Advanced Finance/ERM Exam
Spring 2011

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.
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.

Topic: Risk Categories and Identification

Learning Objective:

1. **The candidate will understand the types of risks faced by an entity and be able to identify and analyze those risks.**

Learning Outcomes:

The candidate will be able to:

a) Identify and analyze financial market risks faced by an entity, including but not limited to: currency risk, credit risk, spread risk, liquidity risk, interest rate risk, and equity risk.

b) Identify and analyze insurance risks faced by an entity, including but not limited to: mortality risk, morbidity risk, catastrophe risk, product risk, and embedded options.

c) Identify and analyze operational risks faced by an entity, including but not limited to:
- Market Conduct (e.g., sales practices)
- HR risk, e.g., productivity, talent management, employee conduct
- Process risk, e.g., supply chain, R&D
- Technology risk, e.g., reliability, external attack, internal attack
- Judicial risk, e.g., litigation
- Compliance risk, e.g., financial reporting
- Internal and External fraud
- Execution risk
- Governance risk
- Supplier/partner risk
- Disaster risk, e.g., natural disaster, man-made disaster

d) Identify and analyze strategic risks faced by an entity including, but not limited to
- Product sustainability risk
- Distribution sustainability risk
- Consumer preferences and demographics
- Geopolitical risk
- Competitor risk
- External relations risk
- Legislative/Regulatory risk
- Reputation Risk
- Sovereign risk

RESOURCES

Hardy, *Investment Guarantees*, 2003
Ch. 1, Investment Guarantees
Ch. 6, Modeling the Guarantee Liability

Tilman, *Asset/Liability Management of Financial Institutions*, 2003
Ch. 1, The Task of Asset/Liability Management, by L. Tilman
Ch. 16, Understanding Options Embedded in Insurers' Balance Sheets, by L. Rubin

FE-C102-07: General American Life Can't Pay Investors, Looks at Suitors
FE-C104-07: Insurance OP Risk: The Big Unknown
FE-C106-07: Mapping of Life Insurance Risks, AAA Report to NAIC
FE-C137-07: Moody's Looks at Risk Management and the New Life Insurance Risks
FE-C154-09: Life Insurance Pricing and the Measurement of the Duration of Liabilities
FE-C151-08: Ch. 13 (Sections 13.1 – 13.4), Annuity and Investment Products of Atkinson & Dallas, *Life Insurance Products and Finance*
FE-C153-09: Variable Annuity – "No Loss" Propositions
FE-C159-09: Countering the Biggest Risk of All, by Slywotzky and Drzik - Harvard Business Review, April 2005
FE-C160-09: Moody's Looks at Terrorism Risk in the U. S. Life Insurance Industry, February 2006
FE-C169-09: Ch. 3, Pricing Assumptions of Atkinson & Dallas, *Life Insurance Products and Finance*

Influenza Pandemics: Are We Ready for the Next One, by Max Rudolph, Risk Management section newsletter, July 2004 http://www.soa.org/library/newsletters/risk-management-newsletter/2004/july/rm-2004-iss02-rudolph.pdf

Fixed Annuities in a Low Interest Rate Environment, Product Development newsletter, April 2003 http://www.soa.org/library/newsletters/product-development-news/2003/april/pdn0304.pdf

Managing Variable Policyholder Behavior Risk, Product Development newsletter, March 2005 http://www.soa.org/library/newsletters/product-development-news/2005/march/pdn0503.pdf

Death Benefit Focused UL, Product Development section newsletter, April 2003
http://www.soa.org/library/newsletters/product-development-news/2003/april/pdn0304.pdf

Whither the Variable Annuity, Product Development section newsletter, November 2003
http://www.soa.org/library/newsletters/product-development-news/2003/november/pdn0311.pdf

Operational and Reputational Risks: Essential Components of ERM", by M. Rochette, Risk Management, December 2006.
http://www.soa.org/library/newsletters/risk-management-newsletter/2006/december/RMN0612.pdf

Enterprise Risk Management Specialty Guide, SOA 2006
http://www.soa.org/library/professional-actuarial-specialty-guides/enterprise-risk-

management/2005/august/spg0605erm.pdf

Topic: Accounting and Value Measures

Learning Objective:

2. The candidate will understand measures of corporate value and be able to analyze the data in corporate financial statements.

