Economics 413: Economic Forecast and Analysis

Department of Economics, Finance and Legal Studies
University of Alabama
Spring 2014

Final Exam

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

1. Consider the case where we have T observations on y, $\{y_t\}_{t=1}^{T}$. For each process listed below, draw a potential time series plot for that process as well as a potential (sample) autocorrelation function and partial autocorrelation function. In each case assume that ε_t is a white noise process.

   (a) $y_t = \varepsilon_t$

   (b) $y_t = \mu + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_3 \varepsilon_{t-3}$

   (c) $y_t = c + \phi_2 y_{t-2} + \varepsilon_t$

   (d) $y_t = y_{t-1} + \varepsilon_t$

   (e) $y_t = \delta + y_{t-1} + \varepsilon_t$

2. Consider two processes Y_t and X_t. Suppose that Y_t represents a 10 year interest rate and X_t represents a three month interest rate. Suppose we are interested in eventually forecasting Y with the help of both past values of Y as well as past values of X. With this information, answer the following questions

   (a) Write down an ARMA(1,1) which also includes a (single) first lagged value for X

   (b) How do you know how many lags to include for Y? How do you know how many lags to include for ε (the error term)? How do you know how many lags to include for X?

   (c) Write down the h-step ahead value for Y (Y_{t+h}) that you put down in part (a)

   (d) Construct the forecast value of Y ($\widehat{Y}_{t+h|h}$) for $h = 1$

   (e) Why is it difficult to forecast for $h = 2$?

3. Consider the following unit root processes. For each process derive the h-step ahead forecast for $h = 1, 2, \ldots$. Assume the error term (ε_t) in each case is white noise.

   (a) $Y_t = Y_{t-1} + \varepsilon_t$

   (b) $Y_t = \delta + Y_{t-1} + \varepsilon_t$

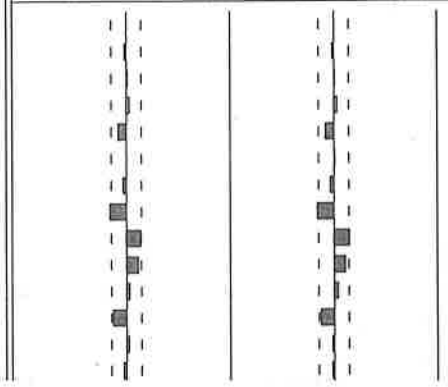
   (c) $Y_t = \beta t + \delta + Y_{t-1} + \varepsilon_t$

4. Suppose we have data on real GDP over the period 1960:Q1 to 2002:Q1. Using *all* of the EViews files below, describe the Box-Jenkins methodology. A few sentences per step should be sufficient and you *must* refer to the relevant EViews output file(s) in each step (hint: they are *not* in the correct order).

(i)

