

ECNS 562 -Econometrics II
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Homework 4
Due Tuesday, April 10

Download the data files 'cons.csv' and 'exchrates.csv' for questions 1 and 2, respectively.

Question 1. In this assignment, you will utilize series on both consumption and GDP to practice estimation through VAR methods. You will need to convert the series in order to use the first difference of the natural logarithm of quarterly values (values are already seasonally adjusted) for the US from 1947 quarter 4 through 2010 quarter 4. Formally, you will estimate the following model:

$$Y_t = \Phi_1 Y_{t-1} + \Phi_2 Y_{t-2} + \dots + \Phi_p Y_{t-p}$$

where Y includes consumption and GDP observations over time and ε_t is a 2×1 vector of white noise, Φ_m , where $m = 1, \dots, p$, is a 2×2 matrix of estimated coefficients, and p includes the number of autoregressive terms.

- (a) Estimate a VAR(p), where $p = \{1, 2, 3, 4\}$ using AIC and SIC information criteria to deduce which model provides the best fit.
- (b) Based on the results from question (a), use the model(s) selected by AIC/SIC information criteria to predict quarterly consumption outcomes for 2011. Compute the forecasted root mean squared error (RMSE) for the predicted outcomes, where

$$RMSE = \sqrt{\sum_{s=1}^n (\hat{v}_s - v_s)^2}$$

such that \hat{v}_s is the forecast of v_s given the previous time periods.

- (c) Repeat the steps in part (b) using an ARMA(3,1) model.
- (d) Based on your results in parts (b) and (c), do the bivariate forecasts outperform those from the univariate model? Justify your conclusion.
- (e) Construct a Granger-causality test based on the model(s) selected in part (a) to examine the following statements: (1) Does consumption lead GDP? (2) Does GDP lead consumption? Show how you set up this test and the parameter of interest. Clearly state the null and alternative hypothesis. Justify your results.
- (f) Plot the impulse response functions corresponding to a shock in consumption to changes in consumption and GDP. How long does the shock appear to impact the given variables? Discuss why or why not you agree with the results. Explain the differences between an impulse response function and the Granger-causality test.

Question 2. The data series for this question are the exchange rates between the US dollar and Japanese Yen at the daily, weekly, and monthly frequencies. The data span January 2, 1992 through March 30, 2012. Define $x(d)$, $x(w)$, and $x(m)$ to be the first differences of the natural logarithms of the daily, weekly, and monthly exchange rates, respectively.

- (a) Present time series plots of $x(d)$, $x(w)$, and $x(m)$. Contrast the time series behavior of these variables. Does a GARCH model seem appropriate for this series? Explain.
- (b) Estimate a GARCH(r,r) model for $x(d)$, $x(w)$, and $x(m)$, where $r = \{0,1,2,3\}$. Use AIC and SIC to determine the most appropriate choice for r corresponding to each series. Briefly comment on the differences between data intervals and the selection of r .
- (c) Present time series plots of the estimated conditional variance obtained for the three series chosen in (b). Discuss the differences in conditional variances across the three series.
- (d) Based on your results, discuss the sensitivity of the volatility pattern in this exchange rate series to the sampling frequency.