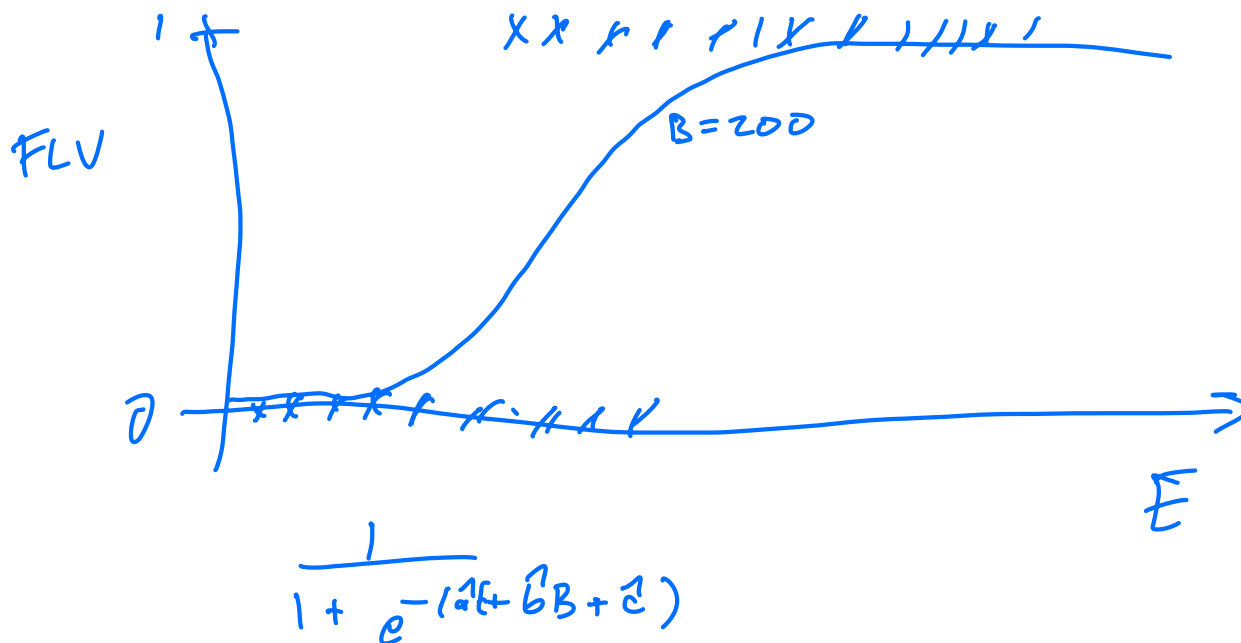


NON NOU ZD
HW 8
NON-LINEAR MODELS

CROSS VALIDATION



MODEL

$$y_i = \exp(2 + x_i + \varepsilon_i)$$

$$\log y_i = 2 + x_i + \varepsilon_i$$

$$\varepsilon_i \sim N(0, \sigma)$$

0.1

$$y_i = \exp(a + b x_i + \varepsilon_i)$$

a b unknown

How to use linear models to est. a, b from data?

$$\log y_i = a + b x_i + \varepsilon_i$$

$$z_i = \log y_i$$

$$z_i = a + b x_i + \varepsilon_i$$

est a, b via least squares

Model:

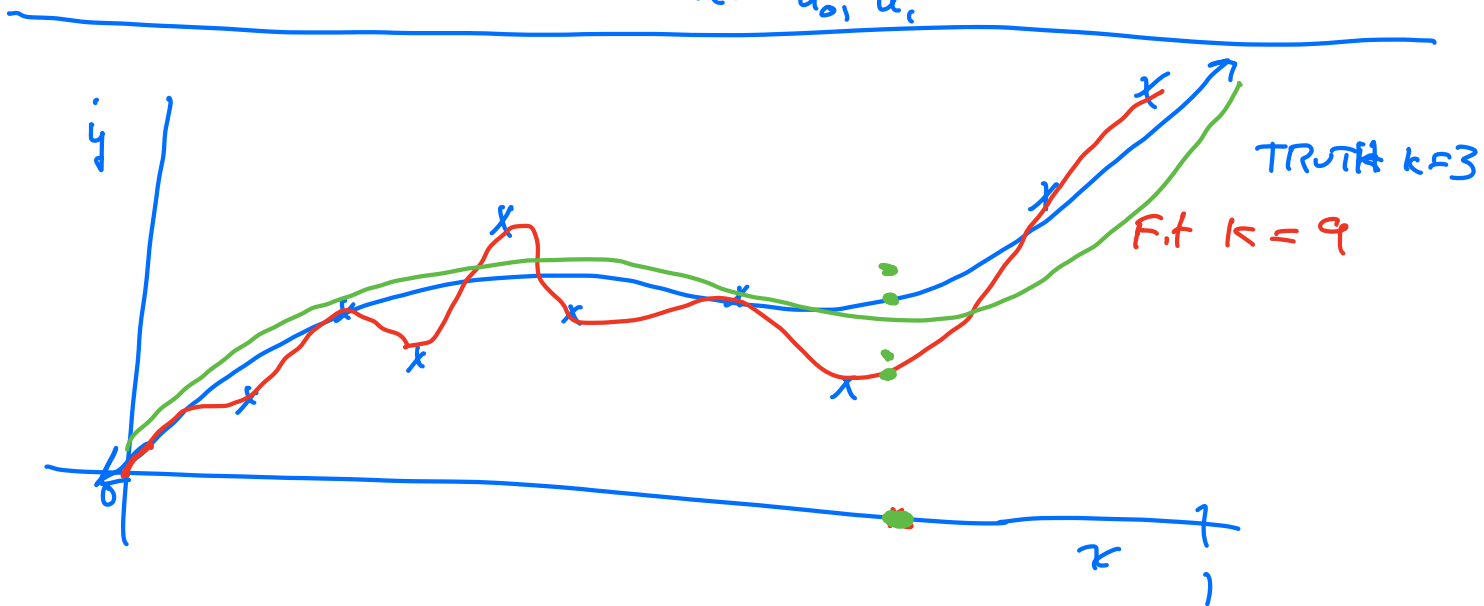
$$y = e^{a + b x} + \varepsilon$$

For given choice of u_0, u_2

$$y_i = e^{u_0 + u_2 x_i}$$

$i = 1, 2, \dots, n$

Minimize squared residuals $\sum_i |y_i - e^{u_0 + u_1 \pi_i}|^2$
over u_0, u_i



$$y_i = a_0 + a_1 \pi_i + a_2 \pi_i^2 + a_3 \pi_i^3 + \dots + a_k \pi_i^k + \epsilon_i$$

a_i unknown

as $k \rightarrow \infty$ you can approx any arbitrary function
continuous

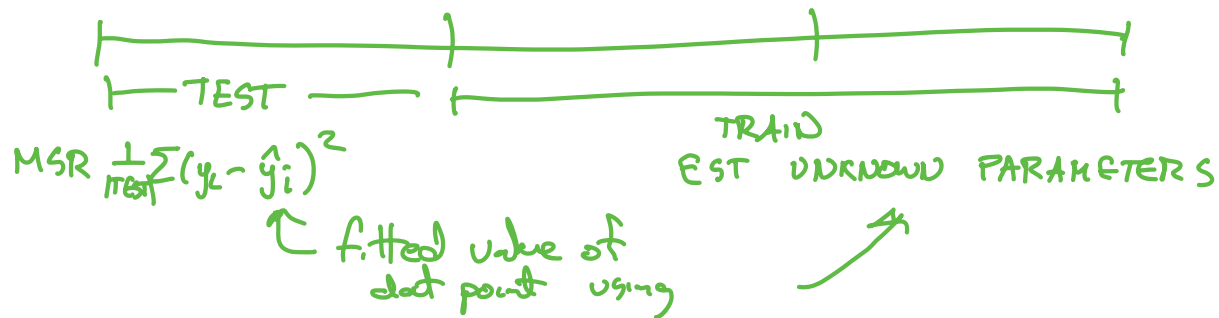
$$f: [0,1] \rightarrow \mathbb{R}$$

$$y_i = f(\pi_i) + \epsilon_i$$

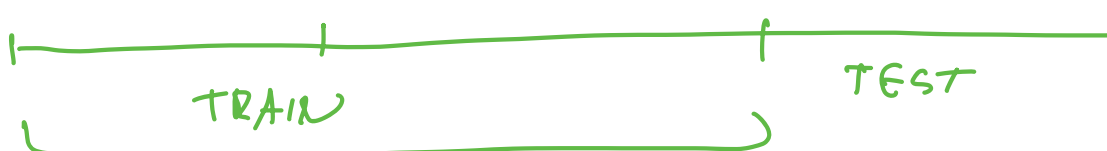
$$X = \begin{bmatrix} 1 & \pi_1 & \pi_1^2 & \dots & \pi_1^k \\ 1 & \pi_2 & \pi_2^2 & \dots & \pi_2^k \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 1 & \pi_n & \pi_n^2 & \dots & \pi_n^k \end{bmatrix}$$

$$y = X \begin{bmatrix} a_0 \\ a_1 \\ \vdots \\ a_k \end{bmatrix} + \epsilon$$

ALL DATA



MSE for this split



MSE for this split