STAT 8320 Spring 2015 Assignment 2

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```
libname da2 'C:\Users\psy6b\Desktop\8320 datasets';
ods graphics on;
options ls=70 ps=35;

data da2.h5q2;
infile 'C:\Users\psy6b\Desktop\8320 datasets\growthdata.dat';
input t @;
do i=1 to 6;
input y @;
output;
end;
run;

data aver;
set da2.h5q2;
by t;
retain count yave;
if first.t then do;
count=0;
yave=0;
end;
count+1;
yave+y;
if last.t then do;
y=yave/count;
```

```
i=7;
output;
end;
keep t i y;
run;

data da2.h5q2plot;
set da2.h5q2 aver;
run;

proc sort data=da2.h5q2plot;
by i;
run;

symbol interpol=join;
proc gplot data=da2.h5q2plot;
plot y*t=i;
run;
quit;

proc nlin data=da2.h5q2 hougaard noitprint method=newton;
parameters beta1=200
beta2=850
beta3=350;
e=exp(-(t-beta2)/beta3);
model y =beta1/(1+e);
run;
proc nlmixed data=da2.h5q2;
parameters beta1=200
beta2=850
beta3=350
resvar=40
varu=900;
e=exp(-(t-beta2)/beta3);
model y ~ normal((beta1+u)/(1+e), resvar);
random u ~ normal(0,varu) subject=i out=EBlups;
predict beta1/(1+e) out=pred;
predict (beta1+u)/(1+e) out=predB;
```

```
estimate 'Beta_3=350?' beta3-350;
ods output ParameterEstimates=estimates;
run;

proc sort data=pred;
by i t;
run;
proc sort data=predB;
by i t;
run;
data panelplot;
merge predB(rename=(pred=PredB)) pred;
by i t;
length type $20;
keep i t type resp;
type='measurement';
resp=y;
output;
type='cluster-specific';
resp=predb;
output;
type='population-average';
resp=pred;
output;
run;

proc sgpanel data=panelplot;
panelby i/spacing=5 rows=2 columns=3 novarname;
vline t/response=resp group=type;
colaxis fitpolicy=thin alternate;
rowaxis alternate;
run;

proc print data=eblups;
title 'Estimation of Random Effect';
var i Estimate tValue Probt;
run;
```

```
title;

/*********************************************************/


/*To reading the data*/
data da2.h5q31;
infile 'C:\Users\psy6b\Desktop\8320 datasets\ssttornado532001.dat';
retain ss1-ss49;
array ss{49} ss1-ss49;
if _N_=1 then do; input ss1-ss49;end;
loc+1;
drop ss1-ss49;
do t=1 to 49;
sst=ss{t};
input torn @;
output;
end;
run;
data da2.h5q32;
infile 'C:\Users\psy6b\Desktop\8320 datasets\MOtornlatlon.dat';
loc+1;
input lat lon;
run;
proc sql;
create table da2.h5q3
as select * from da2.h5q31 as a, da2.h5q32 as b
where a.loc=b.loc;
run;
quit;

/*Fitting different models*/
proc genmod data=da2.h5q3;
class loc;
model torn = sst sst*loc / dist=poisson link=log;
output out=h5q3out1 resraw=Residual pred=Predicted lower=Lower upper=Upper;
proc glimmix data=da2.h5q3 noitprint;
class loc;
```

```
model torn = sst sst*loc / dist=poisson link=log ddfm=betwithin solution;
random intercept / subject=loc type=sp(exp)(lon lat);
nloptions tech=newrap;
covtest 'Random Int.' indep;
output out=h5q3out2 pred(ilink)=predicted lcl(ilink)=lower ucl(ilink)=upper res
run;
proc glimmix data=da2.h5q3 noitprint;
class loc;
model torn = sst sst*loc / dist=poisson link=log ddfm=betwithin solution;
random sst / subject=loc type=sp(exp)(lon lat);
nloptions tech=newrap;
covtest 'Random Coef.' indep;
output out=h5q3out3 pred(ilink)=predicted lcl(ilink)=lower ucl(ilink)=upper res
run;
proc glimmix data=da2.h5q3 noitprint;
class loc;
model torn = sst sst*loc / dist=poisson link=log ddfm=betwithin solution;
random intercept sst / subject=loc type=sp(exp)(lon lat);
nloptions tech=newrap;
covtest 'Random Int. & Coef.' indep;
output out=h5q3out4 pred(ilink)=predicted lcl(ilink)=lower ucl(ilink)=upper res
run;


/*Processing output*/
proc sort data=h5q3out1;
by loc;
run;
data h5q3eval1;
set h5q3out1;
by loc;
keep loc torn predicted residual lat lon;
retain sumtorn sumpred sumres;
if first.loc then do;
sumtorn=0;
sumpred=0;
sumres=0;
end;
```

```
sumtorn+torn;
sumpred+predicted;
sumres+residual;
if last.loc then do;
torn=sumtorn;
predicted=sumpred;
residual=sumres;
output;
end;
run;
proc sort data=h5q3out2;
by loc;
run;
data h5q3eval2;
set h5q3out2;
by loc;
keep loc torn predicted residual lat lon;
retain sumtorn sumpred sumres;
if first.loc then do;
sumtorn=0;
sumpred=0;
sumres=0;
end;
sumtorn+torn;
sumpred+predicted;
sumres+residual;
if last.loc then do;
torn=sumtorn;
predicted=sumpred;
residual=sumres;
output;
end;
run;
proc sort data=h5q3out3;
by loc;
run;
data h5q3eval3;
set h5q3out3;
```

