

# All Interactions Are Wrong: Logit vs Probit

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2025-01-14

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## 1 Introduction

Under common conditions in which there are two main effects and no interaction, fitting a model with the wrong link function leads to detecting pseudointeractions, that is, to inflating the false positive rates for the interaction. This happen even if one fits a binomial GLM, but uses the “logit” link function when the data were generate using the “probit”, or vice versa.

## 2 Data generating process showing a logit link function

In scenario A, the true data generating model is specified as follows:

$$\text{logit}(p_i) = \beta_0 + \beta_1 X_1 + \beta_2 X_2$$

Where:

- $p_i$  is the probability of a positive response for individual  $i$ .
- $\beta_0$  is the fixed intercept.
- $\beta_1$  and  $\beta_2$  are the fixed effect coefficients for predictors  $X_1$  and  $X_2$ , respectively.

Thus, the model incorporates fixed effects of  $X_1$  and  $X_2$ , but not their interaction. For simplicity and computational speed we choose not to enter random effects, although they are frequently present in this scenario.