FINAL PROJECT REQUIREMENTS

CFRM 543 Spring 2016

Due Date: 11:59pm Sunday June 12

This Document

This document provides specific requirements that your Final Project report must meet with regard to:

1. Submission deadline
2. Software
3. Custom performance reports to be used
4. Returns data sets for each of two project parts
5. Portfolio optimization methods (“strategies”)
6. Criteria for “best” portfolios proposed for investment
7. Report write-up content.

1. **Submission deadline**: 11:59PM Sunday June 12

2. **Software**: R and R packages

3. **Custom Performance Reports**:

You will create these with the performance and risk measures on the next slide using the **`mpo`** function **`table.Performance`**. The data input to this function will be the time series of optimized portfolio returns resulting from your portfolio strategies back-tests.

Custom Performance Report

Functions below from **`mpo`** are indicated with an asterisk. The others are from PerformanceAnalytics. Use default arguments unless otherwise indicated.

- **`Return.cumulative`**
- **`Return.annualized`** (this computes geometric mean return)
- **`maxDrawdown`**

- **`Return.annualized`** (with **`geometric = F`**)
- **`StdDev.annualized`**
- **`sharpeRatio*`** (with "annualize = T") (don't use SharpeRatio)

annualized

- **`sharpeRatio*`** (with "annualize = F")
- **`SortinoRatio`** slide
- **`starrRatio*`**

these are all at returns frequency

- **`etl*`** (don't use ES or ETL)

4. Returns Data Sets

This final project is in two parts, with the following data:

Part 1

`smallcapW` in **`mpo`**: 20 small-cap weekly returns 1997-2010

Part 2

`stocks145bonds7.csv`:

Note: The former requirement to include bonds in your portfolios is dropped, as there is quite enough to do in the following Part 1 and Part 2 given deadline. This is a good thing to think about in the future.

5. Portfolio Optimization Strategies

Part 1: The 20 small-cap weekly returns **`smallcapW`**

a) No factor model

b) Use both monthly and weekly rebalancing

c) Use 60 weeks and 104 weeks rolling windows

d) Global min-variance portfolios obtained by modifying the script **`BTgmvLoBoxWeekly104.R`**

e) Choose any type of constraint or penalty covered in course, but must do at least modification of above script to include short-box [-.03,0.025]

f) Quadratic utility portfolios obtained by modifying **`BTQuLoBox104Lambda20.R.`** For each choice in (e) you must choose a good risk aversion value lambda

Part 1: Continued

g) Now modify **`BTgmvLoBoxWeekly104.R`** to compute a global minimum expected shortfall portfolio. You must replace "**`quadprog"`** with "**`glpk"`** in your code, and use the folllowing in your portfolio specification object:

```
p = .95
pspec.gmesLo = add.objective(pspec.lo,
   type="risk",name="ES",arguments=list(p=p))
```

Now for each choice in (e) you should consider the alternative choice for **`p`** of **`p =.9.`**

Part 2: The monthly returns **stocks145bonds7.csv**

a) A statistical factor model obtained with fitSfm

b) Monthly rebalancing

c) Five-year rolling windows

d) Global min-variance portfolios obtained by modifying the script **BTgmv145StocksLoSfm.R.**

e) Constraints: Same as you used in Part 1-(e).

f) Quadratic utility portfolios: same risk aversion parameters that you used in Part 1-(f).

g) Optional: Same as above but with random matrix theory (RMT) function **estRMT** from the **covmat** package. If you have any problems with the code, skip this.

An Allowable Part 2 Alternative

Some of you may be interested in focusing on a fundamental factor model rather than a statistical factor model, using the data set below. I have not assigned this because to date I have not made my back-test code with **`fitFfm`** work (likely will change this weekend). However, those who can successfully do Part 2 with **`fitSfm`** replaced with **`fitFfm`** are encouraged to do so, with a caveat emptor.

- 145 stocks monthly returns, 6 scores, risk-free rate
  - "stocks145scores6.csv"
  - Monthly returns 1990 through 2014 (25 years)
  - Spread across market-cap groups and sectors
  - 6 scores: ROE, BP, PM12M1M, SIZE, ANNVOL1M, EP

6. Choice of Four Best Portfolio's

For each of Part 1 and Part 2 in Section 5, choose the two "best portfolios", one by each of the following two performance measures

1. Geometric mean return (Return.annualized)
2. Sharpe ratio

Discuss these portfolios as described in the next Section 7 slides.

7. Report Document Requirements

Your report must have the following numbered sections and content:

1. Use charts.PerformanceSummary to display the results for the four best portfolios chosen as in Section 6, two for Part 1 and two for Part 2. Following those figures include plots of the time series of the DIV and TO for each of the four portfolios.

2. Use table.Performance to create a table (export to Excel then embed in your report might be best) showing the risk and performance results for the four best portfolios chosen as in Section 6, two for Part 1 and two for Part 2. Below that table list the time average of the DIV and TO values.

3. State your choice of the single best portfolio among the four above to pitch to investors and discuss in detail why you think it is the overall best portfolio.

4. Create a table listing all the portfolio strategies you tested, the previous four plus all others, with their detailed description (sufficient that anyone reading the table could replicate your results in their favorite software).
5. A section stating what additional portfolio optimization strategies you try next because you think they might do even better than your best portfolio, if you had the time to do so
6. An Appendix A with the R script for Part 1 with all the code for all the portfolio strategies you tested, and an Appendix B for Part 2.