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HOPT 62 : OP 4

Financial Mathematics

(100 marks, 80 lectures)

(To answer five questions, choosing one out of two questions from each unit)

Unit-I: Basic Principles, Arbitrage and risk aversion, interest (simple and compound, discrete and continuous), time value of money, inflation, net present value, internal rate of return (calculation by bisection and Newton-Raphson methods), Comparison of NPV and IRR .

Unit-II: Concept of Bonds, bond prices and yields, Macaulay and modified duration, term structure of interest rates: spot and forward rates, explanations of term structure, running present value, floating- rate bonds, immunization, convexity, putable and callable bonds . Marks:20

Unit -III: Asset return, short selling, portfolio return, (brief introduction to expectation, variance, covariance and correlation) , random returns, portfolio mean return and variance, diversification, portfolio diagram, feasible set, Markowitz model, Two fund theorem, Capital market line, Capital Asset Pricing Model, Use of CAPM in investment analysis and as a pricing formula, Jensen's index .

Unit-IV: Forwards and futures, marking to market, currency futures, hedging (short, long, cross, rolling), optimal hedge ratio, hedging with stock index futures, Lognormal distribution, Lognormal model, Geometric Brownian motion for stock prices, Binomial tree model for stock prices, parameter estimation.

Unit-V: Insurance Fundamentals- Insurance defined, Meaning of loss, Chances of loss , peril, hazard and proximate cause in insurance, Costs and benefits of insurance to the society and branches of insurance- life insurance and various types of general insurance , Life insurance mathematics- Construction of mortality tables, Computation of premium of life- insurance for a fixed duration and for the whole life, Determination of claims for general insurance- using Poisson Distribution and Negative Binomial Distribution- the Polya Case .

BOOKS

Text books:

1. David G. Luenberger, Investment Science, Oxford University Press, Delhi, 1998
2. John C. Hull, Options, Futures and Other Derivatives (6 Edition), Prentice – Hall India, 2006
3. Sheldon M. Ross, An Elementary Introduction to Mathematical Finance, (2nd Edition), Cambridge University Press, USA, 2003.
4. Sankalp[Srivastava, Financial Mathematics , New Age International, (paper back). 2011.
5. Samir Kumar Chakraborty, Financial Mathematics, New Age international (Paper back), 2011.

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Reference books:

1. Aswath Damodaran, Corporate Finance- Theory and Practice, John Wiley and Sons, Inc
2. Mark S. Dorfman, Introduction to Risk Management and Insurance, Prentice Hall, Englwood Cliffs, New Jersey,
3. C. D. Daykin, T. Pentikainen and M. Pesonen, Practical Risk Theory for Actuaries, Chapman and Hall .