



## **2017 FRM EXAM TRAINING SYLLABUS**

### **PART I**

#### **Introduction to Financial Mathematics**

1. Introduction to Financial Calculus
  - a. Variables – Discrete and Continuous
  - b. Univariate and Multivariate Functions – Dependent variable and Independent variable
  - c. Physical representation of a function
  - d. Linear and Non-Linear functions
  - e. Limits of a function
  - f. The number e and Natural Logarithm
  - g. Differential Calculus – Differentiation, Interpretation - Slope of a tangent, using derivatives to calculate function values and deltas. Linear functions - 1<sup>st</sup> order derivative. Non-linear functions – 1<sup>st</sup> and higher order derivatives, interpretations and usage. Rules of derivatives.
  - h. Functions – Differentiation and Taylor Series Expansion
  - i. Introduction to Partial Derivatives
  - j. Introduction to Integral Calculus
2. Introduction to Bond Mathematics
  - a. Finance and the Time Value of Money
  - b. Concept of Zero Coupon (Discount) Bonds and Coupon Bonds.
  - c. Bond Characteristics
  - d. Bond Types – Fixed Rate, Floating Rate, Inverse Floater Rate, etc.
  - e. Interest Rates – Discrete and Continuous Compounding
  - f. Bond Pricing – using ZCYC or YTM with discrete compounding or continuous compounding
  - g. Difference between bond coupon rate and bond yield
  - h. Calculating Bond Yield (YTM, CY, MMY, ZCY/Spot, Par Yield, etc.)
  - i. Price Yield Relationship

#### **Introduction to Financial Statistics**

1. Introduction to Financial Statistics
    - a. Frequency distributions
    - b. Measures of Central Tendency/Location (Mean/Mode/Median)
    - c. Dispersion, Measures of Dispersion (Variance/SD/Quartiles/Percentiles/Ranges) and its relevance to Risk Management
    - d. Correlations
  2. Introduction to Probability Theory
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- a. Random variables
- b. Probability and its uses
- c. Probability Rules
- d. Conditional Probabilities
- e. Probability Distributions (Single Variable)
  - i. Continuous Time/Discrete Time; Continuous Value/ Discrete Value
  - ii. Probability Mass Function
  - iii. Probability Density Function
  - iv. Cumulative Distribution Function
  - v. Applications and relevance in Risk Management
- f. Mathematical Expectation
- g. Moments of Distribution (Mean, Variance, Skewness, Kurtosis), Central Moments, Standardized Moments

## **Quantitative Analysis**

1. Discrete and continuous probability distributions
2. Estimating the parameters of distributions
3. Population and sample statistics
4. Bayesian analysis
5. Statistical inference and hypothesis testing
6. Correlations and copulas
7. Estimating correlation and volatility using EWMA and GARCH models
8. Volatility term structures
9. Linear regression with single and multiple regressors
10. Time series analysis
11. Simulation methods

## **Foundations of Risk Management**

1. Basic risk types, measurement and management tools
  2. Creating value with risk management
  3. The role of risk management in corporate governance
  4. Enterprise Risk Management (ERM)
  5. Financial disasters and risk management failures
  6. The Capital Asset Pricing Model (CAPM)
  7. Risk-adjusted performance measurement
  8. Multi-factor models
  9. Data aggregation and risk reporting
  10. Ethics and the GARP Code of Conduct
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## **Financial Markets and Products**

1. Structure and mechanics of OTC and exchange markets
2. Structure, mechanics, and valuation of forwards, futures, swaps and options
3. Hedging with derivatives
4. Interest rates and measures of interest rate sensitivity
5. Foreign exchange risk
6. Corporate bonds
7. Mortgage-backed securities
8. Rating agencies

## **Valuation and Risk Modeling**

1. Value-at-Risk (VaR)
  2. Expected shortfall (ES)
  3. Stress testing and scenario analysis
  4. Option valuation
  5. Fixed income valuation
  6. Hedging
  7. Country and sovereign risk models and management
  8. External and internal credit ratings
  9. Expected and unexpected losses
  10. Operational risk
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## **PART II**

### **Market Risk Measurement and Management**

1. VaR and other risk measures
  - a. Parametric and non-parametric methods of estimation
  - b. VaR mapping
  - c. Backtesting VaR
  - d. Expected shortfall (ES) and other coherent risk measures
2. Modeling dependence: Correlations and copulas
3. Term structure models of interest rates
4. Discount rate selection
5. Volatility: Smiles and term structures

### **Credit Risk Measurement and Management**

1. Credit analysis
2. Default risk: Quantitative methodologies
3. Expected and unexpected loss
4. Credit VaR
5. Counterparty risk
6. Credit derivatives
7. Structured finance and securitization

### **Operational and Integrated Risk Management**

1. Principles for sound operational risk management
  2. Enterprise Risk Management (ERM)
  3. Risk appetite frameworks and IT infrastructure
  4. Information risk and data quality management
  5. Internal and external operational loss data
  6. Modeling operational loss distributions
  7. Extreme value theory (EVT)
  8. Validating models
  9. Benchmarking models
  10. Model risk
  11. Risk-adjusted return on capital (RAROC)
  12. Economic capital frameworks and capital allocation
  13. Liquidity risk:
  14. Failure mechanics of dealer banks
  15. Stress testing banks
  16. Outsourcing Risk
  17. Regulation and the Basel Accords
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## **Risk Management and Investment Management**

1. Portfolio construction
2. Portfolio risk measures
3. Risk budgeting
4. Risk monitoring and performance measurement
5. Portfolio-based performance analysis
6. Hedge funds

## **Current Issues In Financial Markets**

1. Bitcoin and virtual currencies
  2. Market and funding liquidity
  3. Algorithmic trading and fixed income market algorithmic trading
  4. Negative policy rates
  5. Emerging economies and corporate debt
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