PART 3

1. Task 5

The main purpose is to implement multiple linear regression with the Fama-French 5 factors as the explanatory variables. You, as the junior quant, are to compare it with CAPM, which is the single-factor model.

Use the latest `F-F_Research_Data_5_Factors_2x3.CSV` and the S&P 500 index data utilized in the previous quantitative analysis. The sample period is from January 1985 through September 2018.

Regress the monthly simple excess return $R_t - \mathrm{RF}_t$ of S&P 500 index on the market factor as follows:

$$R_t - \mathrm{RF}_t = a + b\,(\mathrm{Mk} - \mathrm{RF})_t + u_t.$$

Next, run the Fama-French 5 factors as follows:

$$R_t - \mathrm{RF}_t = a + b\,(\mathrm{Mk} - \mathrm{RF})_t + c\,\mathrm{SMB}_t + d\,\mathrm{HML}_t + e\,\mathrm{RMW}_t + f\,\mathrm{CMA}_t + v_t.$$

For reporting, you need to document at least the following estimates and statistics:

- $\widehat{a}$ to $\widehat{f}$

- t statistics for $\widehat{a}$ to $\widehat{f}$ under the default null hypotheses. The alternative hypotheses are $a \neq 0$ and $b \neq 0$, and so on.

- Critical values for 5% significance level, and your inference

- R^2 and adjusted R^2

- Akaike Information Criterion according to

$$\mathrm{AIC} = T \ln\left(\frac{\mathrm{RSS}}{T}\right) + 2K,$$

  where T is the sample size, K is the total number of parameter estimates, and RSS is the residual sum of squares.

2. Task 6

- Treat the Fama-French 5-factor model as the unrestricted regression and the CAPM as the restricted regression.

- Compute the F-test statistic and make your inference.

3. Assessment

The hands-on report after each session is to be handed in via the dropbox. The assessment criteria are still the same:

1. Scientific correctness of the numbers crunched out by the computer codes

2. Soundness and sensibility of the conclusions made

3. Organization and clarity of the report

4. Timeliness of the report submission

5. The $\mathcal{X}$ factor