2011 FRM® Examination AIM Statements

GARP | Global Association of Risk Professionals

Topic Outline, Readings, Test Weightings

The Study Guide sets forth primary topics and subtopics under the five risk-related disciplines covered in the FRM exam. The topics were selected by the FRM Committee as topics that risk managers who work in practice today have to master. The topics are reviewed yearly to ensure the FRM exam is kept timely and relevant.

FRM Examination Approach

The FRM exam is a practice-oriented examination. Its questions are derived from a combination of theory, as set forth in the readings, 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.

The FRM exam is a practice-oriented examination. Its questions are derived from a combination of theory, as set forth in the readings, and "real-world" work experience.

The FRM examination is also a comprehensive examination, testing a risk professional on a number of risk management concepts and approaches.

It is very rare that a risk manager will be faced with an issue that can immediately be slotted into one category. In the real world, a risk manager must be able to identify any number of risk-related issues and be able to deal with them effectively.

Readings

Questions for the FRM examination are derived from the readings listed under each topic outline. These readings were selected by the FRM Committee to assist candidates in their review of the subjects covered by the exam. It is strongly suggested that candidates review these readings in depth prior to sitting for the exam.

The *Financial Risk Manager Handbook, 6th Edition*, by Philippe Jorion (New York: John Wiley & Sons, 2011), covers most of the FRM examination topics at the appropriate level. However, please note that the FRM Handbook was designed to help candidates review the material and is not a textbook. Alone, the FRM Handbook is not sufficient to prepare a candidate to pass the examination. The FRM Handbook includes an interactive eLearning platform with questions and answers from previous FRM exams to assist candidates with their exam preparation.

FRM Course Providers

Some candidates may want to more formally review the materials with FRM Course Providers. Course Providers are listed on the GARP website. GARP does not endorse any Course Provider but merely lists them as a service to FRM candidates.

2011 FRM Examination

Part I AIM Statements

Table of Contents

FRM PART I—TOPICS AND READINGS

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

- The role of risk management
- Basic risk types, measurement and management tools
- Creating value with risk management
- Modern Portfolio Theory (MPT)
- Standard and non-standard forms of the Capital Asset Pricing Model (CAPM)
- Single and multi-index models and the Arbitrage Pricing Theory (APT)
- Risk-adjusted performance measurement
- Enterprise Risk Management
- Financial disasters and risk management failures
- Case studies
- Ethics and the GARP Code of Conduct

Readings for Foundations of Risk Management

1. Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition* (New York: McGraw-Hill, 2007).
   - Chapter 1 .....The Need for Risk Management

2. René Stulz, *Risk Management & Derivatives* (Florence, KY: Thomson South-Western, 2002).
   - Chapter 2 .....Investors and Risk Management
   - Chapter 3 .....Creating Value with Risk Management

3. Edwin J. Elton, Martin J. Gruber, Stephen J. Brown and William N. Goetzmann, *Modern Portfolio Theory and Investment Analysis, 7th Edition* (Hoboken, NJ: John Wiley & Sons, 2007).
   - Chapter 5 .....Delineating Efficient Portfolios
   - Chapter 13.....The Standard Capital Asset Pricing Model
   - Chapter 14.....Nonstandard Forms of Capital Asset Pricing Models
   - Chapter 16.....The Arbitrage Pricing Model APT – A New Approach to Explaining Asset Prices

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. Casualty Actuarial Society, Enterprise Risk Management Committee, "Overview of Enterprise Risk Management," May 2003. Copy available at: www.GARPDigitalLibrary.org

6. Steve Allen, *Financial Risk Management: A Practitioner's Guide to Managing Market and Credit Risk* (New York: John Wiley & Sons, 2003).
   - Chapter 4 .....Financial Disasters

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

8. **GARP Code of Conduct** http://www.garp.com/about/GARPCodeofConduct.aspx

AIMS:

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

Chapter 1 .....The Need for Risk Management

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

- Define risk and describe some of the major sources of risk.
- Differentiate between business and financial risks and give examples of each.
- Relate significant market events of the past several decades to the growth of the risk management industry.
- Describe the functions and purposes of financial institutions as they relate to financial risk management.
- Define what a derivative contract is and how it differs from a security.
- Describe the dual role leverage plays in derivatives and why it is relevant to a risk manager.
- Define financial risk management.
- Define value-at-risk (VaR) and describe how it is used in risk management.
- Describe the advantages and disadvantages of VaR relative to other risk management tools such as stop-loss limits, notional limits, and exposure limits.
- Compare and contrast valuation and risk management, using VaR as an example.
- Define and describe the four major types of financial risks: market, liquidity, credit, and operational.
- Within market risk:
  - Describe and differentiate between absolute and relative market risk
  - Describe and differentiate between directional and non-directional market risk
  - Describe basis risk and its sources
  - Describe volatility risk and its sources
- Within liquidity risk:
  - Describe and differentiate between asset and funding liquidity risk
- Within credit risk:
  - Describe and differentiate between exposure and recovery rate
  - Describe credit event and how it may relate to market risk
  - Describe sovereign risk and its sources
  - Describe settlement risk and its sources
- Within operational risk:
  - Describe the potential relationships between operational, market and credit risk
  - Describe model risk and its sources
  - Describe people risk
  - Describe legal risk and its sources

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

Chapter 2 .....Investors and Risk Management

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

- Explain how expected return and returns variance are used to describe the return distribution for a security or portfolio of securities.

- Define and describe the significant characteristics of the efficient frontier.
- Differentiate between diversifiable and systematic risk and describe how diversification can reduce risk in a portfolio.
- Describe the CAPM, and explain the concepts of beta and the security market line.
- Calculate and interpret firm value using the CAPM.
- Use the CAPM to discuss the value of risk management to investors with respect to:
  - A firm's diversifiable risk
  - A firm's systemic risk
- Define and discuss the "hedging irrelevance proposition" as it relates to:
  - Diversifiable risk
  - Systematic risk
  - Risks valued by investors differently from what CAPM would predict

Chapter 3 .....Creating Value with Risk Management

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

- Explain how risk management can create value by handling bankruptcy costs.
- Explain how risk management can create value moving income across time and reducing taxes.
- Describe those circumstances when risk reduction benefiting a large shareholder may increase or decrease firm value.
- Explain the relationship between risk management, managerial incentives, and the structure of management compensation.
- Describe debt overhang, and explain how risk management can increase firm value by reducing the probability of debt overhang.
- Explain how risk management can reduce the problem of information asymmetry and increase firm value.

Edwin J. Elton, Martin J. Gruber, Stephen J. Brown and William N. Goetzmann, *Modern Portfolio Theory and Investment Analysis, 7th Edition* (Hoboken, NJ: John Wiley & Sons, 2007).

Chapter 5 .....Delineating Efficient Portfolios

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

- Calculate the expected return and volatility of a portfolio of risky assets.
- Explain how covariance and correlation affect the expected return and volatility of a portfolio of risky assets.
- Describe the shape of the portfolio possibilities curve.
- Define the minimum variance portfolio.
- Define the efficient frontier and describe the impact on it of various assumptions concerning short sales and borrowing.

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

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

- Describe the CAPM and the assumptions underlying it.
- Derive the CAPM.
- Describe the capital market line.
- Use the CAPM to calculate the expected return on an asset.

Chapter 14.....Nonstandard Forms of Capital Asset Pricing Models

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

- Describe the impact on the CAPM of the following:
  - Short sales disallowed
  - Riskless lending and borrowing
  - Personal taxes
  - Nonmarketable assets
  - Heterogeneous expectations
  - Non-price-taking behavior
- Describe the following multi-period versions of CAPM:
  - Consumption-oriented CAPM
  - CAPM including inflation
  - Multi-beta CAPM

Chapter 16.....The Arbitrage Pricing Model APT—A New Approach to Explaining Asset Prices

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

- Describe the APT and the assumptions underlying it.
- Use the APT to calculate the expected returns on an asset.
- Explain the relationship between the CAPM and the APT.
- Describe how the APT can be used in both active and passive portfolio management.

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.

Casualty Actuarial Society, Enterprise Risk Management Committee, "Overview of Enterprise Risk Management," May 2003. Copy available at: www.GARPDigitalLibrary.org

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

- Describe what is meant by ERM.
- Identify and describe risks addressed by ERM.
- Describe the measures, models, and tools typically used within an ERM framework.
- Discuss practical considerations related to ERM implementation.

Steve Allen, *Financial Risk Management: A Practitioner's Guide to Managing Market and Credit Risk* (New York: John Wiley & Sons, 2003).

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
- Long Term Capital Management (LTCM)
- Metallgesellschaft
- Bankers Trust

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

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 discuss the shortcomings of existing risk metrics.

GARP Code of Conduct http://www.garp.com/about/GARPCodeofConduct.aspx

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**
- **Monte Carlo Methods**
- **Estimating correlation and volatility using EWMA and GARCH models**
- **Volatility term structures**
- **Quantifying volatility in VaR models**

Readings for Quantitative Analysis

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

- Chapter 2 .....Review of Probability
- Chapter 3 .....Review of Statistics
- Chapter 4 .....Linear Regression with One Regressor
- Chapter 5 .....Regression with a Single Regressor: Hypothesis Tests and Confidence Intervals
- Chapter 6 .....Linear Regression with Multiple Regressors
- Chapter 7 .....Hypothesis Tests and Confidence Intervals in Multiple Regression

10. **Svetlozar Rachev, Christian Menn, and Frank Fabozzi, *Fat-Tailed and Skewed Asset Return Distributions: Implications for Risk Management, Portfolio Selection and Option Pricing* (Hoboken, NJ: John Wiley & Sons, 2005).**

- Chapter 2 .....Discrete Probability Distributions
- Chapter 3 .....Continuous Probability Distributions

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

- Chapter 12.....Monte Carlo Methods

12. **John Hull, *Options, Futures, and Other Derivatives, 7th Edition* (New York: Pearson Prentice Hall, 2009).**

- Chapter 21.....Estimating Volatilities and Correlations

13. **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

AIMS:

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

Chapter 2 .....Review of Probability

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

- Define random variables, and distinguish between continuous and discrete random variables.
- Define the probability of an event.
- Define, calculate, and interpret the mean, standard deviation, and variance of a random variable.
- Define, calculate, and interpret the skewness, and kurtosis of a distribution.
- Describe joint, marginal, and conditional probability functions.
- Explain the difference between statistical independence and statistical dependence.
- Calculate the mean and variance of sums of random variables.
- Describe the key properties of the normal, standard normal, multivariate normal, Chi-squared, Student t, and F distributions.
- Define and describe random sampling and what is meant by i.i.d.
- Define, calculate, and interpret the mean and variance of the sample average.
- Describe, interpret, and apply the Law of Large Numbers and the Central Limit Theorem.

