Name: _____

Final Exam
Economics 427. Economic Forecasting
Prof. Byron Gangnes
December 11, 2007

- Make sure your name is on the exam. Write all answers on the exam sheets.
- Carefully read the instructions for each question.
- The weight of each section in your grade is indicated by the points.

Section I. (22 points) Matching! Please write the letter of the item from column b that matches the concept in column a:

	Column a	Column b
_____	1. Density forecast	a. running total of recursive residuals
_____	2. Unbiased	b. Infinite unconditional variance
_____	3. White noise	c. for normal variables, forecast both mean and variance
_____	4. Covariance stationary	d. most general single-equation model
_____	5. VAR	e. zero mean, constant variance, autocov. not a function of calendar time
_____	6. Impulse response	f. multivariate regression model
_____	7. Mincer-Zarnowitz regression	g. zero-mean forecast error
_____	8. Random walk	h. effects of shocks on a system
_____	9. Transfer function model	i. zero mean, constant variance, no serial correlation
_____	10. Chain rule of forecasting	j. used to forecast AR processes
_____	11. CUSUM statistic	k. tests whether errors are forecastable

Section II. (18 points)
Define each of the concepts below and briefly explain the rationale for its use:

1. Granger causality test

2. Impulse response function

3. Augmented Dickey-Fuller test

Section III. (30 points) Analytical. Show all your work on this page (use the back if necessary).
Consider the following ARMA(1,1) process:

$$y_t = \phi y_{t-1} + \varepsilon_t + \theta \varepsilon_{t-1}, \qquad \varepsilon_t = WN(0, \sigma^2)$$

1. Derive the moving average representation by recursively substituting lagged *y*. (Hint: you really only need to substitute once for this question.)

2. Based on your result from part 1, write down expressions for the 1-step-ahead and 2-step-ahead forecast errors under the optimal forecasts. (Remember that the forecast error will be the part of y_t that is unknown at time T.) Are the errors serially correlated? Explain.

3. What are the forecast error variances for the 1-step-ahead and 2-step-ahead cases? Would the variances grow without bound for h-step ahead forecasts as h gets large? (You don't have to derive the h-step ahead algebra.)

4. How would the h-step ahead forecast error variance differ if the process has a unit root?

Section IV. (30 points) Application of Univariate Modeling. A candidate model of US real consumption is reported on pages 6 to 10. Review these model results and answer the following questions. TIME is a time trend. The data is seasonally adjusted.

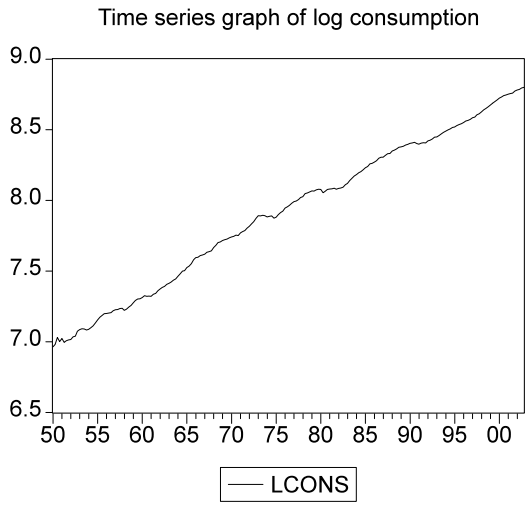
1. What features of the data are evident in the time series plots and related statistics that should be captured by a model? Is there other evidence that would be useful in formulating a modeling strategy?

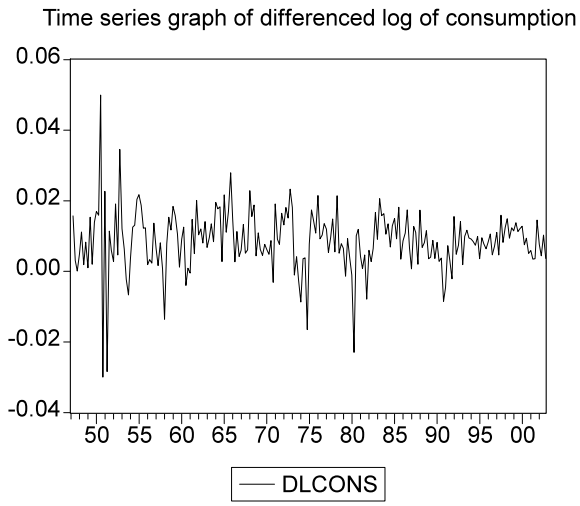
2. Evaluate the in-sample characteristics of the candidate model. Assess its apparent ability to capture features of the underlying data. What criteria could you use to select the appropriate number of lags of the dependent variable to include?