```
by loc;
keep loc torn predicted residual lat lon;
retain sumtorn sumpred sumres;
if first.loc then do;
sumtorn=0;
sumpred=0;
sumres=0;
end;
sumtorn+torn;
sumpred+predicted;
sumres+residual;
if last.loc then do;
torn=sumtorn;
predicted=sumpred;
residual=sumres;
output;
end;
run;
proc sort data=h5q3out4;
by loc;
run;
data h5q3eval4;
set h5q3out4;
by loc;
keep loc torn predicted residual lat lon;
retain sumtorn sumpred sumres;
if first.loc then do;
sumtorn=0;
sumpred=0;
sumres=0;
end;
sumtorn+torn;
sumpred+predicted;
sumres+residual;
if last.loc then do;
torn=sumtorn;
predicted=sumpred;
residual=sumres;
```

```
output;
end;
run;
data h5q3eval;
set h5q3eval1(in=a) h5q3eval2(in=b) h5q3eval3(in=c) h5q3eval4(in=d);
length model $23;
if a then do;
model='Independent';
end;
if b then do;
model='Random Int.';
end;
if c then do;
model='Random Coef.';
end;
if d then do;
model='Random Int. & Coef.';
end;
label torn='Actual Measurements';
run;



/*Evaluating models*/
proc sort data=h5q3eval;
by torn;
run;
proc sgpanel data=h5q3eval noautolegend;
panelby model/columns=2 rows=2 spacing=5;
scatter x=torn y=predicted/ datalabel=loc;
series x=torn y=torn;
KEYLEGEND "Observations" "Reference Line";
run;
proc sql;
title 'Model Comparation';
select model,sum(residual*residual) label='Model Type' as SSR label='Sum of Squ
from h5q3eval
group by model;
```

```
quit;

/*Plotting the profile*/
data panelplot2;
set h5q3out2;
length type $20;
keep loc t type resp;
t=t+1952;
type='measurement';
resp=torn;
output;
type='cluster-specific';
resp=predicted;
output;
type='lower bound';
resp=lower;
output;
type='upper bound';
resp=upper;
output;
run;
proc sgpanel data=panelplot2;
where loc le 4 and loc ge 1;
panelby loc/rows=2 columns=2 spacing=5;
vline t/response=resp group=type;
colaxis fitpolicy=thin alternate;
rowaxis alternate;
run;
proc sgpanel data=panelplot2;
where loc le 8 and loc ge 5;
panelby loc/rows=2 columns=2 spacing=5;
vline t/response=resp group=type;
colaxis fitpolicy=thin alternate;
rowaxis alternate;
run;
proc sgpanel data=panelplot2;
where loc le 12 and loc ge 9;
panelby loc/rows=2 columns=2 spacing=5;
```

```
vline t/response=resp group=type;
colaxis fitpolicy=thin alternate;
rowaxis alternate;
run;
proc sgpanel data=panelplot2;
where loc le 16 and loc ge 13;
panelby loc/rows=2 columns=2 spacing=5;
vline t/response=resp group=type;
colaxis fitpolicy=thin alternate;
rowaxis alternate;
run;
proc sgpanel data=panelplot2;
where loc le 20 and loc ge 17;
panelby loc/rows=2 columns=2 spacing=5;
vline t/response=resp group=type;
colaxis fitpolicy=thin alternate;
rowaxis alternate;
run;
```

Figure 1: Regression Analysis