Chapter 3 .....Review of Statistics

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

- Describe the concept of statistical inference, including estimation and hypothesis testing.
- Describe and interpret estimators of the sample mean and their properties.
- Describe and interpret the least squares estimator.
- Define and interpret critical t-values.
- Define, calculate and interpret a confidence interval.
- Describe the properties of point estimators:
  - Distinguish between unbiased and biased estimators
  - Define an efficient estimator and consistent estimator
- Explain and apply the process of hypothesis testing:
  - Define and interpret the null hypothesis and the alternative hypothesis
  - Distinguish between one-sided and two-sided hypotheses
  - Describe the confidence interval approach to hypothesis testing
  - Describe the test of significance approach to hypothesis testing
  - Define, calculate and interpret type I and type II errors
  - Define and interpret the p value
- Define, calculate, and interpret the sample variance, sample standard deviation, and standard error.
- Define, calculate, and interpret confidence intervals for the population mean.
- Perform and interpret hypothesis tests for the difference between two means.
- Define, describe, apply, and interpret the t-statistic when the sample size is small.
- Interpret scatterplots.
- Define, describe, and interpret the sample covariance and correlation.

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 and the intercept.
- Define and interpret the stochastic error term (or noise component).
- Define and interpret a sample regression function, regression coefficients, parameters, slope and the intercept.
- Describe the key properties of a linear regression.
- Describe the method and assumptions of ordinary least squares for estimation of parameters:
  - Define and interpret the explained sum of squares, the total sum of squares, and the residual sum of squares
  - Interpret the results of an ordinary least squares 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 hypothesis tests about regression coefficients.
- Define and differentiate between homoskedasticity and heteroskedasticity.
- Describe the implications of homoskedasticity and heteroskedasticity.

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

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

- Define, interpret, and discuss methods for addressing omitted variable bias.
- Distinguish between simple and multiple regression.
- Define and interpret the slope coefficient in a multiple regression.
- Describe homoskedasticity and heterosckedasticity in a multiple regression.
- Describe and discuss 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, perform, and interpret hypothesis tests and confidence intervals for a single coefficient in a multiple regression.
- Construct, perform, and interpret hypothesis tests and confidence intervals for multiple coefficients in a multiple regression.
- Define and interpret the F-statistic.
- Define, calculate, and interpret the homoskedasticity-only F-statistic.
- Describe and interpret tests of single restrictions involving multiple coefficients.
- Define and interpret confidence sets for multiple coefficients.
- Define and discuss omitted variable bias in multiple regressions.
- Interpret the R2 and adjusted-R2 in a multiple regression.

Svetlozar Rachev, Christian Menn, and Frank Fabozzi, *Fat-Tailed and Skewed Asset Return Distributions: Implications for Risk Management, Portfolio Selection and Option Pricing* (Hoboken, NJ: John Wiley & Sons, 2005).

Chapter 2 .....Discrete Probability Distributions

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

- Describe the key properties of the Bernoulli distribution, Binomial distribution, and Poisson distribution, and identify common occurrences of each distribution.
- Identify the distribution functions of Binomial and Poisson distributions for various parameter values.

Chapter 3 .....Continuous Probability Distributions

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

- Describe the key properties of Normal, Exponential, Weibull, Gamma, Beta, Chi-squared, Student's t, Lognormal, Logistic and Extreme Value distributions.
- Explain the summation stability of normal distributions.
- Describe the hazard rate of an exponentially distributed random variable.
- Explain the relationship between exponential and Poisson distributions.
- Explain why the generalized Pareto distribution is commonly used to model operational risk events.
- Explain the concept of mixtures of distributions.

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

Chapter 12.....Monte Carlo Methods

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

- Describe how to simulate a price path using a geometric Brownian motion model.

- Describe how to simulate various distributions using the inverse transform method.
- Describe the bootstrap method.
- Explain how simulations can be used for computing VaR and pricing options.
- Describe the relationship between the number of Monte Carlo replications and the standard error of the estimated values.
- Describe and identify simulation acceleration techniques.
- Explain how to simulate correlated random variables using Cholesky factorization.
- Describe deterministic simulations.
- Discuss the drawbacks and limitations of simulation procedures.

John Hull, *Options, Futures, and Other Derivatives, 7th Edition* (New York: Pearson Prentice Hall, 2009).

Chapter 21 .....Estimating Volatilities and Correlations

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

- Discuss 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:
  - Estimate volatility using the EWMA model
- Describe the generalized auto regressive conditional heteroscedasticity (GARCH(p,q)) model for estimating volatility and its properties:
  - Estimate volatility using the GARCH(p,q) model
  - Explain mean reversion and how it is captured in the GARCH(1,1) model
- Discuss 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.
- Discuss how correlations and covariances are calculated, and explain the consistency condition for covariances.

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:

- Discuss how asset return distributions tend to deviate from the normal distribution.
- Explain potential reasons for the existence of fat tails in a return distribution and discuss the implications fat tails have on analysis of return distributions.
- Distinguish between conditional and unconditional distributions.
- Discuss the implications regime switching has on quantifying volatility.
- Explain the various approaches for estimating VaR.
- Compare, contrast and calculate parametric and non-parametric approaches for estimating conditional volatility, including:
  - Historical standard deviation
  - Exponential smoothing
  - GARCH approach
  - Historic simulation
  - Multivariate density estimation
  - Hybrid methods
- Explain the process of return aggregation in the context of volatility forecasting methods.

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, and equities
- Commodity derivatives
- Foreign exchange risk
- Corporate bonds

Readings for Financial Markets and Products

14. Hull, *Options, Futures, and Other Derivatives, 7th 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 9 .....Properties of Stock Options
- Chapter 10 .....Trading Strategies Involving Options

15. Robert McDonald, *Derivatives Markets, 2nd Edition* (Boston: Addison-Wesley, 2006).
- Chapter 6 .....Commodity Forwards and Futures

16. 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

17. Anthony Saunders and Marcia Millon Cornett, *Financial Institutions Management: A Risk Management Approach, 6th Edition* (New York: McGraw-Hill, 2008).
- Chapter 14.....Foreign Exchange Risk

18. Frank Fabozzi, *The Handbook of Fixed Income Securities, 7th Edition* (New York: McGraw-Hill, 2005).
- Chapter 13.....Corporate Bonds

AIMS:

Hull, *Options, Futures, and Other Derivatives, 7th 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 and how it differs from trading on an exchange, including advantages and disadvantages.
- Differentiate between options, forwards, and futures contracts.
- Calculate and identify 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 ephemeral.
- Describe some of the risks that can arise from the (mis)use of derivatives.
- Define:
  - Derivative
  - Market maker
  - Spot contract, Forward contract, and Futures contract
  - Call option and Put option
  - American option and European option
  - Long position and short position
  - Exercise (strike) price
  - Expiration (maturity) date
  - Bid price and offer price
  - Bid-offer spread
  - Hedgers and speculators
  - Arbitrageurs

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.
- Compare and contrast forward and futures contracts.
- 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 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.
- Define and demonstrate an understanding of the impact of different order types, including: market, limit, stop-loss, stop-limit, market-if-touched, discretionary, time-of-day, open, and fill-or-kill.
- Define:
  - Notice of intention to deliver
  - Limit up and limit down
  - Margin account
  - Initial margin, maintenance margin, variation margin and clearing margin
  - Collateralization
  - Settlement price
  - Open interest

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 appropriate uses.
- Describe the arguments for and against hedging and the potential impact of hedging on firm profitability.
- Define and compute the basis.
- Define the various sources of basis risk and explain how basis risks arise when hedging with futures.
- Define cross hedging.
- Define, compute and interpret the minimum variance hedge ratio and hedge effectiveness.
- Define, compute and interpret the optimal number of futures contracts needed to hedge an exposure, including a "tailing the hedge" adjustment.
- Demonstrate how to use stock index futures contracts to change a stock portfolio's beta.
- Describe what is meant by "rolling the hedge forward" and discuss some of the risks that arise from such a strategy.

Chapter 4 .....Interest Rates

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

- Calculate the value of an investment using daily, weekly, monthly, quarterly, semiannual, annual, and continuous compounding. Convert rates based on different compounding frequencies.
- Calculate the theoretical price of a coupon paying bond using spot rates.
- Calculate forward interest rates from a set of spot rates.
- Value and calculate the cash flows from a forward rate agreement (FRA).
- Describe the limitations of duration and how convexity addresses some of them.
- Calculate the change in a bond's price given duration, convexity, and a change in interest rates.
- Define and discuss the major theories of the term structure of interest rates.
- Define:
  - Spot rate
  - Par yield
  - Bootstrap method
  - Forward rate agreement
  - Basis point
  - Duration
  - Modified duration
  - Dollar duration
  - Convexity

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 short squeeze.
- Discuss 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 price, with or without short sales and/or consideration to the income or yield of the underlying asset. Describe an arbitrage argument in support of these prices.
- Explain the relationship between forward and futures prices.
- Use the interest rate parity relationship to calculate a forward foreign exchange rate.
- Define income, storage costs, and convenience yield.

- Calculate the futures price on commodities incorporating 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.
- Discuss the various delivery options available in the futures markets and how they can influence futures prices.
- Analyze the relationship between current futures prices and expected future spot prices, including the impact of systematic and nonsystematic risk.
- Define contango and backwardation, interpret the effect contango or backwardation may have on the relationship between commodity futures and spot prices, and relate the cost-of-carry model to contango and backwardation.

