Problem Set # 7

Econ 722

Due at noon on Tuesday, May 10th

1. This question and the one that follows it are based on Stock and Watson (JBES, 2012) "Generalized Shrinkage Methods for Forecasting Using Many Predictors." You can download the paper, a supplemental appendix, data and replication files from Mark Watson's webpage at `https://www.princeton.edu/~mwatson/publi.html`

   (a) Read the Stock and Watson (2012) paper. Provide a brief (one or two paragraph) summary of the main findings in the paper.

   (b) Familiarize yourself with the data set. The transformed series which Stock and Watson use in their estimation are posted at `http://ditraglia.com/econ722/SW2012data.csv`. Take a look at Section B of the Supplemental Appendix to understand how the raw data (you can find them in the replication zip file on Mark's webpage) are transformed into the data that I have posted. Compare the GDP growth series in the Stock and Watson data set to a GDP growth series that you construct from FRED data.

   (c) Compute the first 20 principal components from 108 lower-level disaggregates.[1] How much variation in each of the 108 series is explained by the first or by the first two principal components? Think carefully about how to present this information in an efficient manner.

2. In this question you will construct diffusion index forecasts of real GDP (GDP 251), consumption (GDP252), and real government consumption expenditures (GDP265) following Stock & Watson (2012). The data you will need for this exercise are posted at `http://ditraglia.com/econ722/SW2012data.csv`. For each series and each part of

[1] Although the paper gives the total number of disaggregates as 109, there in fact only 108 in the replication dataset. This agrees with the count based on table B.1 of the Supplementary Appendix.

this question you will construct one-step-ahead, pseudo-out-of-sample forecasts based on a rolling window of the most recent 100 observations and use RMSE to compare the different forecasting methods. (The procedure is detailed in section 3.1 of the paper.) Note that you will *not* use cross-validation in this question.

(a) First try to replicate Stock and Watson's (2012) one-step-ahead RMSE results for the AR(4) model and the OLS model, both relative to the DFM5. These appear in Table S-8 in the online supplemental appendix and are described in section 4.1 of the paper.

(b) An AR(4) model may be somewhat too complicated to serve as a reasonable benchmark for the DFM5. Augment your results from the preceding part by adding an AR(1) model as well as two model-selection based AR forecasting procedures: one using AIC and another using BIC. How do the results compare? Do they differ across the three series?

(c) Although Stock & Watson (2012) explore a number of shrinkage estimators in their paper, Ridge and Lasso are not among them. Try using Ridge and Lasso rather than OLS for the forecasting regression based on the first 50 PCs. Remember: since the design is orthogonal, there is a simple closed form for both Lasso and Ridge. Experiment with a variety of values for the shrinkage parameters. Try to find values that give similar performance to the DFM5. Can you find a level of shrinkage that beats the best AR benchmark forecast? How do your results compare across the three series?