19CS10071

$t = M, M+1, \ldots, 100$

Q8) $\hat{z}_{t+1} = \theta_1 z_t + \theta_2 z_{t-1} + \cdots + \theta_M z_{t-M+1}$

$$\therefore A = \begin{bmatrix} z_M & z_{M-1} & \cdots & z_1 \\ z_{M+1} & z_M & \cdots & z_2 \\ z_{M+2} & \cdots & & \\ \vdots & & & \\ z_{100} & \cdots & & z_{101-M} \end{bmatrix}_{101-M \times M}$$

$$\theta = \begin{bmatrix} \theta_1 \\ \vdots \\ \theta_M \end{bmatrix}_{M \times 1} \qquad b = \begin{bmatrix} z_{M+1} \\ \vdots \\ z_{101} \end{bmatrix}_{101-M \times 1}$$

$A\theta = b$: LS problem.

Observations:

1. Diagonally elements in A are same $\begin{bmatrix} z_M & z_{M-1} & \cdots \\ & z_M & z_M \\ & & \ddots \end{bmatrix}$

2. Thus only 100 values are required to specify entire A, i.e. $z_1, z_2, \ldots, z_{100}$

Relation of Rank(A) with M.

$\text{Rank} \leq \min(M, 101-M)$ [$\because$ Row Rank = Col Rank & Row Rank $\leq 101-M$, Col Rank $\leq M$]