HOMEWORK 5 — SOLUTIONS

Problem 5.13

(a) Model 1 v. 2: F statistic is $\frac{(70.11949-0.49895)/5}{0.49895/35} = 991$ which is obviously significant (with such a large F statistic, there is no need to look up in a table). Conclusion: Yes, arrest numbers do vary by type.

(b) We can test sequentially, e.g. first take model 2 as null, model 3 as alternative; then model 3 as null, model 4 as alternative, etc. The F statistics are

$$\frac{(0.49895-0.49329)/1}{0.49329/34} = 0.39,$$
$$\frac{(0.49329-0.35348)/1}{0.35348/33} = 13.05,$$
$$\frac{(0.35348-0.35337)/1}{0.35337/32} = 0.01.$$

The first and third F statistics are obviously not statistically significant (no $F < 1$ ever is) but 13.05 is statistically significant against the $F_{1,33}$ distribution (in R, 1-pf(13.05,1,33) yields the answer 0.0009956947, or a p-value of about .001). Therefore, the best model (among these four) is model 4 (cubic regression plus type effect).

(c) Model 4 as null against model 8: $F = \frac{(0.35348-0.23434)/5}{0.23434/28} = 2.85$. The p-value is 1-pf(2.85,5,28)=0.03340356; significant at .05 level, therefore prefer model 8. The interpretation is that the (cubic) trend is different for the different types of arrest.

(d) We can go through a similar process for model 8 against model 11 ($F = 5.24$, significant, p-value about .002), model 11 against model 13 ($F = 1.93$, not significant, p-value about .14), and model 13 against model 15 ($F = 2.22$, not significant, p-value about .11). This suggests model 11 as the best overall (not the only possible answer; other answers can be accepted if they are backup up by appropriate analysis).

(e) $F = 11.06$: yes, significant. The interpretation is that taking into account number of searchers also improves the predicitions (above the overall trend and trend-type interactions), too a highly significant extent.

(f) Largest VIF is 12.35 (for t); largest condition index is 7.2. These do not seem to indicate any problem.

(g) Observation 4; maybe 20.

(h) $2p/n = 0.667$ so no (large H values in observations 43-48 can be ignored as these are not part of the fitted data)

(i) $2\sqrt{p/n} = 1.15$; observation 4 is worst but others (e.g. 1, 38, 41) could be a problem

(j) $2/\sqrt{n} = .31$; many values exceed this

(k) According to page 194 of the notes, the critical values of COVRATIO are $1 \pm \frac{3p}{n} = 1 \pm 1$ or 0 and 2. Many values exceed 2.

(l) It looks as though the variance is different for the different types (especially in type 6, but others could be a problem as well).

(m) The test statistics (Shapiro-Wilk etc.) do not indicate a rejection of the normal hypothesis and the probability plot is a straight line. So the normal distribution seems fine.

(n) There are a few outliers and/or influential values that should be investigated, but observation 4 seems worst. We could explore a model with different variances for the different types.

(o) As an example, consider the "stolen property" category. For log arrests, the prediction interval (bottom of page 10 of this solution) is (5.4813,8.6968). Exponentiating, that leads to a prediction interval of (240,5984) for actual arrests. This is probably *not* realistic and reflects a shortcoming of trying to extrapolate a cubic polynomial trend. If I were being more systematic about trying to come up with a realistic prediction, I would probably go back to the linear trend model and just work with that, or forget about trends altogether and use a time series approach (but that's a different course).

(p) This is the most open-ended part of all! Following on the comment in part (o), if the trend model was wrong it would not matter which of the two strategies was adopted — neither would work. However if we assume the trend model is correct, then I would make the following comparisons. If *all* parts of the model were correct, strategy (i) ought to be best, on the grounds that it never actually pays to throw away data. As an explicit example of this, for instance, if we followed strategy (i) there would be many more degrees of freedom to estimate σ^2, and knowing σ^2 more accurately would improve the performance of our prediction intervals. However even without worrying about the form of the trend, we already had doubts about the correctness of the model, in particular, the question of whether σ^2 is actually the same in all six types. Faced with this sort of uncertainty, strategy (ii) may be more robust. That analysis is quite simple and it's hard to say why a simple analysis is wrong. On balance, I would probably go for strategy (ii).

