

## The SAS System

Obs	MULCH	DISTANCE	RUN	_TYPE_	_FREQ_	COUNT
1	0	1	1	0	4	15.7500
2	0	1	2	0	4	11.5000
3	0	2	1	0	4	10.0000
4	0	2	2	0	4	6.7500
5	0	3	1	0	4	7.5000
6	0	3	2	0	4	5.2500
7	0	4	1	0	4	4.7500
8	0	4	2	0	4	2.5000
9	0	5	1	0	4	5.0000
10	0	5	2	0	4	2.7500
11	0	6	1	0	4	6.5000
12	0	6	2	0	4	1.2500
13	0	7	1	0	4	2.7500
14	0	7	2	0	4	2.0000
15	0	8	1	0	4	4.2500
16	0	8	2	0	4	1.7500
17	0	9	1	0	4	2.2500
18	0	9	2	0	4	1.0000
19	0	10	1	0	4	1.2500
20	0	10	2	0	4	2.0000
21	0	11	1	0	4	2.0000
22	0	11	2	0	4	1.5000
23	0	12	1	0	4	1.5000
24	0	12	2	0	4	2.0000
25	7	1	1	0	4	4.0000
26	7	1	2	0	4	3.7500
27	7	2	1	0	4	3.2500
28	7	2	2	0	4	4.0000
29	7	3	1	0	4	1.7500
30	7	3	2	0	4	1.0000
31	7	4	1	0	4	0.2500
32	7	4	2	0	4	1.2500
33	7	5	1	0	4	0.5000
34	7	5	2	0	4	0.7500
35	7	6	1	0	4	0.7500
36	7	6	2	0	4	0.2500
37	7	7	1	0	4	1.0000
38	7	7	2	0	4	0.7500
39	7	8	1	0	4	1.0000
40	7	8	2	0	4	0.5000
41	7	9	1	0	4	0.7500
42	7	9	2	0	4	0.0000

43	7	10	1	0	4	0.7500
44	7	10	2	0	4	0.7500
45	7	11	1	0	4	0.3333
46	7	11	2	0	4	0.3333
47	7	12	1	0	4	0.5000
48	7	12	2	0	4	0.0000

## The SAS System

The NLIN Procedure  
Dependent Variable COUNT  
Method: Gauss-Newton

MULCH=0

Iterative Phase			
Iter	A	B	Sum of Squares
0	1.0000	-0.1000	637.1
1	12.8610	-1.0644	505.8
2	7.3773	-0.1435	169.9
3	12.8618	-0.2458	78.4708
4	15.7308	-0.2691	62.6999
5	16.0402	-0.2726	62.5772
6	16.0752	-0.2734	62.5751
7	16.0833	-0.2736	62.5750
8	16.0854	-0.2737	62.5750
9	16.0859	-0.2737	62.5750
10	16.0860	-0.2737	62.5750

NOTE: Convergence criterion met.

Estimation Summary	
Method	Gauss-Newton
Iterations	10
Subiterations	2
Average Subiterations	0.2
R	4.841E-6
PPC(B)	3.007E-6
RPC(B)	0.000012
Object	4.74E-10
Objective	62.57499
Observations Read	24
Observations Used	24
Observations Missing	0

Note: An intercept was not specified for this model.

Source	DF	Sum of Squares	Mean Square	F Value	Approx Pr > F
Model	2	709.1	354.6	124.65	<.0001
Error	22	62.5750	2.8443		
Uncorrected Total	24	771.7			

Parameter	Estimate	Approx Std Error	Approximate 95% Confidence Limits	
A	16.0860	1.7100	12.5396	19.6324

<b>B</b>	-0.2737	0.0363	-0.3489	-0.1985
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Approximate Correlation Matrix		
	A	B
A	1.0000000	-0.8031608
B	-0.8031608	1.0000000

## The SAS System

The NLIN Procedure  
Dependent Variable COUNT  
Method: Gauss-Newton

MULCH=7

Iterative Phase			
Iter	A	B	Sum of Squares
0	1.0000	-0.1000	36.7955
1	3.9781	-0.4553	17.4921
2	5.9191	-0.3271	7.3763
3	5.7111	-0.3562	6.5202
4	5.8142	-0.3678	6.4997
5	5.8464	-0.3706	6.4986
6	5.8536	-0.3713	6.4986
7	5.8552	-0.3714	6.4986
8	5.8555	-0.3714	6.4986
9	5.8556	-0.3714	6.4986

NOTE: Convergence criterion met.

Estimation Summary	
Method	Gauss-Newton
Iterations	9
R	5.747E-6
PPC(B)	3.822E-6
RPC(B)	0.000018
Object	8.55E-10
Objective	6.498563
Observations Read	24
Observations Used	24
Observations Missing	0

Note: An intercept was not specified for this model.

Source	DF	Sum of Squares	Mean Square	F Value	Approx Pr > F
Model	2	62.2237	31.1118	105.32	<.0001
Error	22	6.4986	0.2954		
Uncorrected Total	24	68.7222			

Parameter	Estimate	Approx Std Error	Approximate 95% Confidence Limits	
A	5.8556	0.7129	4.3772	7.3340
B	-0.3714	0.0527	-0.4806	-0.2622

Approximate Correlation Matrix

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	A	B
A	1.0000000	-0.8244421
B	-0.8244421	1.0000000

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The SAS System

Obs	MULCH	DISTANCE	RUN	_TYPE_	_FREQ_	COUNT	LOGCOUNT
1	0	1	1	0	4	15.7500	2.81840
2	0	1	2	0	4	11.5000	2.52573
3	0	2	1	0	4	10.0000	2.39790
4	0	2	2	0	4	6.7500	2.04769
5	0	3	1	0	4	7.5000	2.14007
6	0	3	2	0	4	5.2500	1.83258
7	0	4	1	0	4	4.7500	1.74920
8	0	4	2	0	4	2.5000	1.25276
9	0	5	1	0	4	5.0000	1.79176
10	0	5	2	0	4	2.7500	1.32176
11	0	6	1	0	4	6.5000	2.01490
12	0	6	2	0	4	1.2500	0.81093
13	0	7	1	0	4	2.7500	1.32176
14	0	7	2	0	4	2.0000	1.09861
15	0	8	1	0	4	4.2500	1.65823
16	0	8	2	0	4	1.7500	1.01160
17	0	9	1	0	4	2.2500	1.17865
18	0	9	2	0	4	1.0000	0.69315
19	0	10	1	0	4	1.2500	0.81093
20	0	10	2	0	4	2.0000	1.09861
21	0	11	1	0	4	2.0000	1.09861
22	0	11	2	0	4	1.5000	0.91629
23	0	12	1	0	4	1.5000	0.91629
24	0	12	2	0	4	2.0000	1.09861
25	7	1	1	0	4	4.0000	1.60944
26	7	1	2	0	4	3.7500	1.55814
27	7	2	1	0	4	3.2500	1.44692
28	7	2	2	0	4	4.0000	1.60944
29	7	3	1	0	4	1.7500	1.01160
30	7	3	2	0	4	1.0000	0.69315
31	7	4	1	0	4	0.2500	0.22314
32	7	4	2	0	4	1.2500	0.81093
33	7	5	1	0	4	0.5000	0.40547
34	7	5	2	0	4	0.7500	0.55962
35	7	6	1	0	4	0.7500	0.55962
36	7	6	2	0	4	0.2500	0.22314
37	7	7	1	0	4	1.0000	0.69315
38	7	7	2	0	4	0.7500	0.55962
39	7	8	1	0	4	1.0000	0.69315
40	7	8	2	0	4	0.5000	0.40547
41	7	9	1	0	4	0.7500	0.55962
42	7	9	2	0	4	0.0000	0.00000

43	7	10	1	0	4	0.7500	0.55962
44	7	10	2	0	4	0.7500	0.55962
45	7	11	1	0	4	0.3333	0.28768
46	7	11	2	0	4	0.3333	0.28768
47	7	12	1	0	4	0.5000	0.40547
48	7	12	2	0	4	0.0000	0.00000



