Ch: 4 Inference

$\beta \rightarrow$ unknown

test e.g. $\beta = 0$ using $\hat{\beta}$

3 ways of testing

- is $\hat{\beta}$ too far from hypothesized β
- how improbable is $\hat{\beta}$
- is β in $\hat{\beta} - E$, $\hat{\beta} + E$

Sampling Distributions

$\hat{\beta}_j = \beta_j +$ a term linear in u

$\downarrow$

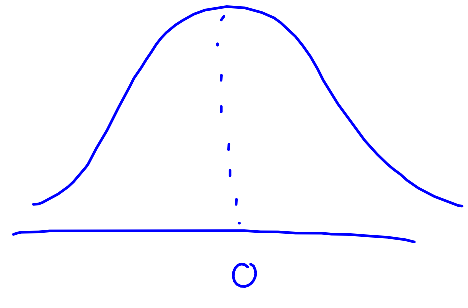
its distribution follows from that of u

Assⁿ: u indep. of $(x_1 \ldots x_k)$

$\hookrightarrow$ normal $E(u) = 0$

$var(u) = \sigma^2$

$u \sim N(0, \sigma^2)$



Given all the ass^{n}s up to normality

$$\hat{\beta}_j \sim N\left(\beta_j \,,\, var(\hat{\beta}_j)\right)$$

↳ derived in ch. 3

Recap of Regression ass^{n}s (prior to normality)

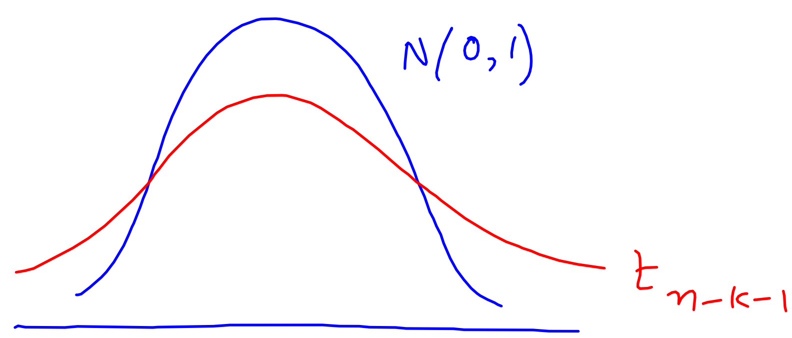
1. Linear in β's
2. Random sample
3. Variation in x — $x_1, x_2, \ldots, x_k$: not linearly related
4. u & x → not correlated
5. Homoskedasticity

$$\frac{\hat{\beta}_j - \beta_j}{sd(\hat{\beta}_j)} \sim N(0,1)$$

$$\frac{\hat{\beta}_j - \beta_j}{se(\hat{\beta}_j)} \sim t_{n-k-1} \quad (t \text{ dist. with } df = n-k-1)$$

$\rightarrow N(0,1)$ as $df \rightarrow \infty$

Using $\hat{\sigma}$ instead of σ



Single Hypothesis — Single Parameter

Null $\quad H_0 : \beta_j = a_j \qquad a_j = 0 \rightarrow$ special case

Alternative $\quad H_1 : \beta_j \neq a_j$