

## Marginal Effects in the Probit model

| Change in $Pr(y_i = 1 x_i) = \Phi(x_i\beta)$                                                                                                                                                                                                                                                                                                 | Marginal effect at the mean                                       | Average marginal effect (AME)                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Continuous variable</b><br><br>$\phi(x_i\beta)\beta_k$                                                                                                                                                                                                                                                                                    | $\phi(\bar{x}\beta)\beta_k$                                       | $\frac{1}{n} \sum_{i=1}^n \phi(x_i\beta)\beta_k$                                     |
| <b>Dummy variable</b><br><br>$\Phi(\beta_1 + \beta_2x_{2i} + \dots + \beta_{k-1}x_{k-1,i} + \beta_k)$<br>$-\Phi(\beta_1 + \beta_2x_{2i} + \dots + \beta_{k-1}x_{k-1,i})$<br><br>$\Phi(x_i\beta x_k = 1) - \Phi(x_i\beta x_k = 0)$<br><br>$Pr(y_i = 1 x_i, x_k = 1) - Pr(y_i = 1 x_i, x_k = 0)$                                               | $\Phi(\bar{x}\beta x_k = 1) - \Phi(\bar{x}\beta x_k = 0)$         | $\frac{1}{n} \sum_{i=1}^n [\Phi(x_i\beta x_k = 1) - \Phi(x_i\beta x_k = 0)]$         |
| <b>Discrete variable</b><br><br>$\Phi(\beta_1 + \beta_2x_{2i} + \dots + \beta_{k-1}x_{k-1,i} + \beta_k(c_k + 1))$<br>$-\Phi(\beta_1 + \beta_2x_{2i} + \dots + \beta_{k-1}x_{k-1,i} + \beta_k c_k)$<br><br>$\Phi(x_i\beta x_k = c_k + 1) - \Phi(x_i\beta x_k = c_k)$<br><br>$Pr(y_i = 1 x_i, x_k = c_k + 1)$<br>$-Pr(y_i = 1 x_i, x_k = c_k)$ | $\Phi(\bar{x}\beta x_k = c_k + 1) - \Phi(\bar{x}\beta x_k = c_k)$ | $\frac{1}{n} \sum_{i=1}^n [\Phi(x_i\beta x_k = c_k + 1) - \Phi(x_i\beta x_k = c_k)]$ |