3. Is there evidence of any problems with the model that could affect the reliability of the parameter estimates? Explain. How would you address these concerns?

4. Assess the out-of-sample forecast performance of the model. Considering the characteristics of the data, do you think we can trust that the true error bands are really this narrow? Explain.

Resources for Section IV





Correlogram and Partial Autocorrelation Function for LCONS
Date: 05/08/03 Time: 13:25
Sample: 1950:1 2000:4
Included observations: 204

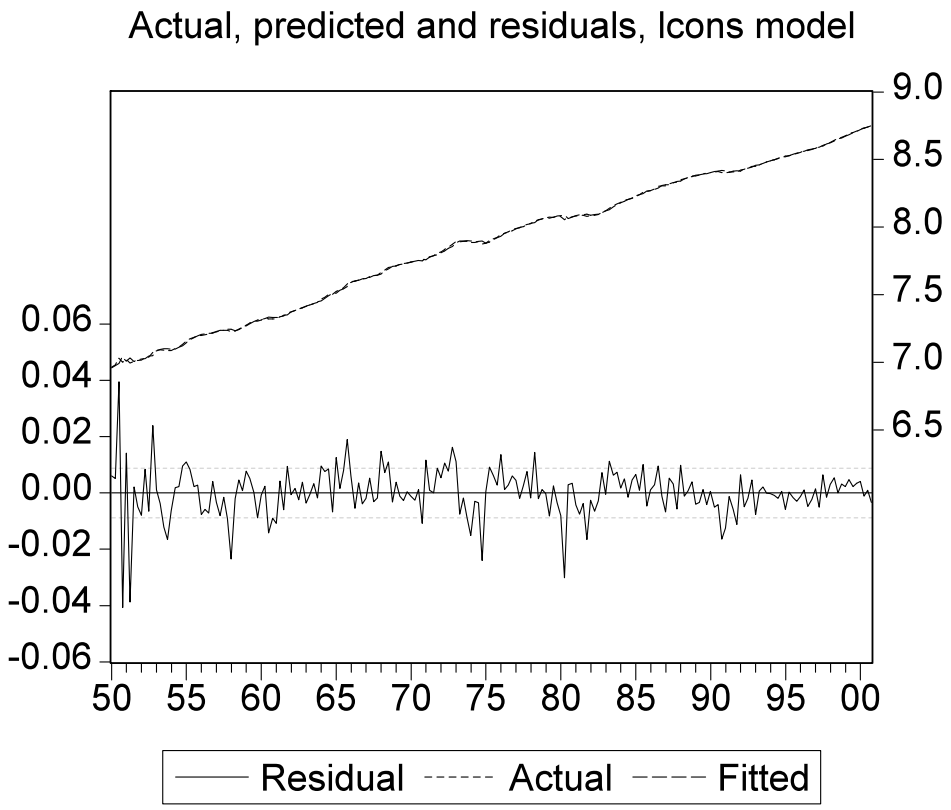
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|********	.|********	1	0.985	0.985	200.85	0.000
.|*******|	.|. |	2	0.970	-0.006	396.61	0.000
.|*******|	.|. |	3	0.956	0.014	587.58	0.000
.|*******|	.|. |	4	0.941	-0.030	773.53	0.000
.|*******|	.|. |	5	0.926	0.004	954.63	0.000
.|*******|	.|. |	6	0.911	-0.027	1130.7	0.000
.|*******|	.|. |	7	0.896	-0.003	1301.9	0.000
.|*******|	.|. |	8	0.881	-0.008	1468.2	0.000
.|*******|	.|. |	9	0.866	-0.007	1629.6	0.000
.|*******|	.|. |	10	0.851	-0.001	1786.4	0.000
.|****** |	.|. |	11	0.836	-0.010	1938.6	0.000
.|****** |	.|. |	12	0.822	0.011	2086.3	0.000
.|****** |	.|. |	13	0.807	-0.003	2229.7	0.000
.|****** |	.|. |	14	0.793	-0.007	2368.8	0.000
.|****** |	.|. |	15	0.779	-0.009	2503.7	0.000
.|****** |	.|. |	16	0.764	-0.018	2634.3	0.000
.|****** |	.|. |	17	0.750	-0.010	2760.7	0.000
.|****** |	.|. |	18	0.735	-0.007	2882.9	0.000
.|****** |	.|. |	19	0.721	-0.007	3000.9	0.000
.|***** |	.|. |	20	0.707	0.000	3115.0	0.000

