Economics 272
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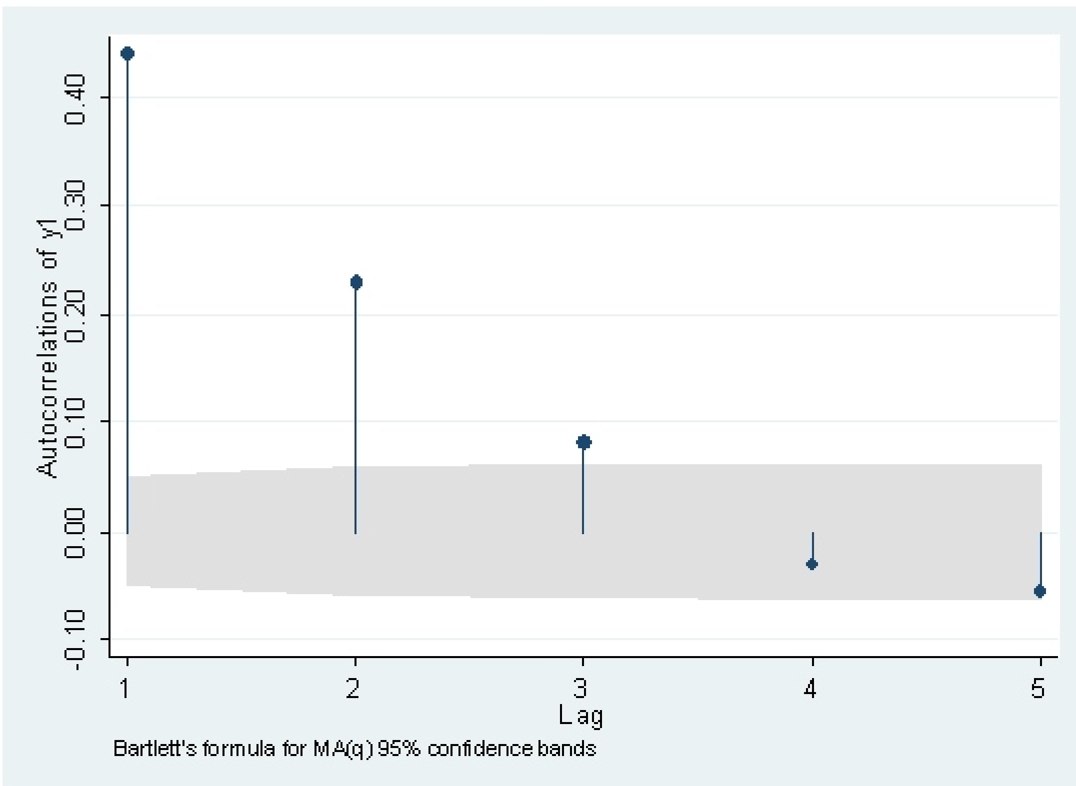
FINAL EXAM

1.

a. Given the following graph of autocorrelations:



Would you guess that variable is an MA or AR process? Why? Write out the statistical equation for the model.

b. We now perform the following regression:

```
. arima  y1,ar(1/8)

(setting optimization to BHHH)
Iteration 0:   log likelihood = -3530.3983
Iteration 1:   log likelihood = -3530.3948
Iteration 2:   log likelihood = -3530.3947

ARIMA regression

Sample:  1 to 2500                              Number of obs      =      2500
```

```
                                                Wald chi2(8)       =    612.17
Log likelihood = -3530.395                      Prob > chi2        =    0.0000

------------------------------------------------------------------------------
             |                 OPG
          y1 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
y1           |
       _cons |   .0226761   .0338513     0.67   0.503    -.0436711    .0890234
-------------+----------------------------------------------------------------
ARMA         |
          ar |
         L1. |   .3983498    .020018    19.90   0.000     .3591153    .4375842
         L2. |    .085018   .0215709     3.94   0.000     .0427399    .1272962
         L3. |  -.0071398   .0216843    -0.33   0.742    -.0496403    .0353606
         L4. |  -.0818443   .0211868    -3.86   0.000    -.1233697   -.0403189
         L5. |  -.0252978   .0220462    -1.15   0.251    -.0685076    .0179119
         L6. |   .0401877   .0213399     1.88   0.060    -.0016378    .0820131
         L7. |  -.0130731   .0218005    -0.60   0.549    -.0558013    .0296552
         L8. |    .015666   .0207091     0.76   0.449     -.024923    .0562551
-------------+----------------------------------------------------------------
      /sigma |   .9931906     .01424    69.75   0.000     .9652807    1.021101
------------------------------------------------------------------------------
```

Do these results alter your opinion of what type of process generated y1? Explain.

2. Given the following model:

$$y_{ti}=x_{ti}\beta+\mu_i+\epsilon_{ti}$$

i=1,2,...,N and t=1,2,...,T.

where all terms are scalars and the error terms are assumed to be iid normal with means equal to zero and standard deviations σ_μ and σ_ϵ respectively. The two error terms are independent of each other.

a. Derive the TN x TN covariance matrix of the disturbances.

b. Suppose that we estimate β by OLS. Show that estimator is unbiased.

c. Given that it is unbiased, why would we consider the use of any other estimator, given the simplicity of OLS?

d. Suppose T is large relative to N and we decide that the assumption of fixed correlation between error terms for the same individual is unrealistic. We therefore drop μ_i and assume the following error structure:

$$\varepsilon_{ti}=\rho_i\varepsilon_{t-1,i}+v_{ti}$$

where $v_{ti}\sim N(0,\sigma_v^2)$ and iid (i.e. “nice” disturbances).