Chapter 6 .....Interest Rate Futures

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

- List the most commonly used day count conventions, identify the markets that each one is typically used in, and apply each to an interest calculation.
- Convert from 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 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.
- Demonstrate 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 discuss some of the criticisms of this argument.
- Explain how the discount rates in a plain vanilla interest rate swap are computed.
- Value a plain vanilla interest rate swap based on two simultaneous bond positions.
- Value 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.
- Describe the comparative advantage argument for the existence of currency swaps.
- Explain how a currency swap can be used to transform an asset or liability and calculate the resulting cash flows.
- Value a currency swap based on two simultaneous bond positions.
- Value a currency swap based on a sequence of FRAs.
- Discuss the role of credit risk inherent in an existing swap position.
- List and define other types of swaps, including commodity, volatility and exotic swaps.

Chapter 9 .....Properties of Stock Options

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

- Identify the six factors that affect an option's price and discuss how these six factors affect the price for both European and American options.
- Identify, interpret and compute upper and lower bounds for option prices.
- Explain put-call parity and calculate, using the put-call parity on a non-dividend-paying stock, the value of a European and American option, respectively.
- Explain the early exercise features of American call and put options on a non-dividend-paying stock and the price effect early exercise may have.
- Discuss the effects dividends have on the put-call parity, the bounds of put and call option prices, and on the early exercise feature of American options.

Chapter 10.....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 and explain the use and payoff functions of spread strategies, including bull spread, bear spread, box spread, calendar spread, butterfly spread, and diagonal spread.
- Calculate the pay-offs of various spread strategies.
- Describe and explain the use and payoff functions of combination strategies, including straddles, strangles, strips, and straps.
- Compute the pay-offs of combination strategies.

Robert McDonald, *Derivatives Markets, 2nd Edition* (Boston: Addison-Wesley, 2006).

Chapter 6 .....Commodity Forwards and Futures

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

- Define forward strip and forward curve.
- Describe how to create a synthetic commodity position and use it to explain the relationship between the forward price and the expected future spot price.
- Explain the effect non-storability has on electricity prices.
- Derive the basic equilibrium formula for pricing commodity forwards and futures.
- Explain the implication basic equilibrium has for different types of commodities.
- Describe an arbitrage transaction in commodity forwards and futures, and compute the potential arbitrage profit.
- Define the lease rate and how it determines the no-arbitrage values for commodity forwards and futures, and explain the relationship between lease rates and contango and lease rates and backwardation.
- Define carry markets.
- Explain the impact storage costs and convenience yields have 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.
- Discuss factors that impact gold, corn, natural gas, and crude oil futures 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 analyze how these differences impact risk management.

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 "bill of lading".
- 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 basic risk and its key components.
- 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.
- Define basis risk and the variance of the basis.
- Identify a commonly used measure for the effectiveness of hedging a spot position with a futures contract; use this measure to compute and compare the effectiveness of alternative hedges.
- Define and differentiate between an Exchange for Physical and agreement and an Alternative Delivery Procedure.
- Describe one common measure of market depth.

Anthony Saunders and Marcia Millon Cornett, *Financial Institutions Management: A Risk Management Approach, 6th Edition* (New York: McGraw-Hill, 2008).

Chapter 14.....Foreign Exchange Risk

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

- Calculate a financial institution's overall foreign exchange exposure.
- Demonstrate 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.
- List 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; 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, 7th Edition* (New York: McGraw-Hill, 2005).

Chapter 13.....Corporate Bonds

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

- Describe a bond indenture and explain the role of the corporate trustee.
- Explain a bond's maturity date and how it impacts bond retirements.
- Describe the main types of interest payment classifications.
- Describe zero-coupon bonds, the relationship between original-issue-discount and reinvestment risk, and the treatment of zeroes in bankruptcy.

- Describe the various security types relevant for corporate bonds, including:
  - Mortgage bonds
  - Collateral trust bonds
  - Equipment trust certificates
  - Debenture bonds (including subordinated and convertible debentures)
  - Guaranteed bonds
- Describe the mechanisms by which corporate bonds can be retired before maturity, including:
  - Call provisions
  - Sinking-fund provisions
  - Maintenance and replacement funds
  - Tender offers
- Describe, and differentiate between credit default risk and credit spread risk.
- Describe event risk and what may cause it in corporate bonds.
- Define high-yield bonds, describe types of high-yield bond issuers and some of the payment features peculiar 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.

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

- **Value-at-Risk (VaR)**
  - **Applied to stock, currencies, and commodities**
  - **Applied to linear and non-linear derivatives**
  - **Applied to fixed income securities with embedded options**
  - **Structured Monte Carlo, stress testing, and scenario analysis**
  - **Extending VaR to operational risk**
  - **Limitations as a risk measure**
  - **Coherent risk measures**
- **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**
- **Country and sovereign risk models and management**
  - **Fundamental analysis**
  - **Contingent claims approach**
- **External and internal credit ratings**
- **Expected and unexpected losses**
- **Operational risk**
- **Stress testing and scenario analysis**

Readings for Valuation and Risk Models

19. **Linda Allen, Jacob Boudoukh and Anthony Saunders, *Understanding Market, Credit and Operational Risk: The Value at Risk Approach*.**
- Chapter 3 .....Putting VaR to Work
- Chapter 5 .....Extending the VaR Approach to Operational Risks

20. **Hull, *Options, Futures, and Other Derivatives, 7th Edition.***
- Chapter 11.....Binomial Trees
- Chapter 13.....The Black-Scholes-Merton Model
- Chapter 17.....The Greek Letters

21. **Bruce Tuckman, *Fixed Income Securities, 2nd Edition* (Hoboken, NJ: John Wiley & Sons, 2002).**
- Chapter 1 .....Bond Prices, Discount Factors, and Arbitrage
- Chapter 2 .....Bond Prices, Spot Rates, and Forward Rates
- Chapter 3 .....Yield to Maturity
- Chapter 5 .....One-Factor Measures of Price Sensitivity

22. **Caouette, Altman, Narayanan, and Nimmo, *Managing Credit Risk, 2nd Edition.* (New York: John Wiley & Sons, 2008).**
- Chapter 6 .....The Rating Agencies
- Chapter 23.....Country Risk Models

23. **Dale F. Gray, Robert C. Merton and Zvi Bodie, "Contingent Claims Approach to Measuring and Managing Sovereign Credit Risk," *Journal of Investment Management*, Vol. 5, No. 4 (2007).**

24. **Arnaud de Servigny and Olivier Renault, *Measuring and Managing Credit Risk* (New York: McGraw-Hill, 2004).**
- Chapter 2 .....External and Internal Ratings

25. **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

26. **Kevin Dowd, *Measuring Market Risk, 2nd Edition* (West Sussex, England: John Wiley & Sons, 2005).**
- Chapter 2 .....Measures of Financial Risk

27. **John Hull, *Risk Management and Financial Institutions, 2nd Edition* (Boston: Pearson Prentice Hall, 2010).**
- Chapter 18.....Operational Risk

28. **Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition*.**
- Chapter 14.....Stress Testing

29. **"Principles for Sound Stress Testing Practices and Supervision" (Basel Committee on Banking Supervision Publication, Jan 2009).** Copy available at: www.GARPDigitalLibrary.org

AIMS:

Linda Allen, Jacob Boudoukh and Anthony Saunders, *Understanding Market, Credit and Operational Risk: The Value at Risk Approach.*

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.
- Explain how to 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.
- Explain structural Monte Carlo, stress testing and scenario analysis methods for computing VaR, identifying strengths and weaknesses of each approach.
- Discuss the implications of correlation breakdown for scenario analysis.
- Describe worst case scenario analysis.

Chapter 5 .....Extending the VaR Approach to Operational Risks

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

- Describe the following top-down approaches to measuring operational risks:
  - Multifactor models
  - Income based models
  - Expense based models
  - Operating leverage models
  - Scenario analysis models
  - Risk profiling models
- Describe the following bottom-up approaches to measuring operational risk:
  - Process approaches:
    - Causal networks and scorecards
    - Connectivity models
    - Reliability models
  - Actuarial approaches:
    - Empirical loss distributions
    - Parametric loss distributions
    - Extreme value theory
- Compare and contrast top-down and bottom-up approaches to measuring operational risk.
- Describe ways to hedge against catastrophic operational losses.
- Describe the characteristics of catastrophe options and catastrophe bonds.
- Describe various methods of hedging operational risks and discuss the limitations of hedging operational risk.

Hull, Options, Futures, and Other Derivatives, 7th Edition.

Chapter 11.....Binomial Trees

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

- Calculate the value of a European call or put option using the one-step and two-step binomial model.
- Calculate the value of an American call or put option using a two-step binomial model.

- Discuss how the binomial model value converges as time periods are added.
- Describe the impact dividends have on the binomial model.
- Discuss how volatility is captured in the binomial model.

Chapter 13 .....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.
- List and 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.
- 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.
- Identify the complications involving the valuation of warrants.

Chapter 17 .....The Greek Letters

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

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

Bruce Tuckman, *Fixed Income Securities, 2nd Edition* (Hoboken, NJ: John Wiley & Sons, 2002).

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

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

- Describe and contrast individual and market expressions of the time value of money.
- Define discount factor and use a discount function to compute present and future values.
- Define the "law of one price", support it using an arbitrage argument, and describe how it can be applied to bond pricing.
- Discuss 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.
- Compute the price of a fixed income security with certain cash-flows and compare its value to fixed-income securities with different, but certain, cash flow characteristics.
- Identify arbitrage opportunities for fixed income securities with certain cash flows.

Chapter 2 .....Bond Prices, Spot Rates, and Forward 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 holding period returns under different compounding assumptions.
- Derive spot rates from discount factors.
- Calculate the value of a bond using spot rates.
- Define and interpret the forward rate, and compute forward rates given spot rates.
- Discuss the impact of maturity on the price of a bond and the returns generated by bonds.
- Recognize the differences yield curve calculations yield when using P-Strips and C-strips.
- Define rich and cheap rates in the context of yield curves.

Chapter 3 .....Yield to Maturity

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

- 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.
- Establish the relationship between spot rates and YTM.
- Understand the relationship between coupon rate, YTM, and bond prices.
- Define and describe:
  - Discount bond
  - Premium bond
  - Coupon effect
  - Pull-to-par
- Calculate the price of an annuity.
- Calculate the realized return on a bond.
- Define reinvestment risk.