Appendix A: SAS Code

```
options ls=77 ps=58;
data crimes;
infile 'crimes.txt';
input yr type x1-x6 y1 y2;
ly2=log(y2);
t=yr-1989;
u=t*t;
v=t*u;
w=t*v;
xt1=x1*t;
xt2=x2*t;
xt3=x3*t;
xt4=x4*t;
xt5=x5*t;
run;
;
proc reg;
model ly2=t u v x1-x5 xt1-xt5 / collin influence r cli clm vif covb;
output p=predval r=resid1;
run;
;
proc plot;
plot resid1*type;
run;
;
proc univariate plot normal;
var resid1;
run;
```

Appendix B: SAS Output (edited for format)

The REG Procedure
Model: MODEL1
Dependent Variable: ly2

Number of Observations Read	48
Number of Observations Used	42
Number of Observations with Missing Values	6

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	13	75.40474	5.80036	693.04	<.0001
Error	28	0.23434	0.00837		
Corrected Total	41	75.63908			

Root MSE	0.09148	R-Square	0.9969
Dependent Mean	7.98263	Adj R-Sq	0.9955
Coeff Var	1.14605		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	8.16428	0.03823	213.57	<.0001	0
t	1	0.24614	0.02481	9.92	<.0001	12.35185
u	1	-0.00335	0.00408	-0.82	0.4181	1.00000
v	1	-0.01039	0.00254	-4.09	0.0003	7.35185
x1	1	1.07177	0.04890	21.92	<.0001	1.66667
x2	1	1.19607	0.04890	24.46	<.0001	1.66667
x3	1	-2.71463	0.04890	-55.51	<.0001	1.66667
x4	1	-0.34774	0.04890	-7.11	<.0001	1.66667
x5	1	-0.21497	0.04890	-4.40	0.0001	1.66667
xt1	1	-0.02047	0.02445	-0.84	0.4096	2.00000
xt2	1	0.03225	0.02445	1.32	0.1979	2.00000
xt3	1	0.00363	0.02445	0.15	0.8830	2.00000
xt4	1	-0.02066	0.02445	-0.85	0.4052	2.00000

xt5	1	0.05218	0.02445	2.13	0.0417	2.00000

Covariance of Estimates

Variable	Intercept	t	u	v
Intercept	0.001461334	0	-0.000066424	0
t	0	0.0006153471	0	-0.000045205
u	-0.000066424	0	0.0000166061	0
v	0	-0.000045205	0	6.4579156E-6
x1	-0.001195637	0	-2.21237E-20	0
x2	-0.001195637	0	-2.21237E-20	0
x3	-0.001195637	0	-2.21237E-20	0
x4	-0.001195637	0	-2.21237E-20	0
x5	-0.001195637	0	-2.21237E-20	0
xt1	0	-0.000298909	0	-1.50564E-20
xt2	0	-0.000298909	0	-1.50564E-20
xt3	0	-0.000298909	0	-1.50564E-20
xt4	0	-0.000298909	0	-1.50564E-20
xt5	0	-0.000298909	0	-1.50564E-20

Covariance of Estimates

Variable	x1	x2	x3	x4
Intercept	-0.001195637	-0.001195637	-0.001195637	-0.001195637
t	0	0	0	0
u	-2.21237E-20	-2.21237E-20	-2.21237E-20	-2.21237E-20
v	0	0	0	0
x1	0.0023912739	0.0011956369	0.0011956369	0.0011956369
x2	0.0011956369	0.0023912739	0.0011956369	0.0011956369
x3	0.0011956369	0.0011956369	0.0023912739	0.0011956369
x4	0.0011956369	0.0011956369	0.0011956369	0.0023912739
x5	0.0011956369	0.0011956369	0.0011956369	0.0011956369
xt1	0	0	0	0
xt2	0	0	0	0
xt3	0	0	0	0
xt4	0	0	0	0
xt5	0	0	0	0

Covariance of Estimates

Variable	x5	xt1	xt2	xt3

Intercept	-0.001195637	0	0	0
t	0	-0.000298909	-0.000298909	-0.000298909
u	-2.21237E-20	0	0	0
v	0	-1.50564E-20	-1.50564E-20	-1.50564E-20
x1	0.0011956369	0	0	0
x2	0.0011956369	0	0	0
x3	0.0011956369	0	0	0
x4	0.0011956369	0	0	0
x5	0.0023912739	0	0	0
xt1	0	0.0005978185	0.0002989092	0.0002989092
xt2	0	0.0002989092	0.0005978185	0.0002989092
xt3	0	0.0002989092	0.0002989092	0.0005978185
xt4	0	0.0002989092	0.0002989092	0.0002989092
xt5	0	0.0002989092	0.0002989092	0.0002989092

