

# Financial Economic Theory and Engineering Exam Spring 2012

## **Important Exam Information:**

Exam Date and Time	A read-through time will be given prior to the start of the exam—15 minutes in the morning session and 15 minutes in the afternoon session.
Exam Registration	Candidates may register online or with an application.
Order Study Notes	Study notes are part of the required syllabus and are not available electronically but may be purchased through the online store..
Introductory Study Note	The Introductory Study Note has a complete listing of all study notes as well as errata and other important information.
Case Study	This case study will also be provided with the examination. Candidates will not be allowed to bring their copy of the case study into the examination room.
Formula Package	A Formula Package will be provided with the exam. Please see the Introductory Study Note for more information.
Table	A cumulative normal distribution table will be provided with the exam
Past Exams	Past Exams from 2000-present are available on SOA web site.
Updates	Candidates should be sure to check the Updates page on the exam home page periodically for additional corrections or notices.
Overview	The Overview is intended to provide candidates with an approach for organizing the course of reading for studying the various sections of the syllabus.

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## Syllabus for Financial Economic Theory and Engineering Exam:

The candidate should be very familiar with the Learning Objectives as described in the syllabus. These Learning Objectives are the first ingredient in developing the syllabus and also guide the examination committee when writing questions. The Learning Objectives set out the cognitive level needed to pass this exam. You will notice that the candidates are expected to “analyze,” “explain,” “calculate,” “describe,” “apply,” etc. While studying the syllabus material, candidates may want to refer back to the Learning Objectives to remain focused on the goals of the exam.

### **1. Modern Corporate Financial Theory**

#### Overview: Definitions of Capital, Sources and Uses, and Optimal Structure

- a. Explain the various definitions of capital, including regulatory, rating agency and other risk-based capital requirements, the context in which they are appropriate, and how they affect decisions.

#### Cost of Capital

- b. Calculate the cost of capital for a venture or a firm using the most appropriate method for given circumstances and justify the choice of method.
- c. Evaluate various profitability measures including IRR, NPV and ROE, etc.

#### Economic Capital

- d. Define and compare risk metrics used to quantify economic capital and describe their limitations.
- e. Apply the concept of economic capital and describe methodologies for allocating capital within a financial organization.

#### Rating Agency Issues

- f. Explain how rating agencies affect the choice of capital structure.

#### Corporate Structure

- g. Recommend a specific legal form of organization and justify the choice.
- h. Recommend specific firm governance measures and justify the recommendation.
- i. Identify sources of agency costs and explain methods to address them.

### **Reading Materials:**

- *Financial Theory and Corporate Policy*, Copeland, Weston, Shastri, 4<sup>th</sup> Edition, 2005
  - Ch. 2: Investment Decisions: The Certainty Case
  - Ch. 9: Multi-period Capital Budgeting under Uncertainty: Real Options Analysis
  - Ch. 15: Capital Structure and the Cost of Capital: Theory and Evidence
  - Ch. 18: Acquisitions, Divestitures, Restructuring, and Corporate Governance, pp. 781-806
- FET-114-07: Capital Allocation in Financial Firms

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- FET-115-08: Specialty Guide on Economic Capital, 2004 (**exclude appendices**)
- FET-162-08: *Financial Markets and Corporate Strategy*, Grinblatt & Titman, 2<sup>nd</sup> Edition, Ch. 18: How Managerial Incentives Affect Financial Decisions
- FET-166-09: Megginson, W. L., *Corporate Finance Theory*, Ch. 2: Ownership, Control, and Compensation
- FET-170-09: Theory of Risk Capital in Financial Firms, by Merton & Perold
  
- CH. 9 CSFB Handbook, Risk Measures: How Long Is a Risky Piece of String?  
[https://www.credit-suisse.com/investment\\_banking/research/doc/credit\\_portfolio\\_modeling.pdf](https://www.credit-suisse.com/investment_banking/research/doc/credit_portfolio_modeling.pdf)
  
- Investor & Management Expectations of the Return on Equity Measure vs. Some Basic Truths of Financial Accounting, by Michelle D. Smith, *The Financial Reporter*, 9/03, <http://www.soa.org/library/newsletters/financial-reporter/2003/september/fm0309.pdf>
  
- Application of Coherent Risk Measures to Capital Requirements in Insurance”, Artzner, NAAJ, Vol 3, No 2 [http://www.soa.org/library/journals/north-american-actuarial-journal/1999/april/naaj9904\\_1.pdf](http://www.soa.org/library/journals/north-american-actuarial-journal/1999/april/naaj9904_1.pdf)

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**2. Corporate Financial Applications**

Sources of Capital

- a. Describe the steps necessary to obtain funds for a given project or firm from any specified source, and be able to recommend a specific approach to raising capital in a given situation.
- b. Describe the process, methods and uses of financial reinsurance (surplus relief) and recommend a structure that is appropriate for a given set of circumstances.
- c. Describe the process, methods and uses of insurance securitizations and recommend a structure that is appropriate for a given set of circumstances.

