Name: Shawn Feng

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Topic: Weekly report (6/24-6/30) – "mco" implemented

Last week, I implemented the "mco" optimizer and made a pull request on "Rglpk" fork. The "mco" solver is a Multiple Criteria Optimization which can help us find desired asset combination with various customized constraints. This capability to optimize with multiple constraints can help us to deal with complex asset pools and fit in real world situation.

In the "mco" engine, I created objective function according to risk/reward parameters; set the constraint function list according to constraints sets; generation and population parameter can be modified by users.

In the test environment, the test data is 10 stocks daily return in real finance world from 2007 to 2019. Compared to "osqp" and "Rglpk" tests, I enlarged the constraints sets, which contains position limited to 3, leverage from 0.5 to 1.05, group limitation (group 1 from 0.15 to 0.65, group 2 from 0.25 to 0.55, group 3 from 0.2 to 0.5, group 4 from 0.1 to 0.4) , and diversification greater than 0.7. The test result contains running time, Sharpe Ratio, and constraint fulfill status.

Method	Time (s)	Sharpe Ratio	Group 1	Group 2	Group 3	Group 4	Diversification	Sum	Position
DEoptim	24.71	2%	15%	29%	29%	15%	68%	90%	3
random	122.3	2%	18%	31%	31%	18%	72%	87%	3
pso	70.05	1%	38%	34%	40%	32%	85%	105%	6
GenSA	109.45	1%	37%	21%	34%	23%	86%	105%	5
mco	51.9	5%	40%	25%	25%	40%	70%	105%	3

We can see that only random and "mco" method provided portfolio satisfied all constraints, "DEoptim" violated diversification, "pso" violated max position, and "GenSA" violated group

constraints and max position. Meanwhile, the portfolio generated by "mco" provided the highest Sharpe ratio which is the test target. In this test, I set the population and generation of "mco" sample to 400, adjust these two parameter can reduce running time or increase the accuracy of result.

This shows us the "mco" optimizer can handle the multiple constraints situation and find a better solution than other methods in a shorter running time.

This week, I will revise the commit comment in "Rglpk"'s pull request. Also, I will polish the codes of "osqp" and "mco" to prepare pull request for them.