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A Credibilistic Decision Support System for Portfolio Optimization

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Abstract

In this paper, a Decision Support System (DSS) for generating a suitable portfolio for an investor in an uncertain multi-criteria framework is proposed. We model uncertain parameters like return and illiquidity of various assets using L-R fuzzy numbers belonging to a power reference function family. Such usage of L-R fuzzy numbers is more generic as compared to the conventional triangular or trapezoidal fuzzy numbers and is a closer representation of uncertain behavior of the asset parameters. The credibility measure which has an advantage of being self-dual as compared to usual possibility measure marks the uncertain context of the entire setup and adds a new dimension to existing studies. We use an “Entropy-Cross Entropy (ECE) Algorithm”, for finding the solution of the optimization problem meant for finding the best fit L-R fuzzy number corresponding to uncertain asset parameters. This automates the entire subjective exercise where, otherwise, a human intervention is required for feeding the parameters required for fitting L-R fuzzy number. Once the L-R fuzzy number are created around various assets available for the portfolio formation, the portfolio optimization problem is solved using Hybrid Intelligent Algorithm (HIA). HIA is designed by embedding fuzzy simulation within the “MIBEX-SM” genetic algorithm. To demonstrate the entire solution approach, four portfolio optimization models are solved using historical data from the National Stock Exchange (NSE) of India. The performance of the models is compared using a modified Sharpe ratio in the fuzzy context, namely the “Credibilistic Sharpe Ratio (CrSR)”. To

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