## The SAS System

The REG Procedure  
 Model: MODEL1  
 Dependent Variable: LOGCOUNT

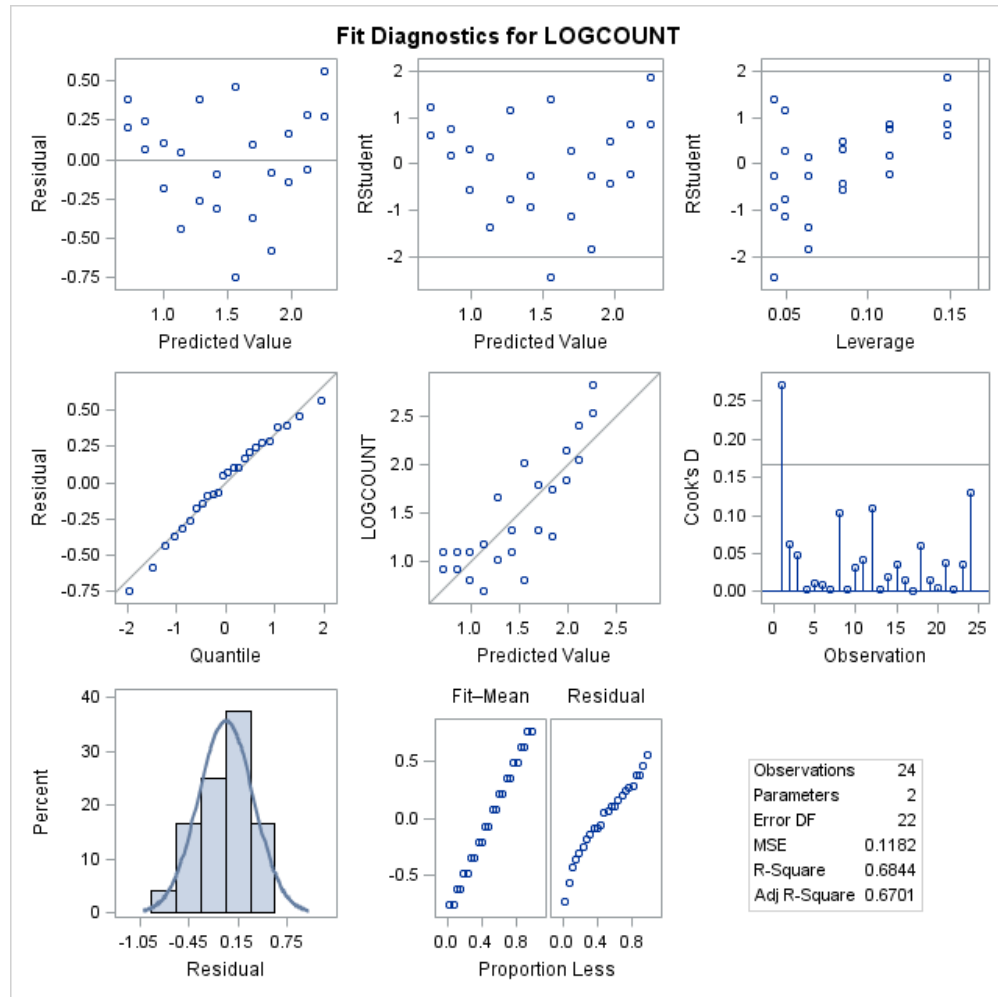
MULCH=0

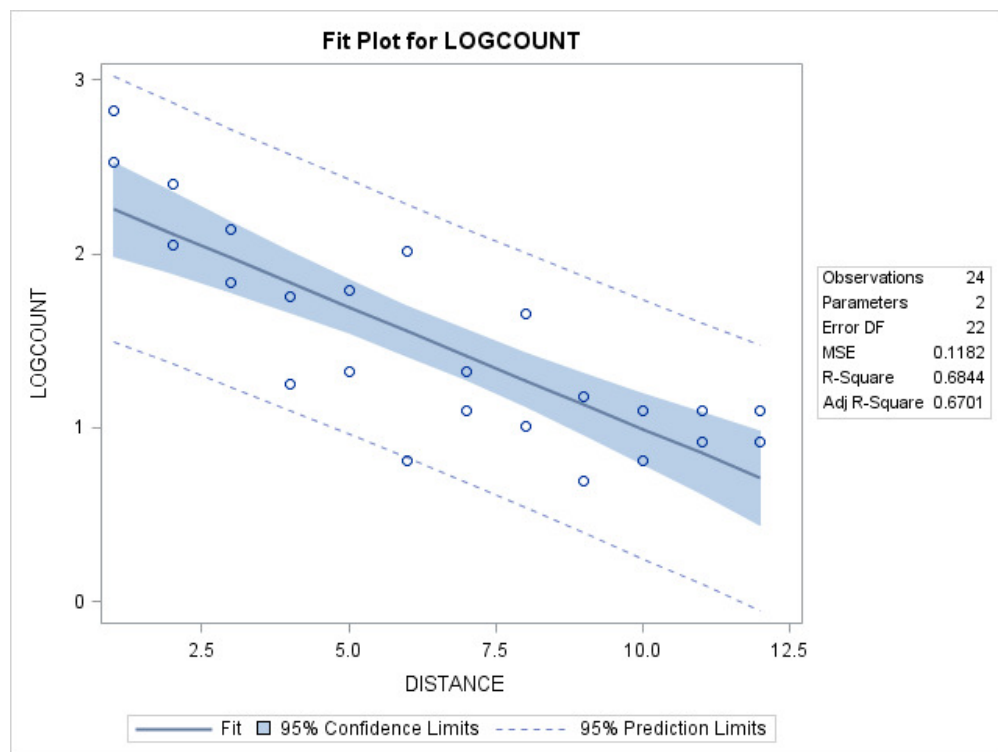
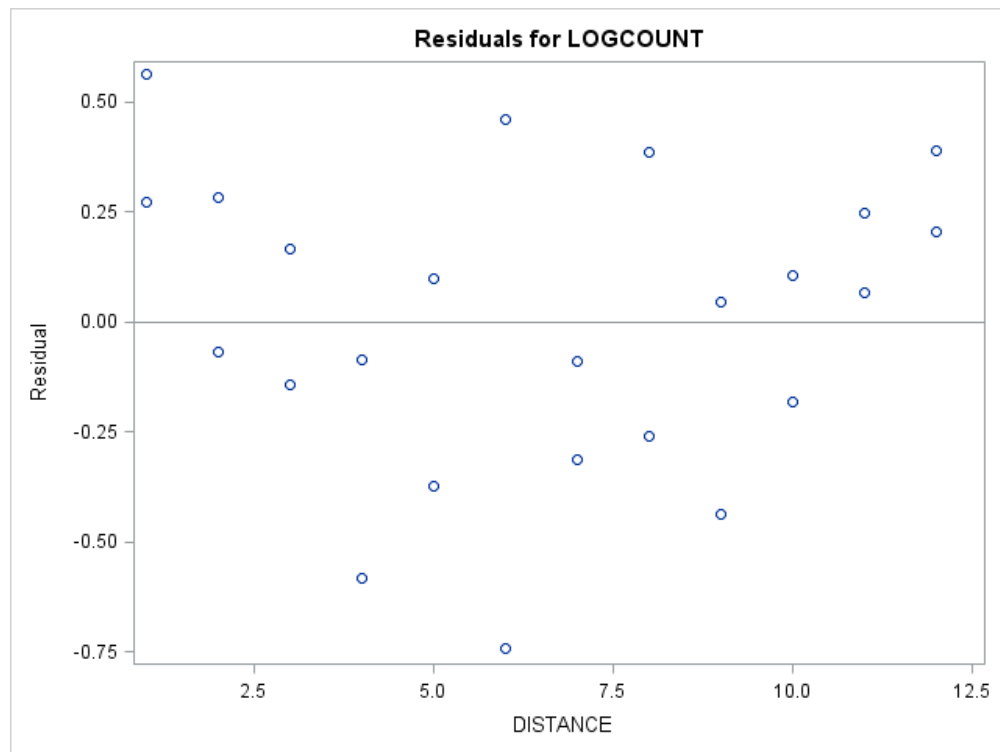
Number of Observations Read	24
Number of Observations Used	24

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	5.64019	5.64019	47.72	<.0001
Error	22	2.60046	0.11820		
Corrected Total	23	8.24065			

Root MSE	0.34381	R-Square	0.6844
Dependent Mean	1.48354	Adj R-Sq	0.6701
Coeff Var	23.17467		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	2.39635	0.14962	16.02	<.0001
DISTANCE	1	-0.14043	0.02033	-6.91	<.0001