Learning Outcomes:

The candidate will be able to:

a) Explain basic accounting concepts used in producing financial statements:
   - in insurance companies
   - in other financial institutions
   - in non-financial institutions

b) Analyze a specific company financial situation by demonstrating advanced knowledge of balance sheet and income statement structures.

c) Describe the concept of economic measures of value (e.g. EVA; embedded value) and demonstrate their uses in the risk management and corporate decision-making processes.

d) Demonstrate how to calculate required capital on an economic capital basis:
   - Define the basic elements and explain the uses of economic capital.
   - Explain the challenges and limits of economic capital calculations and explain how economic capital may differ from external requirements of rating agencies and regulators.
   - Demonstrate the ability to develop an economic capital model for a representative financial firm.

<u>RESOURCES</u>

Fridson, Alvarez, *Financial Statement Analysis: A Practitioners Guide*, 2002
Ch. 1, The Adversarial Nature of Financial Reporting
Ch. 13, Credit Analysis
Background only:
Ch. 2, The Balance Sheet
Ch. 3, The Income Statement
Ch. 4, The Statement of Cash Flows

Tilman, *Asset/Liability Management of Financial Institutions*, 2003
Ch. 24, Accounting Standards and Requirements, by E. Habayeh & S. Sethi

FE-C149-07: Use of Stochastic Techniques to Value Liabilities under Canadian GAAP
FE-C162-09: "EVA and Strategy"
FE-C163-09: "Modern Valuation Techniques," Staple Inn Actuarial Society, February 2001

Fair Value – Financial Economics Perspective by Babbel, Gold and Merrill, NAAJ, http://www.soa.org/library/journals/north-american-actuarial-journal/2002/january/naaj0201_2.pdf

Fair Valuation of Insurance Liabilities: Principles and Methods" AAA Monograph, September 2002 http://www.actuary.org/pdf/finreport/fairval_sept02.pdf

An Overview of Embedded Value, H. Mueller, Financial Reporter, Sept. 2003. http://www.soa.org/library/newsletters/financial-reporter/2003/november/frn-2003-iss55-mueller.pdf

Economic Capital for Life Insurance Companies, SOA Monograph, 2008 http://www.soa.org/files/pdf/research-ec-report.pdf

Topic: Risk Quantification and Risk Measures

Learning Objective:

3. The candidate will understand how the financial risks faced by an entity can be quantified and the use of metrics to measure risk.

Learning Outcomes:

The candidate will be able to:

a) Demonstrate the use of risk metrics to quantify major types of risk exposure in the context of an integrated risk management process.
   - Demonstrate how each of the financial risks faced by an entity can be amenable to quantitative analysis including an explanation of the advantages and disadvantages of various techniques such as Value at Risk (VaR), stochastic analysis, scenario analysis and stress testing.
   - Describe and evaluate risk aggregation techniques, incorporating the use of correlation, integrated risk distributions and copulas.
   - Describe how and why risks are correlated, and give examples of risks that are positively correlated and risks that are negatively correlated.
   - Assess the overall corporate risk exposure arising from financial and non-financial risks.

b) Evaluate the properties of risk measures and explain their limitations.

c) Define and evaluate model and parameter risk

RESOURCES:

Crouhy, Galai, & Mark, *Risk Management*, 2001
- Ch. 5, Measuring Market Risk: The VaR Approach
- Ch. 6, Measuring Market Risk: Extensions of the VaR Approach and Testing the Models
- Ch. 15, Model Risk

Hardy, *Investment Guarantees,* 2003,
- Ch. 9, Risk Measures
- Ch. 10, Emerging Cost Analysis
- Ch. 11, Forecast Uncertainty

FE-C142-07: "Theory and Practice of Model Risk Management," Ricardo Rebonato

FE-C143-07: Dynamic Financial Models of Property-Casualty Insurers

FE-C166-09: "Black Monday and Black Swans," J. Bogle, Financial Analysts Journal, 64:2(30-40) 2008

CSFB Credit Portfolio Modeling Handbook –
- Ch. 2, The Default/No-Default World and Factor Model
- Ch. 4, Demystifying Copulas

Ch. 9, Risk Measures: How Long Is a Risky Piece of String?
http://www.csfb.com/institutional/research/CreditPortfolioModeling.pdf

Actuaries, Stochasticity and Risk Management: The Real Lessons of Long-term Capital Management", B. Crompton, The Actuary, September 2007.

http://www.soa.org/library/newsletters/the-actuary-magazine/2007/august/act2007aug.aspx

Risk Aggregation for Capital Requirements Using the Copula Technique", Song Zhang, Risk Management Newsletter, March 2005, Issue #4

http://www.soa.org/library/newsletters/risk-management-newsletter/2005/march/rmn0503.pdf

Topic: Risk Management

Learning Objective:

4. The candidate will understand the means available for managing various risks and how an entity makes decisions about appropriate techniques.