Covariance of Estimates

Variable	xt4	xt5
Intercept	0	0
t	-0.000298909	-0.000298909
u	0	0
v	-1.50564E-20	-1.50564E-20
x1	0	0
x2	0	0
x3	0	0
x4	0	0
x5	0	0
xt1	0.0002989092	0.0002989092
xt2	0.0002989092	0.0002989092
xt3	0.0002989092	0.0002989092
xt4	0.0005978185	0.0002989092
xt5	0.0002989092	0.0005978185

Collinearity Diagnostics

		Condition	-------Proportion of Variation-------		
Number	Eigenvalue	Index	Intercept	t	u
1	2.79438	1.00000	0	0.01000	0
2	2.57642	1.04144	0.01907	0	0.04929
3	1.00000	1.67164	0	0	0
4	1.00000	1.67164	0	0	0

5	1.00000	1.67164	0	0	0
6	1.00000	1.67164	0	0	0
7	1.00000	1.67164	0	0	0
8	1.00000	1.67164	0	0	0
9	1.00000	1.67164	0	0	0
10	1.00000	1.67164	0	0	0
11	0.34268	2.85561	0.03002	0	0.85823
12	0.15239	4.28223	0	0.00311	0
13	0.08090	5.87703	0.95090	0	0.09248
14	0.05324	7.24488	0	0.98689	0

Collinearity Diagnostics

	--------------------Proportion of Variation--------------------				
Number	v	x1	x2	x3	x4
1	0.01604	0	0	0	0
2	0	0.01332	0.01332	0.01332	0.01332
3	0	0.02500	0.02500	0.02500	0.40000
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0.37500	0.04167	0.04167	0
7	0	0	0	0	0
8	0	0	0.33333	0.08333	0
9	0	0	0	0.25000	0
10	0	0	0	0	0
11	0	0.06955	0.06955	0.06955	0.06955
12	0.39147	0	0	0	0
13	0	0.51713	0.51713	0.51713	0.51713
14	0.59249	0	0	0	0

Collinearity Diagnostics

	--------------------Proportion of Variation--------------------				
Number	x5	xt1	xt2	xt3	xt4
1	0	0.01164	0.01164	0.01164	0.01164
2	0.01332	0	0	0	0
3	0.02500	0	0	0	0
4	0	0.02500	0.02500	0.40000	0.02500
5	0	0.04167	0.04167	0	0.04167
6	0.04167	0	0	0	0
7	0	0.08333	0.33333	0	0.08333

8	0.08333	0	0	0	0
9	0.25000	0	0	0	0
10	0	0.25000	0	0	0.25000
11	0.06955	0	0	0	0
12	0	0.36458	0.36458	0.36458	0.36458
13	0.51713	0	0	0	0
14	0	0.22378	0.22378	0.22378	0.22378

Collinearity Diagnostics

	-Proportion of Variation-
Number	xt5
1	0.01164
2	0
3	0
4	0.02500
5	0.37500
6	0
7	0
8	0
9	0
10	0
11	0
12	0.36458
13	0
14	0.22378

Output Statistics

Obs	Dependent Variable	Predicted Value	Std Error Mean Predict	95% CL Mean	
1	8.9092	8.8093	0.0673	8.6714	8.9472
2	8.7323	8.7755	0.0673	8.6375	8.9134
3	4.9904	4.9506	0.0673	4.8127	5.0885
4	7.2004	7.3904	0.0673	7.2525	7.5283
5	7.3715	7.3046	0.0673	7.1667	7.4426
6	7.7098	7.6761	0.0673	7.5382	7.8141
7	8.8537	8.8544	0.0512	8.7495	8.9593
8	8.7796	8.8733	0.0512	8.7683	8.9782
9	4.9488	5.0198	0.0512	4.9149	5.1247
10	7.5704	7.4353	0.0512	7.3303	7.5402
11	7.4844	7.4224	0.0512	7.3174	7.5273