Candidate model:

Dependent Variable: LCONS
Method: Least Squares
Date: 05/08/03 Time: 13:03
Sample: 1950:1 2000:4
Included observations: 204

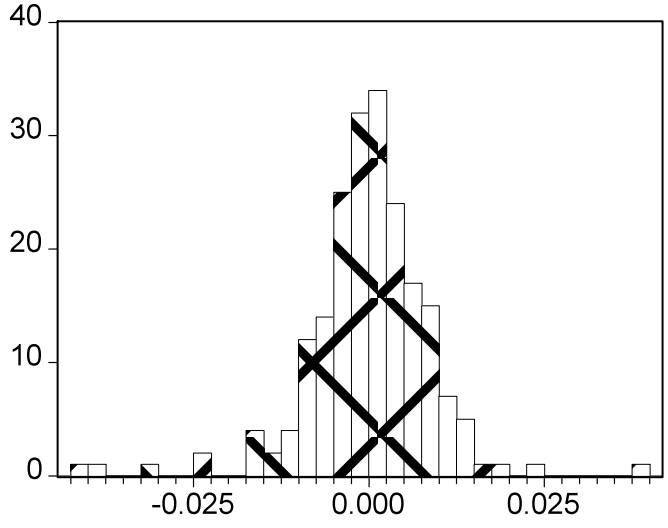
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.211943	0.111522	1.900462	0.0588
TIME	0.000249	0.000142	1.755010	0.0808
LCONS(-1)	1.012139	0.070654	14.32537	0.0000
LCONS(-2)	-0.041581	0.070461	-0.590122	0.5558

R-squared	0.999711	Mean dependent var	7.879933
Adjusted R-squared	0.999707	S.D. dependent var	0.515522
S.E. of regression	0.008825	Akaike info criterion	-6.603127
Sum squared resid	0.015575	Schwarz criterion	-6.538066
Log likelihood	677.5190	F-statistic	230860.8
Durbin-Watson stat	2.024805	Prob(F-statistic)	0.000000



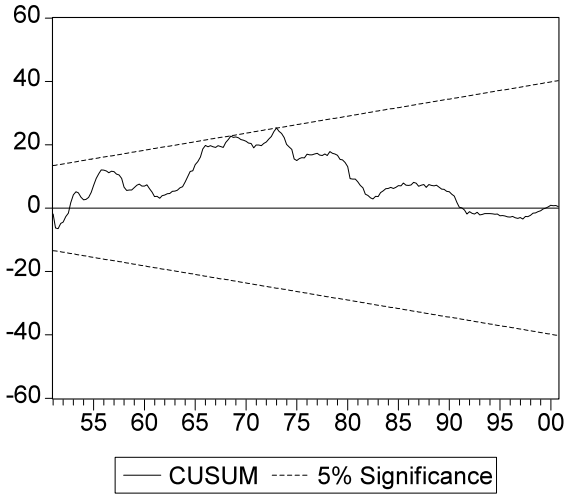
Correlogram and Partial Autocorrelation Function for Model Residuals
Date: 05/08/03 Time: 13:08
Sample: 1950:1 2000:4
Included observations: 204

