Academic Year 2019-2020

B-74-3-B Time Series Econometrics

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EXERCISE SHEET 2

1.

Consider the process $\{Y_t\}_{t=-\infty}^{\infty}$ generated by the model

$$Y_t = \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + \varepsilon_t$$

where ε_t is white noise $(0, \sigma^2)$.

Derive the autocorrelation function of $\{Y\}_{t=-\infty}^{\infty}$ up to $j = 5$ when

i. $\phi_1 = 0.8$, $\phi_2 = -0.8$

ii. $\phi_1 = -0.5$, $\phi_2 = 0.3$.

iii. What is the impulse response function (IRF)? For each case, derive the first five points ψ_j of the IRF.

2.

Consider the process $\{Y_t\}_{t=-\infty}^{\infty}$ generated by the model

$$Y_t = 0.5 Y_{t-1} + \varepsilon_t + 0.7\varepsilon_{t-1}$$

where ε_t is white noise $(0, \sigma^2)$.

i. Check stationarity and invertibility of $\{Y_t\}_{t=-\infty}^{\infty}$.

ii. Derive the IRF for a generic point j.

iii. Derive the autocorrelation function of the $\{Y\}_{t=-\infty}^{\infty}$ up to $j = 3$.

3.

Let $\{\varepsilon_t\}_{t=-\infty}^{\infty}$ be a white noise $(0, \sigma^2)$.

Plot the autocorrelation function up to $j = 3$ of

$$Y_t = 0.7 Y_{t-1} - 0.1 Y_{t-2} + \varepsilon_t + 0.5\varepsilon_{t-1} - 0.14\varepsilon_{t-2}$$

(hint: factorize the polynomials first)

4.

Consider the process $\{Y\}_{t=-\infty}^{\infty}$ generated by the model

$$Y_t = 0.2Y_{t-1} + \varepsilon_t + 0.6\varepsilon_{t-1}$$

where $\{\varepsilon_t\}_{t=-\infty}^{\infty}$ is white noise $(0, \sigma^2)$ (i.e., ε_t is wn$(0, \sigma^2)$).

i. Explain how you would compute the best forecast linear forecast of Y_{t+1} assuming that a time series $Y_1, ..., Y_t$ is available.

ii. Explain why the procedure in part i may be computationally intensive in large samples and describe an approximation that avoids that problem.