12	7.7053	7.7417	0.0512	7.6368	7.8466
13	8.9227	9.0174	0.0433	8.9287	9.1061
14	9.1160	9.0890	0.0433	9.0003	9.1777
15	5.2040	5.2069	0.0433	5.1182	5.2956
16	7.6639	7.5981	0.0433	7.5094	7.6868
17	7.6009	7.6580	0.0433	7.5693	7.7468
18	7.9266	7.9252	0.0433	7.8364	8.0139
19	9.1901	9.2361	0.0382	9.1577	9.3144
20	9.5468	9.3604	0.0382	9.2820	9.4387
21	5.5013	5.4496	0.0382	5.3713	5.5280
22	7.9010	7.8165	0.0382	7.7382	7.8948
23	7.8240	7.9493	0.0382	7.8710	8.0276
24	8.1605	8.1643	0.0382	8.0860	8.2426
25	9.3927	9.4480	0.0433	9.3593	9.5367
26	9.6803	9.6250	0.0433	9.5363	9.7137
27	5.6168	5.6857	0.0433	5.5970	5.7744
28	8.0262	8.0283	0.0433	7.9395	8.1170
29	8.1577	8.2339	0.0433	8.1452	8.3226
30	8.4051	8.3967	0.0433	8.3080	8.4854
31	9.6225	9.5909	0.0512	9.4860	9.6958
32	9.7700	9.8206	0.0512	9.7157	9.9256
33	5.9636	5.8527	0.0512	5.7478	5.9576
34	8.1227	8.1710	0.0512	8.0661	8.2759
35	8.4949	8.4495	0.0512	8.3445	8.5544
36	8.5291	8.5601	0.0512	8.4551	8.6650
37	9.6678	9.6025	0.0673	9.4646	9.7404
38	9.8037	9.8849	0.0673	9.7470	10.0229
39	5.8289	5.8884	0.0673	5.7505	6.0263
40	8.1374	8.1824	0.0673	8.0445	8.3203
41	8.6179	8.5337	0.0673	8.3958	8.6716
42	8.6197	8.5921	0.0673	8.4542	8.7300
43	.	7.0891	0.7795	5.4923	8.6858
44	.	7.5824	0.7795	5.9856	9.1792
45	.	3.4713	0.7795	1.8746	5.0681
46	.	5.6682	0.7795	4.0714	7.2650
47	.	6.3108	0.7795	4.7140	7.9076
48	.	6.1605	0.7795	4.5638	7.7573

Output Statistics

Obs	95% CL Predict		Residual	Std Error Residual	Student Residual	-2-1 0 1 2
1	8.5766	9.0420	0.0999	0.0619	1.613	| |*** |

```
 2   8.5428   9.0081   -0.0432   0.0619   -0.697 |      *|       |
 3   4.7179   5.1833    0.0398   0.0619    0.643 |       |*      |
 4   7.1577   7.6231   -0.1900   0.0619   -3.067 |******|       |
 5   7.0719   7.5373    0.0669   0.0619    1.079 |       |**     |
 6   7.4435   7.9088    0.0336   0.0619    0.543 |       |*      |
 7   8.6396   9.0692 -0.000728   0.0758  -0.0096 |       |       |
 8   8.6585   9.0880   -0.0937   0.0758   -1.236 |     **|       |
 9   4.8050   5.2346   -0.0710   0.0758   -0.937 |      *|       |
10   7.2205   7.6500    0.1352   0.0758    1.783 |       |***    |
11   7.2076   7.6371    0.0620   0.0758    0.818 |       |*      |
12   7.5269   7.9565   -0.0364   0.0758   -0.481 |       |       |
13   8.8101   9.2248   -0.0948   0.0806   -1.176 |     **|       |
14   8.8817   9.2963    0.0270   0.0806    0.335 |       |       |
15   4.9996   5.4143 -0.002902   0.0806  -0.0360 |       |       |
16   7.3908   7.8054    0.0658   0.0806    0.816 |       |*      |
17   7.4507   7.8654   -0.0571   0.0806   -0.709 |      *|       |
18   7.7178   8.1325  0.001432   0.0806   0.0178 |       |       |
19   9.0330   9.4392   -0.0459   0.0831   -0.552 |      *|       |
20   9.1572   9.5635    0.1865   0.0831    2.243 |       |****   |
21   5.2465   5.6527    0.0516   0.0831    0.621 |       |*      |
22   7.6134   8.0196    0.0845   0.0831    1.016 |       |**     |
23   7.7462   8.1524   -0.1253   0.0831   -1.507 |    ***|       |
24   7.9612   8.3674 -0.003758   0.0831  -0.0452 |       |       |
25   9.2406   9.6553   -0.0553   0.0806   -0.687 |      *|       |
26   9.4177   9.8324    0.0553   0.0806    0.687 |       |*      |
27   5.4783   5.8930   -0.0689   0.0806   -0.855 |      *|       |
28   7.8209   8.2356 -0.002112   0.0806  -0.0262 |       |       |
29   8.0265   8.4412   -0.0762   0.0806   -0.946 |      *|       |
30   8.1893   8.6040  0.008460   0.0806    0.105 |       |       |
31   9.3761   9.8057    0.0315   0.0758    0.416 |       |       |
32   9.6059  10.0354   -0.0507   0.0758   -0.669 |      *|       |
33   5.6379   6.0675    0.1109   0.0758    1.463 |       |**     |
34   7.9562   8.3858   -0.0483   0.0758   -0.638 |      *|       |
35   8.2347   8.6642    0.0455   0.0758    0.600 |       |*      |
36   8.3453   8.7748   -0.0310   0.0758   -0.408 |       |       |
37   9.3698   9.8352    0.0653   0.0619    1.054 |       |**     |
38   9.6523  10.1176   -0.0813   0.0619   -1.312 |     **|       |
39   5.6557   6.1211   -0.0594   0.0619   -0.960 |      *|       |
40   7.9497   8.4151   -0.0450   0.0619   -0.727 |      *|       |
41   8.3010   8.7664    0.0843   0.0619    1.360 |       |**     |
42   8.3594   8.8248    0.0276   0.0619    0.446 |       |       |
43   5.4813   8.6968         .        .        .
44   5.9746   9.1901         .        .        .
45   1.8636   5.0791         .        .        .
```

