Economics 421/612 Midterm Exam

Answer each of the following equally weighted questions. Use the backs of the pages if you need additional space.

1) Econometric models are described as stochastic rather than deterministic. The stochastic nature of the models comes from the error term which we have labeled e. Describe the sources of this error term. List and explain the assumptions we make about both the error term and the model in deriving the ordinary least squares estimator.

2) Estimate the model $Y = a + bX + e$ from the data:

Y	X
3	5
1	3
5	10

Theory suggests that $b > 0$. Evaluate this possibility.

3) State what is known about the predicted errors derived from the ordinary least squares regression model and about their relationship to the independent variable and the predictions of the dependent variable. Demonstrate these relationships for the data given in problem 2 and calculate the R squared for the model of problem 2.

4) Ordinary least squares estimates are said to be best linear unbiased. Explain what this means. Use examples if possible to illustrate your points.

5) You set up a time series model using quarterly data. You have the following data:

$$Y_1X_1 + Y_2X_2 + \ldots + Y_{100}X_{100} = 300$$

$$X_1^2 + X_2^2 + \ldots + X_{100}^2 = 1500$$

$$\text{xbar} = 3,\ \text{ybar} = 2,\ N = 100$$

where N is the sample size.

A) Find the OLS estimates of the slope and intercept of the model $Y = a + bX + e$.

B) The estimated variance of e is 100. Find the variance of your estimate of the slope.

C) Using the 95% probability level, test the hypothesis that b equals -1.

D) You believe that the slope and the intercept of your model are different in the fourth quarter of every year from what they are in the first, second and third quarters of the year. How would you test this hypothesis? That is:

I) What would your proposed model be? Define or describe your variables.

II) What would be your statistical test and how would you conduct it?