

# Special Lecture at the Economics Department

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Raghunandan Sengupta, Professor, Department of Industrial and Management Engineering Indian Institute of Technology Kanpur talked on Bi-Objective Portfolio Optimization Problems for Extreme Value Asset Returns under Symmetric and Asymmetric Loss Functions. Abstract: Markowitz published the paper on mean variance portfolio optimization in 1952, since then researchers from all over the world are trying to allocate optimal weights to a list of some assets to minimize or maximize (or both) the objective function/s given some constraints. Most of the time researchers are mainly focusing on (i) risk associated with the portfolio and (ii) portfolio return. In that if someone is assuming the Gaussian distribution of returns with linear objective function then the optimization problem becomes easy to solve. But if the distribution of returns is non normal, optimization has multiple objectives, non linear constraints, and in addition to that if the parameters of the optimization problem are considered to be uncertain in nature, etc., then with some/all of these conditions portfolio optimization problem become highly complex.

The main aim of this research work is to develop a Reliability Based Design Optimization method to consider the uncertainty of parameter estimates i.e., returns. This method helps us to find more reliable solutions than deterministic solutions by integrating both RBDO techniques and Extreme Value Theory which is used to define the long tail (non normal) distribution of parameters. This research work contains 3 Multi objective portfolio models by considering 3 different types of risks which are Linear Exponential (LINEX) risk, Relative Linear Exponential (RLINEX) risk, and Squared Error Loss (SEL) risk respectively. These models are used to form portfolio optimization problems by considering RBDO techniques like the Sequential Optimization Reliability Assessment (SORA) method, Most Probable Point (MPP) Method to tackle uncertainty problem of parameter estimates and tested on BSE30 assets listed on Bombay Stock Exchange. Block Bootstrap re sampling method is used to find out the distribution of returns. In the end, we have plotted some graphs about optimal solutions which are displaying trade-offs between optimal return values and reliability values, based on which an investor can invest his/her money. As a result, this approach presents a range of returns, risks, and reliabilities to decision makers, allowing them to select the most suitable option based on their preferences. The talk was meant for the post-graduate students of Applied Economics and Ph.D. Scholars.

Link to the Activity report on the website- <https://sites.google.com/view/econpresi/special-lectures-workshops>