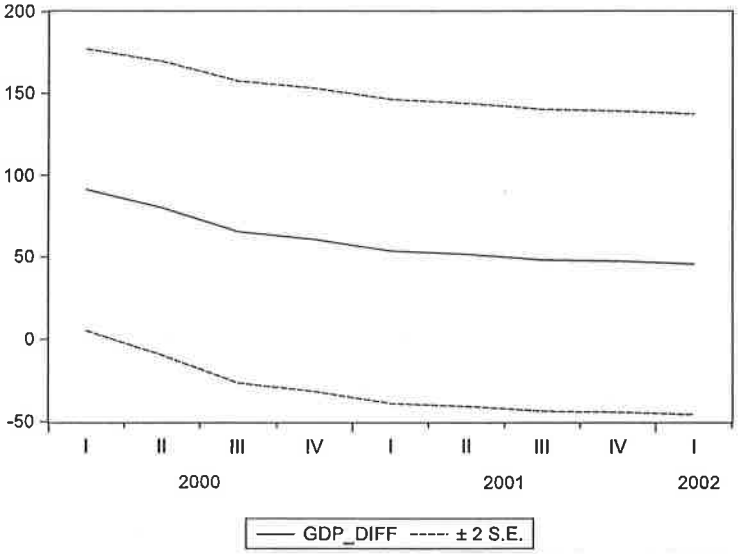
Correlogram of RESID

Date: 04/23/14 Time: 14:15
Sample: 1960Q1 2002Q1
Included observations: 166



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.001	0.001	0.0002	0.990
		2	-0.011	-0.011	0.0211	0.990
		3	0.011	0.011	0.0429	0.998
		4	0.039	0.038	0.2990	0.990
		5	-0.074	-0.074	1.2476	0.940
		6	0.007	0.008	1.2571	0.974
		7	-0.027	-0.030	1.3877	0.986
		8	-0.161	-0.161	5.9440	0.654
		9	0.147	0.158	9.7967	0.367
		10	0.123	0.117	12.493	0.253
		11	0.036	0.044	12.732	0.311
		12	-0.124	-0.124	15.518	0.214
		13	0.029	-0.010	15.673	0.267
		14	-0.022	-0.009	15.760	0.328

(ii)

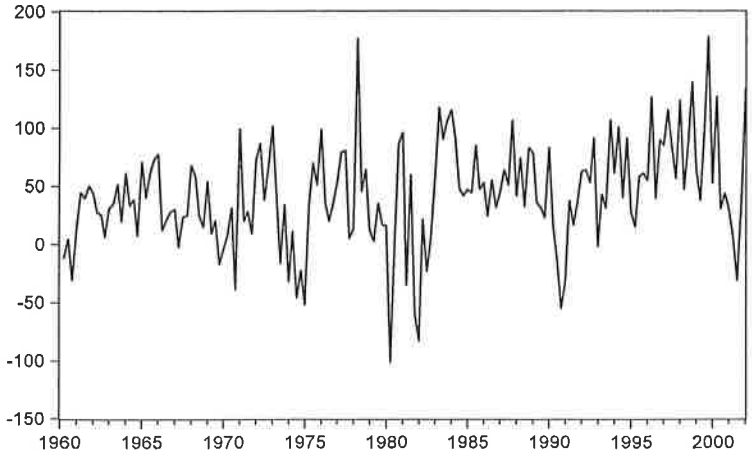


Forecast: GDP_DIFF
Actual: GDP_DIF
Forecast sample: 2000Q1 2002Q1
Included observations: 9

Root Mean Squared Error	49.23244
Mean Absolute Error	42.39991
Mean Abs. Percent Error	144.6674
Theil Inequality Coefficient	0.374395
Bias Proportion	0.065003
Variance Proportion	0.497947
Covariance Proportion	0.437050

(iii)

GDP_DIF



(iv)

Dependent Variable: GDP_DIF
Method: Least Squares
Date: 04/23/14 Time: 14:14
Sample (adjusted): 1960Q4 2002Q1
Included observations: 166 after adjustments
Convergence achieved after 16 iterations
MA Backcast: 1960Q2 1960Q3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	43.77616	6.395473	6.844866	0.0000
AR(1)	-0.051006	0.583095	-0.087474	0.9304
AR(2)	0.498419	0.447721	1.113236	0.2673
MA(1)	0.329684	0.600630	0.548896	0.5838
MA(2)	-0.241595	0.339463	-0.711697	0.4777

R-squared	0.150738	Mean dependent var	42.76205
Adjusted R-squared	0.129639	S.D. dependent var	44.66611
S.E. of regression	41.67042	Akaike info criterion	10.32712
Sum squared resid	279564.3	Schwarz criterion	10.42085
Log likelihood	-852.1508	Hannan-Quinn criter.	10.36517
F-statistic	7.144115	Durbin-Watson stat	1.951365
Prob(F-statistic)	0.000025		