Chapter 5 .....One-Factor Measures of Price Sensitivity

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

- Describe four ways in which measures of fixed income price sensitivity are used.
- Describe an interest rate factor and name 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.
- Explain the limitations of DV01 as a measure of price sensitivity.
- 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.
- 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.
- Calculate the effective duration and convexity of a portfolio of fixed income security.
- Explain the effect negative convexity has on the hedging of fixed income securities.

Caouette, Altman, Narayanan, and 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.

- Describe some of the market and regulatory forces that have played a role in the growth of the rating agencies.
- Describe what a rating scale is, what credit outlooks are, and the difference between solicited and unsolicited ratings.
  - Identify 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 what concerns the issuer-pay model engenders.
- Describe and contrast the process for rating industrial and sovereign debt and describe how the distributions of these ratings may differ.
- Discuss the ratings performance for corporate bonds.
- 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.
- Discuss some of the trends and issues emerging from the current credit crisis relevant to the rating agencies and the use of ratings in the market.

Chapter 23 .....Country Risk Models

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

- Define and differentiate between country risk and transfer risk and discuss some of the factors that might lead to each.
- Define and describe contagion.
- Identify and describe some of the major risk factors that are relevant for sovereign risk analysis.
- Compare and contrast corporate and sovereign historical default rate patterns.
- Describe how country risk ratings are used in lending and investment decisions.
- Describe some of the challenges in country risk analysis.

Dale F. Gray, Robert C. Merton and Zvi Bodie, "Contingent Claims Approach to Measuring and Managing Sovereign Credit Risk," *Journal of Investment Management*, Vol. 5, No. 4 (2007).

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

- Describe the contingent claims balance sheet approach.
- Describe methods of estimating sovereign balance sheet values, volatilities, and risk.
- Explain how the sovereign CCA framework can be applied to the diversification, hedging, or mitigation of sovereign 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.
- Discuss the impact of time horizon, economic cycle, industry, and geography on external ratings.
- Review the results and explanation of the impact of ratings changes on bond and stock prices.
- Explain and compare the through-the-cycle and at-the-point approaches to score a company.
- Describe the process for and issues with building, calibrating and backtesting an internal rating system.
- Define and explain a ratings transition matrix and its elements.
- 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.
- Distinguish between loan and bond portfolios.
- 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
  - Explain how covenants impact exposures
- Define usage given default and how it impacts expected and unexpected loss:
  - Explain 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 for 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, discuss 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.
- 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.
- Describe and calculate the features of a distribution including mean, median, variance, standard deviation, skewness and kurtosis, and interpret their importance in risk measurement.

John Hull, *Risk Management and Financial Institutions, 2nd Edition* (Boston: Pearson Prentice Hall, 2010).

Chapter 18.....Operational Risk

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

- Calculate the regulatory capital using the basic indicator approach and the standardized approach.
- Explain how to get 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 there is scarce data.
- Describe how to use risk and control self assessment (RCSA) and key risk indicators (KRIs) to measure and manage operational risks.
- Discuss 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.

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

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.
- Explain the difference in event-driven scenarios and portfolio-driven scenarios.
- Identify common one-variable sensitivity tests.
- Describe the Standard Portfolio Analysis of Risk (SPAN®) system for measuring portfolio risk.
- Discuss the drawbacks to scenario analysis.
- Explain the difference between unidimensional and multidimensional scenarios.
- Compare and contrast various approaches to 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 our risk analysis and risk management systems.

"Principles for Sound Stress Testing Practices and Supervision" (Basel Committee on Banking Supervision Publication, Jan 2009). Copy available at: www.GARPDigitalLibrary.org

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 the following specific risks:
    - Risks arising from the use of complex structured products
    - Basis risk
    - Counterparty credit risk
    - Pipeline risk
    - Contingent risk
    - Funding liquidity risk

2011 FRM Examination

Part II AIM Statements

Table of Contents

FRM PART II—TOPICS AND READINGS

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

- Fixed income securities
  - Duration, DV01, and convexity
  - Key rate exposures
  - Hedging and immunization
  - Risk neutral pricing
  - Mortgage-backed securities: structure and valuation
- VaR and other risk measures
  - VaR mapping
  - Backtesting VaR
  - Expected shortfall (ES) and other coherent risk measures
  - Parametric and non-parametric methods of estimation
  - Modeling dependence: correlations and copulas
  - Extreme value theory (EVT)
- Volatility: smiles and term structures
- Exotic options

Readings for Market Risk Measurement and Management

30. Hull, *Options, Futures, and Other Derivatives, 7th Edition.*
- Chapter 18.....Volatility Smiles
- Chapter 24.....Exotic Options

31. Tuckman, *Fixed Income Securities, 2nd Edition.*
- Chapter 6 .....Measures of Price Sensitivity Based on Parallel Yield Shifts
- Chapter 7 .....Key Rate and Bucket Exposures
- Chapter 9 .....The Science of Term Structure Models
- Chapter 21.....Mortgage-Backed Securities

32. Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition*.
- Chapter 6 .....Backtesting VaR
- Chapter 11.....VaR Mapping

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

34. Frank Fabozzi, *Handbook of Mortgage Backed Securities, 6th Edition* (New York: McGraw-Hill, 2006).
- Chapter 1 .....An Overview of Mortgages and the Mortgage Market
- Chapter 31.....Valuation of Mortgage-Backed Securities

AIMS:

Hull, *Options, Futures, and Other Derivatives, 7th Edition.*

Chapter 18 .....Volatility Smiles

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

- Define volatility smile and volatility skew.
- Explain how put-call parity indicates that the implied volatility used to price call options is the same used to price put options.
- Relate 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.
- Explain why foreign exchange rates are not necessarily lognormally distributed and the implications this can have on option prices and implied volatility.
- Discuss the volatility smile for equity 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 24 .....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.
- List and describe how various option characteristics can transform standard American options into nonstandard American options.
- List and describe the characteristics and pay-off structure of:
  - Forward start options
  - Compound options
  - Chooser and barrier options
  - Binary options
  - Lookback options
  - Shout options
  - Asian options
  - Exchange options
  - Rainbow options
  - 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.

Tuckman, *Fixed Income Securities, 2nd Edition.*

Chapter 6 .....Measures of Price Sensitivity Based on Parallel Yield Shifts

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

- Describe advantages, disadvantages, and limitations of the use of price sensitivities based on parallel shifts of the yield curve.

- Define and calculate yield-based DV01, modified duration, and Macaulay duration.
- Calculate and describe the Macaulay duration of zero-coupon bonds, par bonds, and perpetuities.
- Explain how coupon rate, maturity, and yield impact the duration and DV01 of a fixed income security.
- Define DV01 in terms of Macaulay duration and use this definition to explain and differentiate between the "duration" effect and the "price" effect.
- Define yield-based convexity and explain how yield-based convexity changes for changes in maturity.
- Explain the difference between a barbell and a bullet portfolio and analyze the impact convexity may have on both.

Chapter 7 .....Key Rate and Bucket Exposures

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

- Describe and analyze the major weakness attributable to single-factor approaches when hedging portfolios or implementing asset liability techniques.
- Describe key-rate shift analysis.
- Define, calculate, and interpret key rate 01 and key rate duration.
- Describe the key rate exposure technique in multifactor hedging applications and discuss its advantages and disadvantages.
- Calculate the key rate exposures for a given security, and compute the appropriate hedging positions given a specific key rate exposure profile.
- Discuss some of the considerations in choosing key rates.
- Discuss why hedges based on key rates only approximate an immunized position in the underlying assets.
- Describe the relationship between key rate and bucket exposures.
- Explain the main differences between the key rate shift and the bucket shift approach to manage interest rate risks.
- Explain how key rate and bucket analysis may be applied in estimating portfolio volatility.

Chapter 9 .....The Science of Term Structure Models

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

- Using replicating portfolios develop and use an arbitrage argument to price a call option on a zero-coupon security. In addition:
  - Explain why the option cannot be properly priced using expected discounted values
  - Explain the role of up-state and down-state probabilities in the option valuation
- Define risk-neutral pricing and explain how it is used in option pricing.
- Relate the difference between true and risk-neutral probabilities 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 non-recombining trees in option pricing.
- Calculate the value of a constant maturity Treasure swap, given an interest rate tree and the risk-neutral probabilities.
- Discuss 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 to value equity derivatives is not appropriate to value derivatives on fixed-income securities.
- Describe the impact of embedded options on the value of fixed-income securities.

Chapter 21 .....Mortgage-Backed Securities

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

- With respect to mortgage-backed securities, define: mortgage, primary market, secondary market, pass-through.
- Calculate interest and principal payments for a level payment mortgage.
- Define a homeowner's prepayment option and relate it to a bond's call option.
- Describe the impact of interest rate changes on the value of the prepayment option and discuss non-interest rate factors that may trigger mortgage prepayments.
- Define and describe in the context of mortgages: current coupon rate, due on sale, lock-in effect, points, media effect, burnout effect.
- Describe reasons why actual mortgage prepayments behavior may be sub-optimal from a financial valuation perspective.
- Discuss the main features as well as the advantages and disadvantages of using static cash flow, implied, and prepayment models in the pricing of mortgage-backed securities.
- Describe the major components of prepayment models and how each variable impacts prepayments.
- Explain path dependence and path independence as it relates to the valuation of mortgage-backed securities.
- Describe how Monte-Carlo simulation can be used to address issues of path dependence.
- Discuss the advantages and disadvantages of Monte-Carlo simulation for valuing options.
- Discuss the calculation of OAS (option-adjusted-spread) when using Monte-Carlo simulations for mortgage-backed security pricing.
- Compare the impact of interest rate changes on a non-repayable mortgage and a mortgage pass-through security.
- Describe the major features of CMOs (collateralized mortgage obligations), PAC (planned amortization class) bonds, and IO (interest only) and PO (principal only) strips.
- Discuss the impact of interest rates and prepayments on different portions of CMOs, IO and PO strips.

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

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.
- Explain the framework of backtesting models with the use of 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, list 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.
- Discuss 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, commodity forwards, forward rate agreements, and interest-rate swaps.
- Describe the method of mapping options.