46	4.0604	7.2759	.	.	.
47	4.7031	7.9186	.	.	.
48	4.5528	7.7683	.	.	.

Output Statistics

Obs	Cook's D	RStudent	Hat Diag H	Cov Ratio	DFFITS	------DFBETAS----- Intercept	t
1	0.220	1.6634	0.5417	0.9263	1.8083	-0.2333	0.2937
2	0.041	-0.6904	0.5417	2.8415	-0.7505	0.0968	-0.1219
3	0.035	0.6360	0.5417	2.9480	0.6914	-0.0892	0.1123
4	0.794	-3.6962	0.5417	0.0118	-4.0182	0.5185	-0.6525
5	0.098	1.0828	0.5417	2.0021	1.1771	-0.1519	0.1912
6	0.025	0.5358	0.5417	3.1306	0.5825	0.1954	-0.2181
7	0.000	-0.009431	0.3135	2.4236	-0.0064	0.0000	0.0014
8	0.050	-1.2485	0.3135	1.1047	-0.8437	0.0000	0.1801
9	0.029	-0.9350	0.3135	1.5514	-0.6318	0.0000	0.1349
10	0.104	1.8599	0.3135	0.4482	1.2568	0.0000	-0.2683
11	0.022	0.8132	0.3135	1.7273	0.5495	0.0000	-0.1173
12	0.008	-0.4738	0.3135	2.1584	-0.3202	-0.1955	0.2190
13	0.029	-1.1843	0.2242	1.0555	-0.6367	-0.0766	0.1607
14	0.002	0.3301	0.2242	2.0271	0.1775	0.0214	-0.0448
15	0.000	-0.0354	0.2242	2.1433	-0.0190	-0.0023	0.0048
16	0.014	0.8114	0.2242	1.5308	0.4362	0.0525	-0.1101
17	0.010	-0.7024	0.2242	1.6645	-0.3776	-0.0454	0.0953
18	0.000	0.0175	0.2242	2.1444	0.0094	0.0079	-0.0050
19	0.005	-0.5454	0.1746	1.7291	-0.2509	-0.0456	0.0000
20	0.076	2.4324	0.1746	0.1258	1.1188	0.2034	0.0000
21	0.006	0.6140	0.1746	1.6601	0.2824	0.0513	0.0000
22	0.016	1.0169	0.1746	1.1911	0.4677	0.0850	0.0000
23	0.034	-1.5438	0.1746	0.6168	-0.7101	-0.1291	0.0000
24	0.000	-0.0444	0.1746	2.0138	-0.0204	-0.0204	0.0000
25	0.010	-0.6800	0.2242	1.6909	-0.3656	-0.0440	-0.0923
26	0.010	0.6801	0.2242	1.6908	0.3656	0.0440	0.0923
27	0.015	-0.8510	0.2242	1.4806	-0.4575	-0.0551	-0.1155
28	0.000	-0.0257	0.2242	2.1440	-0.0138	-0.0017	-0.0035
29	0.018	-0.9443	0.2242	1.3609	-0.5076	-0.0611	-0.1281
30	0.000	0.1031	0.2242	2.1329	0.0554	0.0467	0.0294
31	0.006	0.4098	0.3135	2.2221	0.2769	0.0000	0.0591
32	0.015	-0.6620	0.3135	1.9346	-0.4473	0.0000	-0.0955
33	0.070	1.4945	0.3135	0.7965	1.0099	0.0000	0.2156
34	0.013	-0.6308	0.3135	1.9748	-0.4263	0.0000	-0.0910
35	0.012	0.5931	0.3135	2.0220	0.4008	0.0000	0.0856