Learning Outcomes:

The candidate will be able to:

General

a. Explain the rationale for managing risk and demonstrate the selection of the appropriate risk retention level.

b. Demonstrate means for transferring risk to a third party, and analyze the costs and benefits of doing so.

c. Demonstrate means for reducing risk without transferring it (internal hedges).

d. Evaluate the performance of risk transference activities.

e. Describe and evaluate risk management techniques that can be used to deal with financial and non-financial risks.

f. Develop an appropriate choice of hedging strategy for a given situation (e.g., reinsurance, derivatives, financial contracting), which balances benefits with inherent costs, including exposure to credit risk, basis risk, moral hazard, and other risks.

Asset Liability Management

g. Analyze funding and portfolio management strategies to control equity and interest rate risk, including key rate risks.
   - Contrast modified duration and effective duration measures.
   - Calculate effective duration and effective key-rate durations of a portfolio.
   - Explain the concepts of immunization including modern refinements and practical limitations.

h. Demonstrate how derivatives, synthetic securities, and financial contracting may be used to manage interest rate risk, including key rate risks.

i. Demonstrate how derivatives, synthetic securities, and financial contracting may be used to manage equity risk, in particular, equity market guarantees found in variable annuities.

j. Analyze the practicalities of market risk hedging, including dynamic hedging.

Credit Risk Management

k. Define and evaluate credit risk as related to fixed income securities.

l. Define and evaluate spread risk as related to fixed income securities

m. Explain how to incorporate best practices in credit risk measurement, modeling, and management.

n. Define credit risk as related to derivatives, define credit risk as related to reinsurance ceded, define counter-party risk and demonstrate the use of comprehensive due diligence and aggregate counter-party exposure limits.

o. Describe and evaluate risk mitigation techniques and practices: credit derivatives, diversification, concentration limits, and credit support agreements.

Liquidity Risk Management

p. Define liquidity risk.

q. Explain methods for managing this risk, both pre-event and post-event.

r. Evaluate examples of company disasters that were the result of these types of risks – what the exposure was, what occurred, the sequence of events, what actions management took, didn't take and could have / should have taken, what the financial impacts and general consequences were.

Strategic Risk Management

s. Define strategic risk

t. Explain methods for managing this risk, both pre-event and post-event

u. Evaluate examples of company disasters that were the result of these types of risks – what the exposure was, what occurred, the sequence of events, what actions management took, didn't take and could have / should have taken, what the financial impacts and general consequences were.

Operational Risk Management

v. Define operational risk

w. Explain methods for managing this risk, both pre-event and post-event

x. Evaluate examples of company disasters that were the result of these types of risks – what the exposure was, what occurred, the sequence of events, what actions management took, didn't take and could have / should have taken, what the financial impacts and general consequences were

RESOURCES

Crouhy, Galai, & Mark, *Risk Management*, 2001
- Ch. 7, Credit Rating Systems
- Ch. 8, Credit Migration Approach to Measuring Credit Risk
- Ch. 9, The Contingent Claim Approach to Measuring Credit Risk
- Ch. 10, Other Approaches: The Actuarial and Reduced-Form Approaches to Measuring Credit Risk
- Ch. 12, Hedging Credit Risk
- Ch. 13, Managing Operational Risk

Damoradan, Strategic Risk-Taking, 2007
- Ch. 9, Risk Management: The Big Picture
- Ch. 10, Risk Management: Profiling and Hedging
- Ch. 11, Strategic Risk Management
- Ch. 12, Risk Management: First Principle

Hardy, *Investment Guarantees*, 2003,

Ch. 8, Dynamic Hedging for Separate Account Guarantees
Ch. 12, Guaranteed Annuity Options

Tiller, *Life, Health and Annuity Reinsurance*, 3rd Edition, 2005,
Ch. 5, Advanced Methods of Reinsurance
Ch. 16, Assumption
Ch. 17, Special Purpose Reinsurance Companies

Tilman, *Asset/Liability Management of Financial Institutions*, 2003,

Ch. 9, Measuring and Marking Counterparty Risk, by E. Canabarro & D. Duffie

Ch. 25, Implications of Regulatory and Accounting Requirements for Asset/Liability Management Decisions, by Hida, Habayeb, Yetis, & Sethi.