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

Chapter 3 .....Estimating Market Risk Measures

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

- Estimate VaR using a historical simulation approach.
- Estimate VaR using a parametric estimation approach assuming that the return distribution is either normal or lognormal.
- Estimate 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 following weighted historic simulation approaches:
  - Age-weighted historic simulation
  - Volatility-weighted historic simulation
  - Correlation-weighted historic simulation
  - Filtered historical simulation
- Discuss 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 for 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 in setting the threshold level when applying the GP distribution.
- Compute VaR and expected shortfall using the POT approach, given various parameter values.
- Explain the importance of multivariate EVT for risk management.

Frank Fabozzi, *Handbook of Mortgage Backed Securities, 6th Edition* (New York: McGraw-Hill, 2006).

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

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

- Define and explain the key characteristics of a mortgage contract, including:
  - Lien status
  - Original loan term
  - Interest-rate type
  - Credit guarantees
  - Loan balance
  - Borrower type
- Describe and calculate the mortgage payment factor.
- Identify graphically the effect loan term and interest rates have on loan balance over time.
- Identify and explain the roles of major players in the mortgage industry.
- Describe the loan underwriting process, and explain important measures of creditworthiness, including:
  - Credit score
  - Loan-to-value ratio
  - Income ratios
  - Documentation
- Describe the various risk associated with mortgages and mortgage backed securities and explain risk based pricing.

Chapter 31 .....Valuation of Mortgage-Backed Securities

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

- Describe how static valuation of mortgage backed securities differs from dynamic valuation.
- Explain the option adjusted spread (OAS) approach to valuing mortgage backed securities.
- Interpret the OAS.
- Define option-adjusted duration, option adjusted convexity and simulated average life.
- Describe the OAS approach to value different types of CMOs and how to interpret the results relative to those provided by static analysis.

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

- **Subprime mortgages and securitization**
- **Counterparty risk and OTC derivatives**
- **Credit risk concentration**
- **Credit derivatives**
  - **Types and uses**
  - **Mechanics and structure**
  - **Valuation**
- **Structured finance and securitization**
  - **The structuring and securitization process**
  - **Agency problems and moral hazard in the securitization process**
  - **Tranching, subordination, and support**

- Default risk
  - Quantitative methodologies
  - Loss given default and recovery rates
  - Estimating defaults and recoveries from market prices and spreads
  - The use of historical default rates and credit risk migration
- Expected and unexpected losses

Readings for Credit Risk Measurement and Management

35. **Adam Ashcroft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit," Federal Reserve Bank of New York Staff Reports, no. 318 (March 2008).** Copy available at: www.GARPDigitalLibrary.org

36. **Eduardo Canabarro and Darrell Duffie, "Measuring and Marking Counterparty Risk" in ALM of Financial Institutions, ed. Leo Tilman (London: Euromoney Institutional Investor, 2003).** Copy available at: www.GARPDigitalLibrary.org

37. **Darrell Duffie, "Innovations in Credit Risk Transfer: Implications for Financial Stability" (July 2008).** Copy available at: www.GARPDigitalLibrary.org

38. **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

39. **de Servigny and Renault, *Measuring and Managing Credit Risk.***
- Chapter 3.....Default Risk: Quantitative Methodologies
- Chapter 4.....Loss Given Default

40. **Hull, *Options, Futures, and Other Derivatives, 7th Edition.***
- Chapter 22.....Credit Risk
- Chapter 23.....Credit Derivatives

41. **Allen, Boudoukh and Saunders, *Understanding Market, Credit and Operational Risk: The Value at Risk Approach.***
- Chapter 4.....Extending the VaR Approach to Non-tradable Loans

42. **Stulz, *Risk Management & Derivatives.***
- Chapter 18.....Credit Risks and Credit Derivatives

43. **Ong, *Internal Credit Risk Models: Capital Allocation and Performance Measurement.***
- Chapter 6.....Portfolio Effects: Risk Contributions and Unexpected Losses

44. **"Studies on credit risk concentration: an overview of the issues and a synopsis of the results from the Research Task Force project" (Basel Committee on Banking Supervision Publication, November 2006).** Copy available at: www.GARPDigitalLibrary.org

AIMS:

Adam Ashcroft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit," Federal Reserve Bank of New York Staff Reports, no. 318 (March 2008). Copy available at: www.GARPDigitalLibrary.org

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

- Explain the subprime mortgage credit securitization process in the United States.
- List and discuss key frictions in the subprime mortgage securitization:
  - Assess the relative contribution of each factor to the subprime mortgage problems
- Discuss the characteristics of the subprime mortgage market, including the creditworthiness of the typical borrower, the features and performance of a subprime loan.
- Explain the structure of the securitization process of the subprime mortgage loans.
- Discuss the credit ratings process in subprime mortgage backed securities.
- Discuss the implications credit ratings had on the emergence of subprime related mortgage backed securities.
- Analyze the relationship between the credit ratings cycle and the housing cycle.
- Discuss the implications the subprime mortgage meltdown has on the management of portfolios.
- Discuss the difference between predatory lending and borrowing.

Eduardo Canabarro and Darrell Duffie, "Measuring and Marking Counterparty Risk" in ALM of Financial Institutions, ed. Leo Tilman (London: Euromoney Institutional Investor, 2003). Copy available at: www.GARPDigitalLibrary.org

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

- Define terms related to counterparty risk.
- Identify and explain the steps of using a Monte Carlo simulation engine to model potential future exposure to a counterparty, and discuss considerations for applying such a model to various market instruments.
- Describe how a credit valuation adjustment is made to an over-the-counter derivatives portfolio.
- Define a risk-neutral mean loss rate.
- Describe the procedures for computing the market value of credit risk when one or both counterparties in the derivatives transaction has credit exposure.

Darrell Duffie, "Innovations in Credit Risk Transfer: Implications for Financial Stability" (July 2008).
Copy available at: www.GARPDigitalLibrary.org

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

- Discuss major benefits of credit risk transfer.
- Discuss the potential problems arising out of credit risk transfer.
- Explain the lemons premium and moral hazard costs incurred by banks when transferring crest risk to another investor.
- Explain how CDS hedging and loan syndication can be near substitutes for loan sales.
- Explain how fractional retention of a loan could signal commitment of the loan seller.
- Explain the incentives for creation of CDOs.
- Explain how default correlation across a pool of loans affects the market value of individual CDO tranches.
- Discuss industry use of copulas to price and hedge CDOs and tranched index products:
  - Describe the impact of ineffective pricing and hedging of CDOs, and explain the role of ineffective hedging in the ratings downgrade of General Motors debt.

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 of a single named credit default swap (CDS), and discuss particular aspects of CDSs such as settlement methods, payments to the protection seller, reference name, ownership, recovery rights, trigger events, accrued interest and liquidity.
- Describe portfolio credit default swaps, including basket CDS, Nth to Default CDS, Senior and Subordinated Basked CDS.
- Discuss the composition and use of iTraxx CDS indices.
- Explain the mechanics 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.
- Discuss 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 players in a structuring process.
- Define and describe the process of tranching and subordination, and discuss the role of loss distributions and credit ratings.

Chapter 16 .....Securitization

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

- Define securitization and describe the process and the role the participants play.
- Analyze the differences in the mechanics of issuing securitized products using a trust or special purpose entity.
- List and discuss the four guiding principles of FAS140 and the conditions necessary to be a qualified special purpose vehicle.
- Describe how a typical Enron transaction violated FAS140 and explain the anti-Enron rule, FIN46R.
- Discuss the various types of internal and external credit enhancements and interpret a simple numerical example.
- Explain the impact liquidity, interest rate and currency risk has on a securitized structure, and list securities that hedge these exposures.
- Discuss 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:

- Define collateralized debt obligations (CDO) and discuss the motivations of CDO buyers and sellers.
- Discuss the types of collateral used in CDOs.
- Define and explain the structure of balance sheet CDOs and arbitrage CDOs.
- Describe the benefits of and motivations for balance sheet CDOs and arbitrage CDOs.
- Discuss cash flow versus market value CDOs.
- Discuss static versus managed portfolios of CDOs.

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
  - Discuss the results and practical implications of empirical studies that use the Merton model to value debt
- Describe the Moody's KMV Credit Monitor Model to estimate probability of default using equity prices:
  - Compare the Moody's-KMV's equity model with the Merton model
- Discuss credit scoring models and the requisite qualities of accuracy, parsimony, non-triviality, feasibility, transparency and interpretability.
- Define and differentiate among the following quantitative methodologies for credit analysis and scoring:
  - Linear discriminant analysis
  - Parametric discrimination
  - K-nearest neighbor approach
  - Support vector machines
- Define and differentiate the following decision rules:
  - Minimum error
  - Minimum risk
  - Neyman-Pearson
  - Minimax
- Discuss the problems and tradeoffs between classification and prediction models of performance.
- Discuss the important factors in the choice of a particular class of model.

Chapter 4 .....Loss Given Default

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

- Define loss given default.
- Identify and discuss four factors that may lead to suboptimal loan recovery rates.
- Identify and discuss the impact of various features on recovery rates of traded bonds, including:
  - Seniority
  - Industrial sector
  - Business cycle
  - Collateral
  - Jurisdiction
- Describe the importance of modeling uncertain recovery rates.
- Discuss the beta distribution approach, kernel modeling, and conditional recovery modeling to estimate of the recovery function.

Hull, Options, *Futures, and Other Derivatives, 7th Edition.*

Chapter 22 .....Credit Risk

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

- Identify ratings of Moody's, Standard & Poors and Fitch that correspond to investment and non-investment grade securities.

- Discuss the historical relationship between default rates and recovery rates.
- Estimate the probability of default for a company from its bond price.
- Compare risk-neutral versus real world default probabilities.
- Describe and apply Merton's approach to estimating default probabilities using equity prices.
- Describe counterparty credit risk in derivatives markets and explain how it affects valuation.
- Describe the following credit mitigation techniques:
  - Netting
  - Collateralization
  - Downgrade triggers
- Discuss the Gaussian copula model for time to default.