```
                        The NLIN Procedure

NOTE: Convergence criterion met.
                        Estimation Summary

                Method                     Newton
                Iterations                      4
                R                        1.187E-7
                PPC(beta3)               1.149E-7
                RPC(beta3)               0.000233
                Object                   5.347E-8
                Objective                37973.58
                Observations Read              60
                Observations Used              60
                Observations Missing            0
```

Figure 1: *continued*

NOTE: An intercept was not specified for this model.

Source	DF	Sum of Squares	Mean Square	F Value	Approx Pr > F
Model	3	1032845	344282	516.78	<.0001
Error	57	37973.6	666.2		
Uncorrected Total	60	1070819			

Parameter	Estimate	Approx Std Error	Approximate 95% Confidence Limits		Skewness
beta1	199.7	10.3827	178.9	220.4	0.5330
beta2	797.8	55.1103	687.4	908.1	0.3725
beta3	300.7	42.8631	214.8	386.5	0.4782

Approximate Correlation Matrix

	beta1	beta2	beta3
beta1	1.0000000	0.8155790	0.7342032
beta2	0.8155790	1.0000000	0.5941190
beta3	0.7342032	0.5941190	1.0000000

The NLMIXED Procedure

Specifications

Data Set	DA2.H5Q2
Dependent Variable	y
Distribution for Dependent Variable	Normal
Random Effects	u
Distribution for Random Effects	Normal
Subject Variable	i
Optimization Technique	Dual Quasi-Newton
Integration Method	Adaptive Gaussian Quadrature

Figure 1: *continued*

Dimensions

Observations Used	60
Observations Not Used	0
Total Observations	60
Subjects	6
Max Obs per Subject	10
Parameters	5
Quadrature Points	1

Parameters

beta1	beta2	beta3	resvar	varu	NegLogLike
200	850	350	40	900	229.066515

Figure 1: *continued*

Iteration History

Iter	Calls	NegLogLike	Diff	MaxGrad	Slope
1	8	222.858676	6.207839	0.135255	-3.44269
2	12	221.325222	1.533454	0.108492	-1.10246
3	16	220.4229	0.902322	0.104243	-0.27509
4	21	217.621537	2.801363	0.067182	-0.77932
5	23	217.520935	0.100602	0.080529	-0.72008
6	25	217.347603	0.173332	0.058901	-0.43968
7	27	217.190674	0.156929	0.039087	-0.15741
8	29	217.100941	0.089734	0.032728	-0.10549
9	31	217.01773	0.08321	0.020822	-0.16928
10	34	217.000377	0.017353	0.012076	-0.02334
11	37	216.988644	0.011733	0.013059	-0.00631
12	39	216.98306	0.005584	0.006165	-0.01167
13	41	216.980417	0.002642	0.003475	-0.00838
14	44	216.978694	0.001723	0.001598	-0.00346
15	48	216.977806	0.000888	0.003132	-0.00003
16	54	216.842805	0.135001	0.020194	-0.00172
17	56	216.712242	0.130563	0.007343	-0.11317
18	59	216.708022	0.00422	0.000293	-0.00773
19	62	216.708009	0.000013	0.000037	-0.00002
20	65	216.708009	1.783E-7	3.067E-6	-2.54E-7

NOTE: GCONV convergence criterion satisfied.

Fit Statistics

-2 Log Likelihood	433.4
AIC (smaller is better)	443.4
AICC (smaller is better)	444.5
BIC (smaller is better)	442.4

Figure 1: *continued*

Parameter Estimates

Parameter	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha
beta1	199.41	15.2372	5	13.09	<.0001	0.05
beta2	797.42	14.6250	5	54.52	<.0001	0.05
beta3	298.48	11.4146	5	26.15	<.0001	0.05
resvar	49.8315	9.5902	5	5.20	0.0035	0.05
varu	1346.95	784.96	5	1.72	0.1468	0.05

Parameter Estimates

Parameter	Lower	Upper	Gradient
beta1	160.24	238.58	4.83E-7
beta2	759.82	835.01	-3.07E-6
beta3	269.14	327.82	2.884E-6
resvar	25.1791	74.4838	2.602E-6
varu	-670.87	3364.76	-1.06E-8

Additional Estimates

Label	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha
Beta_3=350?	-51.5207	11.4146	5	-4.51	0.0063	0.05

Additional Estimates

Label	Lower	Upper
Beta_3=350?	-80.8627	-22.1786

Figure 1: *continued*

```
                    Estimation of Random Effect

             Obs    i    Estimate     tValue      Probt

               1    1      9.0186     0.58954    0.58113
               2    2     48.3441     3.15760    0.02516
               3    3    -61.3289    -4.00406    0.01028
               4    4     28.0234     1.83138    0.12654
               5    5      7.4494     0.48697    0.64687
               6    6    -31.5072    -2.05886    0.09457
                         The GENMOD Procedure

                          Model Information

                      Data Set              DA2.H5Q3
                      Distribution           Poisson
                      Link Function              Log
                      Dependent Variable        torn
                  Number of Observations Read         980
                  Number of Observations Used         980
                          Class Level Information

