STA 3180 Statistical Modelling: Regression

Extra Practice Problems: Regression

1.

Question: Find the least squares regression line for the following data set: (2,3), (4,5), (6,7).

Solution: To solve this problem, we will use the least squares method to find the equation of the regression line. First, we will calculate the mean of x and y values. The mean of x is 4 and the mean of y is 5. Then, we will calculate the slope of the regression line using the formula: slope = (Σ(xy) - n*xmean*ymean)/(Σ(x^2) - n*xmean^2). In this case, Σ(xy) = 2*3 + 4*5 + 6*7 = 56, Σ(x^2) = 2^2 + 4^2 + 6^2 = 56, n = 3, xmean = 4, and ymean = 5. Plugging these values into the formula, we get slope = (56 - 3*4*5)/(56 - 3*4^2) = (56 - 60)/(56 - 48) = -4/8 = -0.5.

Now, we can calculate the y-intercept of the regression line using the formula: y-intercept = ymean - slope*xmean. In this case, y-intercept = 5 - (-0.5)*4 = 5 + 2 = 7.

Therefore, the equation of the least squares regression line is y = -0.5x + 7.

[CORRECT]

2.

Question: Find the least squares regression line for the following data set: (2,3), (4,5), (6,7), (8,9).

Solution: To solve this problem, we will use the least squares method to find the equation of the regression line. First, we will calculate the mean of x and y values. The mean of x is 5 and the mean of y is 6. Then, we will calculate the slope of the regression line using the formula: slope = (Σ(xy) - n*xmean*ymean)/(Σ(x^2) - n*xmean^2). In this case, Σ(xy) = 2*3 + 4*5 + 6*7 + 8*9 = 130, Σ(x^2) = 2^2 + 4^2 + 6^2 + 8^2 = 120, n = 4, xmean = 5, and ymean = 6. Plugging these values into the formula, we get slope = (130 - 4*5*6)/(120 - 4*5^2) = (130 - 120)/(120 - 100) = 10/20 = 0.5.

Now, we can calculate the y-intercept of the regression line using the formula: y-intercept = ymean - slope*xmean. In this case, y-intercept = 6 - (0.5)*5 = 6 - 2.5 = 3.5.

Therefore, the equation of the least squares regression line is y = 0.5x + 3.5.

[CORRECT]