Inverted AR Roots	.68	-.73
Inverted MA Roots	.35	-.68

Correlogram of GDP

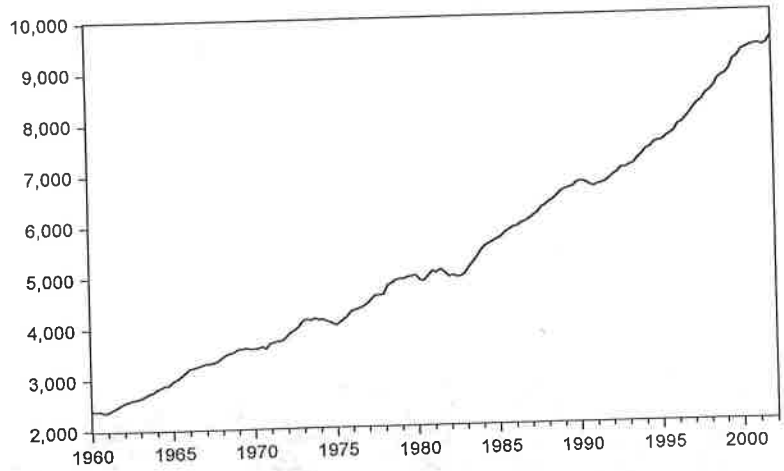
(v)

Date: 04/23/14 Time: 14:10
Sample: 1960Q1 2002Q1
Included observations: 169

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.980	0.980	165.26	0.000
		2	0.960	-0.006	324.91	0.000
		3	0.941	-0.018	478.90	0.000
		4	0.920	-0.032	627.03	0.000
		5	0.898	-0.022	769.26	0.000
		6	0.877	-0.013	905.64	0.000
		7	0.856	-0.011	1036.3	0.000
		8	0.834	-0.012	1161.2	0.000
		9	0.814	0.003	1280.8	0.000
		10	0.793	-0.012	1395.0	0.000
		11	0.773	0.007	1504.1	0.000
		12	0.753	-0.006	1608.4	0.000
		13	0.733	-0.012	1707.9	0.000
		14	0.713	-0.009	1802.6	0.000
		15	0.694	0.006	1893.0	0.000

GDP

(vi)



(vii)

Augmented Dickey-Fuller Unit Root Test on GDP

Null Hypothesis: GDP has a unit root
Exogenous: None
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		13.36334	1.0000
Test critical values:	1% level	-2.578799	
	5% level	-1.942733	
	10% level	-1.615446	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP)
Method: Least Squares
Date: 04/23/14 Time: 14:12
Sample (adjusted): 1960Q2 2002Q1
Included observations: 168 after adjustments

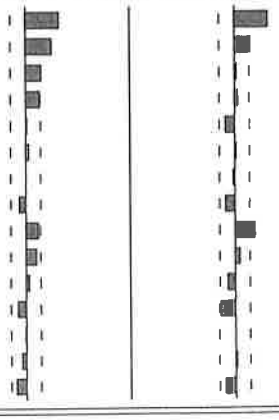
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	0.007828	0.000586	13.36334	0.0000

R-squared	0.083158	Mean dependent var	42.20893
Adjusted R-squared	0.083158	S.D. dependent var	44.69340
S.E. of regression	42.79475	Akaike info criterion	10.35664
Sum squared resid	305842.3	Schwarz criterion	10.37524
Log likelihood	-868.9580	Hannan-Quinn criter.	10.36419
Durbin-Watson stat	1.405315		

(viii)

Correlogram of GDP_DIF

Date: 04/23/14 Time: 14:13
Sample: 1960Q1 2002Q1
Included observations: 168

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.344	0.344	20.210	0.000
		2	0.270	0.172	32.716	0.000
		3	0.161	0.030	37.206	0.000
		4	0.140	0.047	40.603	0.000
		5	0.014	-0.083	40.638	0.000
		6	0.040	0.022	40.921	0.000
		7	0.003	-0.011	40.922	0.000
		8	-0.064	-0.083	41.663	0.000
		9	0.128	0.208	44.610	0.000
		10	0.111	0.057	46.851	0.000
		11	0.038	-0.069	47.109	0.000
		12	-0.074	-0.136	48.116	0.000
		13	-0.006	0.003	48.123	0.000
		14	-0.035	0.019	48.354	0.000
		15	-0.095	-0.085	50.044	0.000