



FINANCIAL DERIVATIVES & RISK MANAGEMENT

PROF. J. P. SINGH

Department of Management

IIT Roorkee

PRE-REQUISITES : Basics of finance, Senior school mathematics (algebra, calculus & probability).

INTENDED AUDIENCE : The audience would comprise of those desirous of get acquainted with the intricacies of derivatives pricing, their strategizing and their applications as hedging instruments and also, appreciating the nuances that have led to the origin and extensive development of this field of knowledge.

INDUSTRIES APPLICABLE TO : This course will attract immense recognition in the entire financial services industry including banks, stock & commodity exchanges, stock & commodity brokers, portfolio managers, investment bankers, market regulators etc. Those employed in corporate finance shall also find it valuable as it would add to their versatility. Academicians will find it a gateway to further work in related areas.

COURSE OUTLINE :

Regulatory reforms across the world are gradually being introduced to reduce trade impediments between nations and usher in free market based pricing. Cross border investments through direct/portfolio routes are also being enticed as a medium for funding of growth and developmental activities. In addition, the governments of developing nations continue to pursue their strategy of partial privatization of the frontier sectors in an attempt to raise revenues for the exchequer as well as reduce operational losses with increased efficiency. Under these stimuli, scientific risk management by the investor fraternity becomes of cardinal necessity for generating competitive returns and surviving in the marketplace. Derivatives have proven to be immensely useful in the management of financial risk. Their vitality can be gauged from the exponential growth in trading volumes as well as the advent of new structured products literally on a day to day basis. Derivatives in petroleum and natural gas industries in the United States are, now, well entrenched, and they are being extensively used in the electricity industry as well.

Traditional courses on derivatives can be classified almost exclusively into those: (i) that provide a comprehensive coverage of the underlying mathematical models using stochastic calculus and develop the subject as an extension of probabilistic mathematics e.g. mathematical finance and (ii) that cover the theme purely at a superficial level focusing on the operating aspects like exchange trading methodologies, marking and margining aspects etc. They consciously avoid entering the mathematical/stochastic structure that forms the very basis of the pricing and applications of these instruments.

The first set is aimed at students who have had a sound grounding in mathematics and statistics and are inclined to study derivatives as an application of the theory of stochastic processes as part of their graduate degree in statistics. The other set caters to the needs of undergraduates/graduates in commerce or management who know very little about the mathematics of derivatives but study derivatives to work on the front office interfaces or trading terminals in broker houses or other market players. The fallout of this mutually exclusive segmentation is that both segments do not cover derivatives as a cogent wholesome. They deliver the content in the asymptote rather than as a mainstream course. This course fights that trend by covering in detail the topics that are thrown by the wayside in the traditional coverage. It provides valuable insights into the underlying financial. The fallout of this mutually exclusive segmentation is that both segments do not cover derivatives as a cogent wholesome. They deliver the content in the asymptote rather than as a mainstream course. This course fights that trend by covering in detail the topics that are thrown by the wayside in the traditional coverage. It provides valuable insights into the underlying financial.

ABOUT INSTRUCTOR :

Prof. Jatinder Pal Singh, is a Professor at the Indian Institute of Technology Roorkee. He is a Fellow member of the Institute of Chartered Accountants of India & Institute of Company Secretaries of India, an Associate Member of Institute of Cost Accountants of India & Institution of Engineers (India). He is also a postgraduate in Physics, Mathematics and a graduate in Law & Operational Research. After about 10 years of corporate experience, he joined the Department of Management Studies, IIT Roorkee in 2001. He is presently Professor (HAG) in the said department. His research interests are in econophysics, mathematical finance, financial risk management, international finance and corporate governance.

COURSE PLAN :

Week 1: Overview of Derivatives; Forwards: Introduction & Pricing, Arbitrage, Forwards Pricing on Consumption Assets; Futures: Introduction & Salient Features.

Week 2: Futures: Margining & MTM, Forwards & Futures Prices, Exposure & Risk, Basics of Futures Hedging, Nuances in Futures Hedging.

Week 3: Further Aspects of Futures Hedging; Basics of Mean-Variance Portfolio Theory & CAPM; Systematic & Unsystematic Risk.

Week 4: Index Futures: Features, Hedging & Arbitrage; Basics of Interest Rates, YTM & Other Yield Measures.

Week 5: Interest Rate Risk & Its Measurement; Interest Rate Futures: Features of IRFs, Hedging of Interest Rate Risk. **Week 6:** T-Bill & Eurodollar Futures, T-Bond Futures; Tailing the Hedge; Basic Theory of Options.

Week 7: Options: Price Bounds, Put-Call Parity; American Options; Trading Strategies.

Week 8: Option Spread Strategies; Stochastic Processes: Basic Theory, Brownian Motion, Diffusion Equation, Central Limit Theorem.

Week 9: Ito's Equation; Stock Price Distribution, Fokker Planck Equation; Option Pricing: Binomial Model.

Week 10: Girsanov Theorem; Black Scholes Model; Option Greeks.

Week 11: Option Greeks: Further Properties, Role in Trading; FRAs & Swaps.

Week 12: Valuation of Swaps; Value at Risk.