ECON 5340 Applied Econometrics – Exam #2

True or False. Five points per question: 2 pts for a correct T/F and 3 pts for the explanation.

1. Measurement error in the dependent variable is more serious than measurement error in the explanatory variables.

2. Autocorrelation biases the coefficients towards zero.

3. Severe multicollinearity will bias the coefficient estimates.

4. Ordinary least squares is a special case of generalized least squares.

5. The “runs test” for autocorrelation is immune from Type I errors.

#6. (50 pts) Consider the earnings model: $Wage_i = \beta_1 + \beta_2 Exper_i + \beta_3 Educ_i + u_i$, where $Wage$ is the measured in dollars per hour, $Exper$ is work experience in years, and $Educ$ is the number of years of schooling. Tables 1-3 and Figure 1 show the OLS regression results for $N = 100$ males in a given year. Use the tables and figures to answer the following questions:

a) (5 pts) Using the results in Table 1, summarize the overall goodness of fit of the model. Do the signs of the coefficients match your explanations? Explain.

b) (10 pts) Interpret the residual pattern in Figure 1. What conclusion do you draw? And based on that conclusion, what are the impacts on the OLS estimates in Table 1? Explain.

c) (10 pts) Using the results in Table 3, perform White's test for heteroscedasticity. Be sure to carefully set up the null and alternative hypotheses and draw a conclusion.

d) (10 pts) Based on your answers to parts (b) and (c), describe a procedure to obtain the efficient estimators for the coefficients.

e) (5 pts) Use the results in Table 2 to discuss the severity of the multicollinearity and the likely impacts on the OLS results in Table 1.

f) (10 pts) Show how to perform a *t* test that the EXPER and EDUC coefficients are equal. Do you have all the necessary information to complete the test? If so, complete the test.

#7. (25 pts) Provide brief answers to the following three questions.

a) (5 pts) Write down an AR(1) process for the error terms and describe how to perform a Durbin-Watson test for autocorrelation.

b) (10 pts) Re-specify the earnings model in question #6, to test the hypothesis that men in a labor union earn more on average than men that are not members of a labor union. How would you test this hypothesis? Draw an appropriate figure of the regression model to support your test.

c) (10 pts) Re-specify the earnings model in question #6, to test the hypothesis that men in a labor union earn more for each additional year of experience than men that are not members of a labor union. How would you test this hypothesis? Draw an appropriate figure of the regression model to support your test.

BONUS QUESTION. (5 pts) Describe an economic situation (other than the one in my lecture notes) where panel data will allow you tease out two impacts that would not be possible using only cross-section or only time-series data.

Table 1. STATA results from OLS estimation of the earnings model

```
  Source |       SS           df       MS                  Number of obs =     100
-------------+------------------------------                F(  2,    97) =   16.47
       Model |  2057.5037     2  1028.75185                  Prob > F      =  0.0000
    Residual |  6059.71269    97  62.4712648                R-squared     =  0.2535
-------------+------------------------------                Adj R-squared =  0.2381
       Total |  8117.21639    99  81.9920847                Root MSE      =  7.9039

------------------------------------------------------------------------------
        wage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        Educ |   1.435782   .321546     4.47   0.000     .7976026    2.073962
       Exper |    .328525   .0658247    4.99   0.000     .1978813    .4591687
       _cons |  -11.91922   4.750254   -2.51   0.014    -21.34716   -2.491275
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Figure 1. Wage residuals versus education

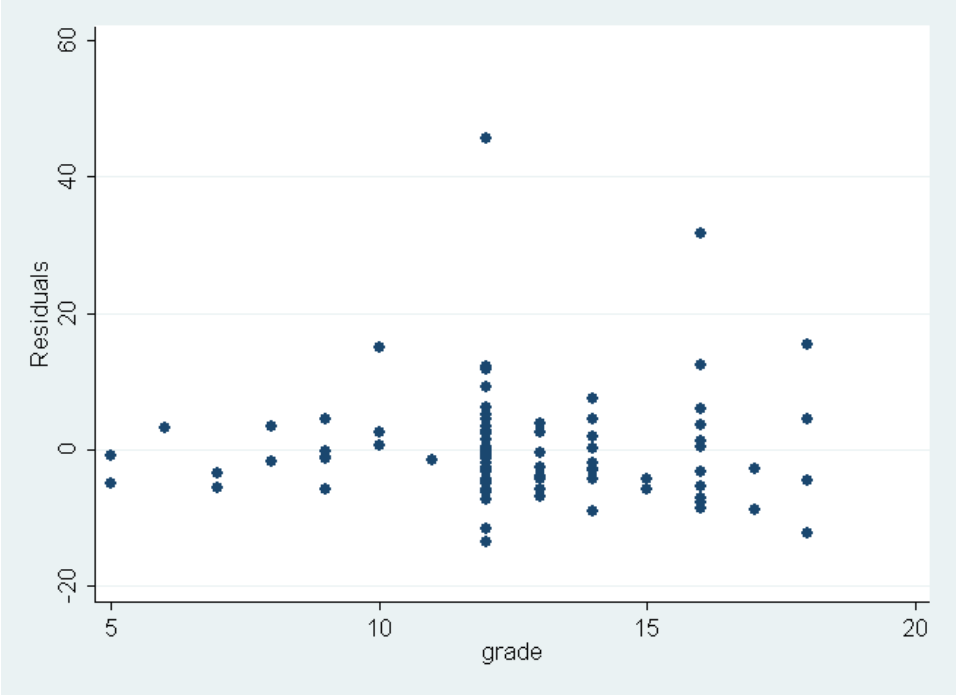

Table 2. Pairwise correlations

	grade	exper	wage
grade	**1.0000**		
exper	**-0.3665**	**1.0000**	
wage	**0.2485**	**0.3163**	**1.0000**

Table 3. STATA results with squared OLS residuals as the dependent variable

Source	SS	df	MS	Number of obs =	100
Model	498933.661	5	99786.7323	Prob > F	0.0901
Residual	4759291.93	94	50630.7652	R-squared	0.0949
Total	5258225.59	99	53113.3898	Adj R-squared	0.0467
				Root MSE	225.01

res2	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Grade	-7.357599	79.35932	-0.09	0.926	-164.9274	150.2122
Exper	-23.67913	16.87954	-1.40	0.164	-57.19386	9.835591
Grade^2	-1.048003	2.223082	-0.47	0.638	-5.461984	3.365978
Exper^2	.270444	.162453	1.66	0.099	-.0521102	.5929982
Exper*Grade	.5788711	.7165818	0.81	0.421	-.8439188	2.001661
_cons	108.2517	582.867	0.19	0.853	-1049.044	1265.548