QUANTITATIVE INVESTMENT MANAGEMENT

PROF. J P SINGH
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IIT Roorkee

PRE-REQUISITES : Senior School Mathematics

INTENDED AUDIENCE : The audience would comprise of those desirous of get acquainted with the quantitative techniques of financial securities valuation and their strategical application in investment management of structured portfolios. The learners would be able to appreciate the nuances that have led to the origin and extensive development of this field of knowledge.

INDUSTRY SUPPORT : 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 investment management by the investor fraternity becomes of cardinal necessity for generating competitive returns and surviving in the marketplace. Financial instruments have proven to be immensely useful as versatile investment avenues. 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. Most courses in this area do not cover investment theory as a cogent wholesome. They deliver the content in the asymptote rather than as a mainstream course focusing either on the purely stochastic underpinnings or emphasizing the trade-based orientation. The proposed course aims to provide valuable insights into the underlying financial nuances involved in investment management holistically. The target audience is the student community who have taken some mathematics courses at the secondary level and are pursuing graduate courses in finance or management with specializations in finance and/or risk management.

ABOUT INSTRUCTOR :

Prof. Jatinder Pal Singh, is a Professor at the Department of Management Studies, Indian Institute of Technology Roorkee since 2001. He was conferred the “Outstanding Teacher Award” by IIT Roorkee in 2018. He has been taking various courses in finance as per Department’s mandate. 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. His research interests are in econophysics, mathematical finance, financial risk management, international finance and corporate governance.

COURSE PLAN :

Week 1: Overview & Introduction, Hybrids & Derivatives, Risk, Return & Arbitrage, Arbitrage Free Pricing
Week 2: Intrinsic value of bonds, Arbitrage free pricing of bonds, Forward rates, Bond pricing with forward rates, Bond valuation with binomial trees, Pathwise valuation
Week 3: Valuation of bonds with embedded options, Impact of yield curve changes on bond prices, Spot rates, Term structure of interest rates, YTM, Implied assumptions & issues with YTM, Yield spreads, Option adjusted spread (OAS)
Week 4: Calculation of OAS, Uses of OAS, Interest rate risk & its measures, Macaulay duration of a bond & its properties, Yield curve shifts & duration
Week 5: Duration of bonds with embedded options, Key rate & one sided duration, Modelling of return on fixed income securities
Week 6: Immunizing a single liability, Bullet vs Barbell, Convexity issues, Effect of yield curve shifts, Portfolio statistics & cardinals. Yield curve strategies
Week 7: Floaters, Caps & Floors & their valuation, Overview of Derivatives; Forwards: Introduction & Pricing, Arbitrage, Forwards Pricing on Consumption Assets; Futures: Introduction & Salient Features.
Week 8: Options: Price Bounds, Put-Call Parity; American Options; Trading Strategies
Week 9: Stochastic Processes: Basic Theory, Brownian Motion, Ito’s Equation; Stock Price Distribution
Week 10: Option Pricing: Binomial Model, Black Scholes Model; Option Greeks
Week 11: Futures: Margining & MTM, Basics of Futures Hedging, Applications of index futures & interest rate futures, Swaps & their

applications
Week 12: Mean Variance Portfolio Optimization, Systematic & Unsystematic Risk, CAPM & APT