Introduction Asset Pricing

Assignment 1

Report

- The deliverable of this assignment is a report (including your names and student numbers, with a maximum of three students per group) with answers to the below and also the code(s) that you use to generate the output.
- The assignment is due April 21, 17:00.

Data

- Go to the data library of Kenneth French: Link "Data library".
- Download the returns of five Fama-French factors ($R_t^{me}, R_t^{smb}, R_t^{hml}, R_t^{rmw}, R_t^{cma}$) (Check the description of those factors: Link: "Description") at a monthly or daily frequency for a region and for a time period of your own choice, including at least the MOST RECENT observations.
- Also download/construct additionally six excess returns that will be used to test the Fama-French five factor model and the power utility model. (These excess returns should of course correspond to the downloaded Fama- French factors in terms of frequency, region, and time period.)

Part 1: Descriptive Statistics

- Describe the return series that you use: Source, frequency, sample period, ...

Remark: We need to take care of the differences between %, fractions, net and gross returns!

- Present commented sample/descriptive statistics of the return series that you use.

Remark: Showing some plots might be helpful when describing the data.

Part 1: Fama-French Five Factor Model

- Test the validity of the Fama-French five factor model, i.e., the normalized pricing kernel

$$\theta_t = 1 - c_1 \left(R_t^{me} - E\left[R_t^{me}\right]\right) - c_2 \left(R_t^{smb} - E\left[R_t^{smb}\right]\right) \\ - c_3 \left(R_t^{hml} - E\left[R_t^{hml}\right]\right) - c_4 \left(R_t^{rmw} - E\left[R_t^{rmw}\right]\right) - c_5 \left(R_t^{cma} - E\left[R_t^{cma}\right]\right)$$

  using SIX linear regressions (corresponding to the six excess returns).
- Report the outcomes of your tests both under the assumption of homoskedasticity and allowing for heteroskedasticity. Interpret your findings and present your conclusion(s).

Part 2: Hansen-Jagannathan Bounds

Repeat the following for DIFFERENT values of γ.

- Construct $\theta_t = c \times (R_t^m)^{-\gamma}$
- Estimate c. Use this estimated c in the sequel.
- Verify whether θ_t satisfies the Hansen-Jagannathan (HJ) bound

$$\sigma(\theta_t) \geq \max_{R^{amb}} \left| \frac{E\left(R_t^{amb}\right)}{\sigma\left(R_t^{amb}\right)} \right|,$$

using for R_t^{amb} each of your six excess returns. Report your findings, also using an appropriate graph.

- Calculate the generalized Hansen-Jagannathan (HJ) bound (i.e. the right-handside of)

$$\sigma(\theta_t) \geq \sqrt{E\left(R_t^e\right)' \left(cov\left(R_t^e\right)\right)^{-1} E\left(R_t^e\right)}$$

by including in R_t^e the six excess returns.

- Compare this generalized HJ bound with the HJ bounds based on the individual excess returns (i.e. $\left| \frac{E\left(R_t^{amb}\right)}{\sigma\left(R_t^{amb}\right)} \right|$ and $\max_{R^{amb}} \left| \frac{E\left(R_t^{amb}\right)}{\sigma\left(R_t^{amb}\right)} \right|$).
- Verify whether $\theta_t = c \times (R_t^m)^{-\gamma}$ satisfies the generalized HJ bound.