ECON 5350 Midterm Exam – Fall 2018

Consider the following model:

$$\ln(Y_i) = \beta_1 + \beta_2 \ln(X_i) + \epsilon_i \tag{1}$$

for $i = 1, ..., n$.

1. **Classical Linear Regression Model and Functional Forms (50 pts)**.

   (a) Write the model in matrix form being careful to denote the dimension of all the matrices.

   (b) Derive the OLS estimator using the matrix model in part (a).

   (c) Now assume that Y is quantity and X is price. Provide an economic interpretation of the regression model and β_2.

   (d) What Classical assumption might be violated for the model in (c) and why?

   (e) Derive the variance-covariance matrix of b when the variance of the errors is proportional to the square of X_i.

2. **Hypothesis Testing and Prediction (50 pts)**. Use regression model #1 to answer the following questions.

   (a) Using the $R\beta = q$ framework, describe two identical methods for testing the null hypothesis: $\beta_2 = 1$.

   (b) How does the test in part (a) compare to a simple t test? Explain.

   (c) Describe how to test the hypothesis that $\frac{\partial \ln Y}{\partial X} = 1$?

   (d) Are normally distributed errors required for the tests in parts (a) through (c)? Explain.

   (e) Describe how you would generate predictions of Y_i, $\hat{Y}_i$. What is a possible complication with calculating the standard error for $\hat{Y}_i$? Explain.