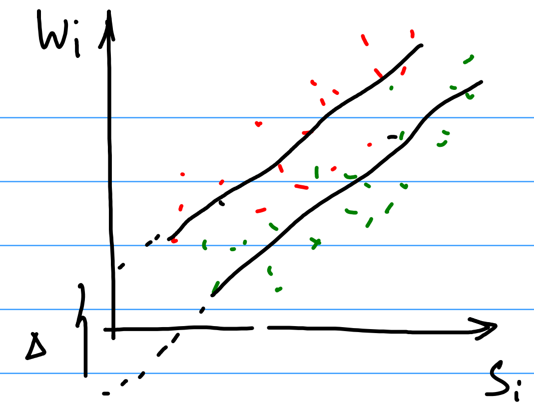
Dummy Variables



$$D_i = \begin{cases} 1, & \text{female} \\ 0, & \text{male}. \end{cases}$$

① $W_i = \beta_0 + \beta_1 S_i + \beta_2 D_i + \varepsilon_i$

t-test for β_2

female : $W_i = (\beta_0 + \beta_2) + \beta_1 \cdot S_i + \varepsilon_i$

male : $W_i = \beta_0 + \beta_1 \cdot S_i + \varepsilon_i$

② $W_i = \beta_0 + \beta_1 S_i + \beta_2 \cdot D_i \cdot S_i + \varepsilon_i$

$$\begin{array}{c} f \\ \\ m \end{array} \begin{bmatrix} 1 & 1 & 1 \\ \vdots & \vdots & 2 \\ & & 3 \\ \vdots & \vdots & 0 \\ 1 & 5 & \vdots \\ & & 0 \end{bmatrix}$$

t-test for β_2

female : $W_i = \beta_0 + (\beta_1 + \beta_2) S_i + \varepsilon_i$

male : $W_i = \beta_0 + \beta_1 \cdot S_i + \varepsilon_i$

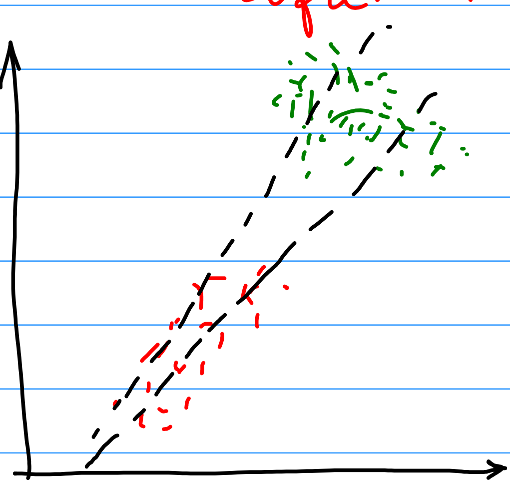
③ $W_i = \beta_0 + \beta_1 S_i + \beta_2 \cdot D_i + \beta_3 \cdot D_i S_i + \varepsilon_i$

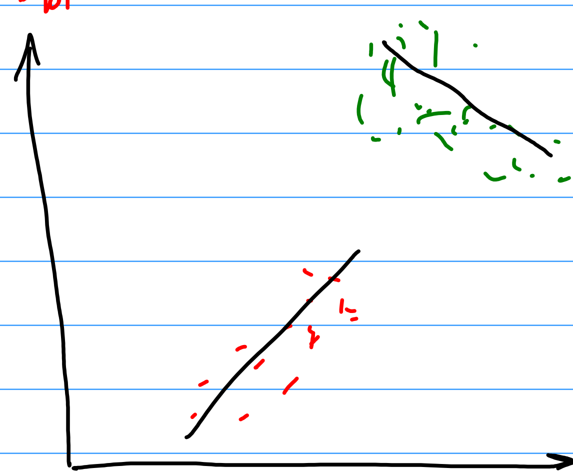
F-test for β_2, β_3

female : $W_i = (\beta_0 + \beta_2) + (\beta_1 + \beta_3) S_i + \varepsilon_i$

male : $W_i = \beta_0 + \beta_1 \cdot S_i + \varepsilon_i$

refrence (all $D_{ki} = 0$)





$$p_t = \beta_0 + \beta_1 \cdot t + \beta_2 D_w + \beta_3 D_{sp} + \beta_4 \cdot D_A + \varepsilon_i$$

$$\beta_0 = E(p_t \mid t=0, \text{summer})$$

for reference cat

?

