8. tétel

Alterbrázisú identifikáció

MOESP:

$$\underline{x}_{t+1} = A\underline{x}_t + Bu_t$$

$$y_t = C\underline{x}_t + Du_t + e_t$$

QE jellegű modell

$$\begin{bmatrix} y_t \\ y_{t+1} \\ \vdots \\ y_{t+q-1} \end{bmatrix} = \begin{bmatrix} C \\ CA \\ CA^2 \\ \vdots \\ CA^{q-1} \end{bmatrix} \underline{x}_t + \begin{bmatrix} D & 0 & 0 & \dots & 0 \\ CB & D & 0 & \dots & 0 \\ CAB & CB & D & & \\ \vdots & & & & \\ CA^{q-2}B & & & & \end{bmatrix} \begin{bmatrix} u_t \\ u_{t+1} \\ \vdots \\ u_{t+q-1} \end{bmatrix} + \begin{bmatrix} e_t \\ e_{t+1} \\ \vdots \\ e_{t+q-1} \end{bmatrix}$$

$$\underline{Y}_t = \underline{\underline{\Gamma}}\,\underline{x}_t + \underline{\underline{H}}\,\underline{u}_t + \underline{e}_t$$

$$q \overbrace{\begin{bmatrix} Y_t & Y_{t+1} & \dots & Y_{t+N} \end{bmatrix}}^{N} \quad n \overbrace{\begin{bmatrix} x_t & x_{t+1} & \dots \end{bmatrix}}^{N} \;\Rightarrow\; \underline{\underline{X}}$$

$$\underline{\underline{Y}} = \underline{\underline{\Gamma}}\,\underline{\underline{X}} + \underline{\underline{H}}\,\underline{\underline{U}} + \underline{\underline{E}}$$

$$\downarrow$$

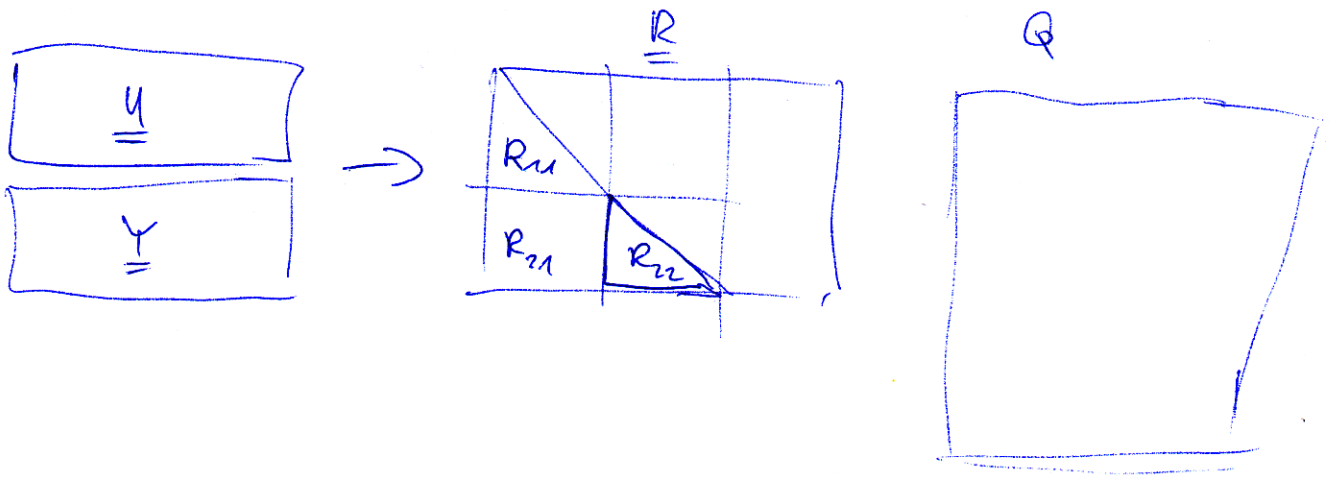
$$\underline{\underline{Y}}_p \underline{\underline{Y}}_p^T = \underbrace{\underline{\underline{\Gamma}}\,\underline{\underline{X}}\,\underline{\underline{Y}}_p^T}_{\text{ill}} + \underbrace{\underline{\underline{E}}\,\underline{\underline{Y}}_p^T}_{\text{zaj}} = \underbrace{\bar{U}_s \bar{D}_s \bar{U}_s^T + \bar{U}_N \bar{D}_n \bar{U}_n^T}_{\text{EVD}}$$

