DEGREE OF MASTER OF SCIENCE IN FINANCIAL ECONOMICS

FINANCIAL ECONOMETRICS

HILARY TERM 2010 COMPUTATIONAL ASSIGNMENT #1

Thursday 4 February 2010.

Assignment must be submitted before 16.00, Friday 19 February 2010.

This is group work. Groups of up to 3 are permitted.
Write the SBS Student Numbers of each member in the header of each answer page.
Do not write your actual names.

Please start the answer to each question on a separate page.

*Candidates should answer **all** questions.*

Assessors will place equal weight on each of the two answers. Answers will be assessed on the quality of the answer, not the quality of the code.

Suggested Length: 1500 words; limit: 3000 words. Average words per page: 250

1. Download the monthly Fama-French Data for from Ken French's website. Use data from 1926 until the end of 2009 for this exercise.

   (a) Using only the BH and SL portfolios, estimate

   $$r_{i,t} = \alpha_i + \mathbf{f}_i \boldsymbol{\beta}_i + \epsilon_i$$

   for $i = BH, SL$ where $\mathbf{f}_i$ is a 1 by 3 vector of factors, $[VWM_i^e \; SMB_i \; HML_i]$. Report parameter estimates, standard errors, t-statistics and p-values.

   (b) Compute White's test for heteroskedasticity in these models. Are the data heteroskedastic?

   (c) Conduct a joint test that $H_0 : \alpha_{BH} = \alpha_{SL} = 0$ using

      i. A Wald test
      ii. A Lagrange multiplier test
      iii. A likelihood-ratio-like test

   Provide a short description of the test and mathematics needed to compute the test statistic, the distribution, the test statistic and 5% critical value and the p-value.

   All tests should be implemented by treating the problem of estimating

   $$[\alpha_{BH} \, \boldsymbol{\beta}_{BH} \, \alpha_{SL} \, \boldsymbol{\beta}_{SL}]$$

   as a method of moments problem which is similar to one of the homework assignments. There are eight parameters and so there are 8 moment conditions. Be certain to use heteroskedasticity robust standard covariance estimators where appropriate. **Note:** You probably will need to use pen and paper to outline the math and steps needed to implement these three tests. These can all be done in the standard regression framework, although it may not be the simplest method to implement this test.

   The key to theis problem is to set up the math (pencil and paper) correctly before trying to compute the test statistics in part (c).

2. Download monthly interest rates for the US 6-month T-bill (GS6M) and Moody's Seasoned Aaa Corporate Bond Yield (AAA) from FRED II (http://research.stlouisfed.org/fred2/). Compute the series PREM as the difference between the corporate bond yield and the 6 month rate. Use data from 1982 until December 2009 for this exercise.

Model Building

Note: Use only the first 75% of the sample (rounding down if not an integer) for this portion of the assignment. When building forecasting models it is crucial that a "hold back" sample is preserved so that models can be evaluated using a different set of data than was used in building the model and estimating the parameters.

(a) Using the first 75% of the observations (t_1 to $t_{\lfloor .75T \rfloor}$), compute the autocorrelations and partial autocorrelation for 48 lags (4 years of monthly data).[1]

(b) What processes are consistent with these ACs and PACs?

(c) Estimate at least 3 models that seem consistent with the ACs and PACs.

(d) Are the residuals from these regressions compatible with a white noise assumption? If all models fail, try a larger model.

(e) Using the AIC and SIC, rank these models. Do the criteria agree?

Forcasting

Note: Use the remaining data points, beginning at $t_{\lfloor .75T \rfloor} + 1$, to evaluate the forecast.

(a) Using the final model selected – and keeping the parameter estimates fixed – construct 1-step ahead forecasts beginning at observation $t_{\lfloor .75T \rfloor} + 1$ until the end of the sample.

(b) Using these 1-step ahead forecasts, run a Mincer-Zarnowitz regression and test the null that the forecasts are optimal.

(c) Compare your forecast to both a random walk and a constant forecast in-terms of mean square error.

(d) Compute the parameters of your model *recursively* and produce the 1-step ahead forecast for $t_{\lfloor .75T \rfloor} + 1$. A recursive estimate using data from 1 to τ to forecast $\tau + 1$ for $\tau = t_{\lfloor .75T \rfloor} + 1, \ldots, T$. Assess whether the recursive forecasts are qualitatively different from the forecasts produced using the single set of estimates.

[1] $\lfloor x \rfloor$ is the mathematical notation for "floor", which mean the largest integer smaller than x.