**The SAS System****The REG Procedure****Model: MODEL1****Dependent Variable: LOGCOUNT****MULCH=0**



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**The SAS System**

**The REG Procedure**  
**Model: MODEL1**  
**Dependent Variable: LOGCOUNT**

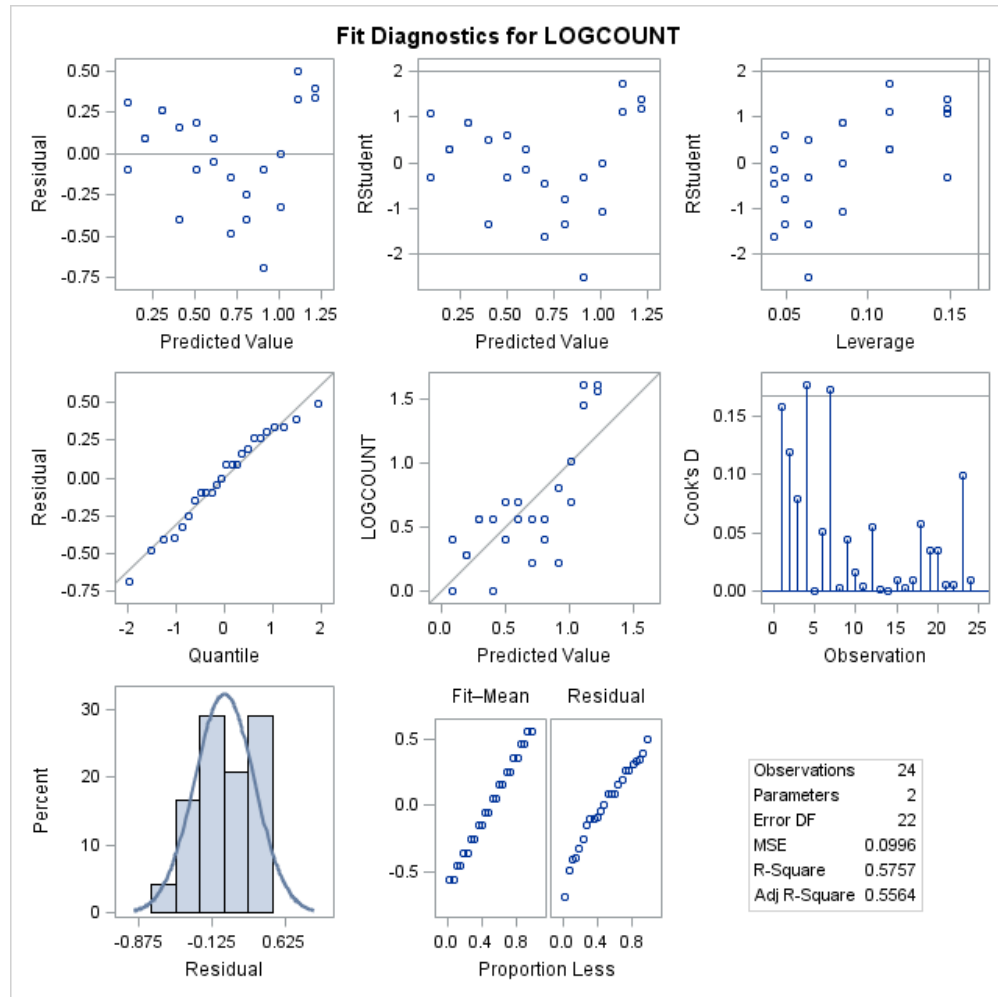
**MULCH=7**

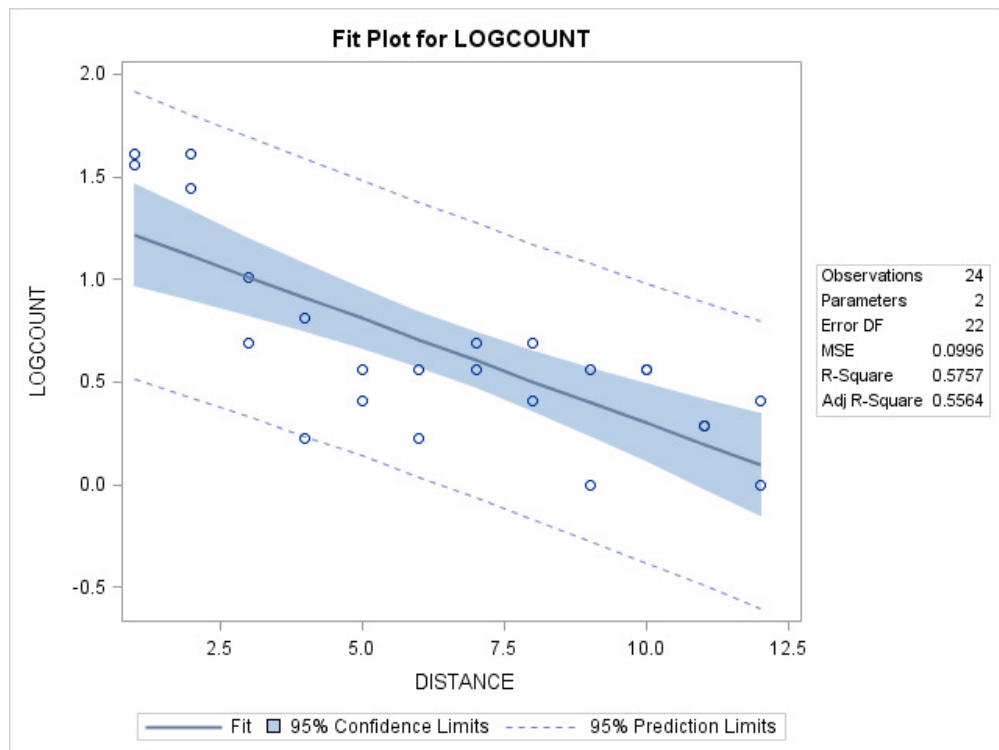
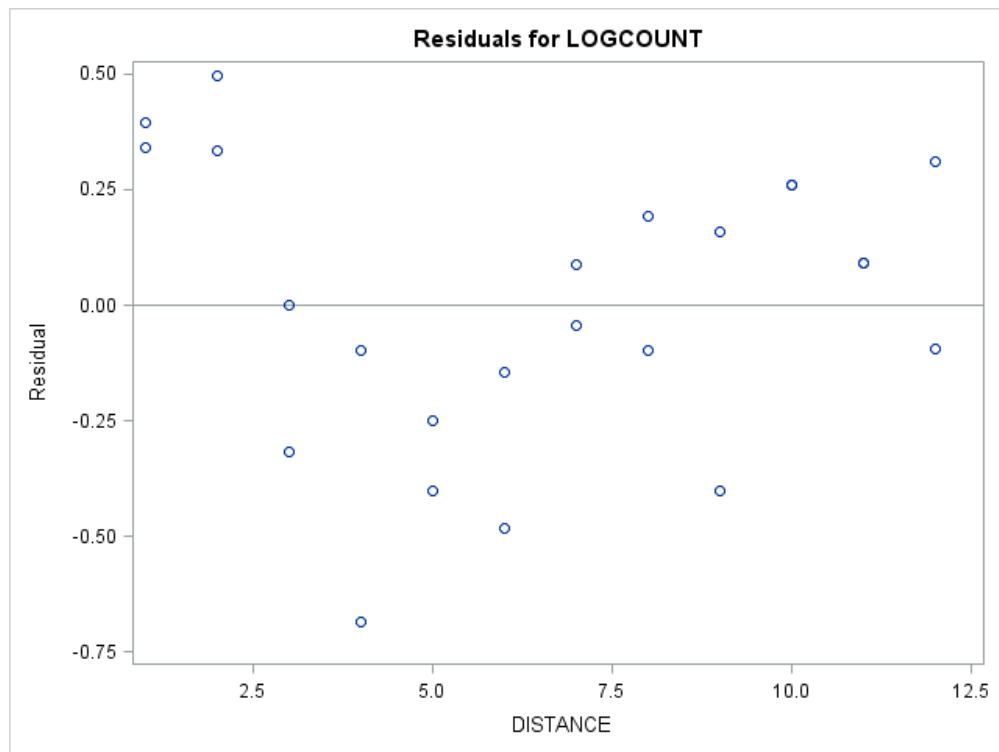
<b>Number of Observations Read</b>	24
<b>Number of Observations Used</b>	24

