Problem Set 3 Macroeconometrics
Due: July 12, 2016

1. Read the mystery series into Stata or R (quarterly, 1959.1-2009.4).

Do the following for mystery series 1-4:

- test for unit roots, difference if necessary
- identify any remaining ARMA components using ACF & PACF (on the differenced data if you found a unit root, otherwise just on the levels)
- estimate the ARMA model
- perform the Beveridge Nelson decomposition to identify the long run and short run impacts of 1-unit shocks on each of the series (see the appendix to Stock and Watson's variable trends article).

2. Suppose theory tells you that the models for MS5 and 6 are as follows:

$MS5_t = \alpha + \varepsilon_t$ and $MS6_t = \alpha + \beta MS7_t + \varepsilon_t$

- estimate these two models using their entire samples
- perform the appropriate stability tests to see whether the model parameters have remained constant throughout the sample.
- If instability is detected, estimate and report the appropriately modified model(s)

3. Estimate the following "Phillips curve" model:

$$\pi_t = \alpha + \sum_{i=1}^{4} \beta_i \pi_{t-i} + \sum_{i=1}^{4} \gamma_i GAP_{t-i} + \varepsilon_t$$

using quarterly data from 1948-2009, where π_t is the consumer price index, excluding food and energy prices and GAP_t is the GDP gap which is calculated as follows:

$$GAP_t = 100 \times [\ln(GDP_t) - \ln(GDP_t^{potential})]$$

- Report the full sample estimates
- Test for stability in γ_i's
- Did the slope of the Phillips Curve Change? Interpret your results.

4. Estimate the bivariate VAR:

$$x_t = \alpha + B(L)x_{t-1} + \varepsilon_t$$

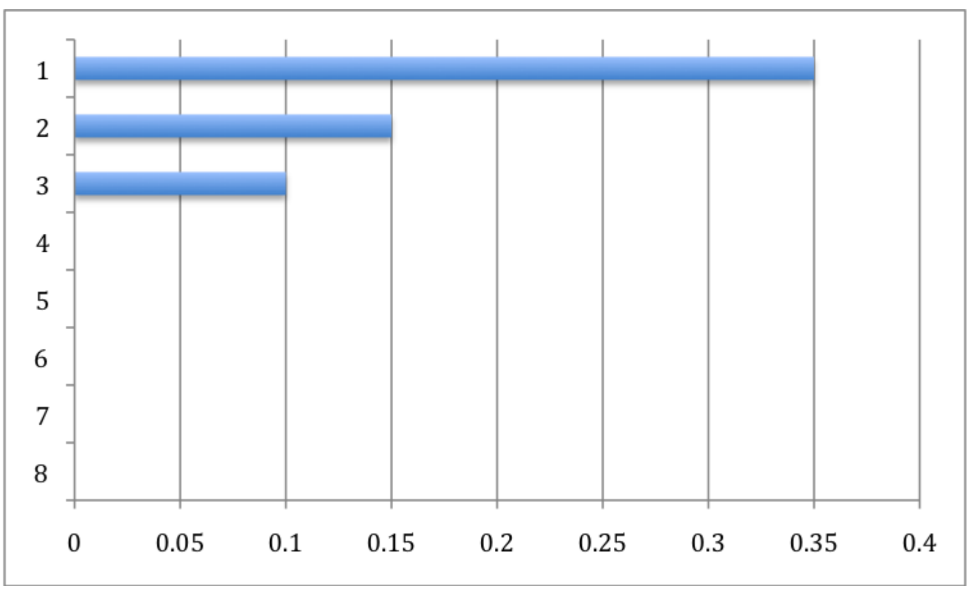
$B(L)$ is a 4th-order polynomial in the lag operator and $x_t = \begin{bmatrix} \pi_t \\ U_t \end{bmatrix}$ where π_t is the consumer price index, excluding food and energy prices and U_t is the civilian unemployment rate.

- Test for Granger-Causality
- report and interpret your results
- what are the potential pitfalls associated with interpreting your results as "causal?"

5. Suppose X_t is a stationary time series which you have identified to be an MA(3):

$$x_t = \varepsilon_t + \theta_1\varepsilon_{t-1} + \theta_2\varepsilon_{t-2} + \theta_3\varepsilon_{t-3}$$

and also suppose the ACF looks like:



Assume $\text{var}(x_t) = 1$ and solve for $\theta_1, \theta_2, \theta_3 and\ \sigma_\varepsilon^2$.