Economics 413: Economic Forecast & Analysis

Department of Economics, Finance and Legal Studies

University of Alabama

Fall 2012

Final Exam

The exam consists of four questions on six pages (final page is blank). Each question is of equal value.

1. Consider the following data generating process

$$Y_t = c + \phi Y_{t-1} + \varepsilon_t$$

where ε_t is a white noise process. Assuming $c \neq 0$ and $-1 < \phi < 0$, answer the following questions.

(a) Derive the expected value of this process.

(b) Derive the variance of this process.

(c) Derive the covariance of this process for all j. Note that j represents the number of periods between Y_t and Y_{t-j}.

(d) Derive the autocorrelation function of this process for all j.

(e) Plot the autocorrelation function with the information you derived above.

2. Suppose we observe $t = 1, 2, \ldots, T$ observations on y. With these T data points on y we want to construct a sample autocorrelation function and a sample partial autocorrelation function.

    (a) What equation do we estimate in order to estimate the spikes in the sample ACF (be specific, write down the equation and emphasize the parameter(s) of interest)?

    (b) What equation do we estimate in order to estimate the spikes in the sample PACF (be specific, write down the equation and emphasize the parameter(s) of interest)?

    (c) Suppose we have an MA(2), how many significant spikes do you expect to see in the sample ACF? How many significant spikes do you expect to see in the sample PACF? Draw the sample ACF and PACF.

    (d) Suppose we have a stationary AR(2), how many significant spikes do you expect to see in the sample ACF? How many significant spikes do you expect to see in the sample PACF? Draw the sample ACF and PACF.

    (e) Suppose we have an AR(1) that is a unit root process, how many significant spikes do you expect to see in the sample ACF? How many significant spikes do you expect to see in the sample PACF? Draw the sample ACF and PACF.

3. Consider the following data generating process

$$Y_t = Y_{t-1} + \varepsilon_t + \theta_2 \varepsilon_{t-2}$$

where ε_t is a white noise process. Assuming $-1 < \theta_2 < 0$ (and without taking a first difference), answer the following:

(a) Find the h-step ahead forecast for $h = 1, 2, \ldots$.

(b) Find the h-step ahead forecast error for $h = 1, 2, \ldots$.

(c) Find the h-step ahead forecast error variance for $h = 1, 2, \ldots$.

(d) Find the h-step ahead interval forecast for $h = 1, 2, \ldots$.

(e) Plot parts (a) and (d) in a single figure.

4. Consider the two EViews regression output files on the next page
   (a) Write out the theoretical model each table is showing.
   (b) Without simplifying, what is the mean of each model (be sure to use the coefficient estimates)?
   (c) The observed data here start in 1965 and end in 2007. Why does the first model show that the sample starts in 1966? Why is this also the case in the second model?
   (d) Is the first model stationary? Is the second model stationary? How do you know?
   (e) Using model selection criteria, argue why one model is preferable to the other.

ARMA(1,1):
sierraleone c ar(1) ma(1)

Dependent Variable: SIERRALEONE
Method: Least Squares
Date: 10/15/12 Time: 14:30
Sample (adjusted): 1966 2007
Included observations: 42 after adjustments
Convergence achieved after 9 iterations
MA Backcast: 1965

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.104062	2.166690	-0.048028	0.9619
AR(1)	0.530569	0.267171	1.985878	0.0541
MA(1)	-0.017524	0.312264	-0.056118	0.9555

R-squared	0.262298	Mean dependent var	-0.245952
Adjusted R-squared	0.224467	S.D. dependent var	7.606705
S.E. of regression	6.698795	Akaike info criterion	6.710482
Sum squared resid	1750.080	Schwarz criterion	6.834601
Log likelihood	-137.9201	Hannan-Quinn criter.	6.755976
F-statistic	6.933439	Durbin-Watson stat	1.986613
Prob(F-statistic)	0.002653		

ARMA(1,2):
sierraleone c ar(1) ma(1) ma(2)

Dependent Variable: SIERRALEONE
Method: Least Squares
Date: 10/15/12 Time: 14:31
Sample (adjusted): 1966 2007
Included observations: 42 after adjustments
Convergence achieved after 23 iterations
MA Backcast: 1964 1965

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.146900	1.721198	-0.085347	0.9324
AR(1)	-0.892852	0.046086	-19.37350	0.0000
MA(1)	1.782075	0.075863	23.49063	0.0000
MA(2)	0.864941	0.068822	12.56777	0.0000

R-squared	0.462343	Mean dependent var	-0.245952
Adjusted R-squared	0.419896	S.D. dependent var	7.606705
S.E. of regression	5.793612	Akaike info criterion	6.441782
Sum squared resid	1275.506	Schwarz criterion	6.607274
Log likelihood	-131.2774	Hannan-Quinn criter.	6.502441
F-statistic	10.89234	Durbin-Watson stat	1.927905
Prob(F-statistic)	0.000027		