Class     Levels   Values

loc           20   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
```

Figure 1: *continued*

Criteria For Assessing Goodness Of Fit

Criterion	DF	Value	Value/DF
Deviance	959	530.4118	0.5531
Scaled Deviance	959	530.4118	0.5531
Pearson Chi-Square	959	1252.0239	1.3056
Scaled Pearson X2	959	1252.0239	1.3056
Log Likelihood		-346.7726	
Full Log Likelihood		-365.5408	
AIC (smaller is better)		773.0817	
AICC (smaller is better)		774.0462	
BIC (smaller is better)		875.7203	

Algorithm converged.

Figure 1: *continued*

Analysis Of Maximum Likelihood Parameter Estimates

Parameter		DF	Estimate	Standard Error	Wald 95% Confidence Limits		Wald Chi-Square
Intercept		1	-2.2769	0.1048	-2.4823	-2.0714	471.93
sst		1	0.4467	0.6489	-0.8250	1.7185	0.47
sst*loc	1	1	-2.1064	0.8124	-3.6986	-0.5141	6.72
sst*loc	2	1	-0.8862	0.9438	-2.7360	0.9635	0.88
sst*loc	3	1	0.1425	0.8980	-1.6176	1.9026	0.03
sst*loc	4	1	-1.5313	0.8803	-3.2566	0.1939	3.03
sst*loc	5	1	-2.0382	0.8199	-3.6452	-0.4311	6.18
sst*loc	6	1	0.1191	0.9011	-1.6470	1.8852	0.02
sst*loc	7	1	0.6651	0.8234	-0.9488	2.2790	0.65
sst*loc	8	1	0.1367	0.8988	-1.6249	1.8983	0.02
sst*loc	9	1	0.5199	0.8444	-1.1351	2.1749	0.38
sst*loc	10	1	-1.0132	0.9349	-2.8456	0.8192	1.17
sst*loc	11	1	0.6194	0.8300	-1.0074	2.2461	0.56
sst*loc	12	1	-0.1438	0.9309	-1.9682	1.6807	0.02
sst*loc	13	1	-0.3399	0.9456	-2.1933	1.5135	0.13
sst*loc	14	1	-0.2098	0.9367	-2.0456	1.6260	0.05
sst*loc	15	1	-0.3049	0.9435	-2.1542	1.5444	0.10
sst*loc	16	1	-1.4916	0.8850	-3.2262	0.2430	2.84
sst*loc	17	1	0.6435	0.8265	-0.9765	2.2634	0.61
sst*loc	18	1	0.1547	0.8964	-1.6022	1.9116	0.03
sst*loc	19	1	-0.3522	0.9463	-2.2069	1.5025	0.14
sst*loc	20	0	0.0000	0.0000	0.0000	0.0000	.
Scale		0	1.0000	0.0000	1.0000	1.0000	

Figure 1: *continued*

Analysis Of Maximum Likelihood Parameter Estimates

Parameter		Pr > ChiSq
Intercept		<.0001
sst		0.4912
sst*loc	1	0.0095
sst*loc	2	0.3477
sst*loc	3	0.8739
sst*loc	4	0.0819
sst*loc	5	0.0129
sst*loc	6	0.8948
sst*loc	7	0.4192
sst*loc	8	0.8791
sst*loc	9	0.5381
sst*loc	10	0.2785
sst*loc	11	0.4555
sst*loc	12	0.8772
sst*loc	13	0.7192
sst*loc	14	0.8228
sst*loc	15	0.7466
sst*loc	16	0.0919
sst*loc	17	0.4363
sst*loc	18	0.8630
sst*loc	19	0.7098
sst*loc	20	.
Scale		

NOTE: The scale parameter was held fixed.

Figure 1: *continued*

```
                    The GLIMMIX Procedure

                      Model Information

          Data Set                      DA2.H5Q3
          Response Variable             torn
          Response Distribution         Poisson
          Link Function                 Log
          Variance Function             Default
          Variance Matrix Blocked By    loc
          Estimation Technique          Residual PL
          Degrees of Freedom Method     Between-Within
                    Class Level Information

Class    Levels    Values

loc          20    1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
                   19 20
             Number of Observations Read         980
             Number of Observations Used         980
                          Dimensions

               G-side Cov. Parameters           2
               Columns in X                    22
               Columns in Z per Subject         1
               Subjects (Blocks in V)          20
               Max Obs per Subject             49
                    Optimization Information

          Optimization Technique        Newton-Raphson
          Parameters in Optimization    2
          Lower Boundaries              2
          Upper Boundaries              0
          Fixed Effects                 Profiled
          Starting From                 Data
      Convergence criterion (PCONV=1.11022E-8) satisfied.
```

Figure 1: *continued*

Fit Statistics

-2 Res Log Pseudo-Likelihood	5209.11
Generalized Chi-Square	1158.20
Gener. Chi-Square / DF	1.21

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error
Variance	loc	0.1122	0.09420
SP(EXP)	loc	1.0000	.

Figure 1: *continued*

Solutions for Fixed Effects

Effect	loc	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept		-2.3014	0.1299	19	-17.71	<.0001
sst		0.5251	0.7078	940	0.74	0.4583
sst*loc	1	-2.3186	0.9117	940	-2.54	0.0111
sst*loc	2	-1.0147	1.0165	940	-1.00	0.3184
sst*loc	3	0.04973	0.9467	940	0.05	0.9581
sst*loc	4	-1.5813	0.9489	940	-1.67	0.0960
sst*loc	5	-2.3085	0.9207	940	-2.51	0.0123
sst*loc	6	0.1876	0.9982	940	0.19	0.8510
sst*loc	7	0.6270	0.8985	940	0.70	0.4855
sst*loc	8	-0.02175	0.9252	940	-0.02	0.9812
sst*loc	9	0.4048	0.9063	940	0.45	0.6552
sst*loc	10	-1.1604	1.0120	940	-1.15	0.2518
sst*loc	11	0.6323	0.9086	940	0.70	0.4866
sst*loc	12	-0.1940	0.9969	940	-0.19	0.8457
sst*loc	13	-0.4288	0.9597	940	-0.45	0.6551
sst*loc	14	-0.2062	1.0594	940	-0.19	0.8457
sst*loc	15	-0.3897	0.9737	940	-0.40	0.6891
sst*loc	16	-1.6004	0.9606	940	-1.67	0.0960
sst*loc	17	0.4378	0.8840	940	0.50	0.6205
sst*loc	18	0.1002	0.9572	940	0.10	0.9167
sst*loc	19	-0.4643	0.8798	940	-0.53	0.5978
sst*loc	20	0	.	.	.	.

Type III Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
sst	1	940	0.19	0.6607
sst*loc	19	940	2.04	0.0053

Figure 1: *continued*

```
                  Tests of Covariance Parameters
               Based on the Residual Pseudo-Likelihood

 Label           DF   -2 Res Log P-Like     ChiSq   Pr > ChiSq   Note

 Random Int.      2             5212.01      2.89       0.2352   --

--: Standard test with unadjusted p-values.
                        The GLIMMIX Procedure

