ECON 5350 Final Exam – Fall 2016

Consider an empirical version of the modern Phillips curve:

$$\pi_t = \beta_1 + \beta_2(unem_t - unem_*) + \beta_3\pi^e_{t+1} + \epsilon_t,$$

where π_t is inflation, $unem_t$ is the unemployment rate, $unem_*$ is the natural rate of unemployment, π^e_{t+1} is expected future inflation, and $t = 1, ..., T$.

1. (25 pts) Write the model in matrix form and derive the OLS estimator of $\beta = (\beta_1, \beta_2, \beta_3)'$.

2. (25 pts) The main coefficient of interest is β_2, the slope of the Phillips curve. Under what condition is the OLS estimator, b_2, unbiased? consistent? efficient? Describe the sampling distribution for b_2.

3. (25 pts) Using our H_0: $R\beta = q$ notation, describe two different methods to test the joint hypothesis that the Fed i) successfully targets a 2% baseline level of inflation and ii) there is a one-to-one response between expected inflation and actual inflation.

4. (25 pts) Describe a procedure to test that $\delta_t = \frac{\partial \pi_t}{\partial unem_t} = -1$ when inflation expectations are correct (i.e., $\pi_t = \pi^e_{t+1}$).

5. (25 pts) Consider a permanent structural break in the variance of the errors at $t = t_*$. Describe the procedure for obtaining an efficient estimate of β. How does this procedure compare to separate OLS estimation before and after $t = t_*$? Explain.

6. (25 pts) Consider a permanent structural break in the slope of the Phillips curve, β_2, at the same point $t = t_*$. Describe a model to incorporate the break, with and without a jump at $t = t_*$.

7. (25 pts) Now consider a simpler, nonlinear version of the Phillips curve model:

$$\pi_t = 2 + \beta(unem_t - 5)^\lambda + \epsilon_t.$$

   Outline a procedure to calculate the nonlinear least squares (NLS) estimates of β and λ.

8. (25 pts) Write a short piece of Matlab code to implement the estimator in part #6 (with a jump). Assume the data on π_t and $unem_t$ have already been imported into Matlab.