

Analysis of Todd Katz' peanut temperature data
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Given below is a scatterplot for temperature measurements taken at five levels of the experimental factor of power. The plot indicates that mean temperature is increasing in power, but not linearly. At each of the five power settings, about 50 observations were taken on each of 2 days, for a total of $N = 501$ measurements taken over a total of 10 days. Some analysis not included here indicates the presence of a day effect (nested in power) on mean temperature. The primary question of interest is to characterize the association between mean temperature and power, so averages were taken over observations within day. This results in an analysis based on $n = 10$ responses. A linear model was fit for these responses and an F -ratio for lack-of-fit was found to be significant ($p = 0.0210$), indicating the need for a nonlinear model. See output below:

The SAS System

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Obs	power	day	_TYPE_	_FREQ_	ymean	powerc
1	803.16	0	3	55	86.756	803.16
2	803.16	1	3	65	83.348	803.16
3	900.00	0	3	55	91.523	900.00
4	900.00	1	3	65	93.044	900.00
5	1185.98	0	3	55	100.966	1185.98
6	1185.98	1	3	65	96.734	1185.98
7	1247.47	0	3	55	106.364	1247.47
8	1247.47	1	3	65	110.555	1247.47
9	1626.92	0	3	55	110.988	1626.92
10	1626.92	1	3	65	108.757	1626.92

Using PROC GLM to get lack-of-fit F-ratio

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The GLM Procedure

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	894.6441251	223.6610313	41.12	0.0005
Error	5	27.1940240	5.4388048		
Corrected Total	9	921.8381491			

Source	DF	Type I SS	Mean Square	F Value	Pr > F
power	1	756.5881672	756.5881672	139.11	<.0001
powerc	3	138.0559579	46.0186526	8.46	0.0210

Source	DF	Type III SS	Mean Square	F Value	Pr > F
power	0	0.0000000	.	.	.
powerc	3	138.0559579	46.0186526	8.46	0.0210