

Consider the following example.

Pollster	Winner based on polls	$P(\text{Dem wins})$
1	1	$p_1$
2	1	$p_2$
3	0	$1 - p_3$
4	0	$1 - p_4$

Here  $p_1 = \frac{\exp(x_1^T \beta)}{1 + \exp(x_1^T \beta)}$

$p_2 = \frac{\exp(x_2^T \beta)}{1 + \exp(x_2^T \beta)}$

$p_3 = \frac{\exp(x_3^T \beta)}{1 + \exp(x_3^T \beta)}$

$p_4 = \frac{\exp(x_4^T \beta)}{1 + \exp(x_4^T \beta)}$

The predicted average probability is

$$\hat{p} = \frac{\hat{p}_1 + \hat{p}_2 + (1 - \hat{p}_3) + (1 - \hat{p}_4)}{4}$$

where  $\hat{p}_i$  ( $i=1, 2, 3, 4$ ) are predictions of  $p_i$  which can be obtained by plugging in the estimation of  $\beta$  into  $p_i$ .

By using a similar method in nonlinear models, the variance of  $\hat{p}$  is (asymptotic)

$$\text{Var}(\hat{p}) = \hat{G} \text{Var}(\hat{\beta}) \hat{G}^T$$

where  $\hat{G} = \frac{1}{4} \left( \frac{\exp(x_1^T \hat{\beta})}{[1 + \exp(x_1^T \hat{\beta})]^2} x_1^T + \frac{\exp(x_2^T \hat{\beta})}{[1 + \exp(x_2^T \hat{\beta})]^2} x_2^T - \frac{\exp(x_3^T \hat{\beta})}{[1 + \exp(x_3^T \hat{\beta})]^2} x_3^T - \frac{\exp(x_4^T \hat{\beta})}{[1 + \exp(x_4^T \hat{\beta})]^2} x_4^T \right)$

Then a 95% prediction interval is

$$\hat{p} \pm z_{0.025} \sqrt{\text{Var}(\hat{p})}$$