($\underline{\underline{\Gamma}}$: $m \times q$; $\bar{U}_s$: $m \times q$)

$$\hat{\underline{\underline{\Gamma}}} = \underline{\underline{U}}_s = \begin{bmatrix} \underline{u}_1 \\ \underline{u}_q \end{bmatrix} = \begin{bmatrix} \hat{C} \\ \hat{C}\hat{A} \\ \vdots \\ \hat{C}\hat{A}^{q-1} \end{bmatrix}$$

$\underline{\underline{U}}_s$ első sora $\hat{C}$

$\underline{u}_1 \cdot A = \underline{u}_q \rightarrow A = u_1^+ u_q$



$$Y_p Y_p^T = R_{22} R_{22}^T$$

$$R_{22} = \bar{U} \bar{S} \bar{V}^T$$

$$\downarrow$$

$$\hat{\Gamma}$$

U, Y Hankel → RQ → R_{22}

→ SVD → $\hat{\Gamma}$ → $\hat{C}$ (LS) → $\hat{A}$

$$\underline{Y} = \underline{\Gamma} \underline{x}_1 + \underline{\underline{H}}\, \underline{u} + \underline{e}$$

$$\Gamma x_1 + H u \longrightarrow$$

átalakítás

$$\begin{bmatrix} \cdot & - & - \\ \cdot & - & - \\ \cdot & - & - \end{bmatrix} \begin{bmatrix} \underline{x}_1 \\ \underline{B} \\ \underline{D} \end{bmatrix} \quad \underline{\nu}$$

LS

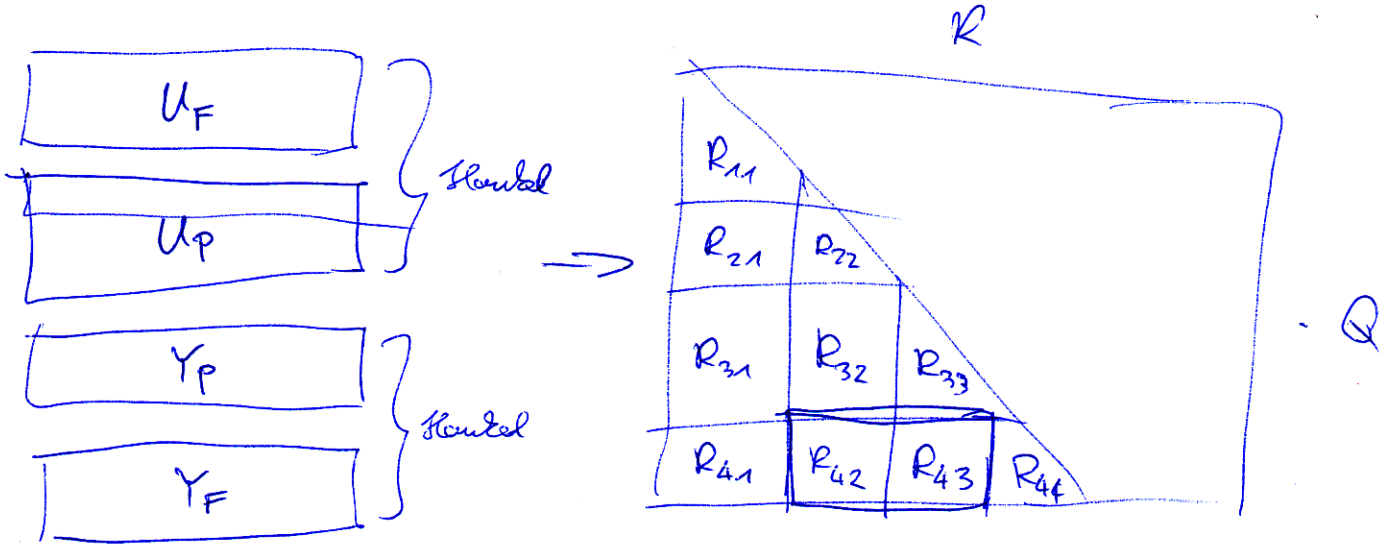
$$\hat{x}_1, \hat{B}, \hat{D}$$

N4SID:

ARMAX modellnél fehér nincs

$$\underline{x}_{t+1} = A\underline{x}_t + Bu_t + Ke_t$$

$$y_t = C\underline{x}_t + Du_t + e_t$$



$$\begin{bmatrix} R_{42} & R_{43} \end{bmatrix} \xrightarrow{SVD} \Gamma$$