

6. PARAMETRIC IDENTIFICATION USING NON-PARAMETRIC NOISE MODEL AND PERIODIC EXCITATIONS - IN FREQUENCY DOMAIN

MEASUREMENTS

$$\hat{Y}(k), \hat{U}(k) \rightarrow \hat{\sigma}_Y^2(k), \hat{\sigma}_U^2(k), \hat{\sigma}_{YU}(k) \quad \text{SAMPLE AVERAGES}$$

$$V_F(\theta, z) = \frac{1}{F} \sum_{k=1}^F \frac{|\hat{Y}(k) - G(\lambda_k, \theta) \hat{U}(k)|^2}{\hat{\sigma}_Y^2(k) + \hat{\sigma}_U^2(k) |G(\lambda_k, \theta)|^2 - 2 \operatorname{Re} \{ \hat{\sigma}_{YU}^2(k) \bar{G}(\lambda_k, \theta) \}}$$

$$G = \frac{B}{A} = \frac{1}{F} \sum \frac{|A(\lambda_k, \theta) \hat{Y}(k) - B(\lambda_k, \theta) \hat{U}(k)|^2}{\hat{\sigma}_Y^2(k) |A(\lambda_k, \theta)|^2 + \hat{\sigma}_U^2(k) |B(\lambda_k, \theta)|^2 - 2 \operatorname{Re} \{ \hat{\sigma}_{YU}^2 A \bar{B} \}}$$

WEIGHTED LS, OE

→ MEASUREMENTS

$$\left. \begin{matrix} U(k) \\ Y(k) \end{matrix} \right\} \hat{G}(\lambda_k) \xrightarrow{\text{NON-PARAMETRIC FRF (ETFE)}} \hat{G}(\lambda_k, \theta)$$

$$V_F(\theta, z) = \frac{1}{F} \sum_k \frac{|G(\lambda_k) - G(\lambda_k, \theta)|^2}{\hat{\sigma}_G^2(k)} \quad (\text{NATURAL CHOICE})$$

$\hat{G}(\lambda_k) \rightarrow H_1$ INPUT NOISE → BIAS

→ PARAMETRIC ESTIMATE WILL BE ALSO BIASED

$$\begin{aligned} \hat{G}(\lambda_k) &= \frac{S_{YU}(k)}{S_{UU}(k)} \\ &= G_0(\lambda_k) \frac{1}{1 + \frac{S_{NN}(k)}{S_{UU}(k)}} \end{aligned}$$

MEASUREMENTS

$$\begin{aligned} Y(k) &= Y_0(k) + N_Y(k) \\ U(k) &= U_0(k) + N_U(k) \\ &\uparrow \\ &\text{NOT KNOWN} \end{aligned}$$

ERRORS - IN-VARIABLES (EIV)

NO DIVISION OF SPECTRA
SPECTRA UNKNOWN PARAMETERS

CONSTRAINT: $Y_0(k) = G(\lambda_k, \theta) U_0(k)$