ECON 4360: Empirical Finance

Spring 2014

Homework 03

Due Monday, 14 April 2014 by 1400

Instructions

Please type your final answers/results neatly and include it as a coversheet. Show all work in the pages that follow - this includes any derivations you might need, .m files, scripts, output results, etc. Final answers without supporting work will receive no credit.

You may work in groups no larger than three for this assignment. If you choose to work in a group, please turn in only ONE copy of your group's assignment - just be sure to include the names of everyone in your group.

Questions

GMM Exercises: The Consumption-Based Model

1. [20 Points] Use the data on the Collab website that we used in class for the following exercises.

   a. Find the mean and the correlation matrix of consumption growth (column 2) and the three excess returns (columns 3-5). Is consumption growth positively correlated with the returns? Which ones have greater correlations?

   b. Plot $E\left[\beta\left(\frac{c_{t+1}}{c_t}\right)^{-\gamma} R^e_{t+1}\right]$ for a fixed $\beta = 1$ and for γ from 0 to 100 for each $R^e = R^m - R^f$, SMB, and HML on one plot (use a different color or symbol for each line). Two of the lines will look "ok", though they will differ on γ. One line will look "wrong". What's wrong?

2. [30 Points] Use the data on the Collab website that we used in class for the following exercises.

   (a) Use the data for consumption growth (column 1), excess returns for the $R^m - R^f$ (column 3), and the risk-free rate (column 6) to estimate the discount factor β and the risk aversion coefficient γ in the consumption-based model using GMM. Assume i.i.d. moment conditions. Report $\widehat{\beta}_{GMM}$ and $\widehat{\gamma}_{GMM}$ and their standard errors.

   (b) Use the data for consumption growth (column 1), excess returns for the $R^m - R^f$ (column 3), the risk-free rate (column 6), SMB (column 4), and HML (column 5) to estimate the discount factor β and the risk aversion coefficient γ in the consumption-based model using GMM. Use the HAC structure (use lag length of $q = 5$) and iterate your estimations until convergence. (I.e., go

beyond just first-stage and second-stage GMM). Report $\widehat{\beta}_{GMM}$ and $\widehat{\gamma}_{GMM}$ and their standard errors.

3. [50 Points] Use the NEW data file "qdata.m" for the following exercises. Note that this data is quarterly data (not annual data, as in questions 1 and 2) - the first column is real, per-capita consumption growth, the second column is SMB, the third column is HML, and fourth column is $R^m - R^f$, and the fifth column is R^f.

   (a) Find the correlation matrix of consumption growth, the three excess returns, and the risk-free rate. Is consumption growth positively correlated with the returns? Which ones have greater correlations?

   (b) Find the correlation matrix of **the lead of** consumption growth, the three excess returns, and the risk-free rate. Is consumption growth positively correlated with the returns? Which ones have greater correlations?

   (c) Now, given what we're learned from parts (a) and (b), assume that the SDF takes the form

   $$m_{t,t+1} = \beta \left(\frac{c_{t+2}}{c_{t+1}} \right)^{-\gamma}$$

   so that we're now working with the lead of consumption growth instead of contemporaneous consumption growth. Use the data for consumption growth, $R^m - R^f$, and R^f to estimate the discount factor β and the risk aversion coefficient γ in the consumption-based model with this new discount factor using GMM. Assume i.i.d. moment conditions. Report $\widehat{\beta}_{GMM}$ and $\widehat{\gamma}_{GMM}$ and their standard errors.

   (d) From part (c), do you see an equity premium puzzle and/or a risk-free rate puzzle? Can you statistically reject the model using this data? Explain.

   (e) Now estimate this same consumption-based model with $m_{t,t+1} = \beta \left(c_{t+2}/c_{t+1} \right)^{-\gamma}$ using all four return series: $R^m - R^f$, R^f, SMB, and HML. Use 2-step GMM with HAC errors with $q = 5$. Report $\widehat{\beta}_{GMM}$ and $\widehat{\gamma}_{GMM}$ and their standard errors.

   (f) Test the overidentifying restrictions you used in part (e). Can you reject the model based on this information? Should you reject the model?