

RELIABILITY IN PORTFOLIO OPTIMIZATION USING UNCERTAIN ESTIMATES

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MTech thesis under the supervision of Dr. RAGHU NANDAN SENGUPTA

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General plan of codes for the paper

Reliability in Portfolio Optimization using Uncertain Estimates

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Model I and Model IV Code Process (With Changes for Model II, III and V incorporated)

- 1) Main program is **optimize_main.m**. Open this MATLAB code
 - 2) This code reads from the excel file **data.xls** the data for the variance covariance matrix and the means of the nine stocks. [The sheet from where we need to read the data for the MATLAB codes is **InputReturns**]
 - 3) This code reads from the bootstrap data (obtained from bootstrap) from **bootstrapdata_nine_scripts.xls**.
 - 4) **optimize_main.m** will call the **bnb_ml60.m**, which is the branch and bound based optimization code.
 - 5) **optimize_main.m** will call the **objective.m**.
 - 6) **optimize_main.m** will call the **confun.m**.
- Once the main code(**optimize_main.m**) is run till this stage (step # 6, given above), the first cycle of optimization is complete, i.e., the deterministic cycle. Now the MPP calculation stage begins.
- 7) **optimize_main.m** will call the **getmpp_pma.m**.

Now we are in the **getmpp_pma.m** code

- i. **getmpp_pma.m** will call **RTrans_case1.m** for Rosenblatt transformation.

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ii. **getmpp_pma.m** will call **fmincon** and thus call **objective_mpp.m** and **confun_mpp.m**.

iii. **getmpp_pma.m** will call **RTransInv_case1.m** for inverse Rosenblatt transformation.

***Note: Steps 1 – 7 mentioned above would be common for all the models I to V.**

8) This step is relevant for Models II, III and V, where **optimize_main.m** will call the **getmppR2_pma.m** (for Model II) and **getmppSD_pma.m** (for Models III and V) respectively.

For Model II:

i. **getmppR2_pma.m** will call **RTrans_case1.m** for Rosenblatt transformation.

ii. **getmpp_pmaR2.m** will call **fmincon** and thus call **objective_mpp_R2.m** and **confun_mpp_R2.m**.

iii. **getmpp_pmaR2.m** will call **RTransInv_case1.m** for inverse Rosenblatt transformation

For Model III and V

i. **getmppSD_pma.m** will call **RTrans_case1.m** for Rosenblatt transformation.

ii. **getmpp_pmaSD.m** will call **fmincon** and thus call **objective_mpp_SD.m** and **confun_mpp_SD.m**.

iii. **getmpp_pmaSD.m** will call **RTransInv_case1.m** for inverse Rosenblatt transformation

At this stage we now have the MPP values. These are again substituted in the main optimization to get the values of the respective number of stocks. Thus this sequential optimization and Reliability Assessment goes ahead in this manner through the **while loop**.

**** the several other .m files in the respective folders for each of the models are called by the **RTrans_case1.m** and **RTransInv_case1.m** at some stage. So please do not delete other files.**

Bootstrap Related Code

1) **Bootstrap_ninescrips.m** is the main code which needs to be run and will read from **stock_data_9scrips.xls**.

2) **Bootstrap_ninescrips.m** will call **plottedensity.m**

3) **Bootstrap_ninescrips.m** will call **vech.m**