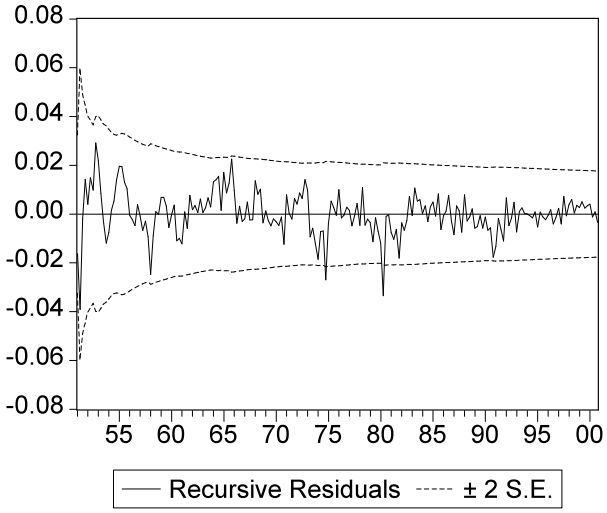
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|. |	.|. |	1	-0.014	-0.014	0.0401	0.841
.|** |	.|** |	2	0.297	0.296	18.333	0.000
.|. |	.|. |	3	0.011	0.019	18.357	0.000
.|. |	*|. |	4	-0.037	-0.136	18.637	0.001
.|. |	*|. |	5	-0.046	-0.064	19.092	0.002
*|. |	.|. |	6	-0.093	-0.048	20.934	0.002
.|. |	.|* |	7	0.035	0.078	21.196	0.003
*|. |	*|. |	8	-0.136	-0.102	25.147	0.001
.|* |	.|. |	9	0.074	0.036	26.342	0.002
.|* |	.|* |	10	0.067	0.142	27.310	0.002
.|. |	.|. |	11	0.031	0.005	27.525	0.004
.|. |	*|. |	12	-0.047	-0.154	28.005	0.006
.|. |	*|. |	13	-0.035	-0.064	28.270	0.008
*|. |	*|. |	14	-0.127	-0.072	31.821	0.004
.|. |	.|. |	15	-0.035	0.036	32.099	0.006
.|. |	.|* |	16	0.046	0.116	32.575	0.008



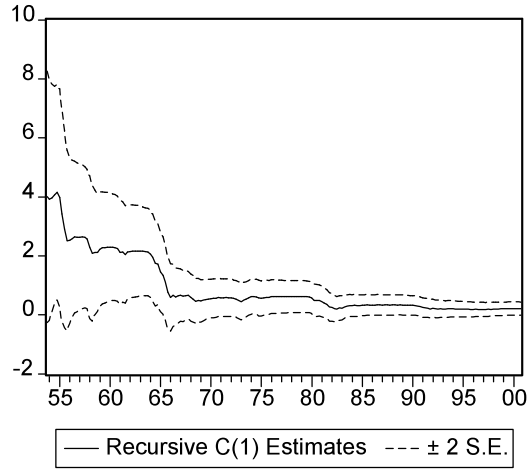
Series: Residuals
Sample 1950:1 2000:4
Observations 204

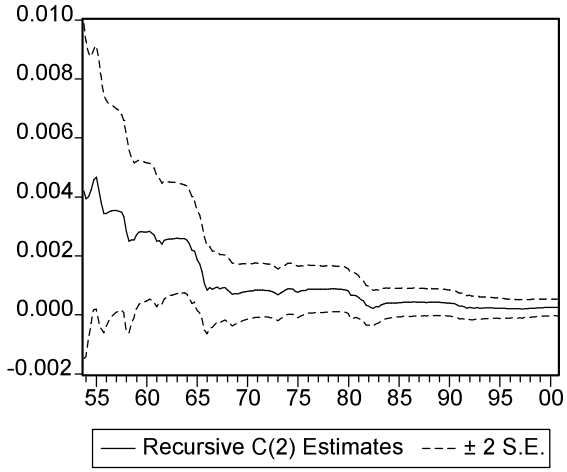
Mean	-4.31E-16
Median	0.000420
Maximum	0.039385
Minimum	-0.040729
Std. Dev.	0.008759
Skewness	-0.692805
Kurtosis	8.644921
Jarque-Bera	287.1729
Probability	0.000000