<b>Analysis of Variance</b>					
<b>Source</b>	<b>DF</b>	<b>Sum of Squares</b>	<b>Mean Square</b>	<b>F Value</b>	<b>Pr &gt; F</b>
<b>Model</b>	1	2.97234	2.97234	29.85	<.0001
<b>Error</b>	22	2.19050	0.09957		
<b>Corrected Total</b>	23	5.16284			

<b>Root MSE</b>	0.31554	<b>R-Square</b>	0.5757
<b>Dependent Mean</b>	0.65507	<b>Adj R-Sq</b>	0.5564
<b>Coeff Var</b>	48.16968		

<b>Parameter Estimates</b>					
<b>Variable</b>	<b>DF</b>	<b>Parameter Estimate</b>	<b>Standard Error</b>	<b>t Value</b>	<b>Pr &gt;  t </b>
<b>Intercept</b>	1	1.31771	0.13732	9.60	<.0001
<b>DISTANCE</b>	1	-0.10194	0.01866	-5.46	<.0001

**The SAS System****The REG Procedure****Model: MODEL1****Dependent Variable: LOGCOUNT****MULCH=7**



## The SAS System

### The Mixed Procedure

Model Information	
Data Set	WORK.A3
Dependent Variable	LOGCOUNT
Covariance Structures	Variance Components, Autoregressive
Subject Effect	RUN*MULCH
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Between-Within

Class Level Information		
Class	Levels	Values
RUN	2	1 2
MULCH	2	0 7

Dimensions	
Covariance Parameters	3
Columns in X	6
Columns in Z	2
Subjects	1
Max Obs per Subject	48

Number of Observations	
Number of Observations Read	48
Number of Observations Used	48
Number of Observations Not Used	0

Iteration History			
Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	44.96652210	
1	4	31.35188694	.
2	1	31.30188606	0.00030712
3	1	31.29332011	0.00001519
4	1	31.29293029	0.00000005
5	1	31.29292915	0.00000000

Convergence criteria met.

Estimated R Matrix for RUN*MULCH 1 0												
Row	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11	Col12
1	0.1255	0.07061	0.03971	0.02234	0.01256	0.007066	0.003974	0.002235	0.001257	0.000707	0.000398	0.000224
2	0.07061	0.1255	0.07061	0.03971	0.02234	0.01256	0.007066	0.003974	0.002235	0.001257	0.000707	0.000398
3	0.03971	0.07061	0.1255	0.07061	0.03971	0.02234	0.01256	0.007066	0.003974	0.002235	0.001257	0.000707
4	0.02234	0.03971	0.07061	0.1255	0.07061	0.03971	0.02234	0.01256	0.007066	0.003974	0.002235	0.001257

5	0.01256	0.02234	0.03971	0.07061	0.1255	0.07061	0.03971	0.02234	0.01256	0.007066	0.003974	0.002235
6	0.007066	0.01256	0.02234	0.03971	0.07061	0.1255	0.07061	0.03971	0.02234	0.01256	0.007066	0.003974
7	0.003974	0.007066	0.01256	0.02234	0.03971	0.07061	0.1255	0.07061	0.03971	0.02234	0.01256	0.007066
8	0.002235	0.003974	0.007066	0.01256	0.02234	0.03971	0.07061	0.1255	0.07061	0.03971	0.02234	0.01256
9	0.001257	0.002235	0.003974	0.007066	0.01256	0.02234	0.03971	0.07061	0.1255	0.07061	0.03971	0.02234
10	0.000707	0.001257	0.002235	0.003974	0.007066	0.01256	0.02234	0.03971	0.07061	0.1255	0.07061	0.03971
11	0.000398	0.000707	0.001257	0.002235	0.003974	0.007066	0.01256	0.02234	0.03971	0.07061	0.1255	0.07061
12	0.000224	0.000398	0.000707	0.001257	0.002235	0.003974	0.007066	0.01256	0.02234	0.03971	0.07061	0.1255

Estimated R Correlation Matrix for RUN*MULCH 1 0												
Row	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11	Col12
1	1.0000	0.5624	0.3163	0.1779	0.1001	0.05628	0.03165	0.01780	0.01001	0.005632	0.003168	0.001782
2	0.5624	1.0000	0.5624	0.3163	0.1779	0.1001	0.05628	0.03165	0.01780	0.01001	0.005632	0.003168
3	0.3163	0.5624	1.0000	0.5624	0.3163	0.1779	0.1001	0.05628	0.03165	0.01780	0.01001	0.005632
4	0.1779	0.3163	0.5624	1.0000	0.5624	0.3163	0.1779	0.1001	0.05628	0.03165	0.01780	0.01001
5	0.1001	0.1779	0.3163	0.5624	1.0000	0.5624	0.3163	0.1779	0.1001	0.05628	0.03165	0.01780
6	0.05628	0.1001	0.1779	0.3163	0.5624	1.0000	0.5624	0.3163	0.1779	0.1001	0.05628	0.03165
7	0.03165	0.05628	0.1001	0.1779	0.3163	0.5624	1.0000	0.5624	0.3163	0.1779	0.1001	0.05628
8	0.01780	0.03165	0.05628	0.1001	0.1779	0.3163	0.5624	1.0000	0.5624	0.3163	0.1779	0.1001
9	0.01001	0.01780	0.03165	0.05628	0.1001	0.1779	0.3163	0.5624	1.0000	0.5624	0.3163	0.1779
10	0.005632	0.01001	0.01780	0.03165	0.05628	0.1001	0.1779	0.3163	0.5624	1.0000	0.5624	0.3163
11	0.003168	0.005632	0.01001	0.01780	0.03165	0.05628	0.1001	0.1779	0.3163	0.5624	1.0000	0.5624
12	0.001782	0.003168	0.005632	0.01001	0.01780	0.03165	0.05628	0.1001	0.1779	0.3163	0.5624	1.0000

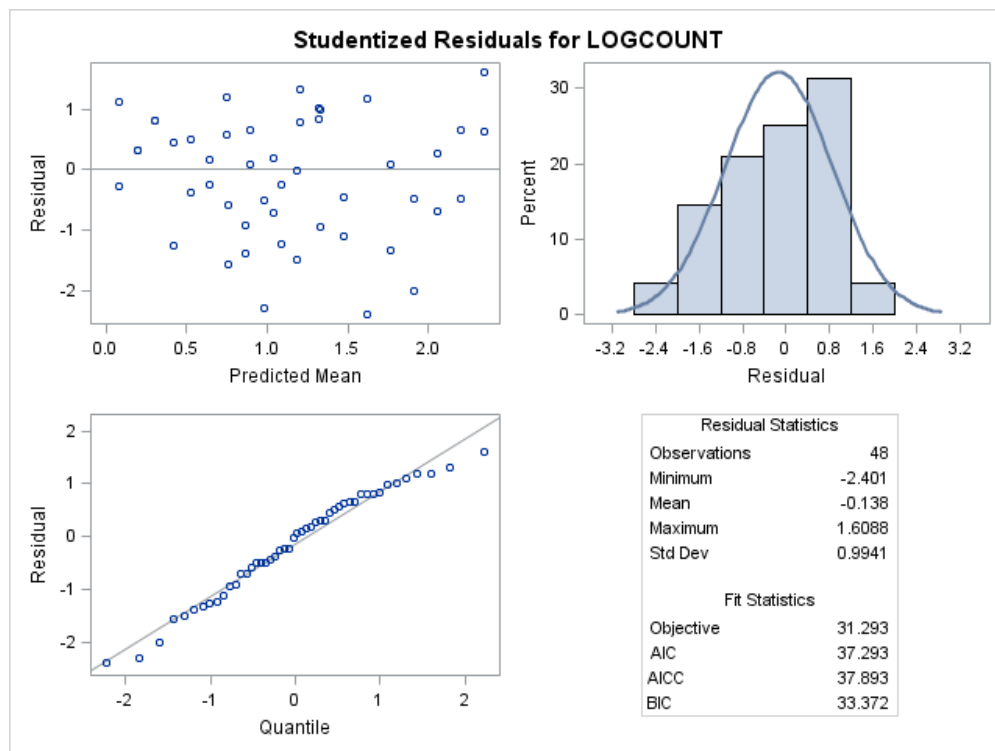
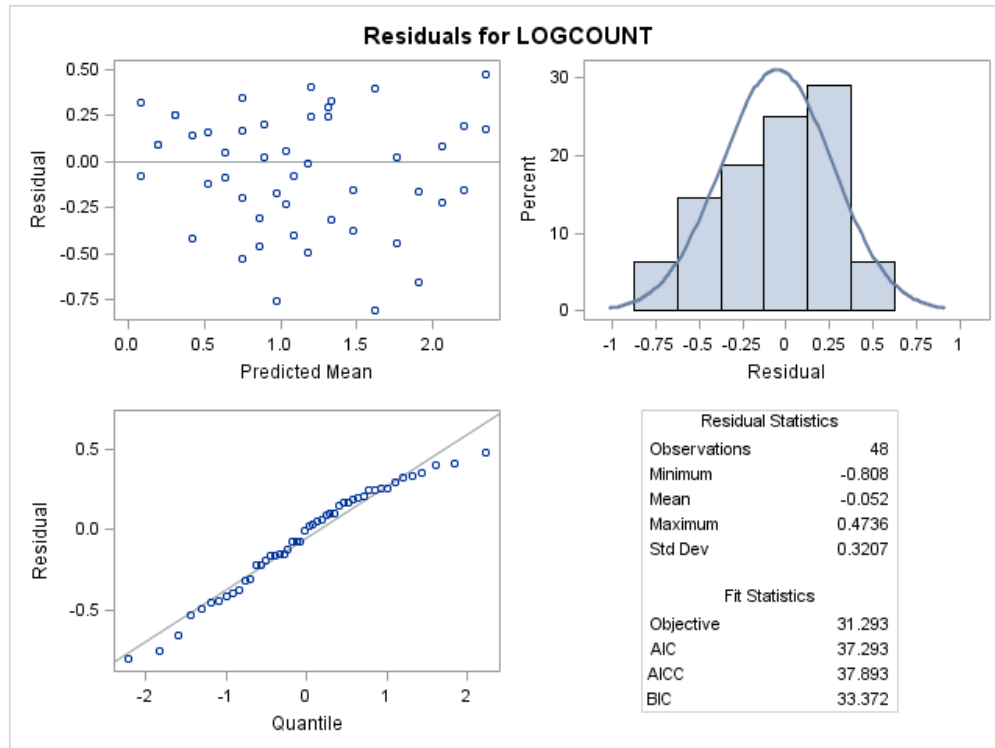
Covariance Parameter Estimates					
Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr >  Z
RUN		0.006563	0.03372	0.19	0.4228
AR(1)	RUN*MULCH	0.5624	0.1742	3.23	0.0012
Residual		0.1255	0.04939	2.54	0.0055