36	0.005	-0.4022	0.3135	2.2293	-0.2718	-0.1659	-0.1859
37	0.094	1.0560	0.5417	2.0601	1.1480	-0.1481	-0.1864
38	0.145	-1.3302	0.5417	1.4928	-1.4461	0.1866	0.2348
39	0.078	-0.9584	0.5417	2.2726	-1.0419	0.1344	0.1692
40	0.045	-0.7203	0.5417	2.7811	-0.7830	0.1010	0.1272
41	0.156	1.3822	0.5417	1.3939	1.5027	-0.1939	-0.2440
42	0.017	0.4396	0.5417	3.2854	0.4779	0.1603	0.1790
43	.	.	72.6052	.	.	.	.
44	.	.	72.6052	.	.	.	.
45	.	.	72.6052	.	.	.	.
46	.	.	72.6052	.	.	.	.
47	.	.	72.6052	.	.	.	.
48	.	.	72.6052	.	.	.	.

Output Statistics

	DFBETAS						
Obs	u	v	x1	x2	x3	x4	x5
1	0.5472	-0.4095	0.6567	-0.0000	-0.0000	-0.0000	-0.0000
2	-0.2271	0.1700	0.0000	-0.2725	0.0000	0.0000	0.0000
3	0.2092	-0.1566	-0.0000	-0.0000	0.2511	-0.0000	-0.0000
4	-1.2160	0.9100	0.0000	0.0000	0.0000	-1.4592	0.0000
5	0.3562	-0.2666	-0.0000	-0.0000	-0.0000	-0.0000	0.4275
6	0.1763	-0.1319	-0.2115	-0.2115	-0.2115	-0.2115	-0.2115
7	0.0000	-0.0019	-0.0030	0.0000	0.0000	0.0000	0.0000
8	0.0000	-0.2511	0.0000	-0.4027	0.0000	0.0000	0.0000
9	0.0000	-0.1881	0.0000	0.0000	-0.3016	0.0000	0.0000
10	-0.0000	0.3741	0.0000	0.0000	0.0000	0.5999	0.0000
11	-0.0000	0.1636	0.0000	0.0000	0.0000	0.0000	0.2623
12	-0.0000	-0.0953	0.1528	0.1528	0.1528	0.1528	0.1528
13	0.1797	-0.2241	-0.3594	0.0000	0.0000	0.0000	0.0000
14	-0.0501	0.0625	0.0000	0.1002	0.0000	0.0000	0.0000
15	0.0054	-0.0067	0.0000	0.0000	-0.0107	0.0000	0.0000
16	-0.1231	0.1535	0.0000	0.0000	0.0000	0.2462	0.0000
17	0.1066	-0.1329	0.0000	0.0000	0.0000	0.0000	-0.2131
18	-0.0026	0.0033	-0.0053	-0.0053	-0.0053	-0.0053	-0.0053
19	0.1070	0.0000	-0.1605	0.0000	0.0000	0.0000	0.0000
20	-0.4770	0.0000	0.0000	0.7156	0.0000	0.0000	0.0000
21	-0.1204	0.0000	0.0000	0.0000	0.1806	0.0000	0.0000
22	-0.1994	0.0000	0.0000	0.0000	0.0000	0.2991	0.0000
23	0.3028	0.0000	0.0000	0.0000	0.0000	0.0000	-0.4542
24	0.0087	0.0000	0.0131	0.0131	0.0131	0.0131	0.0131
25	0.1032	0.1287	-0.2063	0.0000	0.0000	0.0000	0.0000

