Coding GREEK unknown

("It is Greek to me ...")

LATIN choice

LATIN fact

Start with

x_1, y_1

x_2, y_2

...

x_N, y_N $\quad i = 1 \dots N$

BELIEVE

$$y_i = \alpha + \beta x_i + \epsilon_i$$

LOOK FOR

$$y_i = a + b x_i + e_i$$

what do we want $e_1 \dots e_N$ to do?

$$e_i = y_i - (a + b x_i)$$

OLS $\min \sum e_i^2$ LAD $\min \sum |e_i|$

OLS ca 1802

$$\frac{2 \sum e_i^2}{2a} = \frac{2 \sum e_i^2}{2b} = 0$$

$$\frac{2 \sum (y_i - a - b x_i)^2}{2a} = -2 \sum (y_i - a - b x_i) = 0$$

$$\frac{2 \sum (y_i - a - b x_i)^2}{2b} = -2 \sum x_i (y_i - a - b x_i) = 0$$

$$\sum e_i = 0$$

"LS normal equations"

$$\sum x_i e_i = 0$$

$$\frac{1}{N} \sum e_i = \frac{1}{N} \cdot 0$$

$$\bar{e} = 0$$

∴

LS forces $\bar{e} \to 0$

LS is complicated mean

LAD "normal equations"

[1955] M&T describe general idea of weighted LS

$$\sum w_i e_i = 0$$

$$\sum w_i X_i e_i = 0$$

$$w_i = \begin{cases} 1/|e_i| & e_i \neq 0 \\ 1 & e_i = 0 \end{cases}$$

Appeal to trichotomy

$e_i > 0$, $e_i < 0$, $e_i = 0$

$e_i > 0$: $w_i e_i = \frac{1}{|e_i|} e_i = \frac{e_i}{e_i} = 1$

$e_i < 0$: $w_i e_i = \frac{1}{|e_i|} e_i = \frac{e_i}{-e_i} = -1$

$e_i = 0$: $w_i e_i = 1 \cdot 0 = 0$

∴ As many $+1$'s as -1 since $\sum w_i e_i =$

∴ 0 is a median of $w_i e_i$

Since $w_i > 0$

0 is a median of e_i (LHI)