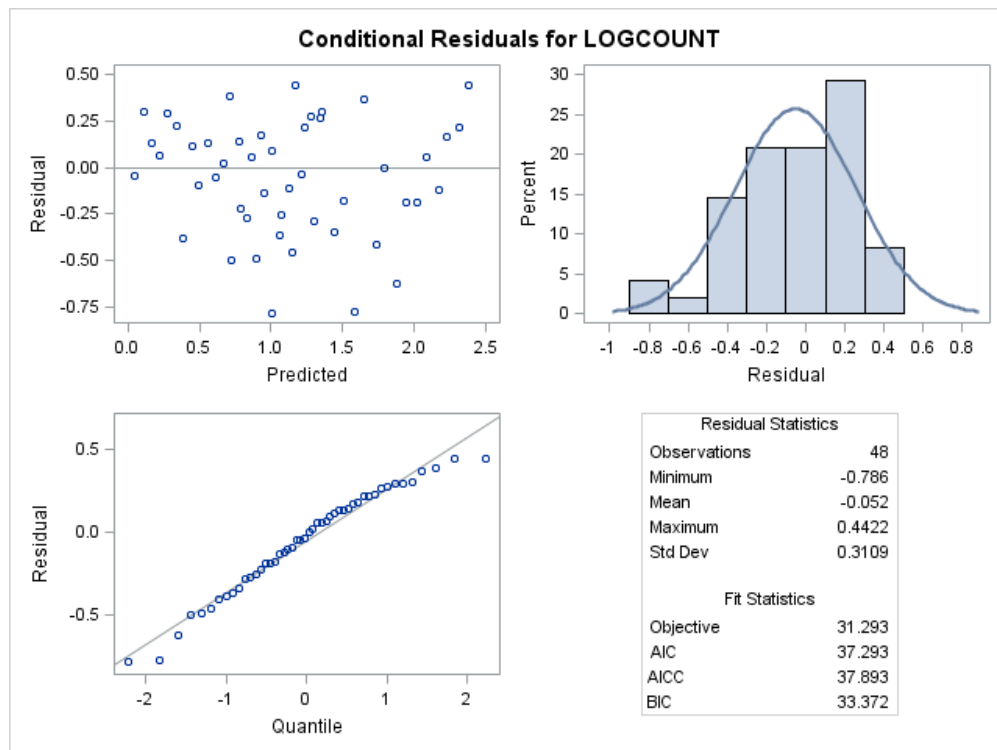
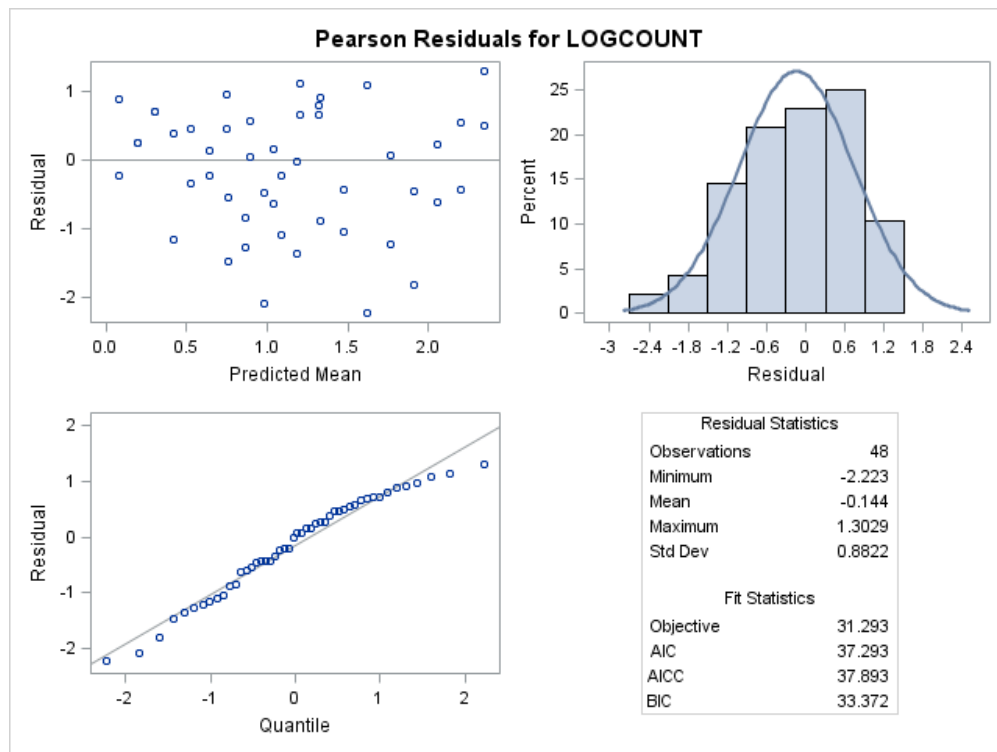
Fit Statistics	
-2 Res Log Likelihood	31.3
AIC (Smaller is Better)	37.3
AICC (Smaller is Better)	37.9
BIC (Smaller is Better)	33.4