26	-0.1032	-0.1287	0.0000	0.2064	0.0000	0.0000	0.0000
27	0.1291	0.1610	0.0000	0.0000	-0.2582	0.0000	0.0000
28	0.0039	0.0049	0.0000	0.0000	0.0000	-0.0078	0.0000
29	0.1433	0.1787	0.0000	0.0000	0.0000	0.0000	-0.2865
30	-0.0156	-0.0195	-0.0313	-0.0313	-0.0313	-0.0313	-0.0313
31	-0.0000	-0.0824	0.1322	0.0000	0.0000	0.0000	0.0000
32	0.0000	0.1332	0.0000	-0.2135	0.0000	0.0000	0.0000
33	-0.0000	-0.3006	0.0000	0.0000	0.4821	0.0000	0.0000
34	0.0000	0.1269	0.0000	0.0000	0.0000	-0.2035	0.0000
35	-0.0000	-0.1193	0.0000	0.0000	0.0000	0.0000	0.1913
36	-0.0000	0.0809	0.1297	0.1297	0.1297	0.1297	0.1297
37	0.3474	0.2600	0.4169	-0.0000	-0.0000	-0.0000	-0.0000
38	-0.4376	-0.3275	0.0000	-0.5251	0.0000	0.0000	0.0000
39	-0.3153	-0.2359	0.0000	0.0000	-0.3784	0.0000	0.0000
40	-0.2370	-0.1773	0.0000	0.0000	0.0000	-0.2843	0.0000
41	0.4547	0.3403	-0.0000	-0.0000	-0.0000	-0.0000	0.5457
42	0.1446	0.1082	-0.1735	-0.1735	-0.1735	-0.1735	-0.1735
43	.	.	.	.	.	.	.
44	.	.	.	.	.	.	.
45	.	.	.	.	.	.	.
46	.	.	.	.	.	.	.

	------------------------DFBETAS------------------------				
Obs	xt1	xt2	xt3	xt4	xt5
1	-0.9850	0.0000	0.0000	0.0000	0.0000
2	-0.0000	0.4088	-0.0000	-0.0000	-0.0000
3	0.0000	0.0000	-0.3766	0.0000	0.0000
4	-0.0000	-0.0000	-0.0000	2.1888	-0.0000
5	0.0000	0.0000	0.0000	0.0000	-0.6412
6	0.3173	0.3173	0.3173	0.3173	0.3173
7	0.0030	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.4027	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.3016	0.0000	0.0000
10	-0.0000	-0.0000	-0.0000	-0.5999	-0.0000
11	-0.0000	-0.0000	-0.0000	-0.0000	-0.2623
12	-0.1528	-0.1528	-0.1528	-0.1528	-0.1528
13	0.1797	0.0000	0.0000	0.0000	0.0000
14	-0.0000	-0.0501	-0.0000	-0.0000	-0.0000
15	0.0000	0.0000	0.0054	0.0000	0.0000
16	-0.0000	-0.0000	-0.0000	-0.1231	-0.0000
17	0.0000	0.0000	0.0000	0.0000	0.1066
18	0.0026	0.0026	0.0026	0.0026	0.0026
19	0.0000	0.0000	0.0000	0.0000	0.0000

20	0.0000	0.0000	0.0000	0.0000	0.0000
21	0.0000	0.0000	0.0000	0.0000	0.0000
22	0.0000	0.0000	0.0000	0.0000	0.0000
23	0.0000	0.0000	0.0000	0.0000	0.0000
24	0.0000	0.0000	0.0000	0.0000	0.0000
25	-0.1032	-0.0000	-0.0000	-0.0000	-0.0000
26	0.0000	0.1032	0.0000	0.0000	0.0000
27	-0.0000	-0.0000	-0.1291	-0.0000	-0.0000
28	-0.0000	-0.0000	-0.0000	-0.0039	-0.0000
29	-0.0000	-0.0000	-0.0000	-0.0000	-0.1433
30	-0.0156	-0.0156	-0.0156	-0.0156	-0.0156
31	0.1322	0.0000	0.0000	0.0000	0.0000
32	-0.0000	-0.2135	-0.0000	-0.0000	-0.0000
33	0.0000	0.0000	0.4821	0.0000	0.0000
34	-0.0000	-0.0000	-0.0000	-0.2035	-0.0000
35	0.0000	0.0000	0.0000	0.0000	0.1913
36	0.1297	0.1297	0.1297	0.1297	0.1297
37	0.6253	-0.0000	-0.0000	-0.0000	-0.0000
38	0.0000	-0.7877	0.0000	0.0000	0.0000
39	0.0000	0.0000	-0.5675	0.0000	0.0000
40	0.0000	0.0000	0.0000	-0.4265	0.0000
41	-0.0000	-0.0000	-0.0000	-0.0000	0.8185
42	-0.2603	-0.2603	-0.2603	-0.2603	-0.2603

