**CHAPTER 13: CONTROLLING FOR A THIRD VARIABLE:**

**MULTIPLE OLS REGRESSION**

**DISCUSSION GROUP QUESTIONS**

1. You have data on four variables for a sample of 24 convicted burglars:

Y: Sentence Length for Convicted Burglars (in months)

X1: Defendant’s Race (non-white=1; white=0)

X2: Number of Prior Convictions

X3: Dollar Amount of Money/Goods Stolen (in thousand dollar units)

Your dependent variable is the length of sentence received. Here are the data.

|  |  |  |  |
| --- | --- | --- | --- |
| Sentence Length (Y) | Defendant’s Race (X1) | # Prior Convictions (X2) | $ Amount Stolen (in Thousands) (X3) |
| 12.00 | 1.00 | 0.00 | 5.00 |
| 32.00 | 0.00 | 2.00 | 5.00 |
| 14.00 | 1.00 | 4.00 | 1.00 |
| 18.00 | 1.00 | 2.00 | 2.00 |
| 22.00 | 0.00 | 4.00 | 2.00 |
| 17.00 | 1.00 | 0.00 | 8.00 |
| 43.00 | 0.00 | 4.00 | 7.00 |
| 23.00 | 1.00 | 5.00 | 7.00 |
| 33.00 | 1.00 | 6.00 | 4.00 |
| 37.00 | 0.00 | 3.00 | 5.00 |
| 27.00 | 1.00 | 7.00 | 3.00 |
| 29.00 | 0.00 | 6.00 | 8.00 |
| 29.00 | 1.00 | 3.00 | 3.00 |
| 19.00 | 1.00 | 0.00 | 3.00 |
| 33.00 | 1.00 | 5.00 | 5.00 |
| 37.00 | 1.00 | 3.00 | 4.00 |
| 48.00 | 0.00 | 6.00 | 8.00 |
| 49.00 | 0.00 | 5.00 | 7.00 |
| 50.00 | 0.00 | 5.00 | 5.00 |
| 67.00 | 0.00 | 9.00 | 12.00 |
| 76.00 | 0.00 | 7.00 | 10.00 |
| 56.00 | 0.00 | 4.00 | 8.00 |
| 60.00 | 0.00 | 8.00 | 9.00 |
| 71.00 | 0.00 | 8.00 | 6.00 |

a. Do a scatterplot for the relationship between sentence length and the number of prior convictions and the dollar amount stolen in the crime, and also between your two X variables and determine if these are good variables to use in a multiple regression. {the correlations are:

ryx2 = .72, ryx3 = .69 and rx2x3 = .48}

b. What is the mean sentence length given to white defendants and non-white defendants and determine if race of defendant seems like a good variable to include in a multiple regression.

c. The following shows the relationship between sentence length and each independent variable in a bivariate regression. Interpret the slope coefficient, determine if you would reject the null hypothesis that each β = 0 with an alpha of .05, and interpret the value of R2.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
|  | (Constant) | 49.231 | 3.752 |  | 13.122 | .000 |
| Race of Defendant | -25.413 | 5.542 | -.699 | -4.586 | .000 |
| a. Dependent Variable: Sentence Length | | | | | | |

R2 = .49

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
| 1 | (Constant) | 14.198 | 5.494 |  | 2.584 | .017 |
| Number of Prior Convictions | 5.295 | 1.086 | .721 | 4.875 | .000 |
| a. Dependent Variable: Sentence Length | | | | | | |

R2 = .52

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
| 1 | (Constant) | 11.316 | 6.572 |  | 1.722 | .099 |
| Dollar Amount Stolen | 4.602 | 1.041 | .686 | 4.421 | .000 |
| a. Dependent Variable: Sentence Length | | | | | | |

R2 = .47

d. Here is the result of the multivariate regression that has all three independent variables included. Interpret each slope coefficient, determine if you would reject the null hypothesis that each β = 0 with an alpha of .05, and interpret the value of R2. Why is the R2 value in this model not simply the sum of the three bivariate model R2s? Which variable has the greatest effect on sentence length?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
| 1 | (Constant) | 18.156 | 7.733 |  | 2.348 | .029 |
| Race of Defendant | -12.378 | 5.096 | -.340 | -2.429 | .025 |
| Number of Prior Convictions | 3.103 | .977 | .422 | 3.176 | .005 |
| Dollar Amount Stolen | 1.997 | .949 | .298 | 2.105 | .048 |
| a. Dependent Variable: Sentence Length | | | | | | |

R2 = .75