RELIABILITY IN PORTFOLIO OPTIMIZATION USING UNCERTAIN ESTIMATES

RACHIT SETH (Y6114008)
MTech thesis under the supervision of Dr. RAGHU NANDAN SENGUPTA
Industrial and Management Engineering, Indian Institute of Technology Kanpur

Pseudo-Codes for the paper Reliability in Portfolio Optimization using Uncertain Estimates

Raghu Nandan SENGUPTA[1], Rachit SETH[1], Peter WINKER[2]
[1]IME Department, IIT Kanpur, INDIA; Ph: +91-512-679-6607
Email: raghus@iitk.ac.in and sethrachit@gmail.com
[2]Department of Statistics and Econometrics, University Giessen, GERMANY Ph: +49-641-99-22641; Fax: +49-641-99-22649
Email: Peter.Winker@wirtschaft.uni-giessen.de

----------**INITIALIZATION**----------

START
IMPORT: *Library Functions,*
DEFINE: *Variables* [B, N, S, r, V_0, time (τ), Delta (δ), Alpha (α), Expected Value/Mean, Variance, Covariance, Threshold value (r_c), Reliability values ($\beta's$), Endowment values]
INPUT: *Initial Values* [B, N, S, V_0, time (τ), Delta (δ), Alpha (α), Reliability values ($\beta's$), Endowment values]

----------**DEFINITIONS OF DIFFERENT FUNCTIONS**----------

----------**FUNCTION: BOOTSTRAP**----------

DEFINE: *Function* [Bootstrap]
START: *Function* [Bootstrap]
FUNCTIONALITY: *Performs bootstrap to find the kernel densities for both Mean and Variance of all N assets*
CALCULATE: [All statistical values and statistical test values as required to check for distribution properties]
REPORT: [All statistical values and statistical test values as required to check for distribution properties]
END: *Function* [Bootstrap]

----------**FUNCTION: OPTIMIZATION (BRANCH & BOUND)**----------

DEFINE: *Function* [Branch & Bound]
START: *Function* [Branch & Bound]
FUNCTIONALITY: *Performs Optimization Branch & Bound algorithm to find the deterministic objective value and decision variables **X**. Also check whether optimality condition is satisfied if **YES** then terminate else proceed*
END: *Function* [Branch & Bound]

----------**FUNCTION: ROSENBLAT TRANSFORMATION**----------

DEFINE: *Function* [Rosenblatt Transformation]
START: *Function* [Rosenblatt Transformation]
FUNCTIONALITY: *Performs* Rosenblatt Transformation *to find **U***
END: *Function* [Rosenblatt Transformation]

----------**FUNCTION: RBDO: PERFORMANCE MEASURE APPROACH**----------

DEFINE: *Function* [RBDO: Performance Measure Approach]
START: *Function* [RBDO: Performance Measure Approach]

Pseudo-Codes for the paper Reliability in Portfolio Optimization using Uncertain Estimates

Raghu Nandan SENGUPTA[1], Rachit SETH[1], Peter WINKER[2]
[1]IME Department, IIT Kanpur, INDIA; Ph: +91-512-679-6607
Email: raghus@iitk.ac.in and sethrachit@gmail.com
[2]Department of Statistics and Econometrics, University Giessen, GERMANY Ph: +49-641-99-22641; Fax: +49-641-99-22649
Email: Peter.Winker@wirtschaft.uni-giessen.de

```
21:      FUNCTIONALITY: Performs RBDO: Performance Measure Approach]
         optimization to find the MPP points U*
22:   END: Function [RBDO: Performance Measure Approach]

      ----------FUNCTION: INVERSE ROSENBLAT TRANSFORMATION----------
23:   DEFINE: Function [Inverse Rosenblatt Transformation]
24:   START: Function [Inverse Rosenblatt Transformation]
25:      FUNCTIONALITY: Performs inverse Rosenblatt Transformation to find
         X
26:   END: Function [Inverse Rosenblatt Transformation]

27:   REPEAT: Steps 11 to 27 till optimality condition is satisfied

28:   CALCULATE: [optimal values of X, Objective function]
29:   REPORT: [optimal values of X, Objective function, return-risk,
      optimal allocation endowment]
30: END
```