Consider the multiple regression model:

\[ E[Y] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \]

- \( Y \) = amount of money in pocket
- \( X_1 \) = # of coins in pocket
- \( X_2 \) = # of pennies, nickels, dimes in pocket

1. Describe the directionality of the two correlation values: between \( Y \) & \( X_1 \) and between \( Y \) and \( X_2 \). Explain.

2. Describe the directionality of the two \( \beta \) coefficients (\( \beta_1 \) and \( \beta_2 \)) in the regression model. Explain.

Solution:

1. Because the amount of money necessarily goes up with more coins, \( Y \) and \( X_1 \) will be positively correlated. Similarly, \( Y \) and \( X_2 \) will be positively correlated.

2. The total number of coins is going to be a better predictor of total amount than the number of low coins. The coefficient on \( X_1 \) (\( \beta_1 \)) will be positive. Given a certain number of coins total in the model, the number of low coins will actually have a negative effect on the model. So the coefficient on \( X_2 \) (\( \beta_2 \)) will be negative.

Coefficients:

| Estimate  | Std. Error | t value | Pr(>|t|) |
|-----------|------------|---------|---------|
| (Intercept) | 0.30724 | 0.46569 | 0.660 | 0.524321 |
| num.coins  | 0.29648 | 0.05778 | 5.132 | 0.000443 *** |
| num.lowcoins | -0.24629 | 0.06561 | -3.754 | 0.003762 ** |

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Signif. codes: 0 *** 0.001 ** 0.01 * 0.05 . 0.1 1