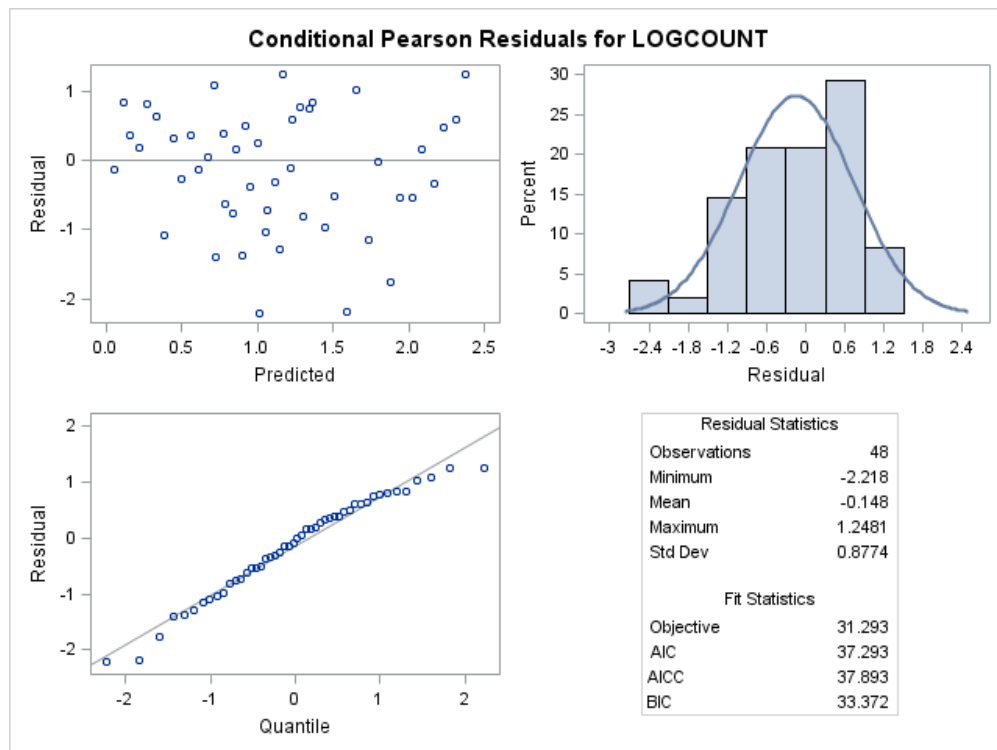
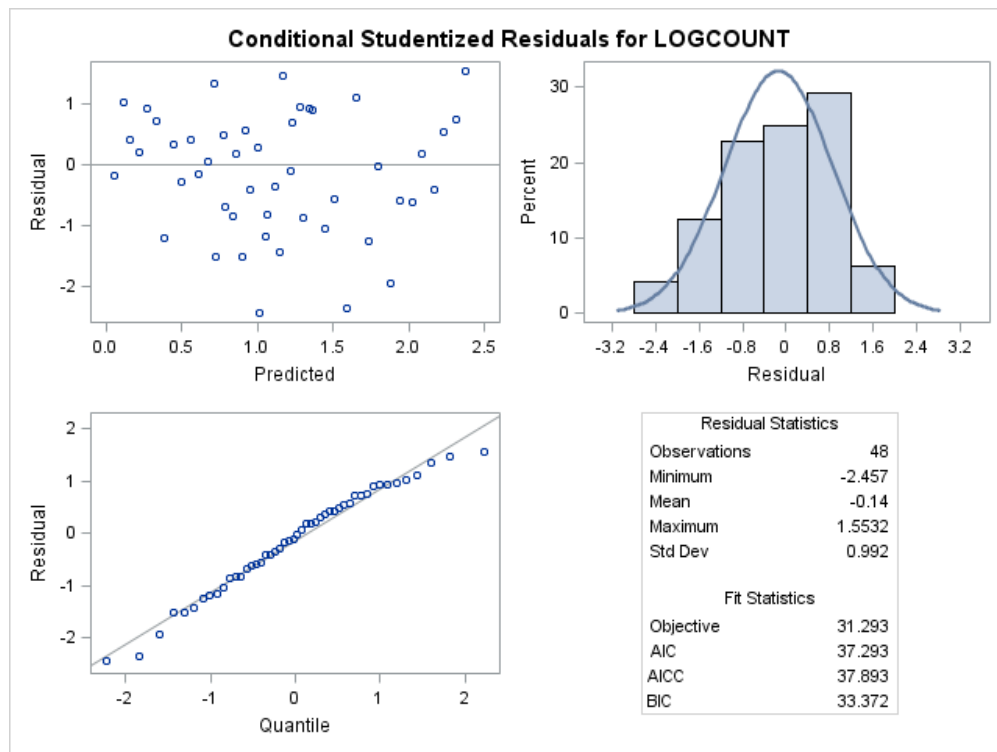
Solution for Fixed Effects						
Effect	MULCH	Estimate	Standard Error	DF	t Value	Pr >  t
Intercept		1.4265	0.2368	2	6.02	0.0265
MULCH	0	1.0635	0.3250	2	3.27	0.0820
MULCH	7	0	.	.	.	.
DISTANCE		-0.1122	0.02976	42	-3.77	0.0005
DISTANCE*MULCH	0	-0.03296	0.04209	42	-0.78	0.4380
DISTANCE*MULCH	7	0	.	.	.	.



Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
MULCH	1	2	10.71	0.0820
DISTANCE	1	42	37.40	<.0001
DISTANCE*MULCH	1	42	0.61	0.4380







## The SAS System

### The Mixed Procedure

Model Information	
Data Set	WORK.A3
Dependent Variable	LOGCOUNT
Covariance Structures	Variance Components, Autoregressive
Subject Effect	RUN*MULCH
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Between-Within

Class Level Information		
Class	Levels	Values
RUN	2	1 2
MULCH	2	0 7

Dimensions	
Covariance Parameters	3
Columns in X	3
Columns in Z	2
Subjects	1
Max Obs per Subject	48

Number of Observations	
Number of Observations Read	48
Number of Observations Used	48
Number of Observations Not Used	0

Iteration History			
Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	41.55956667	
1	3	27.44743822	0.00154408
2	2	27.40470779	0.00000075
3	1	27.40468733	0.00000000

Convergence criteria met.

Estimated R Matrix for RUN*MULCH 1 0												
Row	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11	Col12
1	0.1230	0.06834	0.03799	0.02111	0.01173	0.006522	0.003625	0.002015	0.001120	0.000622	0.000346	0.000192
2	0.06834	0.1230	0.06834	0.03799	0.02111	0.01173	0.006522	0.003625	0.002015	0.001120	0.000622	0.000346
3	0.03799	0.06834	0.1230	0.06834	0.03799	0.02111	0.01173	0.006522	0.003625	0.002015	0.001120	0.000622
4	0.02111	0.03799	0.06834	0.1230	0.06834	0.03799	0.02111	0.01173	0.006522	0.003625	0.002015	0.001120
5	0.01173	0.02111	0.03799	0.06834	0.1230	0.06834	0.03799	0.02111	0.01173	0.006522	0.003625	0.002015
6	0.006522	0.01173	0.02111	0.03799	0.06834	0.1230	0.06834	0.03799	0.02111	0.01173	0.006522	0.003625

7	0.003625	0.006522	0.01173	0.02111	0.03799	0.06834	0.1230	0.06834	0.03799	0.02111	0.01173	0.006522
8	0.002015	0.003625	0.006522	0.01173	0.02111	0.03799	0.06834	0.1230	0.06834	0.03799	0.02111	0.01173
9	0.001120	0.002015	0.003625	0.006522	0.01173	0.02111	0.03799	0.06834	0.1230	0.06834	0.03799	0.02111
10	0.000622	0.001120	0.002015	0.003625	0.006522	0.01173	0.02111	0.03799	0.06834	0.1230	0.06834	0.03799
11	0.000346	0.000622	0.001120	0.002015	0.003625	0.006522	0.01173	0.02111	0.03799	0.06834	0.1230	0.06834
12	0.000192	0.000346	0.000622	0.001120	0.002015	0.003625	0.006522	0.01173	0.02111	0.03799	0.06834	0.1230