Uses of Capital

- d. Evaluate alternative options for utilizing capital and recommend the most appropriate use in a given situation.
- e. Apply real options analysis to recommend and evaluate firm decisions on capital utilization.
- f. Describe the process, methods and effects of a potential acquisition or reinsurance of a business including its effect on capital structure, return on equity, price/earnings multiples, and share price.

Optimal Capital Structure

- g. Recommend an optimal capital structure and how to implement it for a given business or strategy and be able to justify the recommendation.
- h. Describe how behavioral characteristics and biases of users and providers of capital affect the capital structure.

**Reading Materials:**

- *Financial Theory and Corporate Policy*, Copeland, Weston, Shastri, 4<sup>th</sup> Edition, 2005
  - Ch. 9: Multi-period Capital Budgeting under Uncertainty: Real Options Analysis
  - Ch. 15: Capital Structure and the Cost of Capital: Theory and Evidence
  - Ch. 16: Dividend Policy: Theory and Evidence
  - Ch. 18: Acquisitions, Divestitures, Restructuring, and Corporate Governance (pp. 781-806)
- *Insurance Industry Mergers & Acquisitions*, Toole and Herget, 2005
  - Ch. 1: Introduction background only
  - Ch. 2: M&A Process Overview background only
  - Ch. 3: Finance
  - Ch. 4: Valuation Techniques
- FET-108-07: *Integrated Risk Management*, Doherty, Ch. 13: Contingent Leverage Strategies and Hybrid Debt
- FET-148-08: Securitization of Life Insurance Assets and Liabilities
- FET-149-08: Are You Paying Too Much for That Acquisition?
- FET-151-08: Real and Illusory Value Creation by Insurance Companies, D. Babbel and C. Merrill, *Journal of Risk and Insurance*, 2005, Vol. 72, No.1, pp.1-21.

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- FET-160-08: Megginson, W. L., *Corporate Finance Theory*, FET: Ch. 9: Understanding and Accessing Financial Markets
- FET-161-08: Tiller & Tiller, *Life, Health and Annuity Reinsurance*, Ch. 5: Advanced Methods of Reinsurance
- FET-163-08: *Financial Markets and Corporate Strategy*, 2<sup>nd</sup> Edition, Grinblatt & Titman, Ch. 19: The Information Conveyed by Financial Decisions
- FET-165-08: *Integrated Risk Management*, Doherty, Ch. 16: A Case Study: The Securitization of Catastrophic Risk

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## 3. Derivatives, Pricing and Modeling

The candidate will be able to:

- a. Define the cash flow characteristics of complex derivatives including exotic options, interest rate derivatives, swaps, and other non traditional derivatives.
- b. Evaluate the risk/return characteristics of complex derivatives.
- c. Identify embedded options in assets and liabilities.
- d. Evaluate the impact of embedded options on risk/return characteristics of assets and liabilities.
- e. Derive the Black Scholes Merton pricing formula.
- f. Demonstrate understanding of option pricing techniques and theory for equity and interest rate derivatives.
- g. Identify limitations of each option pricing technique.
- h. Describe and evaluate equity and interest rate models
- i. Contrast commonly used equity and interest rate models
- j. Define and apply the concepts of martingale, market price of risk and measures in single and multiple state variable contexts
- k. Describe and apply alternatives to the Black-Scholes-Merton model
- l. Recommend an equity or interest rate model for a given situation
- m. Describe issues and best practices in the estimation or calibration of financial models
- n. Describe how option pricing models can be modified or alternative techniques that can be used to deal with option pricing techniques' limitations.
- o. Use numerical methods to effectively model complex assets or liabilities.
- p. Understand the differences and implications of P Measures and Q Measures

### Reading Materials:

- *Options Futures & Other Derivatives, Hull, J.C., 8<sup>th</sup> Edition, 2012*
  - Ch. 12: Binomial Trees (12.1 – 12.7 and 12.9 – 12.11 only, exclude Appendix) (*background only*)
  - Ch. 13: Wiener Processes and Ito's Lemma (Appendix, exclude multivariate material)
  - Ch. 14: The Black-Scholes-Merton model
  - Ch. 18: Greek Letters
  - Ch. 19: Volatility Smiles
  - Ch. 20: Basic Numerical Procedures
  - Ch. 22: Estimating Volatilities and Correlations (22.1 – 22.7 only)
  - Ch. 25: Exotic Options (25.1, 25.2, 25.4, 25.6 – 25.8, 25.10 – 25.16 only)
  - Ch. 26: More on Models and Numerical Procedures (26.1 (*excluding page 602 from "Models such as Merton's..." to page 603 before "The Variance-Gamma Model"*), 26.2, 26.3 only)
  - Ch. 27: Martingales and Measures
  - Ch. 28: Interest Rate Derivatives: The Standard Market Models
  - Ch. 29: Convexity, Timing, and Quanto Adjustments
  - Ch. 30: Interest Rate Derivatives: Models of the Short Rate (exclude 30.2 properties of Vasicek and CIR, exclude 30.3 BDT and Black-Karasinski)
  - Ch. 31: Interest Rate Derivatives: HJM and LMM

