Dummies and Slope Dummies (interaction terms)

Figure 1: Intercept or "null" model.
$\mathbb{E}[Y] = \bar{Y} = \hat{Y} = \hat{\beta}_0$
in R: $lm(Y \sim 1)$

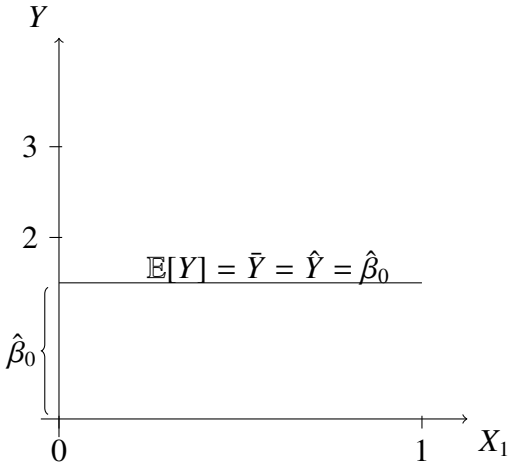

Figure 2: Simple linear regression model.
$\mathbb{E}[Y|X_1] = \hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 X_1$
in R: $lm(Y \sim X1)$ or: $lm(Y \sim 1 + X1)$

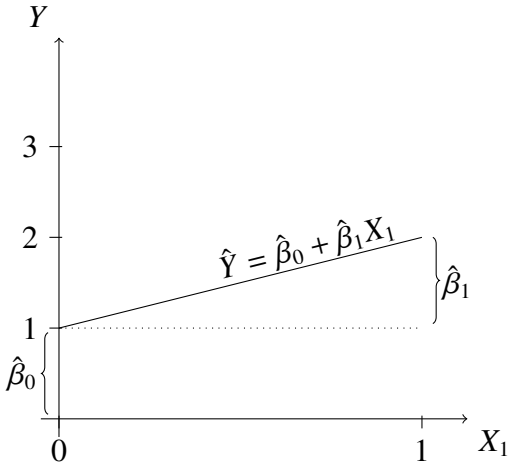

Figure 3: Linear model with level dummy variable X_2.
$\mathbb{E}[Y|X_1, X_2] = \hat{Y} = \hat{\beta}_0 + \hat{\beta}_3 X_2 + \hat{\beta}_1 X_1$
in R: $lm(Y \sim X1 + X2)$

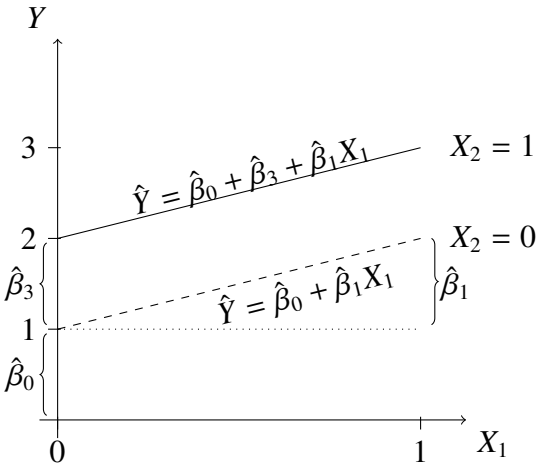

Figure 4: Linear model with slope dummy variable X_2.
$\mathbb{E}[Y|X_1, X_2] = \hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_1 \cdot X_2$
in R: $lm(Y \sim X1 + X1 : X2)$

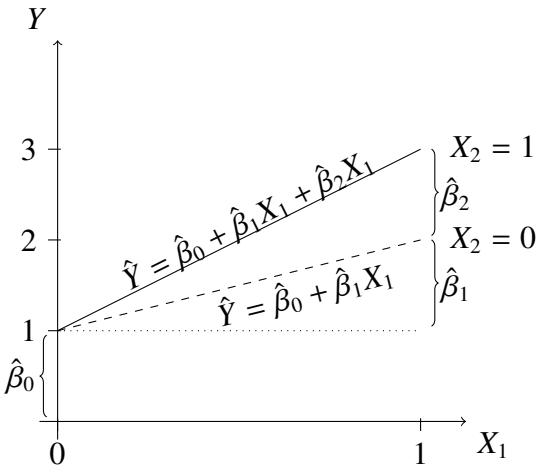

Figure 5: Linear model with level and slope dummy variable X_2.
$\hat{Y} = \hat{\beta}_0 + \hat{\beta}_3 X_2 + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_1 \cdot X_2$
in R: $lm(Y \sim X1 + X2 + X1 : X2)$
or simply: $lm(Y \sim X1 * X2)$