Chapter 23 .....Credit Derivatives

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

- Describe a credit default swap (CDS), and explain the functions and uses of a CDS.
- Compute the value of a CDS, given unconditional default probabilities, survival probabilities, market yields, recovery rates and cash flows.
- Discuss the potential asymmetric information problem with CDSs.
- Discuss the implications of marking-to-market CDSs.
- Discuss concerns with default probability and recovery rate estimates.
- Identify and explain the functions and uses of:
  - Basket CDSs.
  - Total return swaps.
- Describe asset backed securities including collateralized debt obligations (CDOs) and explain:
  - Tranches
  - Role of credit ratings
  - Synthetic CDOs
  - Role of correlation in valuing CDOs
- Discuss the use of the Gaussian Copula Model to measure the time to default.

Allen, Boudoukh and Saunders, *Understanding Market, Credit and Operational Risk: The Value at Risk Approach.*

Chapter 4 .....Extending the VaR Approach to Non-tradable Loans

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

- Describe the following traditional approaches to measuring Credit Risk:
  - Expert systems
  - Rating systems
  - Credit scoring models
- Compare structural and reduced form models for estimating default probabilities.
- Describe Merton's option theoretic model to estimate default probabilities.
- Explain the relationship between the yield spread and the probability of default, and calculate default probability of a debt security using the credit spread.
- Describe the CreditMetrics and Algorithmics proprietary VaR models for credit risk measurement.

Stulz, Risk Management & Derivatives.

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

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

- Explain the relationship of 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 stochastic interest rates have on the valuation of risky bonds, equity, and the risk of default.
- Assess the credit risks of derivatives.
- Discuss the fundamental differences between CreditRisk+, CreditMetrics and KMV credit portfolio models.
- Define and describe a credit derivative, credit default swap, and total return swap.
- Define a vulnerable option, and explain how credit risk can be incorporated in determining the option's value.
- Discuss how to account for credit risk exposure in valuing a swap.

Ong, *Internal Credit Risk Models: Capital Allocation and Performance Measurement.*

Chapter 6 .....Portfolio Effects: Risk Contributions and Unexpected Losses

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

- Explain the relationship between expected and unexpected losses for an individual asset and a portfolio of asset.
- Compare expected loss and unexpected loss risk measures.
- Explain how the recovery rate, credit quality, and expected default frequency affect the expected and unexpected loss.
- Discuss and compare different approaches to mitigate maturity effects.
- Define, calculate and interpret expected and unexpected portfolio loss.
- Define, calculate and interpret risk contributions within a portfolio.
- Explain the different impact diversifiable and un-diversifiable risk has on portfolio expected and unexpected loss, respectively.
- Define, calculate and interpret the effect correlation has on the expected and unexpected losses in a portfolio.

"Studies on credit risk concentration: an overview of the issues and a synopsis of the results from the Research Task Force project" (Basel Committee on Banking Supervision Publication, November 2006).

Copy available at: www.GARPDigitalLibrary.org

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

- Define and differentiate between systematic risk and idiosyncratic risk in the context of the Basel II IRB model.
- Describe how concentration risk may arise in a credit portfolio.
- Describe key assumptions of the Asymptotic Single-Risk Factor (ASRF) model.
- Describe how concentration risk in a credit portfolio violates the assumptions of the ASRF model and what the implications of this are.
- Discuss imperfect granularity, its impact on economic capital, and proposed adjustments.
- Discuss the potential impact of sectoral concentration on capital requirements within the Basel II IRB model.
- Describe contagion risk in the context of credit portfolios and some of the difficulties in estimating it.
- Describe desirable properties for stress tests of sector concentration risk, including:
  - Plausibility
  - Consistency
  - Adaptability to the portfolio
  - Adaptability to internal reporting requirements

- Describe open issues related to modeling concentration risk, particularly those related to:
  - The adequacy of sector schemes
  - The definition of a benchmark for concentration risk correction
  - Data-related issues

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

- **Calculating and applying risk-adjusted return on capital (RAROC)**
- **Estimating liquidity risk, sources of model risk,**
- **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**
  - **Data sufficiency**
  - **Extrapolating beyond the data**
- **Failure mechanics of dealer banks**
- **Regulation and the Basel Accords**
  - **Minimum capital requirements**
  - **Methods for calculating credit, market, and operational risk**
  - **Liquidity risk management**
  - **Modeling risk aggregation**
  - **Stress testing**
  - **Revisions to the Basel II Accord**
  - **The Basel III framework**

Readings for Operational and Integrated Risk Management

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

46. **"Range of practices and issues in economic capital modeling" (Basel Committee on Banking Supervision Publication, March 2009).** Copy available at: www.GARPDigitalLibrary.org

47. **Dowd, *Measuring Market Risk, 2nd Edition.***
- Chapter 14.....Estimating Liquidity Risks
- Chapter 16.....Model Risk

48. **Jimmy Hong, John Knight, Steve Satchell and Bernd Scherer, "Using approximate results for validating value-at-risk," *The Journal of Risk Model Validation*, Volume 4/Number 3, Fall 2010: pp. 69-81.**

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

50. **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.**

51. **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.**

52. **Patrick De Fontnouvelle, Eric S. Rosengren and John S. Jordan, 2006. "Implications of Alternative Operational Risk Modeling Techniques." Ch. 10 in Mark Carey and René Stulz (eds.), Risks of Financial Institutions, NBER, 475-505. And comment by Andrew Kuritzkes 505-511.**

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

AIMS:

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 discuss some of the potential benefits of its use.
- 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 modeling" (Basel Committee on Banking Supervision Publication, March 2009). Copy available at: www.GARPDigitalLibrary.org

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.

- Discuss 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.
- Discuss 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.
- Discuss Endogenous Price approaches to LVaR, its motivation and limitations.
- Discuss the relationship between liquidation strategies, transaction costs and market price impact.
- Describe liquidity at risk (LaR) and discuss the factors that affect future cash flows.
- Explain the role of liquidity in crisis situations and discuss approaches to estimating crisis liquidity risk.

Chapter 16.....Model Risk

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

- Define model risk.
- Identify and discuss sources of model risk, including:
  - Incorrect model specification
  - Incorrect model application
  - Implementation risk
  - Incorrect calibration
  - Programming and data problems
- Discuss 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.
- Discuss the role of senior managers in managing model risk.
- Describe procedures for vetting and reviewing a model.
- Discuss the function of an independent risk oversight (IRO) unit.

Jimmy Hong, John Knight, Steve Satchell and Bernd Scherer, "Using approximate results for validating value-at-risk," *The Journal of Risk Model Validation*, Volume 4/Number 3, Fall 2010: pp. 69-81.

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

- Describe the issues related to using long or short periods to estimate VaR.
- Describe the basic framework for estimating the asymptotic distribution for VaR.
- Describe the procedure to investigate different methods of computing VaR.
- Discuss methods to obtain confidence intervals of VaR estimates.

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

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

- Define enterprise risk management (ERM).
- Explain how implementing ERM practices and policies create shareholder value both at the macro and the micro level.
- Discuss how an ERM program can be used to determine the right amount of risk.
- Discuss the development and implementation of an ERM system.
- Discuss 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.

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:

- Discuss the loss distribution approach to measuring operational risk.
- Discuss issues related to external and internal operational loss data sets.
- Discuss how frequency and severity distributions of operational losses are obtained.
- Discuss 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:

- Discuss the nature of operational loss distributions.
- Discuss 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.

Patrick De Fontnouvelle, Eric S. Rosengren and John S. Jordan, 2006. "Implications of Alternative Operational Risk Modeling Techniques." Ch. 10 in Mark Carey and René Stulz (eds.), Risks of Financial Institutions, NBER, 475-505. And comment by Andrew Kuritzkes 505-511.

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

- Describe the properties of distributions of operational loss data.
- Give a descriptive analysis of operational loss data.
- Describe ways to fit distributions to operational loss data.
- Carry out a threshold analysis of operational loss data.
- Describe how the aggregate loss distribution is developed.

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 attendant to each.
- 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.
- Discuss various factors that can precipitate or accelerate a liquidity crisis at a dealer bank and what prudent risk management steps can be taken to mitigate these risks.
- Relate a liquidity crisis at a dealer bank to a traditional bank run.
- Discuss policy measures that could alleviate some of the firm-specific and systemic risks related to large dealer banks.

Readings for Basel Reference

Candidates are expected to understand the objective and general structure of the Basel II Accord and general application of the various approaches for calculating minimum capital requirements. Candidates are not expected to memorize specific details like risk weights for different assets.

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

55. **"Basel III: A global regulatory framework for more resilient banks and banking systems" (Basel Committee on Banking Supervision Publication, December 2010).** Copy available at: www.GARPDigitalLibrary.org

56. **"Basel III: International framework for liquidity risk measurement, standards and monitoring" (Basel Committee on Banking Supervision Publication, December 2010).** Copy available at: www.GARPDigitalLibrary.org

57. **"Guidelines for computing capital for incremental risk in the trading book – final version" (Basel Committee on Banking Supervision Publication, July 2009).** Copy available at: www.GARPDigitalLibrary.org

58. **"Revisions to the Basel II market risk framework– final version" (Basel Committee on Banking Supervision Publication, July 2009).** Copy available at: www.GARPDigitalLibrary.org

59. **"Developments in Modelling Risk Aggregation" (Basel Committee on Banking Supervision Publication, July 2009).** Copy available at: www.GARPDigitalLibrary.org

AIMS:

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

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
  - Risk weights and risk-weighted assets
  - 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" (Basel Committee on Banking Supervision Publication, December 2010). Copy available at: www.GARPDigitalLibrary.org

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

- Discuss 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, and the use of external ratings
  - The use of leverage ratios

- Discuss 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: International framework for liquidity risk measurement, standards and monitoring" (Basel Committee on Banking Supervision Publication, December 2010). Copy available at: www.GARPDigitalLibrary.org

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

- Define and discuss the minimum liquidity coverage ratio.
- Define and discuss the net stable funding ratio.
- Define and discuss practical applications of prescribed liquidity monitoring tools, including:
  - Contractual maturity mismatch
  - Concentration of funding
  - Available unencumbered assets
  - Liquidity coverage ratio by significant currency
  - Market related monitoring tools

"Guidelines for computing capital for incremental risk in the trading book – final version" (Basel Committee on Banking Supervision Publication, July 2009). Copy available at: www.GARPDigitalLibrary.org

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

- Explain the regulatory reason for incorporating the incremental default risk charge into the trading book capital calculation.
- Describe perceived shortcomings in the original VaR framework for measuring risk in the trading book.
- Define the risks captured by the incremental risk charge and the key supervisory parameters for computing the incremental risk charge.
- Define the frequency banks must calculate the incremental risk charge.
- Calculate the capital charge for incremental risk as a function of recent increment risk charge measures.

