Financial Forecasting

M.Sc. in Finance – 2018/19 – 1st Semester

Solutions of selected exercises

Week 2:

1. Consider the following stochastic processes where $\varepsilon_t \sim WN(0, \sigma_\varepsilon^2)$, $\beta_1, \beta_2 \neq 0$:
   i. stationary
   ii. not stationary ($X_t - \beta_0 - \beta_1 t - \beta_2 t^2 = \varepsilon_t$ is stationary)
   iii. not stationary ($\Delta X_t = X_t - X_{t-1} = \alpha + \varepsilon_t$ is stationary)

Week 3:

2- $r_{T|T-1} = 0{,}0001587$

5- a) $f_{t|t+1} = (1105 - 45.5 \times 1) \times 0.97 = 1027.715$
   $f_{t|t+2} = 1054.56$
   $f_{t|t+3} = 1009.24$
   $f_{t|t+4} = 876.8$
   c) $\hat{a}_{t+1} = 6.91365$ $\hat{b}_{t+1} = -0.040135$

Week4:

6.
   a. $\rho_1 = -\frac{0.12}{(1+0.12^2)}$ $\rho_k = 0, k \geq 2$
   b. MA processes are always stationary
   c. Yes.
   d. The PACF is statistically different from zero at least for first lags. Decays to zero .

8.
   b. 1.000127; 0.2;

Week 5:

9.
   a. Yes.
   b. $E[Y_t] = \frac{20}{3}$

10.

b. $\widehat{E[y_t]} \approx$ 1.(eviews output "c" is the estimate of the unconditional average of the AR process)

c.

i. $\hat{\phi}_1 \approx 1\ \hat{\phi}_2 \approx 0.769\ \ \hat{\mu} \approx 1$

$\hat{c} \approx 1 \times (1 - 1 + 0.769) \approx\ 0.769$

$f_{t,1} = 0.769 + 1 * 1.2 - 0.769 * 1 \approx 1.2$

ii. $f_{t,2} = 0.769 + 1 * 1.2 - 0.769 * 1.2 \approx 1.05$

d.

i. $(0.285364)^2 = 0.081225$

ii. $(1 + \hat{\phi}_1)0.081225 = 0.16245$

Week6:

11. $Y_t = c + \varepsilon_t + \theta_1\varepsilon_{t-1} + \theta_{12}\varepsilon_{t-12} + \theta_1\theta_{12}\varepsilon_{t-13}$

12. $(1 - \phi_1 L)(1 - \phi_4 L^4)y_t = \varepsilon_t (1 - \phi_1 L - \phi_4 L^4 + \phi_1\phi_4 L^5)y_t = \varepsilon_t \Leftrightarrow$

$y_t - \phi_1 y_{t-1} - \phi_4 y_{t-4} + \phi_1\phi_4 y_{t-5} = \varepsilon_t \Leftrightarrow y_t = \phi_1 y_{t-1} + \phi_4 y_{t-4} - \phi_1\phi_4 y_{t-5} + \varepsilon_t$

Week 7:

14.

a. stationary. Not invertible.

b. Not stationary. invertible.

c. stationary. invertible.

15. $Y_t = 2 + 0.8Y_{t-1} + 0.5\varepsilon_{t-1} + \varepsilon_t$

Week 8:

16.

i. MA(1)

ii. ARMA(1,1)

iii. ARMA(2,1)

iv. ARMA(1,3)

19.

a. $Y_t = -0.740\varepsilon_{t-1} - 0.888\varepsilon_{t-12} + 0.888 \times 0.740\varepsilon_{t-13} + \varepsilon_t$

c. No. The residuals present significant autocorrelations.

Week 9:

20. a. $\mathrm{f}_{\mathrm{t|t+1}} = 12.1$

$\mathrm{f}_{\mathrm{t|t+2}} = 11.125$

$\mathrm{f}_{\mathrm{t|t+3}} = 10.844$

b. $\mathrm{f}_{\mathrm{t|t+h}} = 2.5 \sum_{\mathrm{i=0}}^{\mathrm{h}} 0.7^{\mathrm{i}} \xrightarrow{\mathrm{h}\to\infty} \frac{2.5}{1-0.75}$

Week 11:

24. ARIMA(1,1,0) -> $\Delta y_t = c + \phi \Delta y_{t-1} + \varepsilon_t \Leftrightarrow y_t = c + \phi \Delta y_{t-1} + y_{t+1} + \varepsilon_t$

$\mathrm{f}_{\mathrm{n|n+1}} = \mathrm{E}[y_{n+1}|\mathrm{I_n}] = 0.9 \times (100 - 120) + 100 = 82$

$\mathrm{f}_{\mathrm{n|n+2}} = \mathrm{E}[y_{n+2}|\mathrm{I_n}] = 0.9 \times (82 - 100) + 82 = 65.8$

25. $\mathrm{f}_{\mathrm{t|t+1}} = 501$ $\mathrm{f}_{\mathrm{t|t+2}} = 502$ $\mathrm{f}_{\mathrm{t|t+3}} = 504$ $\mathrm{f}_{\mathrm{t|t+2}} = 508$

26.

a. Spurious regression: it occurs when we regress variables that are not mean starionary.
b. Apply the ADF test with a constant and a trend
c. auxiliary regression: $\Delta \log(C_t) = c + \beta t + \pi \log(C_{t-1}) + \Delta \log(C_{t-1})$.

$$H_0: \pi = 0 \ (unit\ root)\ vs\ H_1: \pi < 0 \ (trend\ stationary)$$

$$t_{obs} = -0.616883 > \mathrm{t}^*_{10\%} = -3.139292$$

do not reject H_0 -> no evidence to say that $\log(C_t)$ is trend stationary

Week 13:

28.

a. False
b. True
c. False
d. False
e. False
f. True