

Economics 471: Econometrics  
Department of Economics, Finance and Legal Studies  
University of Alabama  
Midterm I

The exam consists of three questions on three pages. Each question is of equal value.

1. Answer the following questions about the Gauss-Markov assumptions:
  - (a) State each of the five Gauss-Markov assumptions.
  - (b) Which assumption(s) guarantee(s) unbiasedness?
  - (c) Which assumption(s) guarantee(s) that OLS is the best linear unbiased estimator?

2. Consider the regression model

$$y_i = \alpha + \beta x_i + u_i, \quad i = 1, 2, \dots, n$$

- (a) Suppose we assume that  $\alpha = 0$  and hence  $y_i = \beta x_i + u_i$ 
  - i. Write down the (sample or population) moment condition(s) used to derive the method of moments estimator for  $\beta$ .
  - ii. Write down the least-squares objective function to derive the OLS estimator for  $\beta$ .
  - iii. Use the equation from either i. or ii. to derive the estimator for  $\beta$ .
- (b) Suppose we assume that  $\beta = 0$  and hence  $y_i = \alpha + u_i$ 
  - i. Write down the (sample or population) moment condition(s) used to derive the method of moments estimator for  $\alpha$ .
  - ii. Write down the least-squares objective function to derive the OLS estimator for  $\alpha$ .
  - iii. Use the equation from either i. or ii. to derive the estimator for  $\alpha$ .

Dependent Variable: LNTESTSCORES

Method: Least Squares

Date: 08/14/08 Time: 08:05

Sample: 1 3733

Included observations: 3733

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.890871	0.010629	366.0531	0.0000
CLASSSIZE	0.002198	0.000436	5.043496	0.0000
R-squared	0.006772	Mean dependent var		3.942173
Adjusted R-squared	0.006505	S.D. dependent var		0.189056
S.E. of regression	0.188440	Akaike info criterion		-0.499534
Sum squared resid	132.4870	Schwarz criterion		-0.496199
Log likelihood	934.3802	F-statistic		25.43685
Durbin-Watson stat	1.716947	Prob(F-statistic)		0.000000

3. Consider the EViews output listed below on the regression of logged test scores on class size.

- Interpret the coefficient on class size.
- Show the formula used to calculate SSR. Give the value of SSR.
- Show the formula used to calculate SST. Give the value of SST.
- Show the formula used to calculate SSE. Give the value of SSE.
- Suppose we multiplied the log of test scores by 10 (for all observations). What will happen to SSR, SSE, SST and  $R^2$ ?
- Suppose we multiplied the class size variable by 10 (for all observations). What will happen to SSR, SSE, SST and  $R^2$ ?