③

Allgemeine Form $J_{general} = \underbrace{U^T(k)}_{1\times N}\ \underbrace{N_{uv}}_{N\times(N+1)}\ \underbrace{M_{vx}}_{(N+1)\times(N+1)n}\ \underbrace{X(k)}_{(N+1)n\times 1} + U^T(k)\,\lambda I\, U(k)$

Recall: $X(k) = (F x(0|k) + \Phi W(k)) + \Phi U(k)$

$J_{general} = U^T(k) N_{uv} M_{vx} (F x(0|k) + \Phi W(k)) + U^T(k)(N_{uv} M_{vx}\Phi + \lambda I)\, U(k)$

umschreiben:

$$J_{general} = \underbrace{\tfrac{1}{2} U^T(k) N_{uv} M_{vx} X(k)}_{\text{Teil I}} + \underbrace{\tfrac{1}{2} X^T(k) M_{vx}^T N_{uv}^T U(k)}_{\text{Teil II}} + \underbrace{U^T(k)(\lambda I) U(k)}_{\text{Teil III}}$$

mit: $X^T(k) = U^T(k)\Phi^T + (W^T(k)\Phi^T + x^T(0|k) F^T)$

Teil I: $\tfrac{1}{2} U^T(k) N_{uv} M_{vx} (F x(0|k) + \Phi W(k)) + \tfrac{1}{2} U^T(k) N_{uv} M_{vx} \Phi U(k)$

Teil II: $\tfrac{1}{2}(W^T(k)\Phi^T + x^T(0|k) F^T) M_{vx}^T N_{uv}^T U(k) + \tfrac{1}{2} U^T(k)(\Phi^T M_{vx}^T N_{uv}^T) U(k)$

(I) hier: $\tfrac{1}{2} U^T(k) N_{uv} M_{vx} (F x(0|k) + \Phi W(k)) = \tfrac{1}{2}(W^T(k)\Phi^T + x^T(0|k) F^T) M_{vx}^T N_{uv}^T U(k)$

$\Rightarrow$ (II): $U^T(k)\left(\tfrac{1}{2} N_{uv} M_{vx}\Phi + \tfrac{1}{2}\Phi^T M_{vx}^T N_{uv}^T + \lambda I\right) U(k)$

definie: $H = \tfrac{1}{2} N_{uv} M_{vx}\Phi + \tfrac{1}{2}\Phi^T M_{vx}^T N_{uv}^T + \lambda I$

$E = N_{uv} M_{vx} (F x(0|k) + \Phi W(k))$

QP: $\tfrac{1}{2} U^T H U + U^T E$

!!! In Matlab Implementierung:

Einfach benutzen. Form: $J_{general} = U^T(k)(N_{uv} M_{vx}(F x(0|k) + \Phi W(k))) + U^T(k)(N_{uv} M_{vx}\Phi + \lambda I) U(k)$

definie $H = N_{uv} M_{vx}\Phi + \lambda I$

$\Rightarrow$ Let: $H = \tfrac{1}{2}(H + \text{transpose}(H))$