FE-C102-07: General American Life Can't Pay Investors, Looks at Suitors
FE-C117-07: Doherty, *Integrated Risk Management*,
Ch. 1, The Convergence of Insurance Risk Management & Financial Risk Management
Ch. 7, Why Is Risk Costly to a Firm?
Ch. 8, Risk Management Strategy: Duality and Globality
FE-C118-07: Securitization of Life Insurance Assets and Liabilities
FE-C127-07: Asset Liability Management for Insurers
FE-C128-07: Asset/ Liability Management, IASA Handbook
FE-C129-07: Principles for the Management of Interest Rate Risk
FE-C130-07: Hedging with Derivatives in Traditional Insurance Products
FE-C135-07: Financial Oversight of Enron: The SEC and Private-Sector Watchdogs (pp. 97-127 only)
FE-C141-07. Letter to SEC Regarding Fitch Ratings' View on the Role and Function of Rating Agencies in the Operation of Securities
FE-C145-07: Dynamic Financial Condition Analysis Handbook, Ch. 1 (background only), 8 and Appendix A
FE-C147-07: Derivatives: Practice and Principles, Recommendations 9-24 and Section III
FE-C155-09: Babbel & Fabozzi, *Investment Management for Insurers*, 1999
Ch. 1, "Risk Management by Insurers: An Analysis of the Process", Babbel & Santomero
FE-C156-09: Key Rate Durations: Measures of Interest Rate Risks
FE-C157-09: Long-Term Economic and Market Trends and Their Implications for Asset-Liability Management of Insurance Companies
FE-C158-09: Variable Product Hedging Practical Considerations
FE-C167-09: Hedging the Bet: Variable Annuity "Bells and Whistles", Moody's October 2005
FE-C168-09: C. Smithson, Credit Portfolio Management
Ch. 1, The Revolution in Credit – Capital Is the Key
FE-C170-09: "Why COSO Is Flawed," by A. Samed-Khan, www.operationalriskonline.com, January 2005
FE-C174-10: Deciphering the Liquidity and Credit Crunch 2007-2008, Brunnermeier

Liquidity Risk Measurement, CIA Educational Note
http://www.actuaries.ca/members/publications/1996/9626e.pdf

Topic: Enterprise Risk Management Framework

Learning Objective:

5. **The candidate will understand the components of an ERM framework and be able to evaluate the appropriateness of a framework in a given situation.**

Learning Outcomes:
The candidate will be able to:

a. Define Enterprise Risk Management and explain the principal terms used in ERM.

b. Describe the fundamental concepts of financial and non-financial risk management and evaluate a particular given risk-management framework.

c. Demonstrate how an organization can create a risk management culture including: risk consciousness, accountabilities, discipline, collaboration, incentives, and communication.

d. Explain the elements of risk governance, and demonstrate how governance issues are resolved through organizational structure.

e. Compare and contrast various regulatory/industry frameworks: Basle II, Sarbanes-Oxley Act, OSFI Supervisory Framework, OSFI Standard of Sound Financial and Business Practices, UK FSA guidelines, and COSO.

f. Explain the perspectives of regulators, rating agencies, stock analysts, and company stakeholders and how they evaluate the risks and the risk management of an organization.

<u>RESOURCES</u>

Crouhy, Galai, & Mark, *Risk Management,* 2001,
- Ch. 2, The New Regulatory and Corporate Environment"
- Ch. 3, Structuring and Managing the Risk Management Function in a Bank
- Ch. 17, Risk Management in the Future

FE-C117-07: Doherty, *Integrated Risk Managemen*t,
- Ch. 1, The Convergence of Insurance Risk Management & Financial Risk Management
- Ch. 7, Why Is Risk Costly to a Firm?
- Ch. 8, Risk Management Strategy: Duality and Globality

FE-C129-07: Principles for the Management of Interest Rate Risk
FE-C133-07: Internal Control – Guidance for Directors on the Combined Code
FE-C134-07: Supervisory Framework – 1999 and Beyond (OSFI – Canadian)
FE-C139-07: No Assurance of Good Governance: Observations on Corporate Governance in the U.S. Insurance Sector
FE-C171-09: Insurance Criteria: Refining the Focus of Insurer Enterprise Risk Management Criteria, Standard & Poor's, June 2006
FE-C172-09: Enterprise Risk Management – Integrated Framework: Executive Summary, COSO, September 2004
FE-C173-09: Risk Management and the Rating Process for Insurance Companies, Best Rating Methodology, January 2008

