IPMA Global Research Award 2019

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Category: IPMA Young Researcher Award

Outstanding Research Contribution 2019

for the Research project:

Project Portfolio Selection Using Risk and Return Optimization

Selecting an appropriate portfolio of projects has a great impact on organizational success. The problem of optimization of projects' risks and returns is among the most prevalent issues in project portfolio selection.

The first step of the research addresses the effect of selecting appropriate risk measures and the impact of these choices on the efficient frontier of the project portfolio. In addition to common risk measures like standard deviation, other measures such as semi-standard deviation were used to differentiate between favorable and unfavorable opportunities. Afterwards, Value at Risk and Expected Shortfall were applied as proper risk measures to make a better estimate of the tail risks.

Determining the appropriate distribution is critical in achieving these expectations. In the next step, various distributions have been examined, and considering the expected and realized risks, the effects of choosing them on estimation of risks have been studied. Extreme Value Theory is applied since it led to the superior performance of the models. The changes in the returns of the studied projects indicate the volatility clustering, and therefore the GARCH models were applied. Due to project interdependencies and causal relationships between project risks, risk analysis at portfolio level is a complex task. Therefore, a model using Bayesian Network Methodology for modeling and analyzing portfolio risks is utilized. Conditional probability distributions for this network are specified and the Bayesian Networks Method is used to estimate the probability of portfolio risks.

In order to solve the project portfolio optimization problem, a Heuristic Dual Harmony Search Algorithm (DHS) has been proposed. Portfolios are optimized by implementing this Algorithm and utilizing Artificial Neural Networks, with multiple risk measures. With the help of this model and considering constrained and unconstrained efficient frontiers, a set of optimized portfolios, which are superior to any other combination, are selected.