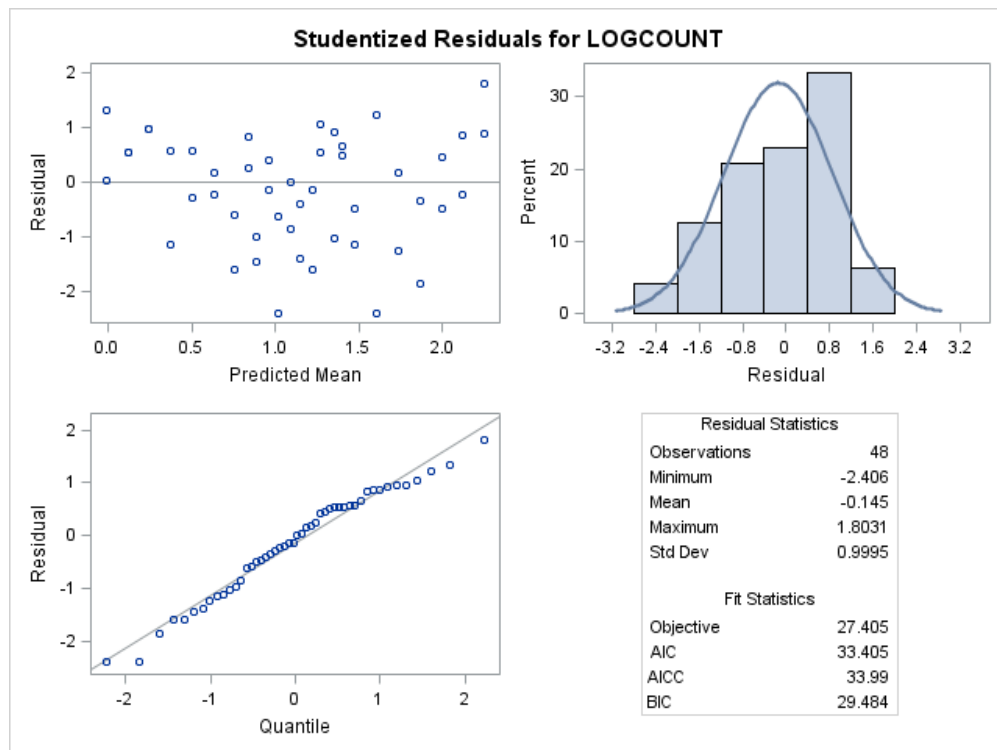
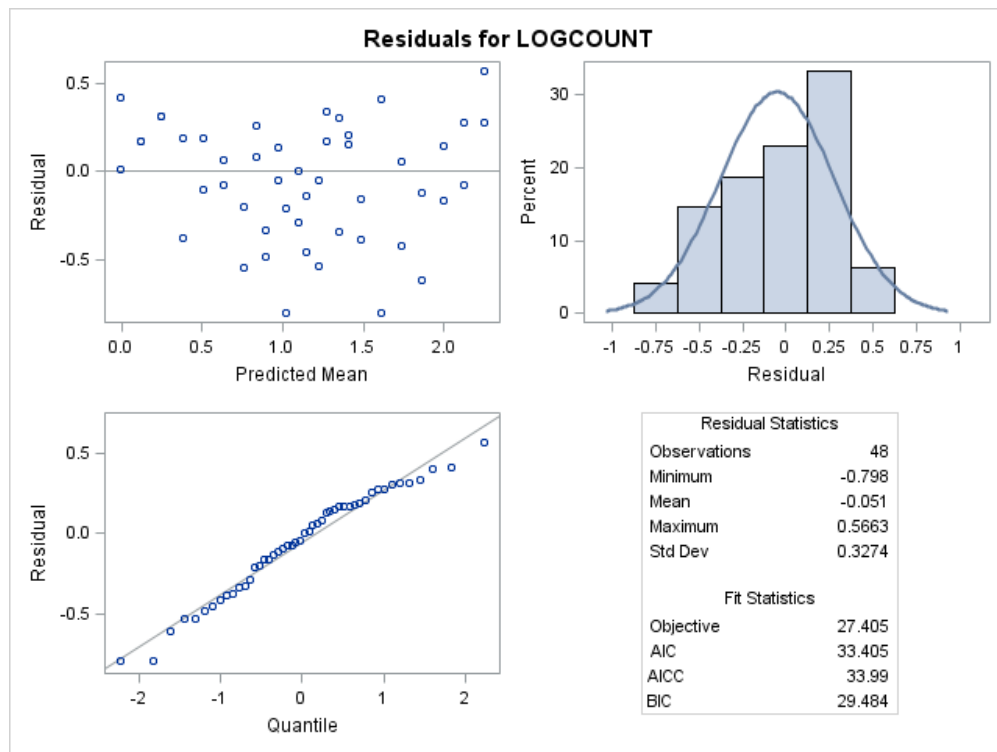
Estimated R Correlation Matrix for RUN*MULCH 1 0												
Row	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11	Col12
1	1.0000	0.5558	0.3089	0.1717	0.09544	0.05304	0.02948	0.01639	0.009108	0.005062	0.002814	0.001564
2	0.5558	1.0000	0.5558	0.3089	0.1717	0.09544	0.05304	0.02948	0.01639	0.009108	0.005062	0.002814
3	0.3089	0.5558	1.0000	0.5558	0.3089	0.1717	0.09544	0.05304	0.02948	0.01639	0.009108	0.005062
4	0.1717	0.3089	0.5558	1.0000	0.5558	0.3089	0.1717	0.09544	0.05304	0.02948	0.01639	0.009108
5	0.09544	0.1717	0.3089	0.5558	1.0000	0.5558	0.3089	0.1717	0.09544	0.05304	0.02948	0.01639
6	0.05304	0.09544	0.1717	0.3089	0.5558	1.0000	0.5558	0.3089	0.1717	0.09544	0.05304	0.02948
7	0.02948	0.05304	0.09544	0.1717	0.3089	0.5558	1.0000	0.5558	0.3089	0.1717	0.09544	0.05304
8	0.01639	0.02948	0.05304	0.09544	0.1717	0.3089	0.5558	1.0000	0.5558	0.3089	0.1717	0.09544
9	0.009108	0.01639	0.02948	0.05304	0.09544	0.1717	0.3089	0.5558	1.0000	0.5558	0.3089	0.1717
10	0.005062	0.009108	0.01639	0.02948	0.05304	0.09544	0.1717	0.3089	0.5558	1.0000	0.5558	0.3089
11	0.002814	0.005062	0.009108	0.01639	0.02948	0.05304	0.09544	0.1717	0.3089	0.5558	1.0000	0.5558
12	0.001564	0.002814	0.005062	0.009108	0.01639	0.02948	0.05304	0.09544	0.1717	0.3089	0.5558	1.0000

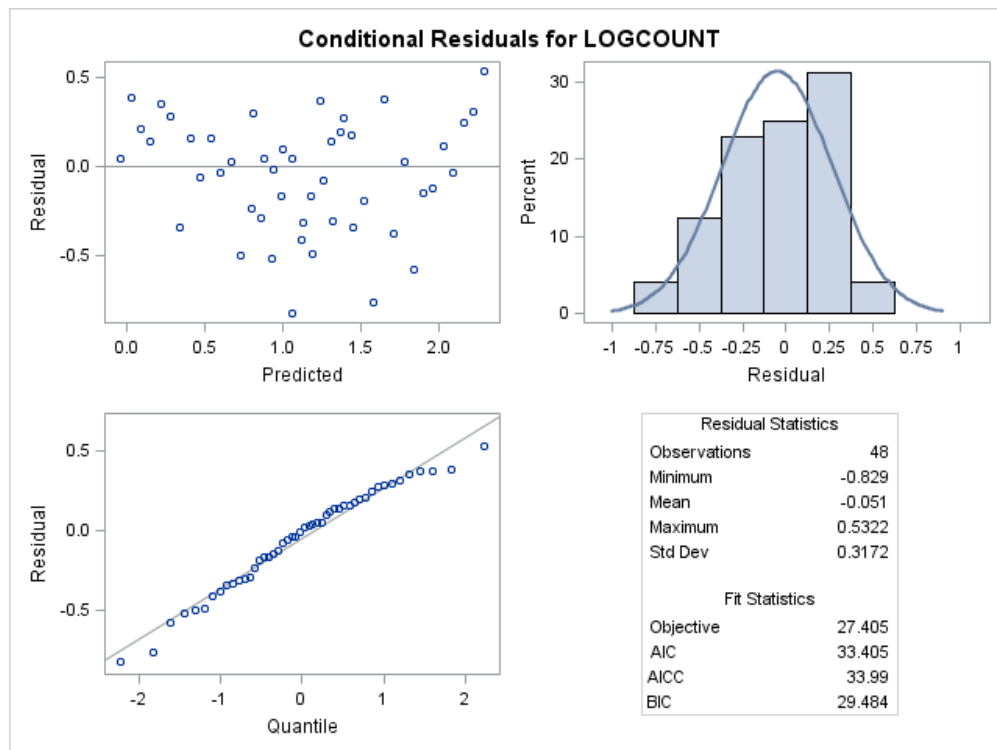
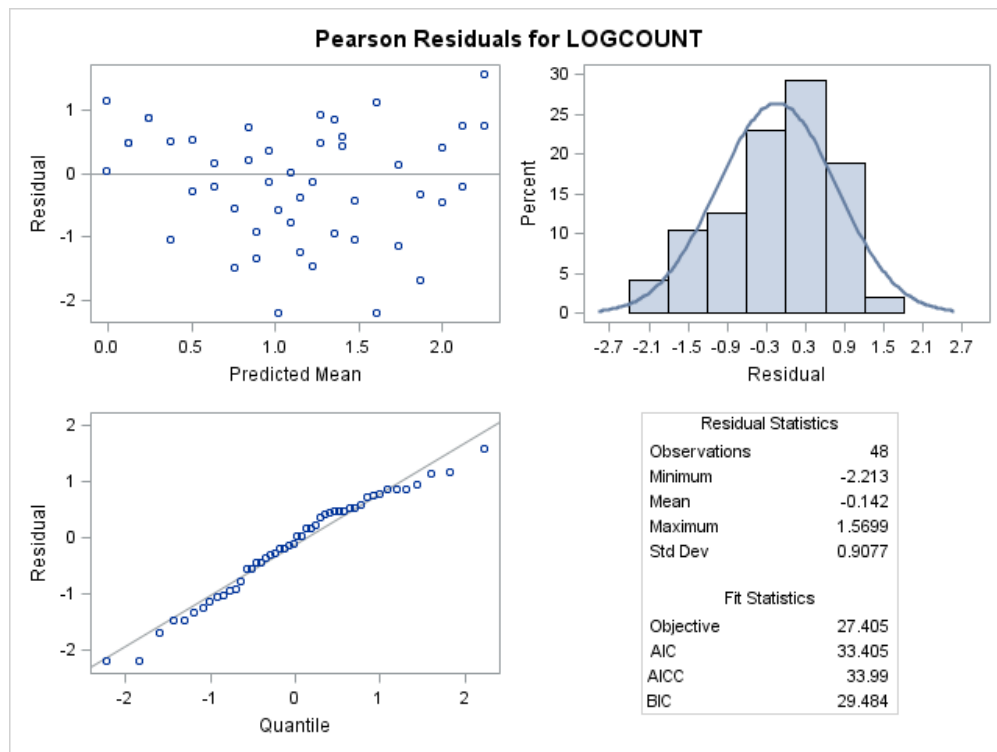
Covariance Parameter Estimates					
Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr > Z
RUN		0.007164	0.03326	0.22	0.4147
AR(1)	RUN*MULCH	0.5558	0.1634	3.40	0.0007
Residual		0.1230	0.04448	2.76	0.0029