                          Model Information

             Data Set                       DA2.H5Q3
             Response Variable              torn
             Response Distribution          Poisson
             Link Function                  Log
             Variance Function              Default
             Variance Matrix Blocked By     loc
             Estimation Technique           Residual PL
             Degrees of Freedom Method      Between-Within
                       Class Level Information

   Class    Levels    Values

   loc          20    1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
                      19 20
                Number of Observations Read         980
                Number of Observations Used         980
                              Dimensions

                   G-side Cov. Parameters           2
                   Columns in X                    22
                   Columns in Z per Subject         1
                   Subjects (Blocks in V)          20
                   Max Obs per Subject             49
```

Figure 1: *continued*

Optimization Information

Optimization Technique	Newton-Raphson
Parameters in Optimization	2
Lower Boundaries	2
Upper Boundaries	0
Fixed Effects	Profiled
Starting From	Data

Convergence criterion (PCONV=1.11022E-8) satisfied.

Estimated G matrix is not positive definite.

Fit Statistics

-2 Res Log Pseudo-Likelihood	5271.30
Generalized Chi-Square	1252.02
Gener. Chi-Square / DF	1.31

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error
Variance	loc	0	.
SP(EXP)	loc	1.0000	.

Figure 1: *continued*

Solutions for Fixed Effects

Effect	loc	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept		-2.2769	0.1048	19	-21.72	<.0001
sst		0.4467	0.6489	940	0.69	0.4913
sst*loc	1	-2.1064	0.8124	940	-2.59	0.0097
sst*loc	2	-0.8862	0.9438	940	-0.94	0.3479
sst*loc	3	0.1425	0.8980	940	0.16	0.8740
sst*loc	4	-1.5313	0.8803	940	-1.74	0.0822
sst*loc	5	-2.0382	0.8199	940	-2.49	0.0131
sst*loc	6	0.1191	0.9011	940	0.13	0.8949
sst*loc	7	0.6651	0.8234	940	0.81	0.4194
sst*loc	8	0.1367	0.8988	940	0.15	0.8792
sst*loc	9	0.5199	0.8444	940	0.62	0.5383
sst*loc	10	-1.0132	0.9349	940	-1.08	0.2788
sst*loc	11	0.6194	0.8300	940	0.75	0.4557
sst*loc	12	-0.1438	0.9309	940	-0.15	0.8773
sst*loc	13	-0.3399	0.9456	940	-0.36	0.7193
sst*loc	14	-0.2098	0.9367	940	-0.22	0.8228
sst*loc	15	-0.3049	0.9435	940	-0.32	0.7466
sst*loc	16	-1.4916	0.8850	940	-1.69	0.0922
sst*loc	17	0.6435	0.8265	940	0.78	0.4365
sst*loc	18	0.1547	0.8964	940	0.17	0.8630
sst*loc	19	-0.3522	0.9463	940	-0.37	0.7098
sst*loc	20	0	.	.	.	.

Type III Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
sst	1	940	0.31	0.5781
sst*loc	19	940	2.16	0.0028

Figure 1: *continued*

```
                  Tests of Covariance Parameters
               Based on the Residual Pseudo-Likelihood

Label            DF   -2 Res Log P-Like     ChiSq   Pr > ChiSq   Note

Random Coef.      2             2854.49         .         1.0000   --

--: Standard test with unadjusted p-values.
                        The GLIMMIX Procedure

                          Model Information

             Data Set                       DA2.H5Q3
             Response Variable              torn
             Response Distribution          Poisson
             Link Function                  Log
             Variance Function              Default
             Variance Matrix Blocked By     loc
             Estimation Technique           Residual PL
             Degrees of Freedom Method      Between-Within
                       Class Level Information

   Class    Levels    Values

   loc          20    1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
                      19 20
              Number of Observations Read         980
              Number of Observations Used         980
                             Dimensions

