MATH202 Multiple Regression Moving Company Labor Hours

The owner of an intracity moving company has typically used "past experience" to determine the number of labor hours needed for the move, but he would like to be able to develop an estimate that would more precisely predict the labor hours. In a preliminary effort to provide a more precise means of estimation, he has collected data for a random sample of 36 moves in which the origin and destination were within the borough of Manhattan in New York City and the travel time was an insignificant portion of the hours worked. A portion of the data follow; the entire data set is posted at the course website:

Labor Hours	Rooms	Cubic Feet
24.00	3.5	545
13.50	2.0	400
26.25	2.5	562
...	...	...
15.00	2.5	275

1. Write down a model to predict labor hours based on the number of rooms and number of cubic feet to be moved from the origin apartment. You are trying to model (or explain) variation in Labor hours by knowing the number of rooms and the amount of stuff to be moved measured in cubic feet. Define each variable you use if you don't use descriptive names.

2. The computer output is attached. Write down the estimated model.

3. Interpret the value of each estimated coefficient ($\hat{\beta}$).

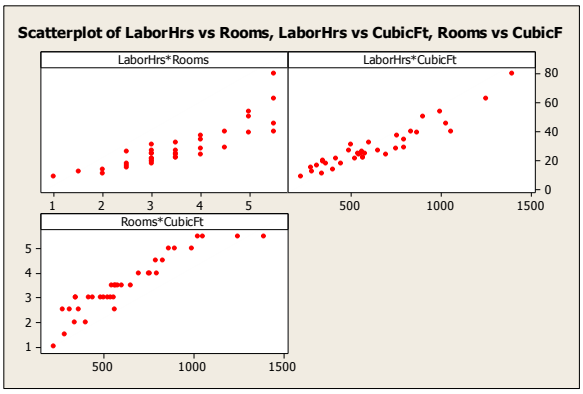
4. Are there any violations of the regression assumptions required for inferences?

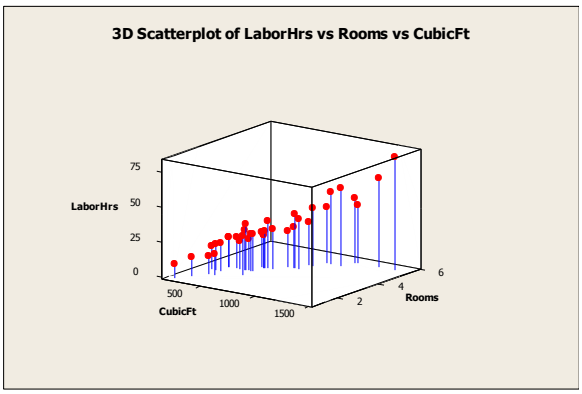
5. Is the overall model significant? That is, is there evidence that at least one of the predictors helps to explain variation in labor hours in the population of moves? Set up Ho and Ha and report the results.

6. If the global F-test warrants it, test for the significance of each individual coefficient. Set up Ho and Ha for each test and report the results.

7. Verify the value of R^2 for this model and interpret it.

8. Use the model to estimate the time required to move 3 rooms with 500 cubic feet of stuff. What is the margin of error (with 95% confidence)? How much does the margin of error shrink if you want to estimate the average time for all moves with 3 rooms and 500 cubic feet of stuff?





Correlations: Rooms, CubicFt

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Pearson correlation of Rooms and CubicFt = 0.933
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Regression Analysis: LaborHrs versus Rooms, CubicFt

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The regression equation is
LaborHrs = - 0.57 - 1.62 Rooms + 0.0563 CubicFt


Predictor       Coef    SE Coef       T       P  VIF
Constant      -0.568      3.094   -0.18   0.855
Rooms         -1.624      2.061   -0.79   0.436  7.8
CubicFt     0.056322   0.008487    6.64   0.000  7.8


S = 5.05970   R-Sq = 89.1%   R-Sq(adj) = 88.5%
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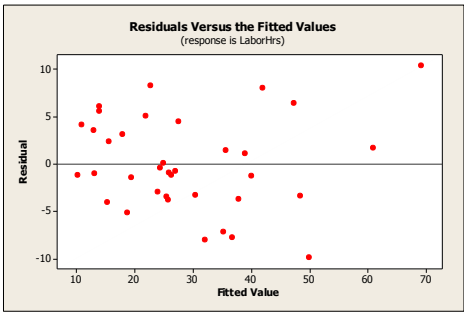

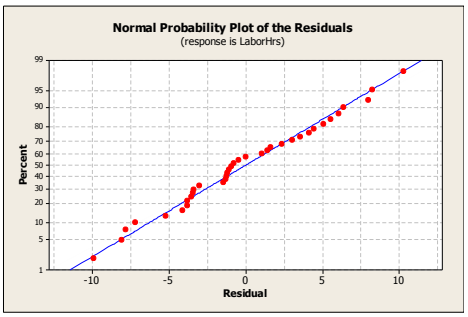


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Analysis of Variance

Source           DF      SS      MS       F       P
Regression        2  6926.6  3463.3  135.28   0.000
Residual Error   33   844.8    25.6
Total            35  7771.4

Predicted Values for New Observations

New
Obs      Fit  SE Fit        95% CI              95% PI
  1   22.721   0.928  (20.833, 24.610)  (12.255, 33.187)
  2   64.963   6.356  (52.032, 77.894)  (48.435, 81.491)XX

XX denotes a point that is an extreme outlier in the predictors.


Values of Predictors for New Observations

New
Obs  Rooms  CubicFt
  1   3.00      500
  2   3.00     1250
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