$$p_t = \beta_0 + \beta_1 \cdot t + \beta_2 D_w + \beta_3 D_{sp} + \beta_4 \cdot D_A + \beta_5 \cdot D_{sum} + \varepsilon_i$$

$$\begin{bmatrix} 1 \\ \vdots \\ \vdots \\ \vdots \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ \vdots \\ 1 \\ 0 \\ \vdots \\ 0 \\ 1 \\ \vdots \\ 1 \end{bmatrix} + \begin{bmatrix} 0 \\ \vdots \\ 0 \\ 1 \\ \vdots \\ 1 \\ 0 \\ \vdots \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ \vdots \\ 0 \\ 1 \\ \vdots \\ 1 \\ 0 \\ \vdots \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ \vdots \\ 0 \\ 1 \\ \vdots \\ 1 \\ 0 \\ \vdots \\ 0 \end{bmatrix}$$

$$\text{rank}(X) = 5 < 6$$

$$\hat{\beta} = (X'X)^{-1} X'y$$

$$\det(X'X) = 0 \Rightarrow \text{not invertible} \Rightarrow \hat{\beta} - ?$$

(7) $P_t = \cancel{\beta_0} + \beta_1 \cdot t + \beta_2 D_w + \beta_3 D_{sp} + \beta_4 \cdot D_A + \beta_5 \cdot D_{sum} + \varepsilon_i$

$$w: \quad P_t = \beta_2 + \beta_1 \cdot t$$

$$sum: \quad P_t = \beta_5 + \beta_1 \cdot t$$

Chow test: $\quad N \quad \text{pooled}: y_i^R = \beta_0 + \beta_1 X_{1i} + \dots + \beta_k \cdot X_{ki} + \varepsilon_i$

$$\parallel$$

$$y^{UR}: \begin{cases} N_A & A: y_i = \beta_0^A + \beta_1^A X_{1i} + \dots + \beta_k^A \cdot X_{ki} + \varepsilon_i \\ + & \\ N_B & B: y_i = \beta_0^B + \beta_1^B X_{1i} + \dots + \beta_k^B \cdot X_{ki} + \varepsilon_i \end{cases}$$

$$H_0: \beta_0^A = \beta_0^B, \dots, \beta_k^A = \beta_k^B \qquad \gamma_0 = \beta_0^B - \beta_0^A$$

$$F = \frac{(RSS_{pooled} - RSS_A - RSS_B)/(k+1)}{(RSS_A + RSS_B)/(N - 2 \cdot (k+1))} \sim F(k+1, N - 2(k+1))$$

$$y_i^{UR} = \beta_0 + \beta_1 \cdot X_{1i} + \dots + \beta_k X_{ki} + \gamma_0 D_i + \gamma_1 X_{1i} D_i + \gamma_k X_{ki} \cdot D_i + \varepsilon_i$$

$$H_0: \gamma_0 = \dots \gamma_k = 0$$

$$F \quad \frac{(\overbrace{RSS_R}^{RSS\ pool} - \overbrace{RSS_{UR}}^{RSS_A + RSS_B})/(k+1)}{RSS_{UR}/(N - 2(k+1))} \sim F(k+1, N - 2 \cdot (k+1))$$

$$\log(y_i) = \beta_0 + \beta_1 \cdot X_i + \beta_2 \cdot D_i + \varepsilon_i$$

$x \uparrow 1 \qquad y \uparrow \beta_1 \cdot 100\% \qquad d \log y_i / d x_i$.

$D_i \uparrow 1 \qquad y \uparrow \beta_2 \cdot 100\% \qquad d \log y_i / d D_i$

$\Delta \log y_i / \Delta D_i$

$$y_i = e^{\beta_0 + \beta_1 \cdot X_i + \beta_2 \cdot D_i + \varepsilon_i}$$

$$\Delta y_i = y_i(D_i = 1) - y_i(D_i = 0) =$$

$$= e^{\beta_0 + \beta_1 \cdot X_i + \beta_2 \cdot} - e^{\beta_0 + \beta_1 \cdot X_i} =$$

$$= e^{\beta_0 + \beta_1 \cdot X_i}\left(e^{\beta_2} - 1\right)$$

$$100 \cdot \frac{\Delta y_i}{y_i} = 100 \cdot \frac{e^{\beta_0 + \beta_1 \cdot X_i}\left(e^{\beta_2} - 1\right)}{e^{\beta_0 + \beta_1 \cdot X_i}} = 100\left(e^{\beta_2} - 1\right) \ \%$$