a manager.
- Describe criteria that can be evaluated in assessing a fund's risk management process.
- Explain how due diligence can be performed on a fund's operational environment.
- Explain how a fund's business model risk and its fraud risk can be assessed.
- Describe elements that can be included as part of a due diligence questionnaire.

G. Constantinides, M. Harris and R. Stulz. eds., *Handbook of the Economics of Finance, Volume 2B* (Oxford: Elsevier, 2013).

Chapter 17 .....Hedge Funds, by William Fung and David Hsieh

Candidates, after completing this reading, should be able to:

- Describe the characteristics of hedge funds and the hedge fund industry, and compare hedge funds with mutual funds.
- Explain biases which are commonly found in databases of hedge funds.
- Explain the evolution of the hedge fund industry and describe landmark events which precipitated major changes in the development of the industry.
- Evaluate the role of investors in shaping the hedge fund industry.
- Explain the relationship between risk and alpha in hedge funds.
- Compare and contrast the different hedge fund strategies, describe their return characteristics, and describe the inherent risks of each strategy.
- Describe the historical portfolio construction and performance trend of hedge funds compared to equity indices.
- Describe market events which resulted in a convergence of risk factors for different hedge fund strategies, and explain the impact of such a convergence on portfolio diversification strategies.
- Describe the problem of risk sharing asymmetry between principals and agents in the hedge fund industry.
- Explain the impact of institutional investors on the hedge fund industry and assess reasons for the growing concentration of assets under management (AUM) in the industry.

Andrew W. Lo, "Risk Management for Hedge Funds: Introduction and Overview," *Financial Analysts Journal*, Vol. 57., No. 6 (Nov to Dec, 2001), pp. 16-33.*

Candidates, after completing this reading, should be able to:

- Compare and contrast the investment perspectives of institutional investors and hedge fund managers.
- Explain how proper risk management can be a source of alpha for a hedge fund.
- Explain the limitations of VaR in measuring hedge fund risks.
- Explain how survivorship bias poses a challenge for hedge fund return analysis.
- Describe how dynamic investment strategies complicate the risk measurement process for hedge funds.
- Describe how nonlinearities in hedge fund returns can be incorporated into risk models.
- Explain how autocorrelation of returns can be used as a measure of an asset's liquidity.
- Describe the roles of risk preferences and operational risks in hedge funds.

CURRENT ISSUES IN FINANCIAL MARKETS—Part II Exam Weight | 10%

- Risk management case studies
- Reference interest rates
- Comparative regulations for OTC derivatives
- Sovereign credit default swaps: roles and regulations
- Capital planning at large banks
- The European credit crisis and transmission of sovereign risks

Readings for Current Issues in Financial Markets

73. U.S. House of Representatives Subcommittee Report on MF Global (through p. 75), November 2012.*

74. "JPMorgan Chase Whale Trades: A Case History of Derivatives Risks and Abuses—Executive Summary," U.S. Senate Subcommittee on Investigations, April 2013.*

75. "Towards Better Reference Rate Practices: A Central Bank Perspective," Working Group Established by the BIS Economic Consultative Committee, March 2013.*

76. "OTC Derivatives: A Comparative Analysis of Regulation in the United States, European Union, and Singapore." (Rajarshi Aroskar, IFM Review of Futures Markets, Volume 21, March 2013).*

77. "A New Look at the Role of Sovereign Credit Default Swaps," IMF Global Financial Stability Report, Chapter 2, April 2013.*

78. "Capital Planning at Large Bank Holding Companies: Supervisory Expectations and Range of Current Practice," Board of Governors of the Federal Reserve System, August 2013.

79. Jaime Caruana and Stefan Avdjiev, "Sovereign Creditworthiness and Financial Stability: An International Perspective." Banque de France Financial Stability Review, No. 16 (April 2012), pp. 71-85.

AIMS:

U.S. House of Representatives Subcommittee Report on MF Global (through p. 75), November 2012.*

Candidates, after completing this reading, should be able to:

- Describe the unauthorized trading incident at MF Global and the events leading up to the appointment of Jon Corzine.
- Explain how the risk exposure at MF Global changed during Jon Corzine's leadership.
- Explain the frictions associated with Corzine's requests to increase MF Global's European repurchase-to-maturity position limits, and the response by risk management and the board of directors to these requests.
- Summarize the evolution of MF Global's accounting practices for its European RTM positions, particularly in capturing the default risk of the RTM positions.
- Explain the increasing liquidity demands on MF Global and the company's response to these demands.
- Describe the net capital rule and the effects of the capital charge imposed by FINRA, and summarize the events of the final days of MF Global.

"JPMorgan Chase Whale Trades: A Case History of Derivatives Risks and Abuses—Executive Summary," U.S. Senate Subcommittee on Investigations, April 2013.*

Candidates, after completing this reading, should be able to:

- Summarize the "London Whale" trades in JP Morgan's Structured Credit Portfolio (SCP) between 2008 and mid-2012 and explain how portfolio size and portfolio risks increased over this period.
- Explain how the Chief Investment Office (CIO) changed its method of reporting SCP trades in 2012 and explain how losses reported by this method differed from the SCP's internally reported losses during that time.
- Identify the five key risk metrics used by the CIO and explain how the CIO responded to breaches of these metrics in the SCP portfolio.
- Summarize the deficiencies in risk management practices related to the SCP, including the VaR model change.
- Compare how the CIO reported its SCP trading intentions and activity to its regulating authority, the OCC, with the actual trading activity which took place at the bank.
- Explain how investors, regulators, and the public were misinformed about the nature, activities, and riskiness of the SCP.