1). What is the error correlation between observation t=1 and t=4 for individual i? What happens to the error correlation for individual i as the time period between the two errors gets longer?

2). Develop an estimator for the ρ_i (i=1,2,...N).

3). Develop a feasible GLS estimator for β.

3. The following estimations were done using data from Thailand. The dependent variable is choice of contraceptive method (1= no method, 2=pill, and 3=other methods)

a. Briefly discuss the method of estimation used below and present the likelihood function.

b. W1524 is a dummy variable for the age of the woman being between ages 15 and 24, w3034, and wgt35 have obvious definition. The omitted category is ages 25-29. Interpret the age dummies for the choice of no method versus the pill. In your answer discuss the difference between relative and absolute probabilities.

```
. mlogit  curmeth_3 w1524 w3034 wgt35 wedlt4 wedgt4

Iteration 0:   log likelihood = -2885.4161
Iteration 1:   log likelihood = -2848.5686
Iteration 2:   log likelihood = -2848.2891
Iteration 3:   log likelihood = -2848.2888

Multinomial logistic regression                   Number of obs   =       2857
                                                  LR chi2(10)     =      74.25
                                                  Prob > chi2     =     0.0000
Log likelihood = -2848.2888                       Pseudo R2       =     0.0129

------------------------------------------------------------------------------
   curmeth_3 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
2            |
       w1524 |  -.3832158   .1294179    -2.96   0.003    -.6368703   -.1295614
       w3034 |   .2284811   .1323495     1.73   0.084    -.0309192    .4878814
       wgt35 |  -.2241922   .1239672    -1.81   0.071    -.4671634    .0187789
      wedlt4 |  -.2053124   .1617068    -1.27   0.204     -.522252    .1116271
      wedgt4 |    -.76947   .2343835    -3.28   0.001    -1.228853   -.3100868
       _cons |  -.5067471   .0932218    -5.44   0.000    -.6894586   -.3240357
-------------+----------------------------------------------------------------
3            |
       w1524 |   -.801087   .1437917    -5.57   0.000    -1.082913   -.5192605
       w3034 |  -.0145205    .141586    -0.10   0.918     -.292024    .2629831
       wgt35 |  -.4945311   .1343113    -3.68   0.000    -.7577764   -.2312858
      wedlt4 |  -.2641968    .187854    -1.41   0.160    -.6323839    .1039903
      wedgt4 |  -.0085019   .2060986    -0.04   0.967    -.4124477     .395444
       _cons |  -.6259013   .0961686    -6.51   0.000    -.8143883   -.4374143
------------------------------------------------------------------------------
(curmeth_3==1 is the base outcome)
```

c. The estimation below drops the third outcome. Compare the pill versus no method results below to the results with other methods included above (just an "eyeball" comparison – not a formal test). What implications do these results have for the independence of irrelevant alternatives assumption? Explain.

```
. mlogit  curmeth_3 w1524 w3034 wgt35 wedlt4 wedgt4 if  curmeth_3<3

Iteration 0:   log likelihood = -1463.2843
Iteration 1:   log likelihood = -1443.0718
Iteration 2:   log likelihood = -1442.8701
Iteration 3:   log likelihood = -1442.8698

Multinomial logistic regression                   Number of obs   =       2291
                                                  LR chi2(5)      =      40.83
                                                  Prob > chi2     =     0.0000
Log likelihood = -1442.8698                       Pseudo R2       =     0.0140

------------------------------------------------------------------------------
   curmeth_3 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
2            |
       w1524 |  -.3716795   .1297097    -2.87   0.004    -.6259059   -.1174532
       w3034 |   .2355634   .1323486     1.78   0.075    -.0238351    .4949618
       wgt35 |  -.2178287    .123764    -1.76   0.078    -.4604017    .0247443
      wedlt4 |  -.2064017   .1616471    -1.28   0.202    -.5232241    .1104207
      wedgt4 |  -.7550453   .2349407    -3.21   0.001    -1.215521     -.29457
       _cons |  -.5137383    .093071    -5.52   0.000     -.696154   -.3313225
------------------------------------------------------------------------------
(curmeth_3==1 is the base outcome)
```

4. Given the following model:

$$Y_{i1} = X_{i1}\gamma + \varepsilon_{i1}$$
$$Y_{i2} = Y_{i1}\alpha + \varepsilon_{i2}$$

where all terms are scalars, the X's are non-stochastic and the error terms have mean zero and variances σ_1^2 and σ_2^2 respectively. We further assume that $cov(\varepsilon_{i1}, \varepsilon_{i2}) = \sigma_{12}$.

a. Check the second equation for identification.

b. Determine $E(Y_{i1}\varepsilon_{i2})$. What implications does this have for the estimation of the second equation by OLS?

c. Discuss a method for consistently estimating α.