Sum of Residuals	0
Sum of Squared Residuals	0.23434
Predicted Residual SS (PRESS)	0.65028

```
          Plot of resid1*type.  Legend: A = 1 obs, B = 2 obs, etc.
   0.20
                      A



   0.15
                                                A


                                   A
   0.10  A

                                                A             A
         A                                      A             A
                      A                                       A
   0.05                            A                          A
R                                  A
e        A            A                                                    B
s
i                                                                          A
d  0.00  A                         A            A                          B
u
a
l                                                                          A
                      A                         A                          A
  -0.05  A            A                         A
         A                         A                          A
                                   B
                      A                                       A
         A            A
  -0.10



                                                              A
  -0.15



                                                A
  -0.20 ---------------------------------------------------------------------
          1            2            3            4             5            6
                                          type
```

The UNIVARIATE Procedure
Variable: resid1 (Residual)

Moments

N	42	Sum Weights	42
Mean	0	Sum Observations	0
Std Deviation	0.07560243	Variance	0.00571573
Skewness	0.05175278	Kurtosis	0.12420723
Uncorrected SS	0.23434484	Corrected SS	0.23434484
Coeff Variation	.	Std Error Mean	0.01166571

Basic Statistical Measures

Location		Variability	
Mean	0.00000	Std Deviation	0.07560
Median	-0.00142	Variance	0.00572
Mode	.	Range	0.37643
		Interquartile Range	0.11067

Tests for Location: Mu0=0

Test	-Statistic-		-----p Value------	
Student's t	t	0	Pr > |t|	1.0000
Sign	M	-1	Pr >= |M|	0.8776
Signed Rank	S	-7.5	Pr >= |S|	0.9266

Tests for Normality

Test	--Statistic---		-----p Value------	
Shapiro-Wilk	W	0.987376	Pr < W	0.9174
Kolmogorov-Smirnov	D	0.096934	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.049305	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.287605	Pr > A-Sq	>0.2500

Quantiles (Definition 5)

Quantile	Estimate
100% Max	0.1864623
99%	0.1864623
95%	0.1108703
90%	0.0844690
75% Q3	0.0553375
50% Median	-0.0014199
25% Q1	-0.0553293
10%	-0.0812767
5%	-0.0947531

Quantiles (Definition 5)

Quantile	Estimate
1%	-0.1899692
0% Min	-0.1899692

Extreme Observations

-------Lowest------		------Highest------	
Value	Obs	Value	Obs
-0.1899692	4	0.0844690	22
-0.1252589	23	0.0999188	1
-0.0947531	13	0.1108703	33
-0.0937044	8	0.1351689	10
-0.0812767	38	0.1864623	20

Missing Values

		-----Percent Of-----	
Missing Value	Count	All Obs	Missing Obs
.	6	12.50	100.00

```
   Stem Leaf                     #             Boxplot
     18 6                        1                |
     16                                           |
     14                                           |
     12 5                        1                |
     10 01                       2                |
      8 44                       2                |
      6 2567                     4                |
      4 0525                     4             +-----+
      2 7824                     4             |     |
      0 18                       2             |  +  |
     -0 4321                     4             *-----*
     -2 61                       2             |     |
     -4 97518653                 8             +-----+
     -6 619                      3                |
     -8 541                      3                |
    -10                                           |
    -12 5                        1                |
    -14                                           |
    -16                                           |
    -18 0                        1                |
    Multiply Stem.Leaf by 10**-2
 0.19+    Normal Probability Plot                    * ++
     |                                               ++
     |                                            +++
     |                                         +++
     |                                       +*
     |                                    ***+
     |                                ****
     |                              ***
     |                           ****
     |                         ++*
     |                       +**
     |                    ++**
     |                 ******
     |              ***+
     |          ****+
     |          ++
     |       *++
     |    +++
     |  ++
-0.19+++ *
      +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```