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File size:
280.31K

Page count:
7

Word count:
919

Character count:
5133

Submission date:
30-Nov-2023 04:54AM (UTC+0530)

Submission ID:
2242343788

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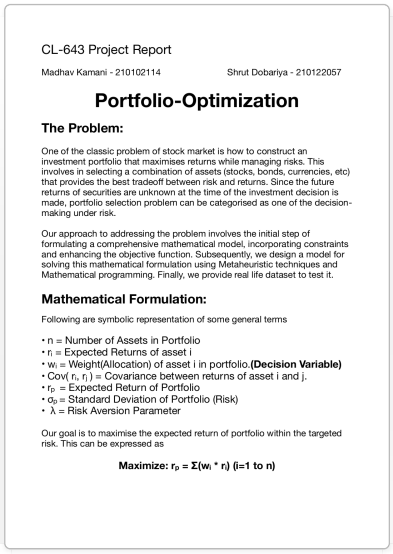

CL-643 Project Report

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Portfolio-Optimization

The Problem:

One of the classic problem of stock market is how to construct an investment portfolio that maximises returns while managing risks. This involves in selecting a combination of assets (stocks, bonds, currencies, etc) that provides the best tradeoff between risk and returns. Since the future returns of securities are unknown at the time of the investment decision is made, portfolio selection problem can be categorised as one of the decision-making under risk.

Our approach to addressing the problem involves the initial step of formulating a comprehensive mathematical model, incorporating constraints and enhancing the objective function. Subsequently, we design a model for solving this mathematical formulation using Metaheuristic techniques and Mathematical programming. Finally, we provide real life dataset to test it.

Mathematical Formulation:

Following are symbolic representation of some general terms

- n = Number of Assets in Portfolio
- r_i = Expected Returns of asset i
- w_i = Weight(Allocation) of asset i in portfolio.**(Decision Variable)**
- $Cov(r_i, r_j)$ = Covariance between returns of asset i and j.
- r_p = Expected Return of Portfolio
- σ_p = Standard Deviation of Portfolio (Risk)
- λ = Risk Aversion Parameter

Our goal is to maximise the expected return of portfolio within the targeted risk. This can be expressed as

Maximize: $r_p = \Sigma(w_i * r_i)$ **(i=1 to n)**

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