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- Ch. 32: Swaps Revisited

**OR, Candidates may use the 7<sup>th</sup> Edition. The references for the 7<sup>th</sup> Edition follow:**

- *Options Futures & Other Derivatives, Hull, J.C., 7<sup>th</sup> Edition, 2008*
  - Ch. 11: Binomial Trees (*background only*)
  - Ch. 12: Wiener Processes and Ito's Lemma
  - Ch. 13: The Black-Scholes-Merton model
  - Ch. 17: Greek Letters
  - Ch. 18: Volatility Smiles
  - Ch. 19: Basic Numerical Procedures
  - Ch. 21: Estimating Volatilities and Correlations
  - Ch. 24: Exotic Options (exclude 24.9)
  - Ch. 26: More on Models and Numerical Procedures (26.1, 26.2, 26.3 only)
  - Ch. 27: Martingales and Measures (27.1 to 27.8 only)
  - Ch. 28: Interest Rate Derivatives: The Standard Market Models (note: page 658,  $92/360 = 0.2556$ )
  - Ch. 29: Convexity, Timing, and Quanto Adjustments
  - Ch. 30: Interest Rate Derivatives: Models of the Short Rate (exclude formula 30.9 30.3 Black-Karasinski section)
  - Ch. 31: Interest Rate Derivatives: HJM and LMM
  - Ch. 32: Swaps Revisited
- *Investment Guarantees: Modeling and Risk Management for Equity-Linked Life Insurance, Hardy, 2003*
  - Ch. 2: Modeling Long-Term Stock Returns
  - Ch. 3: Maximum Likelihood Estimation of Stock Returns
  - Ch. 8: Dynamic hedging for separate account guarantees
- FET-106-07: Ho & Lee, *The Oxford Guide to Financial Modeling*, Ch. 5: Interest Rate Derivatives: Interest Rate Models and Ch. 6: Implied Volatility Surface: Calibrating the Models, **background only**
- FET-153-08: What Does An Option Pricing Model Tell Us About Option Prices?
- FET-158-09: Babbal & Fabozzi, *Investment Management for Insurers*, Ch. 11: "The Four Faces of an Interest Rate Model", by Fitton & McNatt
- FET-167-09: How to Use the Holes in Black-Scholes by Black, F.
- FET-169-09: "Empirical Properties of Asset Returns: Stylized Facts and Statistical Issues" by Rama Cont, *Quantitative Finance Volume 1 (2001)* 223–236
- FET-174-10: *Stochastic Calculus for Finance 1: The Binomial Asset Pricing Model* Shreve, **background only**, Ch.1, pp. 1-15, Ch.2, pp. 25-45, Ch.3, pp. 61-71
- Variance of the CTE Estimator by Manistre and Hancock, NAAJ, April, 2005  
<http://www.soa.org/news-and-publications/publications/journals/naaj/naaj-april-2005.aspx>

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### 4. Efficient and Inefficient Markets, Complete and Incomplete Markets, Information Theory & Market Misbehavior

- a. Define capital market efficiency and the value of information.
- b. Describe tests of efficiency and their implications for capital structure, portfolio management, and risk management.
- c. Describe empirical evidence and results regarding market efficiency.
- d. Explain information asymmetry and how it can affect financial markets, especially insurance markets.
- e. Define principal-agency theory and explain how it affects capital structure, portfolio management and risk management.
- f. Explain the implications of incomplete markets for financial theory.

### Reading Materials:

- *Financial Theory and Corporate Policy*, Copeland, Weston, Shastri, 4<sup>th</sup> Edition,
  - Ch. 6: Market Equilibrium: CAPM and APT (pp. 164-188)
  - Ch. 10: Efficient Capital Markets: Theory
  - Ch. 11: Efficient Capital Markets: Evidence
  - Ch. 12: Information Asymmetry and Agency Theory
  - Ch. 15: Capital Structure and the Cost of Capital: Theory and Evidence
  - Ch. 16: Dividend Policy: Theory and Empirical Evidence
- FET-175:10: Models, by Derman, E., *Financial Analysts Journal*, 2009
- FET-176-11: *Handbook of Economics of Finance*, Vol. 1, Part 2, Ch. 18, A Survey of Behavioral Finance - Barberis and Thaler
- FET-177-11: The Known, the Unknown and the Unknowable in Financial Risk Management, by Diebold et. al
  - Chapter 3: Mild and Wild Randomness