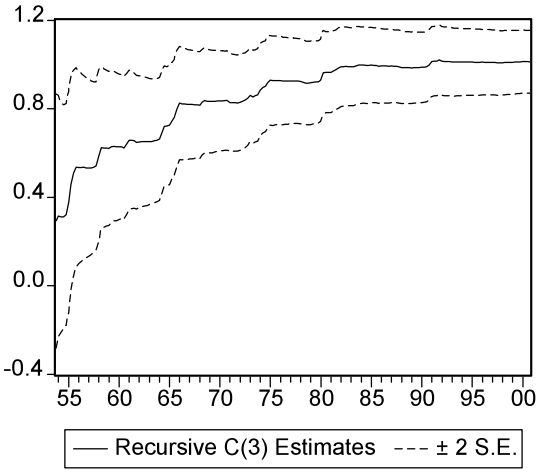


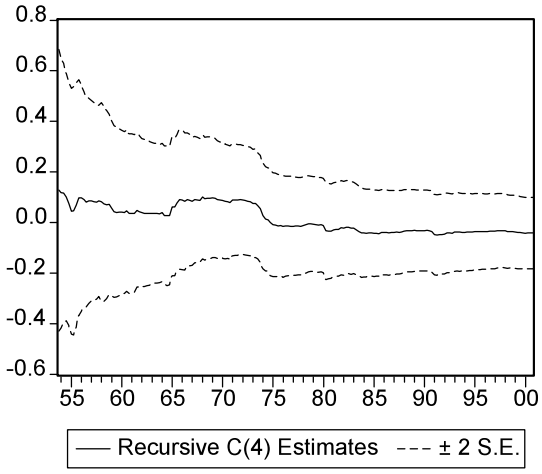


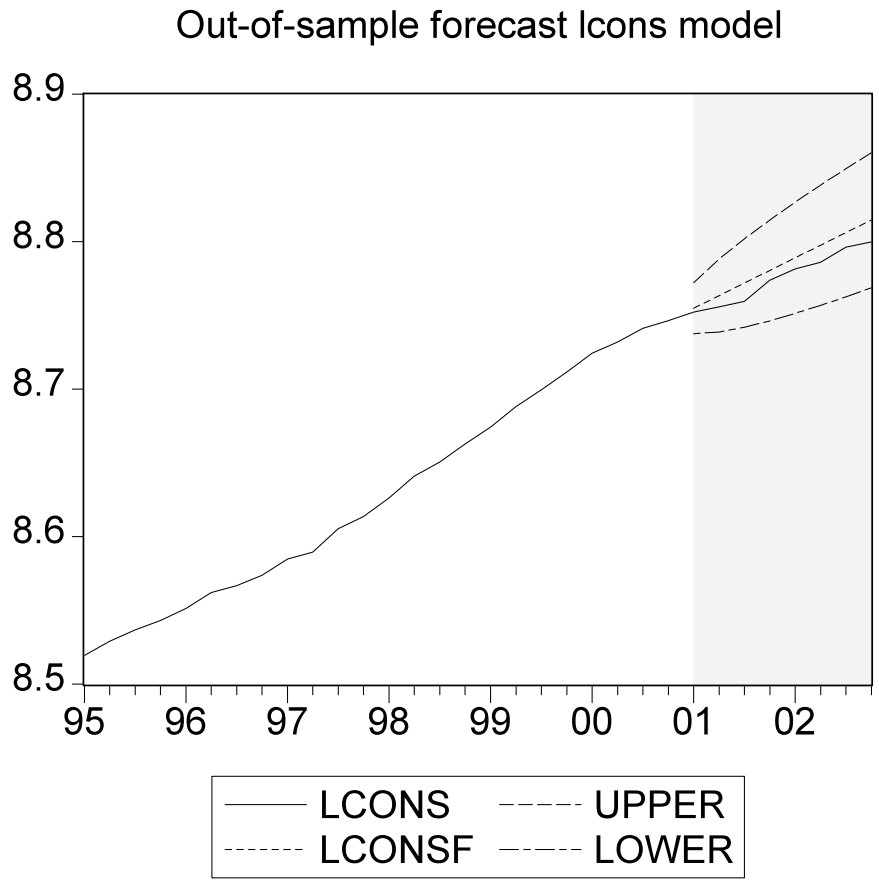
Recursive parameter estimates










Out-of-sample forecast lcons model
8.9
8.8
8.7
8.6
8.5
95
96
97
98
99
00
01
02
LCONS
LCONSF
UPPER
LOWER