18 質的回帰

18.1 ロジスティック回帰モデル

$$\pi = E[Y]$$

$$\log \frac{\pi}{1-\pi} = \beta_0 + \beta_1 x_1 + \cdots + \beta_p x_p$$

18.2 プロビットモデル

$$\pi = \Phi(\beta_0 + \beta_1 x_1 + \cdots + \beta_p x_p)$$

18.3 ポアソン回帰モデル

$$\log \pi = \beta_0 + \beta_1 x_1 + \cdots + \beta_p x_p$$

18.4 一般化線形モデル

例題

問18.1

[1] $\log \frac{\pi}{1-\pi} = \beta_0 + \beta_1 \cdot LI$ （$\log \frac{\pi}{1-\pi}$ = 0, β_0 = −3.7, β_1 = 0.14）

$LI = \frac{3.7}{0.14} = \frac{370}{14} = 26.\cdots$

$\log \frac{\pi}{1-\pi} = -3.7 + 0.14 \times 10$

$= 0.5$

$\Rightarrow \pi = 0.63$

[2] $\frac{\pi}{1-\pi} = e^{(\beta_0 + \beta_1 \cdot LI)}$

求めたい

$= (e^{0.14})^2$

1.3498

예제 8.2

$\beta_0 = -2.17$ $\beta_1 = -0.06$ $\beta_2 = 0.69$ $\beta_3 = 0.87$

[1] $\log \frac{\pi}{1-\pi} = \beta_0 + \beta_1 \cdot \text{Smoking} + \beta_2 \text{Obesity} + \beta_3 \cdot \text{Snoring}$

$\log \frac{\pi}{1-\pi} = -0.87 \rightarrow \frac{\pi}{1-\pi} = e^{-0.87}$ $\frac{1}{\pi} = \frac{1+e^{0.87}}{e^{0.87}}$ $\pi = \frac{e^{-0.87}}{1+e^{-0.87}} = 0.29$

[2] $e^{0.69} \rightarrow 2$

[3] $0.69 \pm 1.96 \times 0.285$ → ⓒ

問183

[1] $\pi = \Phi(-1.37 - 0.03x_1 + 0.39x_2 + 0.46x_3)$

$= \Phi(-0.55) = 0.29$

[2] $\frac{\partial \pi}{\partial x_2} = \Phi(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3) \cdot \beta_2$

問14 $\log \pi = \beta_0 + \beta_1 x_1 + \cdots + \beta_p x_p$

(1)

$6.3 - 0.8\,\mathrm{Dist} + 0.019\,\mathrm{Sprint}$

(−) (+)

[2] Dist：有意ではない

Sprint：有意 → 関係あり