Yule–Walker in matrix form and Yule–Walker estimation

4/4 points (100.00%)

Quiz, 4 questions

Congratulations! You passed!

Next Item

1 / 1 points

1.
Find and write Yule-Walker equations in matrix form for the AR(3) process

$X_t = \frac{1}{2}X_{t-1} + \frac{1}{9}X_{t-2} - \frac{1}{18}X_{t-3} + Z_t.$

- [x] $\begin{bmatrix}\rho(1)\\ \rho(2)\\ \rho(3)\end{bmatrix} = \begin{bmatrix}1 & \rho(1) & \rho(2)\\ \rho(1) & 1 & \rho(1)\\ \rho(2) & \rho(1) & 1\end{bmatrix} \begin{bmatrix}\frac{1}{2}\\ \frac{1}{9}\\ -\frac{1}{18}\end{bmatrix}$

Correct
Correct!

We take Yule-Walker equations for $k = 1, 2, 3$, and use that $\rho(k)$ is an even function. $\rho(0)'s$ are replaced by 1.

- [x] $\begin{bmatrix}\rho(1)\\ \rho(2)\\ \rho(3)\end{bmatrix} = \begin{bmatrix}\rho(0) & \rho(1) & \rho(2)\\ \rho(1) & \rho(0) & \rho(1)\\ \rho(2) & \rho(1) & \rho(0)\end{bmatrix} \begin{bmatrix}\frac{1}{2}\\ \frac{1}{9}\\ -\frac{1}{18}\end{bmatrix}$

Correct
Correct!

We take Yule-Walker equations for $k = 1, 2, 3$, and use that $\rho(k)$ is an even function. $\rho(0)'s$ can be replaced by 1.

- [ ] $\begin{bmatrix}\rho(1)\\ \rho(2)\\ \rho(3)\end{bmatrix} = \begin{bmatrix}1 & \frac{1}{9} & \frac{1}{2}\\ \frac{1}{9} & 1 & \frac{1}{18}\\ \frac{1}{2} & \frac{1}{18} & 1\end{bmatrix} \begin{bmatrix}\rho(0)\\ \rho(1)\\ \rho(2)\end{bmatrix}$

Un-selected is correct

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1 / 1 points

2.
Sample autocorrelation coefficients of an AR(3) process are given: $r_1 = 0.8$, $r_2 = 0.6$, and $r_3 = 0.2$. Use Yule-Walker equations in matrix form to estimate model parameters $\hat{\phi}_1$, $\hat{\phi}_2$, $\hat{\phi}_3$.

- [x] $\hat{\phi}_1 = 0.8125$, $\hat{\phi}_2 = 0.5000$, $\hat{\phi}_3 = -0.6875$.

Correct
Correct!

We find $\hat{R}^{-1}\hat{b}$. This could be done by using R routine solve(R,b).

- [ ] $\hat{\phi}_1 = 0.8$, $\hat{\phi}_2 = 0.6$, $\hat{\phi}_3 = 0.2$

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1 / 1

points

3. Yule-Walker in matrix form and Yule-Walker estimation

4/4 points (100.00%)

Quiz, 4 questions

Use Question 2 information and the fact that sample autocovariance at lag 0, $c(0)=5$ $to estimate the variance of the noise in the same AR(3) process, i.e., \hat{\sigma^2}=?$$

- $\hat{\sigma^2} = 5$
- $\hat{\sigma^2} = 0.9375$

Correct
Correct!

Yule-Walker estimator for $\hat{\sigma^2}$ is $c(0)(1 - \sum \hat{\phi}_n b_n)$.

1 / 1 points

4.
Which of the following is the fitted model to the process described above in Question 2 and Question 3?

- $X_t = 0.8125X_{t-1} + 0.5000X_{t-2} - 0.6875X_{t-3} + Z_t.$

  where $\hat{\sigma_Z^2} = 0.9375$

Correct
Correct!

It is an AR(3) process where coefficients are $\phi's$.

- $X_t = 0.8X_{t-1} + 0.6X_{t-2} + 0.2X_{t-3} + Z_t.$

  where $\hat{\sigma_Z^2} = 0.9375$
- $X_t = 0.8125X_{t-1} + 0.5000X_{t-2} - 0.6875X_{t-3} + Z_t.$

  where $\hat{\sigma_Z^2} = 5$