"Revisions to the Basel II market risk framework– final version" (Basel Committee on Banking Supervision Publication, July 2009). Copy available at: www.GARPDigitalLibrary.org

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.

"Developments in Modelling Risk Aggregation" (Basel Committee on Banking Supervision Publication, July 2009). Copy available at: www.GARPDigitalLibrary.org

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

- Describe frameworks for risk aggregation.
- Describe risk aggregation methods within regulatory frameworks.
- Describe approaches of validation and management of models in risk aggregation.
- Describe diversification effects in risk aggregation.

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

- **Portfolio construction**
- **Portfolio-based performance analysis**
- **Tests of the Capital Asset Pricing Model (CAPM)**
- **Portfolio and component VaR**
- **Risk budgeting**
- **Risk monitoring and performance measurement**
- **Hedge funds**
  - **Hedge fund strategies**
  - **Due diligence and fraud detection**
  - **Liquidity**
  - **Risk management of hedge funds**
- **Private equity**

Readings for Risk Management and Investment Management

60. **Grinold and 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
- Chapter 17.....Performance Analysis

61. **Eugene Fama and Kenneth French, 2004. "The Capital Asset Pricing Model: Theory and Evidence," *Journal of Economic Perspectives* 18:3, 25-46.**

62. **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

63. **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

64. **Lars Jaeger, *Through the Alpha Smoke Screens: A Guide to Hedge Fund Returns* (New York: Euromoney Institutional Investor Books, 2005).**

- Chapter 5 .....Individual Hedge Fund Strategies

65. **Stephen Brown, William Goetzmann, Bing Liang, Christopher Schwarz, "Trust and Delegation", May 28, 2010.** Copy available at: www.GARPDigitalLibrary.org

66. **Stephen Dimmock and William Gerken, "Finding Bernie Madoff: Detecting Fraud by Investment Managers," (December 2009).** Copy available at: www.GARPDigitalLibrary.org

67. **Amir E. Khandani and Andrew W. Lo, "An Empirical Analysis of Hedge Funds, Mutual Funds, and U.S. Equity Portfolios", June 24, 2009.** Copy available at: www.GARPDigitalLibrary.org

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

69. **Leslie Rahl (editor), *Risk Budgeting: A New Approach to Investing* (London: Risk Books, 2004).**

- Chapter 6.....Risk Budgeting for Pension Funds and Investment Managers Using VaR, by Michelle McCarthy

70. **Steven N. Kaplan and Per Stromberg, 2009. "Leveraged Buyouts and Private Equity" *Journal of Economic Perspectives* 23:1, 121-146.** Copy available at: www.GARPDigitalLibrary.org

AIMS:

Grinold and 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:

- Describe the inputs to the portfolio construction process.
- Discuss the motivation and methods for refining alphas in the implementation process.
- Describe neutralization and methods for refining alphas to be neutral.
- Discuss the implications transaction costs have on portfolio construction.
- Discuss 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:
  - Discuss the optimal no-trade region for rebalancing with transaction costs
- Describe the following portfolio construction techniques, including strengths and weaknesses:
  - Screens
  - Stratification
  - Linear programming
  - Quadratic programming
- Define dispersion, its causes and methods for controlling forms of dispersion.

Chapter 17 .....Performance Analysis

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

- Describe the goal of performance analysis and its uses for investors and fund managers.
- Discuss the tradeoff of skill and luck in fund management, including the implication of the efficient market hypothesis for active management.
- Define and compute the compound total return, geometric average return, average log return and the arithmetic average return for a portfolio.
- Describe cross-sectional analysis of performance data and discuss shortcomings of this approach.
- Describe the return regression approach to performance analysis and interpret resulting alpha values.
- Describe refinements to the basic return-based performance assessment models including Bayesian correction, adjustments for heteroskedasticity and autocorrelation, inclusion of benchmark timing and style analysis, and controlling for size and value.
- Describe portfolio-based performance analysis, including the use of performance attribution and performance analysis.
- Define, describe and calculate active systematic returns, expected active beta returns, active beta surprise, and active benchmark timing return.

Eugene Fama and Kenneth French, 2004. "The Capital Asset Pricing Model: Theory and Evidence," *Journal of Economic Perspectives* 18:3, 25-46.

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

- Explain the logic of the CAPM.
- Describe empirical tests of the CAPM and their conclusions.
- Describe explanations for the results of the empirical tests of CAPM.
- Explain the market proxy problem.

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 and distinguish between individual VaR, incremental VaR and diversified portfolio VaR.
- Discuss the role correlation has on portfolio risk.
- Compute diversified VaR, individual VaR, and undiversified VaR of a portfolio.
- Define, compute, and explain the uses of marginal VaR, incremental VaR, and component VaR.
- Describe the challenges associated with VaR measurement as portfolio size increases.
- Demonstrate how one can use marginal VaR to guide decisions about portfolio VaR.
- Explain the difference between risk management and portfolio management, and demonstrate 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.
- Discuss the impact horizon, turnover and leverage have 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 with hedge funds.
- Define and describe the following types of risk:
  - Absolute risk
  - Relative risk
  - Policy-mix risk
  - Active management risk
  - Funding risk
  - 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 development of investment guidelines.
- Describe the risk budgeting process across asset classes and active managers:
  - Define tracking error and information ratio.

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 objectives and participants in its development.
- Describe risk budgeting and the role of quantitative methods.
- Describe risk monitoring and its role in an internal control environment.
- Discuss sources of risk consciousness within an organization.
- Discuss the objectives of a risk management unit in an investment management firm.
- Describe how risk monitoring confirms that investment activities are consistent with expectations.
- Discuss the importance of liquidity considerations for a portfolio.
- Explain the objectives of performance measurement.
- Describe common features of a performance measurement framework including:
  - Comparison of performance with expectations
  - Return attribution
  - Metrics such as Sharpe and information ratios
  - Comparisons with benchmark portfolios and peer groups.

Lars Jaeger, *Through the Alpha Smoke Screens: A Guide to Hedge Fund Returns* (New York: Euromoney Institutional Investor Books, 2005).

Chapter 5 .....Individual Hedge Fund Strategies

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

- Describe the underlying characteristics, sources of returns and risk exposures of various hedge fund strategies including:
  - Equity long/short
  - Market-neutral
  - Statistical arbitrage
  - Market timing
  - Short-selling
  - Distressed securities
  - Fixed-income arbitrage
  - Capital structure arbitrage
  - Event-driven and merger arbitrage
  - Global macro
  - Regulation D
  - Commodity trading adviser
  - Relative value
  - Volatility arbitrage
- Describe the reasons behind market inefficiencies and ways to exploit these inefficiencies.
- Explain the importance of individual fund manager's skill in performance of hedge funds.

Stephen Brown, William Goetzmann, Bing Liang, Christopher Schwarz, "Trust and Delegation", May 28, 2010. Copy available at: www.GARPDigitalLibrary.org

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

- Explain the role of third party due diligence firms in the delegated investment decision-making process.
- Explain how past regulatory and legal problems with hedge fund reporting relates to expected future operational events.
- Explain the role of the due diligence process in successfully identifying inadequate or failed internal process.

Stephen Dimmock and William Gerken, "Finding Bernie Madoff: Detecting Fraud by Investment Managers," (December 2009). Copy available at: www.GARPDigitalLibrary.org

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

- Discuss the importance of predicting fraud of investment managers.
- Explain how Form ADV helps in predicting investment fraud.
- Discuss whether investors are compensated for fraud risk.
- Discuss whether there is predictive capability in information hidden in Form ADV.
- Discuss firm death and investor outflows with respect to type of fraud disclosure.

Amir E. Khandani and Andrew W. Lo, "An Empirical Analysis of Hedge Funds, Mutual Funds, and U.S. Equity Portfolios", June 24, 2009. Copy available at: www.GARPDigitalLibrary.org

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

- Describe how asset return autocorrelation can be used as a measure of the asset's liquidity.
- Explain the process of estimating the risk premium associated with illiquidity (illiquidity premia) using autocorrelations.
- Compare illiquidity premia across hedge funds, mutual funds and U.S equity portfolios.
- Discuss time series properties of illiquidity premia.

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

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

- Compare and contrast the investment perspectives between institutional investors and hedge fund managers.
- Explain how proper risk management can itself be a source of alpha for a hedge fund.
- Explain the limitations of the VaR measure in capturing the spectrum of 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 the phase-locking phenomenon and nonlinearities in hedge fund returns can be incorporated into risk models.
- Explain how autocorrelation of returns can be used as a measure of liquidity of the asset.

Leslie Rahl (editor), *Risk Budgeting: A New Approach to Investing* (London: Risk Books, 2004).
Chapter 6 .....Risk Budgeting for Pension Funds and Investment Managers Using VaR, by Michelle McCarthy

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

- Discuss how VaR differs from traditional portfolio risk measures.
- Identify and discuss common misconceptions about VaR.
- Discuss key market risks for pension funds and asset management firms.
- Define risk budgeting and identify components in an investment process which may be subject to a risk budget.
- Discuss risk tolerance thresholds and describe common ways such thresholds are determined.
- Identify and discuss factors that differentiate risk budgeting from asset allocation.
- Identify practices that can decrease the validity of a VaR measure and discuss considerations for maintaining a quality VaR measure.
- Identify potential actions to take if risk tolerance thresholds are exceeded.
- Compare and contrast risk budgeting with traditional means of measuring and controlling risk including: (i) asset allocation, (ii) investment guidelines, (iii) standard deviation, (iv) beta, and (v) duration.
- Explain how backtesting can be used to calibrate a VaR model.

Steven N. Kaplan and Per Stromberg, 2009. "Leveraged Buyouts and Private Equity" *Journal of Economic Perspectives* 23:1, 121-146. Copy available at: www.GARPDigitalLibrary.org

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

- Describe how a private equity firm raises capital.
- Describe a typical private equity transaction.
- Describe the sets of changes that the private equity firms apply to the firms in which they invest.
- Describe boom and bust cycles in private equity.

