Response Y

Summary of Fit

RSquare	0.879336
RSquare Adj	0.86727
Root Mean Square Error	13.82136
Mean of Response	52.34783
Observations (or Sum Wgts)	23

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	27842.616	13921.3	72.8749
Error	20	3820.602	191.0	Prob > F
C. Total	22	31663.217		<.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	28.183658	6.332162	4.45	0.0002
X1	1.5586707	0.145198	10.73	<.0001
X2	-1.716567	0.263991	-6.50	<.0001

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
X1	1	1	22013.606	115.2363	<.0001
X2	1	1	8076.917	42.2809	<.0001

Residual by Predicted Plot
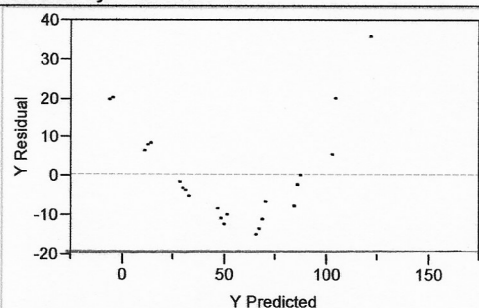
Box-Cox Transformations

Rows	Y	X1	X2	Y X
1	26	0	0	135.36124
2	17	0	10	117.708996
3	13	0	20	106.56367
4	.	0	30	.
5	38	12	0	151.127558
6	26	12	10	135.36124
7	20	12	20	124.461025
8	15	12	30	112.508954
9	50	24	0	162.529342
10	37	24	10	150.019596
11	27	24	20	136.929204
12	22	24	30	128.420793
13	76	36	0	179.925128
14	53	36	10	164.950188
15	37	36	20	150.019596
16	27	36	30	136.929204
17	108	48	0	194.524343
18	83	48	10	183.585642
19	57	48	20	167.973056
20	41	48	30	154.284477
21	157	60	0	210.067349
22	124	60	10	200.263952
23	87	60	20	185.541114
24	63	60	30	172.131135

Handwritten annotations:

- Analyze
  - Fit Model (Enter Y-variable and Model Effect, click "Run Model")
  - Factor Profiling (see the red down arrows)
    - Box-Cox Y transformation

Click on this red down arrow to "Save Best Transformation" or "Save Specific Transformation" as a column in the input file.

Transformed Y-value. See Edit Formula window to discover that $\hat{\lambda} = 0$.

See below for results of regression using transformed Y as the response.

Response Y X

Summary of Fit

RSquare	0.995123
RSquare Adj	0.994636
Root Mean Square Error	2.112483
Mean of Response	154.8342
Observations (or Sum Wgts)	23

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	18213.017	9106.51	2040.635
Error	20	89.252	4.46	Prob > F
C. Total	22	18302.269		<.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	133.45469	0.967819	137.89	<.0001
X1	1.2831212	0.022192	57.82	<.0001
X2	-1.309449	0.040349	-32.45	<.0001

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
X1	1	1	14918.247	3342.961	<.0001
X2	1	1	4700.040	1053.21	<.0001

Residual by Predicted Plot
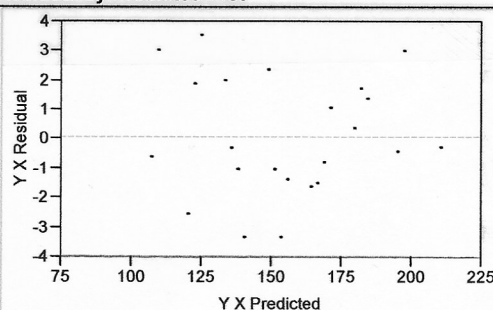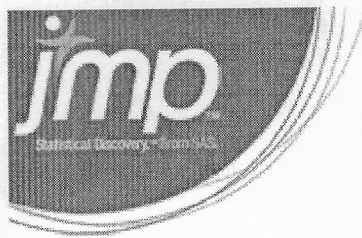
Statistics and Graphics Guide

Standard Least Squares:
## Exploring the Prediction Equation

NOTE: In JMP, consider – Analyze, and then refer to the discussion below.
– Fit Model

Box Cox Y Transformations

Sometimes a transformation on the response fits the model better than the original response. A commonly used transformation raises the response to some power. Box and Cox (1964) formalized and described this family of power transformations. The **Factor Profiling** menu has the **Box Cox Y Transformation** command. The formula for the transformation is constructed so that it provides a continuous definition and the error sums of squares are comparable.

$$y^{(\lambda)} = \begin{cases} \dfrac{y^{\lambda} - 1}{\lambda \dot{y}^{\lambda-1}} & \text{if } \lambda \neq 0 \\ \dot{y}\ln(y) & \text{if } \lambda = 0 \end{cases}$$

where $\dot{y}$ is the geometric mean

The plot shown here illustrates the effect of this family of power transformations on Y.
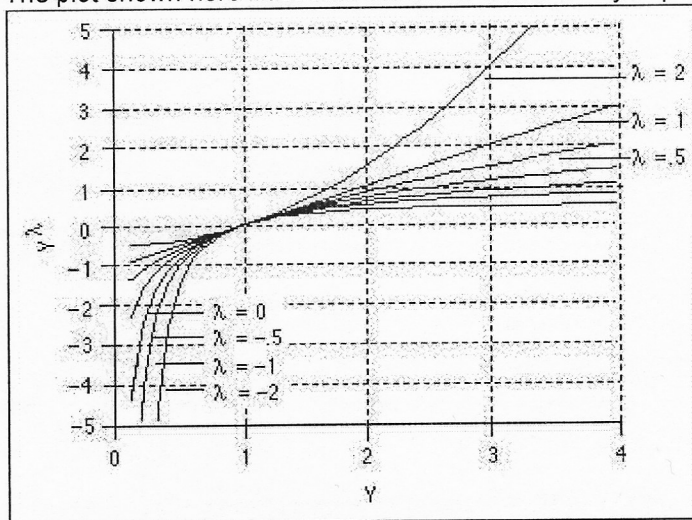
The **Box-Cox Y Transformation** command fits transformations from $\lambda = -2$ to 2 in increments of 0.2, and it plots the sum of squares error (SSE) across the λ power. The plot below shows the best fit when λ is between 1.0 and 1.5 for the `Reactor.jmp` data using the model with effects F, Ct, A, T, and Cn and all two-factor interactions. The best transformation is found on the plot by finding the lowest point on the curve.