Econ 301 **Bilkent University**
Econometrics **Department of Economics**

Lab Exercise 7

You start with an hypothetical true values of β_1, β_2 and construct a sample using a random error terms and built in autocorrelation.

Try to estimate this parameter values that you started with and test the estimation and other detection techniques to find out their properties.

We are attempting to estimate the coefficients of the relationship between the variables of Y and X, which is drawn from the population where the true relationship is given by the following equation:

$E(Y_i / X_i) = 1.0 + 0.8X_i$ **(TRUE LINE-which is unobserved in standard estimation problems)**

The variable X, (independent and fixed), takes the values of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 for 100 observations.
The variable Y (dependent) which depends on X, and the error term is determined according to the following equation:

$Y_i = 1.0 + 0.8X_i + u_i$. Where u_t is determined by $u_i = \rho u_{t-1} + \varepsilon_t$

a) The ρ will take four different values ($\rho = 0.0$, $\rho = 0.2$, $\rho = 0.9$ $\rho = 1.0$, $\rho = 0.7$). For each value of ρ compute the u_t series with the assumption that $u_0 = 5.00$. Label them as $u_{1t}, u_{2t}, u_{3t}, u_{4t}, u_{5t}$.
b) For each u_t series compute the corresponding Y_t. Your will have Y_{1t}, Y_{2t}, Y_{3t}, Y_{4t}, Y_{5t}.
c) For each Y and X combination, estimate $\hat{\beta}_0$ and $\hat{\beta}_1$. (How close are they to the actual values?)
d) Note $se(\hat{\beta}_0)$ and $se(\hat{\beta}_1)$.
e) How does the conclusion of the hypothesis $H_o : \beta_i = 0$ change across the estimated coefficients.
f) For each estimation, plot $\hat{u}_t$. Do the pattern indicate autocorrelation?
g) Examine the Durbin Watson autocorrelation test statistics for each estimation.
h) Compute the correlation coefficient between $\hat{u}_t$ and $\hat{u}_{t-1}$. Is this close to the ρ value you have used in creating the error terms.
i) Estimate the value of ρ by using $u_i = \rho u_{t-1} + \varepsilon_t$
j) Conduct the Breusch-Pagan-Godfrey LM test. Interpret your results.

k) Using the estimated $\hat{\rho}$, perform the Generalized Least Square estimation. Does the variances and DW statistics improve.

PLEASE FILL IN THE BELOW TABLE

TRUE LINE	$\beta_0 = 1.0\ \beta_1 = 0.8$				
ρ	$\hat{\beta}_0$, $\hat{\beta}_1$	$s\hat{e}(\hat{\beta}_0)$, $s\hat{e}(\hat{\beta}_1)$	**R^2**	**Durbin Watson**	**Correlation between $\hat{u}_t$ and $\hat{u}_{t-1}$**
0					
0.2					
0.9					
1					
0.7					