"Actuarial Aspects of SOX 404", The Financial Reporter, Dec. 2004,
http://www.soa.org/library/newsletters/financial-reporter/2004/december/frn-2004-iss59-

brownehay.pdf

"Responsibilities of the Actuary for Communicating Sarbanes-Oxley Controls" The Financial Reporter, Dec. 2004, http://www.soa.org/library/newsletters/financial-reporter/2004/december/frn-2004-iss59-auvinen.pdf

Enterprise Risk Management Specialty Guide, SOA 2006 http://www.soa.org/library/professional-actuarial-specialty-guides/enterprise-risk-management/2005/august/spg0605erm.pdf

Topic: Enterprise Risk Management Process

Learning Objective:

6. **The candidate will understand the structure of an ERM process in an entity and be able to demonstrate best practices in enterprise risk management.**

Learning Outcomes:
The candidate will be able to:

a. Demonstrate the ERM process steps to be followed once the ERM framework is in place:
   - Risk identification
      i. Defining and categorizing risk
      ii. Qualitative risk assessments
   - Risk quantification
      i. Scenario development / types of scenarios
      ii. Individual risk quantification, including inherent vs. residual exposures
      iii. Quantifying enterprise risk exposure, including correlations of risks
   - Risk management
      i. Defining risk appetite
      ii. Managing enterprise risk exposure towards risk appetite
   - Internal reporting
      i. Performance measurement
      ii. Performance management and incentive compensation
   - External disclosures
      i. Shareholders
      ii. Rating agencies
      iii. Regulators

b. Assess how risk and opportunity influence the selection of a firm's vision and strategy and demonstrate how ERM can be appropriately embedded in an entity's strategic planning.

c. Articulate risk objectives; demonstrate how to define and measure an organization's risk appetite; and demonstrate how an organization uses risk appetite to make strategic decisions.

d. Determine a desired risk profile and appropriate risk filters, and analyze the risk and return trade-offs that result from changes in the organization's risk profile.

e. Demonstrate how ERM is able to contribute to shareholder value creation and how the performance of a given firm or venture may be evaluated against its objectives including total returns.

f. Demonstrate how risk metrics can be incorporated into the risk monitoring function as part of an ERM framework.

g. Explain means for managing risks and demonstrate measures for evaluating their effectiveness.

h. Describe and assess the elements of a successful risk management function and recommend a structure for an organization's risk management function.

RESOURCES:

Crouhy, Galai, & Mark, *Risk Management,* 2001,
- Ch. 3, Structuring and Managing the Risk Management Function in a Bank
- Ch. 13, Managing Operational Risk
- Ch. 14, Capital Allocation and Performance Measurement

Hardy, *Investment Guarantees*, 2003
- Ch. 6, Modeling the Guarantee Liability
- Ch. 9, Risk Measures
- Ch. 12, Guaranteed Annuity Options

FE-C117-07: Doherty, *Integrated Risk Managemen*t,
- Ch. 7, Why Is Risk Costly to Firms?
- Ch. 8, Risk Management Strategy: Duality and Globality

FE-C124-07: Performance Measurement Using Transfer Pricing, M. Wallace
FE-C125-07: Total Return Approach to Performance Measurement
FE-C133-07: Internal Control – Guidance for Directors on the Combined Code
FE-C138-07: Managing the Invisible: Measuring Risk, Managing Capital, Maximizing Value, Panning
FE-C140-07: Risk Measurement, Risk Management and Capital Adequacy in Financial Conglomerates (exclude appendices)
FE-C143-07: Dynamic Financial Models of Property-Casualty Insurers
FE-C145-07: Dynamic Financial Condition Analysis Handbook, Ch. 1 (background only), Ch. 8 and Appendix A
FE-C171-09: Insurance Criteria: Refining the Focus of Insurer Enterprise Risk Management Criteria, Standard & Poor's, June 2006

Risk Management: The Total Return Approach and Beyond, Ho, Risk Management Newsletter, November, 2004, Issue #3
http://www.soa.org/library/newsletters/risk-management-newsletter/2004/november/rmn0411.pdf

Enterprise Risk Management Specialty Guide, SOA 2006
http://www.soa.org/library/professional-actuarial-specialty-guides/enterprise-risk-management/2005/august/spg0605erm.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