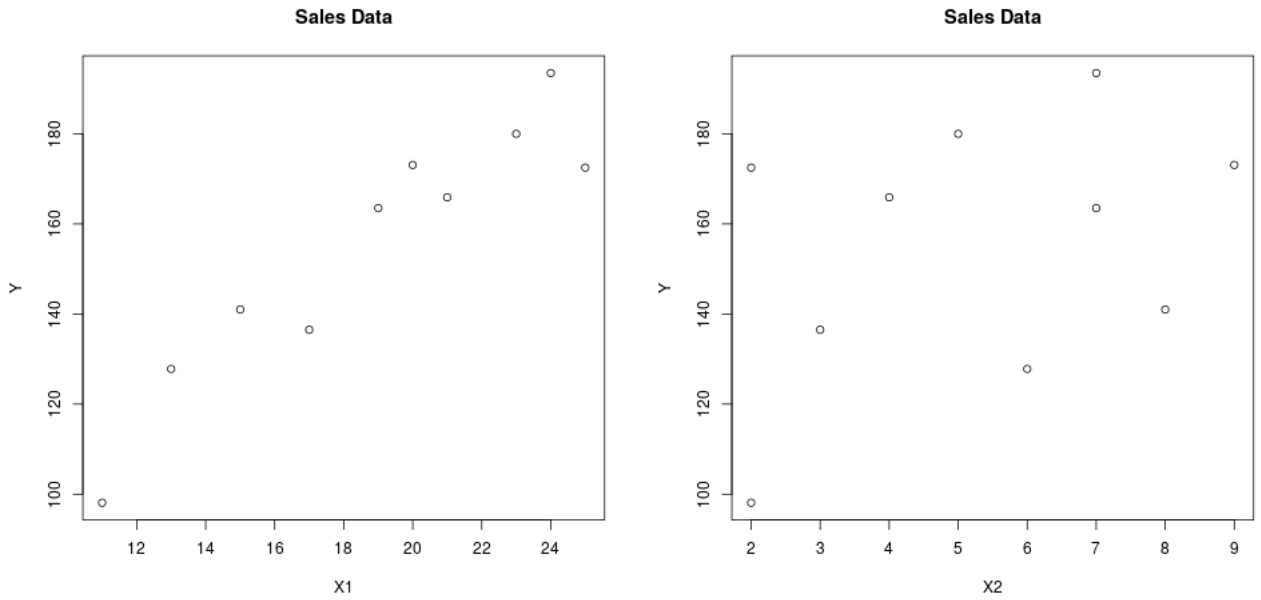
We consider the following model of the data,

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon$$

For the sales data, we have,

$$Y = 29.3468 + 5.6128 X_1 + 3.8344 X_2$$

1. We begin by plotting each of the independent variables against the Sales data in order to determine the nature of their relationship.



We see from these plots that X_1 is clearly linearly related to Y, while the relationship between X_2 and Y is more complex than a simple linear relationship. We consider the model, $\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_2^2 + \epsilon$ Computing, we find our model to be,

$$Y = 19.0737 + 5.5596 X_1 + 9.2229 X_2 - .5129 X_2^2$$

2. We next consider a model that accounts for potential interactions between X_1 and X_2, $\beta_0+\beta_1 X_1+\beta_2 X_2+\beta_3 X_2^2+\beta_4 X_1 X_2+\epsilon$. We compute this model to be,

$$Y = 27.43798 + 5.08130 X_1 + 7.28995 X_2 - .53110 X_2^2 + .11473 X_1 X_2$$

3. In order to test the significance of this interaction model, we shall test,

$$H_0 : \beta_4 = 0$$
$$H_A : \beta_4 \neq 0$$

The p-value for our computed value of β_4 is .014032. Thus, at $\alpha = .05$, we may accept that there is a non-zero level of interaction between the variables. At the $\alpha = .01$ level however, we see that the interaction is not significant enough.

4. We now compare the R^2 value for each of the computed models,

Model	R^2	Adjusted R^2
1	0.9901	0.9873
2	0.9975	0.9962
3	0.9993	0.9988

We see that as we have added a term to each of these models, the overall "correctness" of the successive models increases. Thus, we may conclude that Model 3 is the best overall at predicting the data.

5. Finally, we consider predicting the sales price(in thousands) using the inputs, $X_1 = 16$ and $X_2 = 8$. The results for each model are below,

Model	Point Prediction	95% Interval
1	149.83	(141.17, 159.48)
2	148.98	(144.07, 153.90)
3	147.75	(144.70, 150.81)

We note that each sucessive prediction interval is smaller than the last, implying that these models are sucessively more accurate than the last.