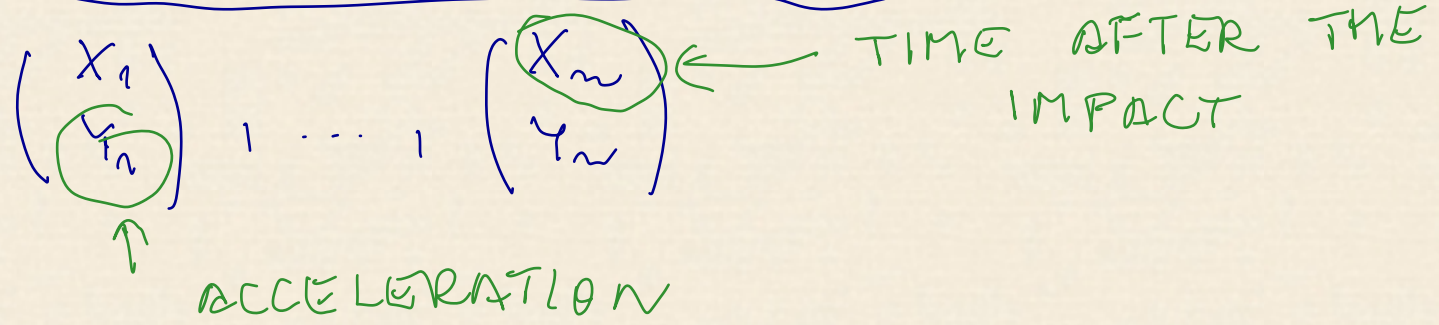


1. MOTORCYCLE DATA



A. GLOBAL POLYNOMIALS

$$\hat{m}_{GP}(x) = \sum_{j=0}^n \hat{\beta}_j x^j$$

WHERE $(\hat{\beta}_0, \dots, \hat{\beta}_n) = \underset{b_0, \dots, b_n}{\text{argmin}} \sum_{i=1}^n (y_i - b_0 - \dots - b_n x_i^n)^2$

B. NW AND LL ESTIMATOR

NADARAYA - WATSON :

- LET $K(x) = \frac{1}{2} \mathbb{1}\{|x| \leq 1\}$

$$\begin{aligned} \leadsto \hat{m}_{NW}(x) &= \frac{\sum_{i=1}^n y_i K\left(\frac{x_i - x}{h_n}\right)}{\sum_{i=1}^n K\left(\frac{x_i - x}{h_n}\right)} = \\ &= \frac{\sum_{i=1}^n y_i \mathbb{1}\{|x_i - x| \leq h_n\}}{\sum_{i=1}^n \mathbb{1}\{|x_i - x| \leq h_n\}} \end{aligned}$$

LOCAL LINEAR

$$\hat{m}_{LL}(x) = \hat{\beta}_0(x)$$

WHERE

$$(\hat{\beta}_0(x), \hat{\beta}_1(x)) = \underset{b_0, b_1}{\text{argmin}} \sum_{i=1}^n \left[Y_i - b_0 - b_1(X_i - x) \right]^2 \cdot \mathbb{1}\{|X_i - x| \leq h_n\}$$

$$\hat{m}_{LL}(x) = \hat{\beta}_0(x) + \hat{\beta}_1(x) \cdot (x - x) \Big|_{x=x}$$

EPANECHNIKOV KERNEL

Epak

$$K(x) = \frac{3}{4} (1 - x^2) \mathbb{1}\{|x| \leq 1\}$$

$$\leadsto K\left(\frac{X_i - x}{h_n}\right) \text{ INSTEAD OF } \mathbb{1}\{|X_i - x| \leq h_n\}$$

CV CHOICE OF BANDWIDTH

$$h_n^{(CV)} = \underset{h_n > 0}{\text{argmin}} \frac{1}{n} \sum_{i=1}^n \left[Y_i - \hat{m}_{LL}^{(-i)}(X_i) \right]^2$$

RULE OF THUMB

$$h_n^{(ROT)} = n^{-1/5} \left[\frac{R(K) \sigma^2 \int w_0(x) dx}{\rho_{2K}^2 \frac{1}{n} \sum_{i=1}^n \left[\hat{m}''(X_i) \right]^2 w_0(X_i)} \right]^{1/5}$$

$$w_0(x) = \mathbb{1}\{x \in (0, 60)\}$$

NW vs LL.

$$\hat{m}_{NW}(x) = \sum_{i=1}^n Y_i w_{ni}^{(NW)}(x)$$

$$\hat{m}_{LL}(x) = \sum_{i=1}^n Y_i w_{ni}^{(LL)}(x)$$

C. LOCAL POLYNOMIAL ESTIMATION

$$\hat{m}_p(x) = \hat{\beta}_0(x), \quad \text{WHERE}$$

$$(\hat{\beta}_0(x), \dots, \hat{\beta}_p(x)) = \underset{b_0, \dots, b_p}{\operatorname{argmin}} \sum_{i=1}^n \left[Y_i - b_0 - \dots - b_p(x_i - x)^p \right]^2 \cdot K\left(\frac{x_i - x}{h_n}\right)$$

D. LOWESS

- ROBUSTIFIED LOCAL LINEAR FIT

WITH h_n CHOSEN BY h -NW METHOD,

WHERE $h = L_n f^{-1}$

DEFAULT
 $f = \frac{2}{3}$

E. CONDITIONAL VARIANCE ESTIMATION

- AIM AT ESTIMATING $\sigma^2(x) = \text{var}(Y|X=x)$

DIRECT:

$$\hat{\sigma}_n^2(x) = \sum_{i=1}^n w_{ni}(x) Y_i^2 - \left[\hat{m}_n(x) \right]^2$$

MODIFIED

$$\tilde{\sigma}_n^2(x) = \sum_{i=1}^n w_{ni}(x) \left(Y_i - \hat{m}_n(x_i) \right)^2$$