Financial Forecasting

M.Sc. in Finance

Solutions of selected exercises

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)

2- $r_{T|T-1} = 0.0002196$

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) $\hat{a}_{t+1} = 6.91365$ $\hat{b}_{t+1} = -0.040135$

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;

9.

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

10.

b. $\widehat{E[y_t]} \approx 1.35.$

c.

i. 1.4
ii. 0.9

d.

i. 0.081225

ii. 0.16245

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

12. $Y_t = c + \phi_1 Y_{t-1} + \phi_4 Y_{t-4} - \phi_4 \phi_1 Y_{t-5} + \varepsilon_t$

14.

a. stationary. Not invertible.

b. Not stationary. invertible.

c. stationary. invertible.

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

16.

i. $\mathrm{MA}(1)$

ii. $\mathrm{ARMA}(1,2)$

iii. $\mathrm{ARMA}(2,1)$

iv. $\mathrm{ARMA}(1,3)$

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.

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

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

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

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

24. $\mathrm{f}_{n|n+1} = 118$ $\mathrm{f}_{n|n+2} = 134.2$

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

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

28.

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

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