

FINANCIAL MODELING AND DERIVATIVES

Learning Objective: To equip students with principles and techniques of Complex Derivatives like Greeks & Exotic Options and Financial modeling to enable them to apply these techniques to financial analysis and decision making.

Course Contents:

Unit I

Lectures: 12

Introduction: Financial Time Series and Their Characteristics: Asset Returns; Distributional Properties of Returns; Review of Statistical Distributions and Their Moments, Distributions of Returns, Multivariate Returns, Likelihood Function of Returns and Empirical Properties of Returns

Unit II

Lectures: 12

Linear Time Series Analysis and Its Applications: Stationarity; Correlation and Autocorrelation Function; White Noise and Linear Time Series; Simple Autoregressive Models, Properties of AR Models, Goodness of Fit; Forecasting.

Unit III

Lectures: 13

Stochastic Processes: Concept of Stochastic Process, A time series, Distribution, Gaussian Process, Expectations and Covariance function, Dependence structure, Homogeneous Poisson process; Brownian motion, Path properties: Non differentiability and Unbounded Variation; Geometric Brownian Motion; Martingales (only properties); Binomial Processes; General Random Walks; Geometric Random Walks

Unit IV

Lectures: 10

The Greek Letters: A Stop Loss strategy; Delta Hedging, Delta of European Stock Options; Delta of a portfolio; Theta of a portfolio; Gamma: Making a portfolio Gamma Neutral, calculation of Gamma, relationship between Delta, Theta and Gamma; Vega and its calculation; Rho; Portfolio Insurance; Stock market Volatility.

Unit V

Lectures: 9

Credit Derivatives: Credit ratings, Default intensities, recovery rates, estimating default probabilities from bond prices; Credit Default Swaps (CDS), Valuation of CDS; MTM a CDS; Binary CDS; Credit Indices.

Text Books:

1. Ruey S. Tsay (2005). *Analysis of Financial Time Series* (2nd ed.). John Wiley.
2. John C. Hull. *Options, Futures and Other Derivatives* (7th ed.). Pearson Education.

References:

1. Jurgen Franke, Wolfgang Hardle and Christian Hafner. *Introduction to Statistics of Financial Markets*.
2. R. Madhumathi, M. Ranganatham. *Derivatives and risk management* (1st ed.)
3. Redhead, K. *Financial Derivatives- An introduction to futures, forwards, options, swaps*. Prentice Hall of India