



## **2018 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. Structures and functions of financial institutions
2. Structure and mechanics of OTC and exchange markets
3. Structure, mechanics, and valuation of forwards, futures, swaps and options
4. Hedging with derivatives
5. Interest rates and measures of interest rate sensitivity
6. Foreign exchange risk
7. Corporate bonds
8. Mortgage-backed securities

## **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. 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) and enterprise-wide risk governance
  3. IT infrastructure and data quality
  4. Internal and external operational loss data
  5. Methods of determining operational risk capital
  6. Model risk and model validation
  7. Extreme value theory (EVT)
  8. Risk-adjusted return on capital (RAROC)
  9. Economic capital frameworks and capital planning
  10. Liquidity risk measurement and management
  11. Failure mechanics of dealer banks
  12. Stress testing banks
  13. Third-party outsourcing risk
  14. Risks related to money laundering and financing of terrorism
  15. Regulation and the Basel Accords
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## **Risk Management and Investment Management**

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

## **Current Issues In Financial Markets**

1. Credit loss provisioning, IFRS 9/CECL
  2. Machine learning and “big data”
  3. Central clearing and risk transformation
  4. The failure of covered interest rate parity
  5. FinTech credit
  6. Corporate culture
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