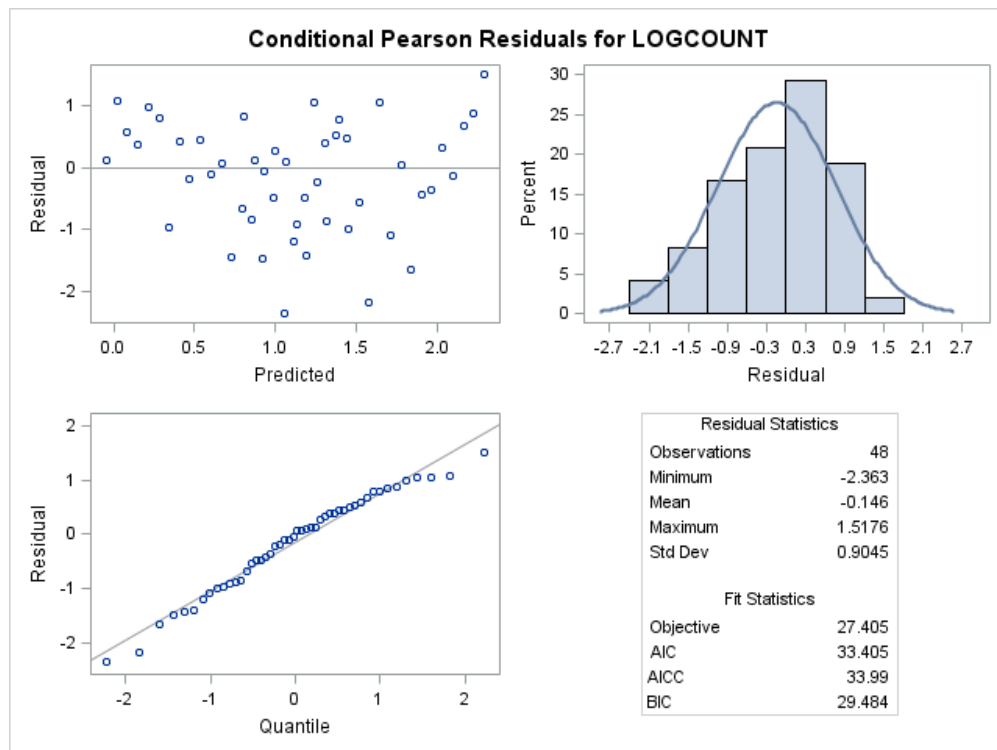
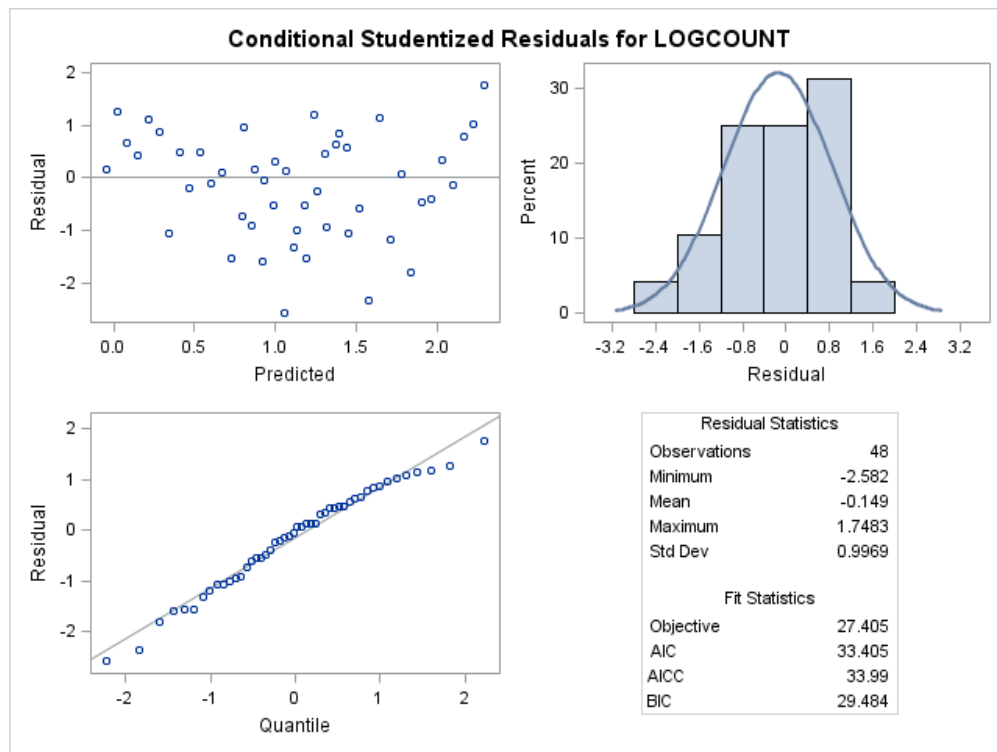
Fit Statistics	
-2 Res Log Likelihood	27.4
AIC (Smaller is Better)	33.4
AICC (Smaller is Better)	34.0
BIC (Smaller is Better)	29.5

Solution for Fixed Effects						
Effect	MULCH	Estimate	Standard Error	DF	t Value	Pr >  t
MULCH	0	2.3806	0.1914	2	12.44	0.0064
MULCH	7	1.5318	0.1914	2	8.00	0.0153
DISTANCE		-0.1286	0.02077	43	-6.19	<.0001

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
MULCH	2	2	77.61	0.0127
DISTANCE	1	43	38.33	<.0001









## The SAS System

### The REG Procedure

Model: MODEL1

Dependent Variable: LOGCOUNT

Number of Observations Read	48
Number of Observations Used	48

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	16.63212	16.63212	152.78	<.0001
Error	46	5.00780	0.10887		
Corrected Total	47	21.63991			

Root MSE	0.32995	R-Square	0.7686
Dependent Mean	1.06931	Adj R-Sq	0.7636
Coeff Var	30.85620		

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	Intercept	1	-0.00488	0.09910	-0.05	0.9609
Pred	Predicted Mean	1	0.95859	0.07755	12.36	<.0001

## The SAS System

The REG Procedure

Model: MODEL1

Dependent Variable: LOGCOUNT

