Empirical Asset Pricing, Assignment 3

Due: 10:00 AM on February 23, 2024 (Friday)

The assessment on this course will be based on three graded assignments. The assignments are due on:

- January 29, 10:00.
- February 14, 10:00.
- February 23, 10:00.

Computer language(s)

You should be prepared to do applied modeling on a computer, using a computer language that can perform matrix operations efficiently. I use Matlab, and therefore this is the language where I can provide the most help if needed, but any language that can perform matrix operations efficiently is acceptable. It is your responsibility to make sure you have access to adequate software.

Types of problems

In this assignment you only find one type of problem:

a. **Compulsory; individual**: These are compulsory problems which should be addressed on an individual basis.

The requirement for a pass grade is that all compulsory problems in the assignments have been done satisfactory.

Datasets

The assignments involve various datasets. Some of the data used throughout the assignments come from commercial data vendors and should therefore only be used for the assignments. Do not use the data outside this course without my prior consent.

Report and submission

You have to prepare a written report (typed, not hand-written) that contains the answers to the problems. Send the report (as a PDF file) to `adam.farago@cff.gu.se.` before the due date. Late assignments will not be graded. Results should be organized into tables and graphs

for readability. You do not need to make fancy graphs and tables, but they should be clear and readable. The computer code for each assignment should also be attached to the report. Please provide ample documentation in the code describing what you are trying to achieve.

You should write up and submit the group problems as a group, while the solutions to the individual problems should be written up and submitted individually. The cover page should state: Course name, date, name(s), and which problem's you submit the solution to.

Contact me if you have questions (if you are not sure what exactly is required at a certain problem, it is better to clarify than to guess and be wrong).

Bonds (Lecture 6)

1. (**Compulsory; individual**) Consider the data in the Excel file "Assignment3Data.xlsx". The sheet contains monthly data on estimated zero-coupon yields with maturities of one to five years ($y_{n,t}$ where $n = 12, 24, 36, 48, 60$, i.e., n is expressed in months). All variables are quoted as continuously compounded and in % per year.

   (a) Construct one-year log forward rates applicable in one, two, three, and four years:

   $$f_{n,t} = \frac{n}{12} y_{n,t} - \frac{n-12}{12} y_{n-12,t} \ ,$$

   where $n = 24, 36, 48, 60$ refers to the ending date of the applicable year. Construct one-year log returns on bonds with maturities of two, three, four, and five years:

   $$r_{n,t+12} = \frac{n}{12} y_{n,t} - \frac{n-12}{12} y_{n-12,t+12} \ ,$$

   where $n = 24, 36, 48, 60$. Finally, construct one-year log excess returns (in-excess of the one-year yield) on bonds with the same maturities:

   $$rx_{n,t+12} = r_{n,t+12} - y_{12,t} \ ,$$

   where $n = 24, 36, 48, 60$.

   Provide summary statistics of the yields, forward rates, and excess returns. Are historical risk premia positive or negative and do they increase or decrease with bond maturity?

   (b) Evaluate the expectations hypothesis by running the regressions below for maturities $n = 24, 36, 48, 60$:

      (i) Inspired by Fama and Bliss (1987):

      $$r_{n,t+12} - y_{12,t} = a_n + b_n(f_{n,t} - y_{12,t}) + \varepsilon_{n,t+12}, \qquad \mathrm{H}_0 : \ b_n = 0.$$

      (ii) Inspired by Campbell and Shiller (1991):

      $$y_{n-12,t+12} - y_{n,t} = a_n + b_n(y_{n,t} - y_{12,t}) / \left(\frac{n}{12} - 1\right) + \varepsilon_{n,t+12}, \quad \mathrm{H}_0 : \ b_n = 1.$$

      (iii) Inspired by Backus et al. (2001):

      $$f_{n-12,t+12} - y_{12,t} = a_n + b_n(f_{n,t} - y_{12,t}) + \varepsilon_{n,t+12}, \qquad \mathrm{H}_0 : \ b_n = 1.$$

   Provide point estimates, standard errors, and tests of the null hypotheses. Motivate your estimation approach (especially on how you chose to estimate the standard errors on the b_n estimates) and interpret your results.