

EE522: SELECTED TOPICS IN QUANTITATIVE ECONOMICS

Assignment 5

Faculty of Economics, Thammasat University

Due: October 20, 2022 before 4.00 pm

Instructions There is 1 question on this assignment. This question involves coding, so start early. Please submit your completed homework to Google Classroom by 4 pm October 20, 2022 with subject: "EE522-Assignment5 –your name –" Submit your homework as the Jupiter Notebook code and figure, all in a.zip folder. (so the TA's can easily split it up for grading). Include your name and email address on each set.

1 [60 points]

To complete this assignment, you will need two data sets: 30 Industry Portfolios and the Fama-French factors (Monthly dataset), both available from Ken French's website: <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html>

In this assignment, you will reproduce some of the results in the JFE Fama and French (1993). The goal is to test the CAPM and a multi-factor asset-pricing model.

1.1 For each asset (industry portfolio), run the following regression (using all dataset). [10 Points]:

$$R_{i,t} - r_f = \alpha_i + \beta_i(R_{m,t} - r_f) + \epsilon_{i,t}$$

1.2 Plot the 30 β 's against $E[R_{i,t} - r_f]$. Do you observe the SML? What do you conclude?. [10 Points]

1.3 Conduct the cross-variation to evaluate the model in 1.1, you have to splitting the dataset into 10 folds. Report the average of RMSE and MAE. [10 Points]

1.4 Let the returns on the SMB and HML portfolios be denoted by R_t^{SMB} and R_t^{HML} , respectively i.e., the Fama-French factors. You will use the SMB and HML factors to see if they improve over the performance of the CAPM. Note that R_t^{SMB} and R_t^{HML} are already in excess return form. [10 Points]

For each asset, run the following regression:

$$R_{i,t} - r_f = \alpha_i + \beta_{1,i}(R_{m,t} - r_f) + \beta_{2,i}R_t^{SMB} + \beta_{3,i}R_t^{HML} + \epsilon_{i,t}$$

1.5 Produce three graphs, plotting each of the $\beta_{k,i}$'s ($k=1, 2, 3$) against $E[R_{i,t} - r_f]$. In particular, your first graph should plot the 30 $\beta_{1,i}$'s against $E[R_{i,t} - r_f]$, which should be directly comparable to what you obtained in question 1.2 Do you observe a relationship between expected excess returns and the various risk prices? Do you think that SMB and HML are priced factors? Why? Is a three-factor Fama-French model more suitable at capturing the fluctuation in equity returns? In answering the questions, refer to your empirical results [10 Points].

1.6 Conduct the cross-variation to evaluate the model in 1.4, you have to split the dataset into 10 folds. Report the average of RMSE and MAE. [10 Points]