STAT 305 - JMP practice

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Wine bottle price

A certain statistician decided to do a deep analysis of the relationship between the cost of wine bottles in the 1997 book and the actual prices the same bottles fetched on open auction sites recently. The dataset he created consists of the last 500 bottles with publically available auction prices that were also listed in *Le Champions de vin rouge* price index.

Line fitting

1. Use the file "JMP.csv" file on the course page into JMP and make a scatter plot of the response variable "Recent Auction Price" vs. the experimental variabl "1977 Guide Price". What do you think of the relationship between the response and experimental variable?

2. Suppose there is a linear relationship between the recent auction price (y) and 1977 guide price (x). Write down the theoretical relationship.

3. Use JMP to fit a line (simple linear relationship) between x and y.

4. Find and <u>interpret</u> the value of R^2 for the fitted linear relationship. What do you think of the usefulness of the fit?

5. What are the values of SSTO, SSE and SSR?

6. Using the JMP output, specify the values of $\hat{\beta}_0$ and $\hat{\beta}_1$ and write down the fitted relationship.

7. Provide a predicted value of the auction price of wine if the price on the 1977 guide book is 100.

8. Save the residuals and plot residuals vs. 1977 guide price. What do you think of the assumptions of residuals?
   - Patternless
   - Bell-shaped

9. Now check the normality of residuals using histogram and Normal qq-plot.

10. Save the predicted values $\hat{y}$ and plot residuals vs. predicted values. What do you think of the assumptions of the model?

Fitting a quadratic (polynomial) model

Let's try fitting a polynomial of order 2. i.e. we are interested in the theoretical relationship

$$y = \beta_0 + \beta_1 x + \beta_2 x^2$$

The goal is to fit a quadratic (polynomial) model to the data.

1. Fit a polynomial to degree 2 to the data. Note that, there are several way to fit this polynomial model. The easiest way is to use the options in 'Analyze > fit model'.

2. Report the R^2 and interpret it.

3. Compare this R^2 with the one of line fitting in part I. Which model do you select and why?

4. Write down the fitted quadratic model.

5. Save the residuals and plot residuals vs. 1977 guide price. What do you think of the assumptions of residuals? - Patternless - Bell-shaped

6. Now check the normality of residuals using histogram and Normal qq-plot.

7. Save the predicted values $\hat{y}$ and plot residuals vs. predicted values. What do you think of the assumptions of the model?

Fitting a multiple regression model

Suppose there is another variable involved in this experiment called "Market Price". i.e. the theoretical relationship is

$$\text{auction price} = \beta_0 + \beta_0 * \text{guide price} + \beta_2 * \text{market price}$$

Now use JMP to fit a multiple regression model (a surface) to learn about the relationship between auction, guide and market price.