

$$\underline{y}_n = \underline{\Theta} \cdot \underline{k}_n + \underline{v}_n$$

$$\hat{\underline{\Theta}} = \arg \min \|\underline{y}_n - \underline{\Theta} \underline{k}_n\|^2$$

LS, LINEAR IN PARAMETERS

$$\begin{bmatrix} \hat{\underline{\Theta}} = \underline{y}_n \underline{k}_n^* (\underline{k}_n \underline{k}_n^*)^{-1} \\ \hat{\underline{G}}(k) = \hat{\underline{\Theta}} \begin{bmatrix} \underline{I}_{n_r} \\ \underline{0} \end{bmatrix} \end{bmatrix}$$

SELECTION $[\hat{G}_1 \hat{G}_2 \dots \hat{G}_{n_r}]$ FULL RECORD AT ONCE $N(R+1)(n_r+1)$

$$\underline{y} = \underline{\Theta} \cdot \underline{k}_n + \underline{v}_n$$

PROPERTIES OF $\hat{G}_{poly}(k)$

$$\text{BIAS: } E\{\hat{G}\} = G_0(k) + \underbrace{e_{1G}}_{\text{LEAKAGE}} + \underbrace{e_{2G}}_{\text{INTERPOLATION}}$$

$$O\left(\left(\frac{n}{N}\right)^{(n+2)}\right)$$

$$G_0(k) O\left(\left(\frac{n}{N}\right)^{(n+1)}\right)$$

N.M IF $M > 1$

$$\text{VARIANCE: } \text{VAR}(\hat{G}_{poly}(k)) = \sigma_{\text{INTG}}^2 + \sigma_{\text{LEAKG}}^2$$

$$\begin{aligned} & |G_0(k)|^2 O\left(\left(\frac{n}{N}\right)^{2(n+1)}\right) & O\left(\left(\frac{n}{N}\right)^{(2R+3)}\right) \\ & & \text{N.M IF } M > 1 \end{aligned}$$

R: INTERPOLATION ERROR \uparrow , LEAKAGE ERROR \downarrow

TRADE-OFF $R=2$
 $n=3$

LPM APPLIED TO FULL N.M RECORD ALWAYS!

(3) LOCAL RATIONAL METHOD - LRM

APPROXIMATION OF RATIONAL FN. $\begin{cases} \text{POLYNOMIAL} \rightarrow \text{LPM} \\ \text{RATIONAL} \rightarrow \text{LRM} \end{cases}$

$$\begin{aligned} G(k+r) &= \frac{N(k+r)}{D(k+r)} & \sum_{s=0}^R h_s(k) r^s \\ T(k+r) &= \frac{M(k+r)}{D(k+r)} & 1 + \sum_{s=1}^R d_s(k) r^s \\ & & \sum_{s=0}^R m_s(k) r^s \end{aligned}$$

- SMOOTHNESS !/?

- G/T SAME POLES