                G-side Cov. Parameters           2
                Columns in X                    22
                Columns in Z per Subject         2
                Subjects (Blocks in V)          20
                Max Obs per Subject             49
```

Figure 1: *continued*

Optimization Information

Optimization Technique	Newton-Raphson
Parameters in Optimization	2
Lower Boundaries	2
Upper Boundaries	0
Fixed Effects	Profiled
Starting From	Data

Convergence criterion (PCONV=1.11022E-8) satisfied.

Estimated G matrix is not positive definite.

Fit Statistics

-2 Res Log Pseudo-Likelihood	5209.11
Generalized Chi-Square	1158.20
Gener. Chi-Square / DF	1.21

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error
Variance	loc	0.1122	0.09420
SP(EXP)	loc	1.0000	.

Figure 1: *continued*

Solutions for Fixed Effects

Effect	loc	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept		-2.3014	0.1299	19	-17.71	<.0001
sst		0.6842	0.8048	940	0.85	0.3955
sst*loc	1	-2.3722	0.9425	940	-2.52	0.0120
sst*loc	2	-1.0899	1.0884	940	-1.00	0.3169
sst*loc	3	-0.1626	1.0903	940	-0.15	0.8815
sst*loc	4	-1.7982	0.9983	940	-1.80	0.0720
sst*loc	5	-2.3047	0.9505	940	-2.42	0.0155
sst*loc	6	0.2787	1.1485	940	0.24	0.8083
sst*loc	7	0.4961	1.0736	940	0.46	0.6442
sst*loc	8	-0.3755	1.0646	940	-0.35	0.7244
sst*loc	9	0.1688	1.0704	940	0.16	0.8747
sst*loc	10	-1.2240	1.0758	940	-1.14	0.2555
sst*loc	11	0.5692	1.0841	940	0.53	0.5997
sst*loc	12	-0.2797	1.1234	940	-0.25	0.8034
sst*loc	13	-0.7348	1.0723	940	-0.69	0.4934
sst*loc	14	-0.06291	1.1820	940	-0.05	0.9576
sst*loc	15	-0.6257	1.0882	940	-0.58	0.5654
sst*loc	16	-1.7484	1.0079	940	-1.73	0.0831
sst*loc	17	0.07983	1.0491	940	0.08	0.9394
sst*loc	18	-0.03744	1.1037	940	-0.03	0.9729
sst*loc	19	-1.2069	0.9933	940	-1.22	0.2246
sst*loc	20	0	.	.	.	.

