Quiz Module 3

Your name: Solution

Your SCIPER: Solution

Q1:

Why is accurate short-term forecasting of load and stochastic generation considered fundamental for modern power-system operation?

- ○ a. To schedule availability of reactive power compensation from PV plants
- ◉ b. To balance generation and demand, schedule operating reserves, and support market bidding
- ○ c. To calculate power-quality indices such as total harmonic distortion
- ○ d. To comply with emission caps imposed by environmental regulators

Q2:

Consider an MA(q) model. The benefit of this model is that it (select the TRUE statement)

- ◉ a. It captures the linear correlation between the elements of the noise sequence $\epsilon_1, \ldots, \epsilon_t$
- ○ b. Since MA(q) processes models noise patterns, they are always stable (and thus inversible)
- ○ c. It captures the linear correlation with lags of the forecasted variable
- ○ d. Finding the order q of an MA(q) model requires plotting the PACF and finding number of significant lags

Q3:

Consider the linear-regression forecasting model $Y_t = \sum_{i=1}^{p} \beta_i f_{t-i} + \epsilon_t$. The error term ϵ_t is assumed to be

- a. Laplacian noise with non-zero mean
- b. Autocorrelated Gaussian noise
- c. Independent and identically distributed (iid) white Gaussian noise with zero mean and variance σ^2
- d. Heteroscedastic but uncorrelated

Q4:

Select the true statement.

- a. Overfitting is not a problem in practical forecasting
- b. Underfitting is always preferred compared to overfitting
- c. There exist an optimal number of parameters of a linear regression model such that we have a trade-off between overfitting and underfitting
- d. Any model with too many parameters results in multicollinearity, i.e., the $X^T X$ matrix becomes non-invertible

Q5:

The 2-lag differencing filter of order 2 can be represented by the following difference equation: (select the CORRECT statement)

- a. $X_t = Y_t - 2Y_{t-2} + Y_{t-1}$
- b. $X_t = Y_t - 2Y_{t-2} - Y_{t-4}$
- c. $X_t = Y_t + Y_{t-2} - Y_{t-1}$
- d. $X_t = Y_t - 2Y_{t-2} + Y_{t-4}$

Q6:

Which pattern in ACF and PACF plots is characteristic of an MA(1) process?

- a. Both ACF and PACF decay geometrically
- b. Both ACF and PACF cut off after lag 1
- c. ACF decays geometrically; PACF cuts off after lag 1
- d. ACF cuts off after lag 1; PACF decays geometrically

Q7:

By definition, an ARIMA(p,d,q) process is one in which:

- a. The original series is stationary and follows an ARMA(p+d,q) model
- b. Seasonal differencing with period d is mandatory
- c. Differencing the series d times yields an ARMA(p,q) process
- d. The MA part has order p and the AR part order q after d integrations

Q8:

Which of the following statements about **stationarity** in ARMA processes is **true**?

- a. An AR(1) process with coefficient $A_1 = -1.2$ is stationary because the coefficient is negative.
- b. A process with constant mean and no memory of past values is never stationary.
- c. Intuitively, an AR model captures the linear correlation between the current value of the time series with the previous ones with a noise that is independent and with constant variance
- d. An AR(2) process is never stationary if one of its coefficients is greater than 1 in magnitude.

Q9:

Which of these ARMA processes are stationary?

1. $X_t = 2X_{t-1} + \epsilon_t$
2. $X_t = X_{t-1} + X_{t-2} + \epsilon_t$
3. $X_t = -0.1X_{t-1} + \epsilon_t$
4. $X_t = 0.5X_{t-1} - 0.5\epsilon_{t-1} + \epsilon_t$

- a. Only 3
- b. 3 and 4
- c. All of them
- d. None of them

Q10:

Consider the following finite impulse response:

$h_0 = 1$

$h_1 = 1$

$h_2 = 1$

$h_3 = 1$

$h_4 = 1$

$h_n = 0, n > 4$

Which of these filters correspond to this impulse response?

- a. Δ_4^1 (lag-4 differencing filter of order 1)
- b. R_4 (De-seasonalizing filter with period 4)
- c. R_3 (De-seasonalizing filter with period 3)
- d. R_5 (De-seasonalizing filter with period 5)