

KAPITEL 2

2.1 Linearisera sambanden kring $x_0 = (-1, 1, 2)$

$$\begin{cases} y_1 = x_1^3 \cdot x_3 + 7 \cos(x_1^3 + x_2^2) \\ y_2 = \arctan\left(\frac{x_3}{x_1}\right) + e^{-x_2} \end{cases}$$

Funktionalmatrix $\bar{f}'(x) = \begin{bmatrix} \frac{\partial y_1}{\partial x_1} & \frac{\partial y_1}{\partial x_2} & \frac{\partial y_1}{\partial x_3} \\ \frac{\partial y_2}{\partial x_1} & \frac{\partial y_2}{\partial x_2} & \frac{\partial y_2}{\partial x_3} \end{bmatrix}$

$$\frac{\partial y_1}{\partial x_1} = \underline{3x_1^2 x_3 - 7 \sin(x_1^3 + x_2^2) \cdot 3x_1}$$

$$\frac{\partial y_1}{\partial x_2} = \underline{-7 \sin(x_1^3 + x_2^2) \cdot 2x_2}$$

$$\frac{\partial y_1}{\partial x_3} = \underline{x_1^3}$$

$$\frac{\partial y_2}{\partial x_1} = \underline{-\frac{x_3}{x_1^2 + t^2}}, \quad \frac{\partial y_2}{\partial x_2} = \underline{-e^{-x_2}}, \quad \frac{\partial y_2}{\partial x_3} = \underline{\frac{a}{a^2 + t^2}}$$

Linearisering kring $x_0 = (-1, 1, 2)$:

SVAR

$$\delta y = f'(x_0) \delta x = \begin{bmatrix} 6 + 14 \sin 2 & -14 \sin 2 & -1 \\ -\frac{2}{5} & -e^{-1} & -\frac{1}{5} \end{bmatrix}$$

2.4 Skriv tillståndsekvationerna till 1.5 på matrisform.

$$\begin{cases} \dot{x}_1 = k_1 x_1 \\ \dot{x}_2 = k_1 x_1 - k_2 x_2 \\ \dot{x}_3 = k_2 x_2 - k_3 x_3 \\ \vdots \\ \dot{x}_n = k_{n-1} x_{n-1} \end{cases}$$

← kan skrivas

$$\frac{d\bar{x}}{dt} = A\bar{x}$$

$$A = \begin{bmatrix} -k_1 & 0 & 0 & \dots & 0 & 0 \\ k_1 & -k_2 & 0 & \dots & 0 & 0 \\ 0 & k_2 & k_3 & \dots & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & \dots & -k_{n-1} & 0 \end{bmatrix}$$