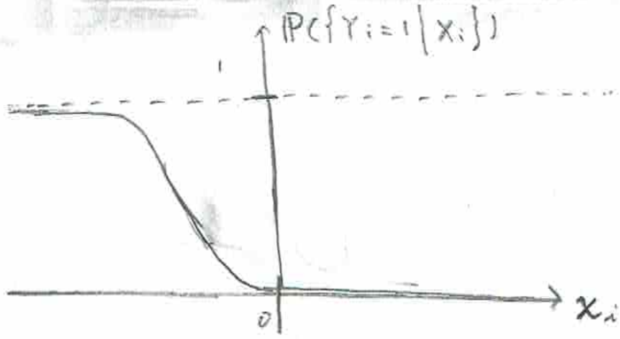
(1) プロビットモデル

$$\mathbb{P}(Y_i = 1 \mid \mathbf{x}_i\} = \Phi(\mathbf{x}_i' \beta).$$



(2) 潜在変数プロビットモデル.

$$\left.\begin{aligned} &Y_i^* = \mathbf{x}_i' \beta + \varepsilon_i \quad (\because \varepsilon_i \sim N(0, \sigma^2)) \\ &Y_i = \begin{cases} 1 & \text{if } Y_i^* > 0 \\ 0 & \text{if } Y_i^* \leq 0. \end{cases} \end{aligned}\right) \text{— (*)}.$$

このとき、

$$\begin{aligned} \mathbb{P}(\{Y_i = 1 \mid \mathbf{X}\} &= \mathbb{P}(\{Y_i^* > 0 \mid \mathbf{x}_i\}) \\ &= \mathbb{P}(\{\mathbf{x}_i' \beta + \varepsilon_i > 0 \mid \mathbf{x}_i\}) \quad (\because Y_i^* \text{のテーギ}) \\ &= \mathbb{P}(\{\varepsilon_i > -\mathbf{x}_i' \beta \mid \mathbf{x}_i\}) \\ &= \mathbb{P}(\{\varepsilon_i < \mathbf{x}_i' \beta \mid \mathbf{x}_i\}) \quad (\because \varepsilon_i \sim N(0, \sigma^2) \text{より対称性} \\ &= \Phi(\mathbf{x}_i' \beta) \end{aligned}$$

を得る。

よって(*)のような設定のもとで、$\mathbb{P}(\{Y_i = 1 \mid \mathbf{x}_i\})$は、$\Phi(\mathbf{x}_i' \beta)$で求められる.