"Towards Better Reference Rate Practices: A Central Bank Perspective," Working Group Established by the BIS Economic Consultative Committee, March 2013.*

Candidates, after completing this reading, should be able to:

- Describe the risk components of market interest rates and explain their implications in choosing a proper reference rate.
- Describe recent market trends which have encouraged market participants to consider changing reference interest rates.
- Explain the implications of reference rates on the transmission of monetary policy, including potential challenges.
- Explain how the use of reference interest rates can impact the financial stability in a banking system.
- Describe characteristics of effective reference rates.
- Explain the role of the public sector in the setting and oversight of reference rates, and in encouraging change and supporting transition to new reference rates when necessary.

"OTC Derivatives: A Comparative Analysis of Regulation in the United States, European Union, and Singapore." (Rajarshi Aroskar, IFM Review of Futures Markets, Volume 21, March 2013).*

Candidates, after completing this reading, should be able to:

- Describe the characteristics and benefits of central clearing.
- Describe the function of a trade repository and explain the benefits of a trade repository to OTC market participants.
- Compare the regulatory requirements and regulatory authority in the United States, European Union, and Singapore with respect to: the central clearing of OTC derivatives, requirements of central counterparties, margin requirements for uncleared OTC derivatives, trading, and backloading of existing OTC contracts.
- Describe the requirements for reporting derivative transactions to trade repositories in the United States, European Union and Singapore.

A New Look at the Role of Sovereign Credit Default Swaps," IMF Global Financial Stability Report, Chapter 2, April 2013.*

Candidates, after completing this reading, should be able to:

- Explain the use of sovereign credit default swaps (SCDS) in hedging, speculating, and basis trading.
- Compare the economic factors that determine SCDS spreads with the factors that traditionally influence government bond spreads.
- Explain the mechanics of risk transmission from government bonds to SCDS and vice versa, and discuss empirical evidence of these transmissions, including the use of the Hasbrouck statistic and volatility decomposition.
- Explain the possible impact of the European Union ban on naked SCDS protection buying on the SCDS market; explain the motivations for this ban as well as its criticisms.
- Explain how the benefit of SCDS central counterparties can address the risks of naked short-selling without the need to limit short-selling.

"Capital Planning at Large Bank Holding Companies: Supervisory Expectations and Range of Current Practice," Board of Governors of the Federal Reserve System, August 2013.*

Candidates, after completing this reading, should be able to:

- Describe the Federal Reserve's Capital Plan Rule and explain the seven principles of an effective capital adequacy process for bank holding companies (BHC's) subject to the Capital Plan Rule.
- Describe practices which can result in a strong and effective capital adequacy process for a BHC in the following areas:
  - Risk identification
  - Internal controls, including model review and validation
  - Corporate governance
  - Capital policy, including setting of goals and targets and contingency planning
  - Stress testing and stress scenario design
  - Estimating losses, revenues, and expenses, including quantitative and qualitative methodologies
  - Assessing the impact of capital adequacy, including RWA and balance sheet projections

Jaime Caruana and Stefan Avdjiev, "Sovereign Creditworthiness and Financial Stability: An International Perspective." Banque de France Financial Stability Review, No. 16 (April 2012), pp. 71-85.*

Candidates, after completing this reading, should be able to:

- Explain three key initial conditions that helped spread the economic crisis globally among sovereigns.
- Describe three ways in which the financial sector risks are transmitted to sovereigns.
- Describe five ways in which sovereign risks are transmitted to the financial sector.
- Summarize the activity of banks and sovereigns in the European Union during the 2002-2007 period leading up to the economic crisis.
- Summarize the activity of banks and sovereigns in the European Union during the economic crisis.
- Describe how risks were transmitted among banks and sovereigns in the European Union during the economic crisis, giving specific examples.
- Describe the economic condition of the European financial sector in 2012, and explain how policy implementation can potentially mitigate the spread of future crises.

NOTES

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2014 FRM Committee Members

Dr. René Stulz (Chairman).....Ohio State University

Richard Apostolik.....Global Association of Risk Professionals

Richard Brandt.....Citibank

Dr. Christopher Donohue.....Global Association of Risk Professionals

Hervé Geny.....London Stock Exchange

Keith Isaac, FRM.....TD Bank

Kai Leifert, FRM.....Northern Trust Global Investments

Steve Lerit, CFA.....UBS Wealth Management

William May.....Global Association of Risk Professionals

Michelle McCarthy.....Nuveen Investments

Adolfo Montoro, FRM.....Deutsche Bank

Ezra Uzi Moualem, FRM.....The Financial Institute of Israel & ZRisk

Dr. Victor Ng.....Goldman Sachs & Co

Dr. Elliot Noma.....Garrett Asset Management

Liu Ruixia.....Industrial and Commercial Bank of China

Robert Scanlon.....Scanlon Associates

Dr. Til Schuermann.....Oliver Wyman

Serge Sverdlov.....Redmond Analytics

Alan Weindorf.....Visa

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