Economics 413: Economic Forecast & Analysis

Department of Economics, Finance and Legal Studies
University of Alabama
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Midterm II

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

1. Consider two processes y_t and x_t where we have $t = 1, 2, \ldots, T$ observations on each. 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_t 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 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)?

   (c) How do you know how many lags to include for x?

   (d) Write down the h-step ahead value for y (y_{t+h}) that you put down in part (a).

   (e) For $h = 1$, construct the forecast value of y ($\widehat{y}_{t+h|t}$).

2. Consider the following model: $Y_t = \mu + \varepsilon_t + \theta_3 \varepsilon_{t-3}$

   (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 forecast interval forecast for $h = 1, 2, \ldots$

   (e) Plots parts (a) and (d) in a single figure

	MA(4)	AR(3)	AR(4)	AR(5)	ARMA(2,2)	ARMA(2,4)
ϕ's (t-ratio) θ's (t-ratio)	$\hat{\theta}_1 = 0.354$ (4.6) $\hat{\theta}_2 = 0.383$ (4.7) $\hat{\theta}_3 = 0.235$ (2.8) $\hat{\theta}_4 = 0.464$ (5.9)	$\hat{\phi}_1 = 0.281$ (3.2) $\hat{\phi}_2 = 0.345$ (3.9) $\hat{\phi}_3 = 0.177$ (1.9)	$\hat{\phi}_1 = 0.238$ (2.8) $\hat{\phi}_2 = 0.261$ (2.9) $\hat{\phi}_3 = 0.111$ (1.2) $\hat{\phi}_4 = 0.284$ (3.2)	$\hat{\phi}_1 = 0.282$ (3.1) $\hat{\phi}_2 = 0.270$ (3.0) $\hat{\phi}_3 = 0.135$ (1.4) $\hat{\phi}_4 = 0.307$ (3.4) $\hat{\phi}_5 = -0.13$ (-1.4)	$\hat{\phi}_1 = 0.134$ (0.6) $\hat{\phi}_2 = 0.777$ (3.5) $\hat{\theta}_1 = 0.137$ (0.5) $\hat{\theta}_2 = -0.415$ (-1.9)	$\hat{\phi}_1 = 0.297$ (1.5) $\hat{\phi}_2 = 0.580$ (2.9) $\hat{\theta}_1 = -0.007$ (-0.04) $\hat{\theta}_2 = -0.338$ (-2.2) $\hat{\theta}_3 = -0.061$ (-0.6) $\hat{\theta}_4 = 0.265$ (2.7)
Covariance-stationary	yes	yes	yes	yes	yes	yes
Invertibility	yes	yes	yes	yes	yes	yes
White noise residuals	no	no	yes	yes	no	no
Q-statistics (p-value)	$Q_5 = 4.178$ (0.04) $Q_8 = 9.970$ (0.04)	$Q_4 = 10.722$ (0.0) $Q_8 = 15.099$ (0.01)	$Q_5 = 2.440$ (0.1) $Q_8 = 5.984$ (0.2)	$Q_6 = 0.704$ (0.4) $Q_8 = 3.968$ (0.2)	$Q_5 = 7.103$ (0.01) $Q_8 = 11.004$ (0.03)	$Q_7 = 4.259$ (0.04) $Q_8 = 4.586$ (0.10)
Residual variance $\hat{\sigma}_\varepsilon^2$	5.769	6.003	5.505	5.489	5.784	5.573
Adjusted R-squared	—	0.362	0.410	0.416	—	—
AIC	4.627	4.660	4.581	4.586	4.630	4.607
SIC	4.735	4.747	4.691	4.719	4.739	4.760

3. Here we will employ the Box-Jenkins methodology using the EViews output

   (a) Is each model stationary? How do you know (note: the "yes/no" in the box is not a full-credit answer)?

   (b) Using model selection criteria, which tenative model should be chosen (hint: there is more than one correct answer here)?

   (c) Give the estimated model from your choice in part (b)?

   (d) Does the estimated model from your choice in part (b) pass the diagnostic checks? How do you know (note: the "yes/no" in the box is not a full-credit answer)?

   (e) Find the $h = 1$ step ahead forecast for your choice from part (b).