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

- Subprime mortgages, securitization, and subprime CDOs
- Causes, consequences, and lessons learned from the current crisis
- Impact of financial development on risk
- Sovereign risk
  - Historical view of sovereign defaults
  - Interpreting sovereign spreads
  - The U.S. and Irish credit crisis
- The Flash Crash
- The Lehman collapse
- Central counterparties
- Sound compensation practices

Readings for Current Issues in Financial Markets

71. **Gary Gorton, "The Panic of 2007," (August 2008).** Copy available at: www.GARPDigitalLibrary.org

72. **Raghuram Rajan, "Has Financial Development Made The World Riskier?" (September 2005).** Copy available at: www.GARPDigitalLibrary.org

73. **Carmen Reinhart and Kenneth Rogoff, "This Time is Different: A Panoramic View of Eight Centuries of Financial Crises."** Copy available at: www.GARPDigitalLibrary.org

74. **Bennett Golub and Conan Crum, "Risk Management Lessons Worth Remembering from the Credit Crisis of 2007-2009," (October 2009).** Copy available at: www.GARPDigitalLibrary.org

75. **"Findings Regarding the Market Events of May 6, 2010, (Executive Summary)" Report of the Staffs of the CFTC and SEC to the Joint Advisory Committee on Emerging Regulatory Issues (September 2010).** Copy available at: www.GARPDigitalLibrary.org

76. **Gregory Connor, Thomas Flavin, and Brian O'Kelly, "The U.S. and Irish Credit Crises: Their Distinctive Differences and Common Features."** Copy available at: www.GARPDigitalLibrary.org

77. **Eli Remolona, Michela Scatigna and Eliza Wu, "Interpreting sovereign spreads," BIS Quarterly Review, March 2007.** Copy available at: www.GARPDigitalLibrary.org

78. **"Making Over-the-Counter Derivatives Safer: The Role of Central Counterparties." IMF Global Financial Stability Report, April 2010, Chapter 3.** Copy available at: www.GARPDigitalLibrary.org

79. **"FSF Principles for Sound Compensation Practices," Financial Stability Forum, April 2009.** Copy available at: www.GARPDigitalLibrary.org

80. **Brunnermeier, Markus, 2009. "Deciphering the Liquidity and Credit Crunch 2007-2008."** ***Journal of Economic Perspectives*** **23:1, 77-100.**

81. **Examiner's Report on Lehman, Appendix 8 (pages 1–49).** Copy available at: www.GARPDigitalLibrary.org

AIMS:

Gary Gorton, "The Panic of 2007," (August 2008). Copy available at: www.GARPDigitalLibrary.org

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

- Explain the evolution of the subprime mortgage market.
- List differences between prime and subprime mortgages and borrowers.
- Describe the design of Subprime Residential Mortgage Backed Securities (RMBS).
- Explain the role of CDOs in subprime securitization.
- Explain how the ABX information together with the lack of information about the location of risks led to a loss in confidence on the part of banks.

Raghuram Rajan, "Has Financial Development Made The World Riskier?" (September 2005).
Copy available at: www.GARPDigitalLibrary.org

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

- List key drivers of change in the financial landscape over the past thirty years and describe their impact.
- Describe ways in which incentive structures for investment managers today differ from those of bank managers of the past and the types of perverse behavior they can induce.
- Describe the impact technology has had on bank lending, regulation, and competition.
- Explain how banks' capital structure may explain banks' organizational form.
- Discuss how the risk-transfer and risk-warehousing function of banks has impacted the overall riskiness of the banking system.
- Explain the link between market integration and the demands on market superstructures.
- Explain the following topics as they relate to investment manager behavior patterns:
  - Hidden tail risk
  - Herding
  - Low interest rates
- Describe how modern bank behavior may impact market liquidity in a downturn.
- Differentiate between micro-prudential and macro-prudential reasons for supervision and describe some of the instruments of prudential supervision.

Carmen Reinhart and Kenneth Rogoff, "This Time is Different: A Panoramic View of Eight Centuries of Financial Crises." Copy available at: www.GARPDigitalLibrary.org

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

- Describe historical default patterns and their relationship to major domestic macro economic factors, international trade and capital flows, and political policies.
- Describe typical default patterns as a function of a nation's stage of development.
- Explain the factors that may drive serial default patterns amongst sovereign debtors and ways to break these patterns.
- Discuss the transmission mechanisms that can propagate shocks throughout the sovereign debt market.

Bennett Golub and Conan Crum, "Risk Management Lessons Worth Remembering from the Credit Crisis of 2007-2009," (October 2009). Copy available at: www.GARPDigitalLibrary.org

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

- Explain the need for alignment of institutional interest and institutional buy-in for successful risk management.
- Explain the need for independent risk management organizations.
- Describe the effectiveness of bottom-up risk management.
- Explain why risk models require constant vigilance.
- Describe the lessons from the crisis worth remembering related to liquidity of assets, sources of liquidity, the opacity of markets and collateralization.

"Findings Regarding the Market Events of May 6, 2010, (Executive Summary)" Report of the Staffs of the CFTC and SEC to the Joint Advisory Committee on Emerging Regulatory Issues (September 2010).
Copy available at: www.GARPDigitalLibrary.org

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

- Describe the liquidity crisis in the E-mini markets on May 6th.
- Describe the liquidity crisis in the equities markets on May 6th.
- Explain the role of high frequency traders and cross market arbitrageurs in the flash crash.
- Explain how an automated execution of a large sell order can trigger extreme price movements.

Gregory Connor, Thomas Flavin, and Brian O'Kelly, "The U.S. and Irish Credit Crises: Their Distinctive Differences and Common Features." Copy available at: www.GARPDigitalLibrary.org

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

- Describe similarities and differences between the US and Irish crisis.
- Discuss how investor and market sentiment can lead to asset price inflation and "bubbles".
- Differentiate between rational and irrational exuberance.
- Discuss the difference in the role of capital flows in the US and Irish crises.
- Describe the role of regulators in the US and Irish crises.
- Define and discuss moral hazard and the role it played in the US and Irish crises.

Eli Remolona, Michela Scatigna and Eliza Wu, "Interpreting sovereign spreads," BIS Quarterly Review, March 2007.
Copy available at: www.GARPDigitalLibrary.org

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

- Describe some advantages to using credit ratings as a measure of sovereign risk.
- Discuss possible sources of variation between observed sovereign spreads and credit ratings.
- Describe the relationship between credit rating scales and implied probabilities of default.
- Discuss the relationship between observed sovereign CDS spreads and other indicators of sovereign risk.
- Describe how sovereign spreads can be decomposed into expected loss and risk premia.
- Discuss what is meant by the "credit spread puzzle" and how it can vary across countries.

"Making Over-the-Counter Derivatives Safer: The Role of Central Counterparties." IMF Global Financial Stability Report, April 2010, Chapter 3. Copy available at: www.GARPDigitalLibrary.org

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

- Describe the mechanics of OTC derivatives clearing.
- Discuss the basics of novation, bilateral, and multilateral netting.

- Discuss counterparty risk in the OTC derivatives markets and some of the risk management techniques commonly employed to mitigate it.
- Describe how central counterparties can reduce counterparty risk.
- Discuss some of the challenges to the widespread use of central counterparties in the OTC derivative markets.

"FSF Principles for Sound Compensation Practices," Financial Stability Forum, April 2009.
Copy available at: www.GARPDigitalLibrary.org

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

- Explain compensation risk and its involvement in the recent crisis.
- Discuss the effective governance of compensation, identifying key roles and methods.
- Discuss the effective alignment of compensation with prudent risk taking.
- Compare and contrast a judgment based system vs a quantitative measures system for risk alignment principles
- Provide examples of asymmetric compensation outcomes.
- Explain the relationship between the time horizon of risk and risk accumulation in conjunction with compensation practices.
- Discuss the importance of effective supervisory oversight and engagement by stakeholders as it relates to the evolution of compensation practices.

Brunnermeier, Markus, 2009. "Deciphering the Liquidity and Credit Crunch 2007-2008." *Journal of Economic Perspectives* 23:1, 77-100.

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

- Discuss banking industry trends that led up to the liquidity squeeze.
- Describe securitization and the originate-to-distribute model.
- Discuss methods of asset/liability maturity management banks employed ahead of the liquidity crunch and their associated risks.
- Describe and differentiate between funding liquidity and market liquidity.
- Describe and differentiate between a "loss spiral" and a "margin spiral".
- Describe and discuss "network risk".

Examiner's Report on Lehman, Appendix 8 (pages 1–49). Copy available at: www.GARPDigitalLibrary.org

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

- Describe the role of Lehman's risk committee .
- Discuss the functions and responsibilities of Lehman's risk management group.
- Discuss Lehman's policies on:
  - Funding adequacy controls
  - Transaction limits
  - Balance sheet limits
  - Stress tests
- Discuss the risk metrics used by Lehman, and identify where there were discrepancies between the metrics used for internal controls and those used for reporting .
- Explain the role of the Consolidated Supervised Entities Program and how it fit with the SEC's regulation of Lehman.
- Explain the situation arising from Lehman's public filings on "Other Measures of Risk".
- Discuss the inconsistencies brought forth regarding Lehman board's risk committee during the examination.

2011 FRM Committee Members

Dr. René Stulz (Chairman)	Ohio State University
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Richard Brandt	Citibank
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Hervé Geny	ICAP
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Kai Leifert, FRM®	Northern Trust Global Investments
Steve Lerit, CFA	New York Life Investment Management
William May	Global Association of Risk Professionals
Michelle McCarthy	Nuveen Investments
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About GARP | *The Global Association of Risk Professionals (GARP) is a not-for-profit global membership organization dedicated to preparing professionals and organizations to make better informed risk decisions. Membership represents over 150,000 risk management practitioners and researchers from banks, investment management firms, government agencies, academic institutions, and corporations from more than 195 countries. GARP administers the Financial Risk Manager (FRM®) and the Energy Risk Professional (ERP®) exams; certifications recognized by risk professionals worldwide. GARP also helps advance the role of risk management via comprehensive professional education and training for professionals of all levels. www.garp.org.*

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