Type III Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
sst	1	940	0.15	0.6975
sst*loc	19	940	1.97	0.0077

Figure 1: *continued*

Tests of Covariance Parameters
Based on the Residual Pseudo-Likelihood

Label	DF	-2 Res Log P-Like	ChiSq	Pr > ChiSq
Random Int. & Coef.	2	2854.49	.	1.0000

Tests of Covariance Parameters Based on the Residual Pseudo-Likelihood

Label	Note
Random Int. & Coef.	--

--: Standard test with unadjusted p-values.

Model Comparation

model	Sum of Squared Residual
Independent	146.3692
Random Coef.	146.3692
Random Int.	56.18219
Random Int. & Coef.	56.18219

Figure 2: Graphs for Regression Analysis

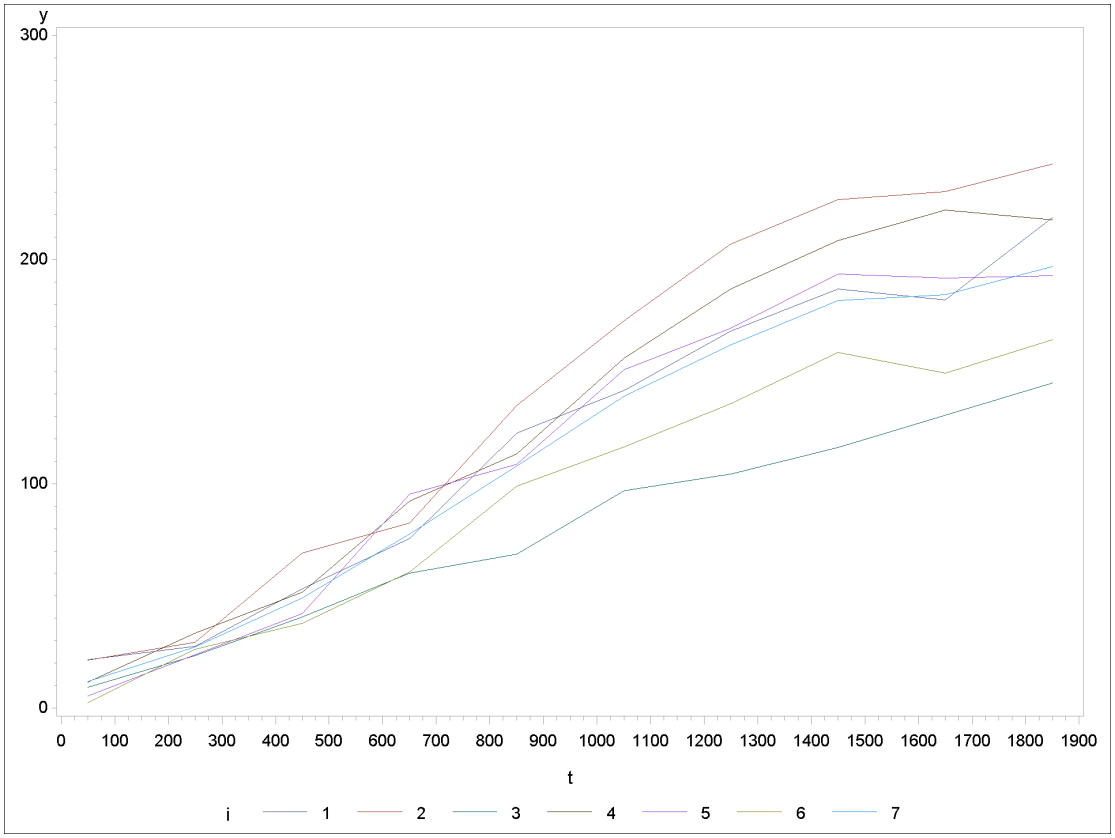

Figure 2: *continued*

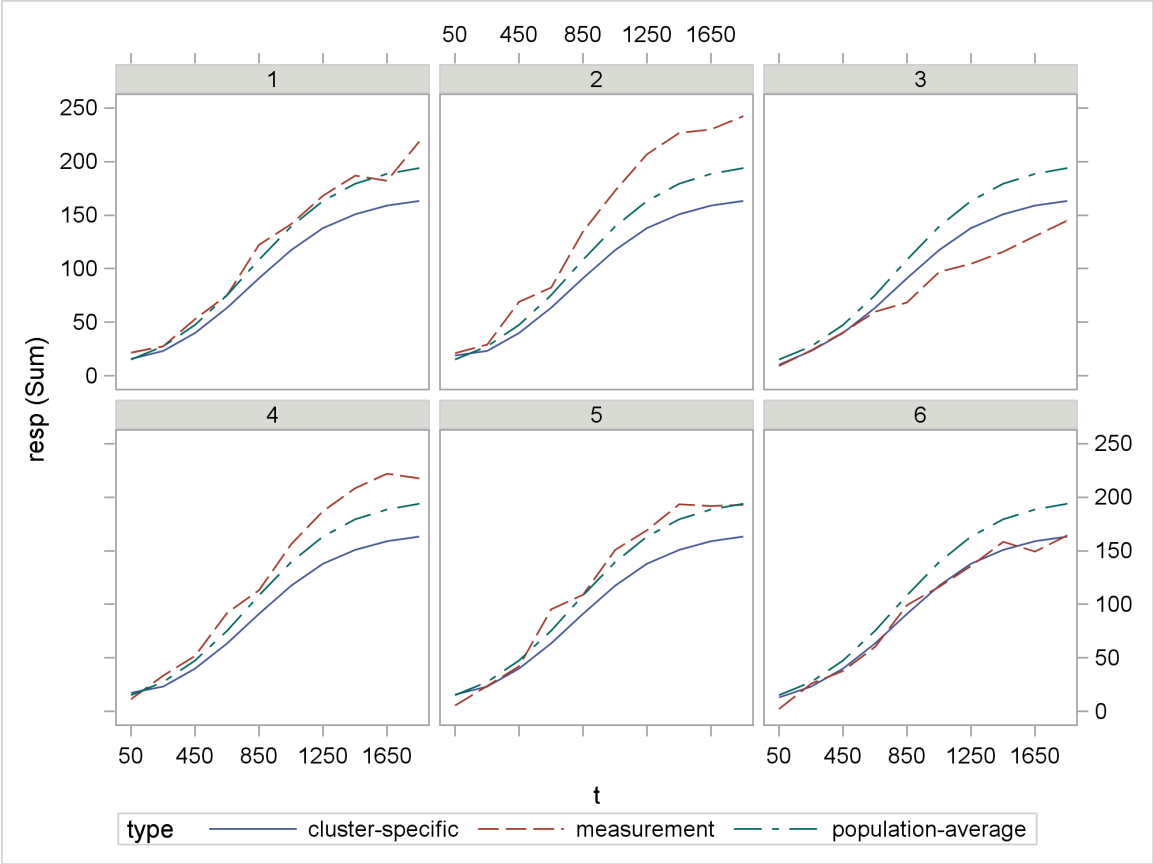

Figure 2: *continued*

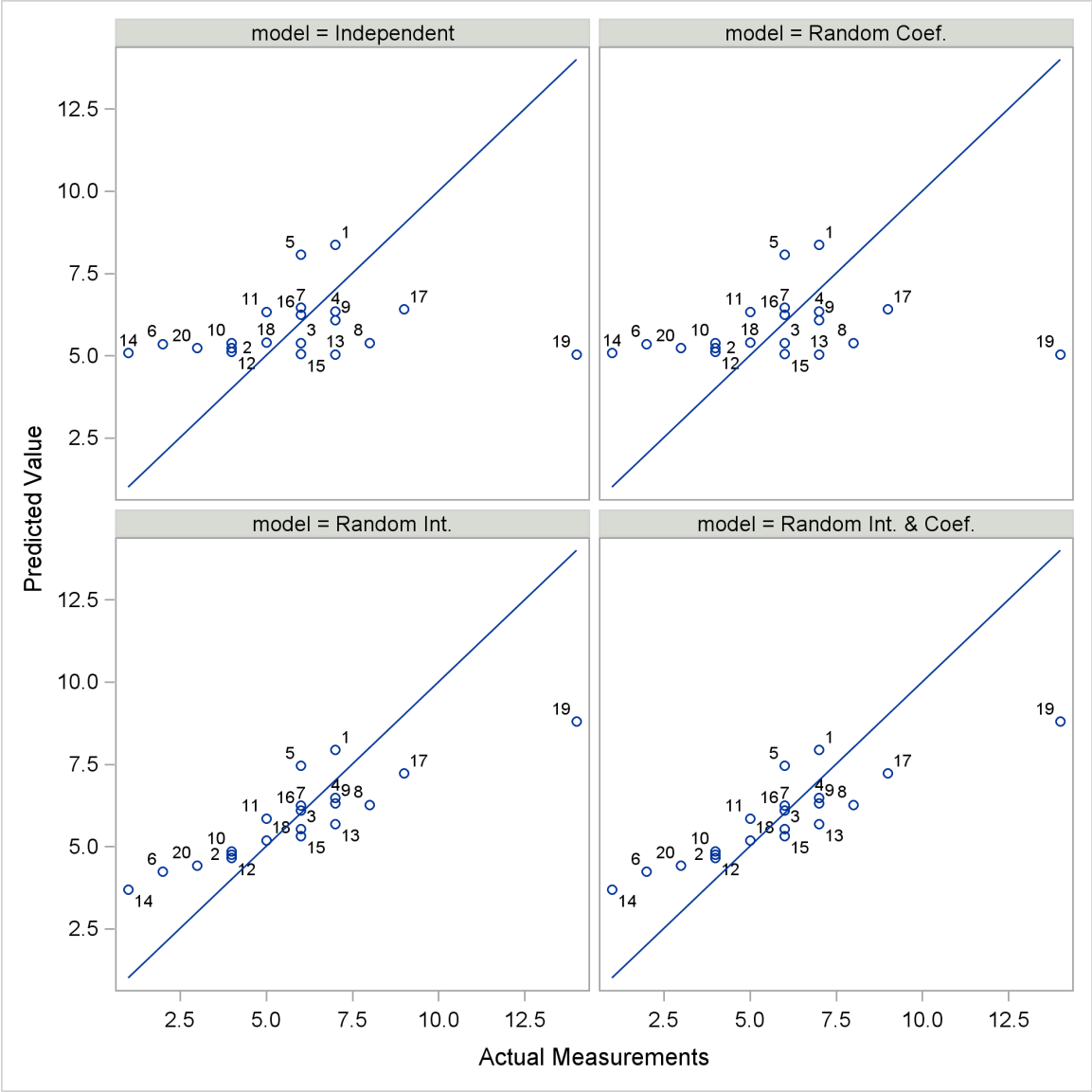

Figure 2: *continued*

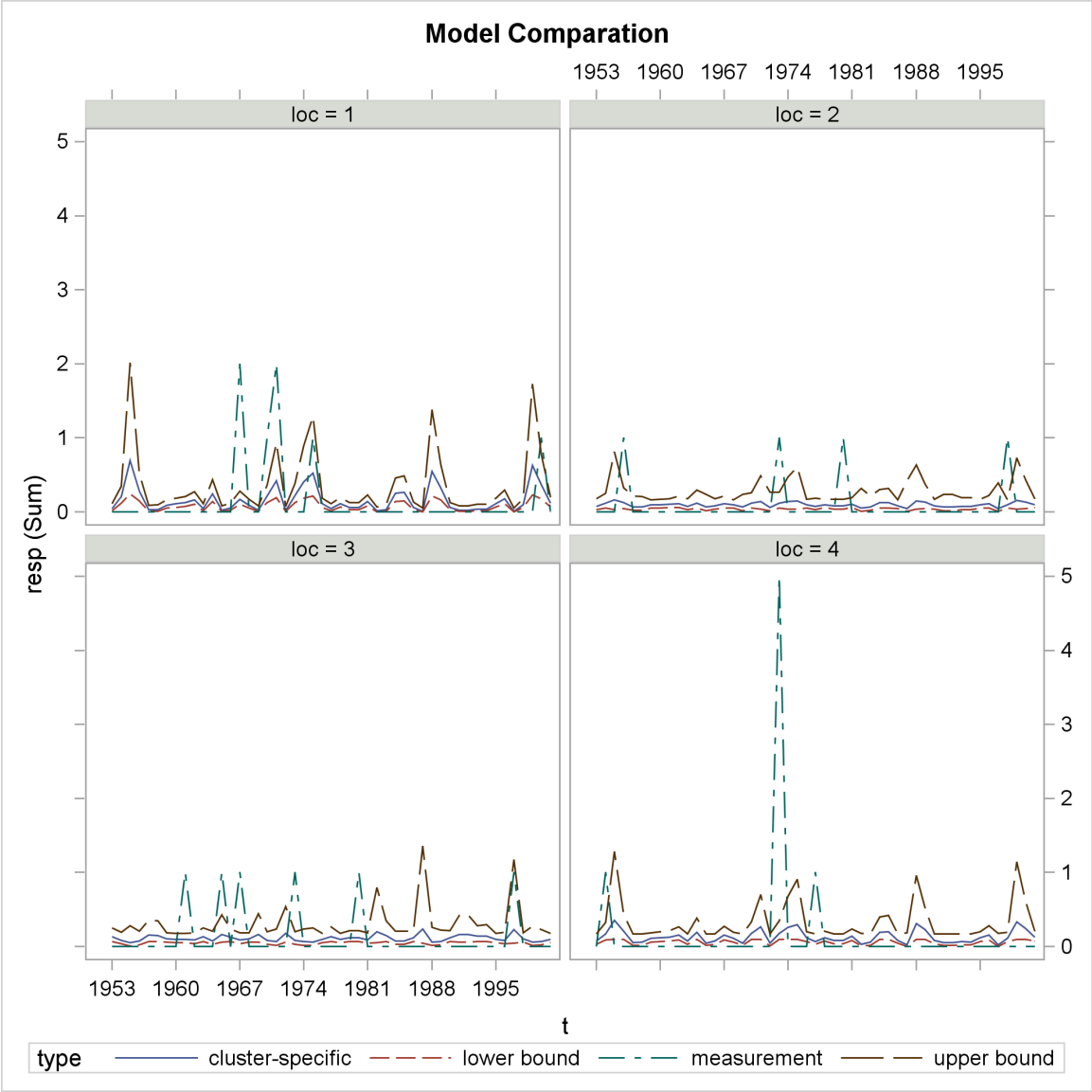

Figure 2: *continued*

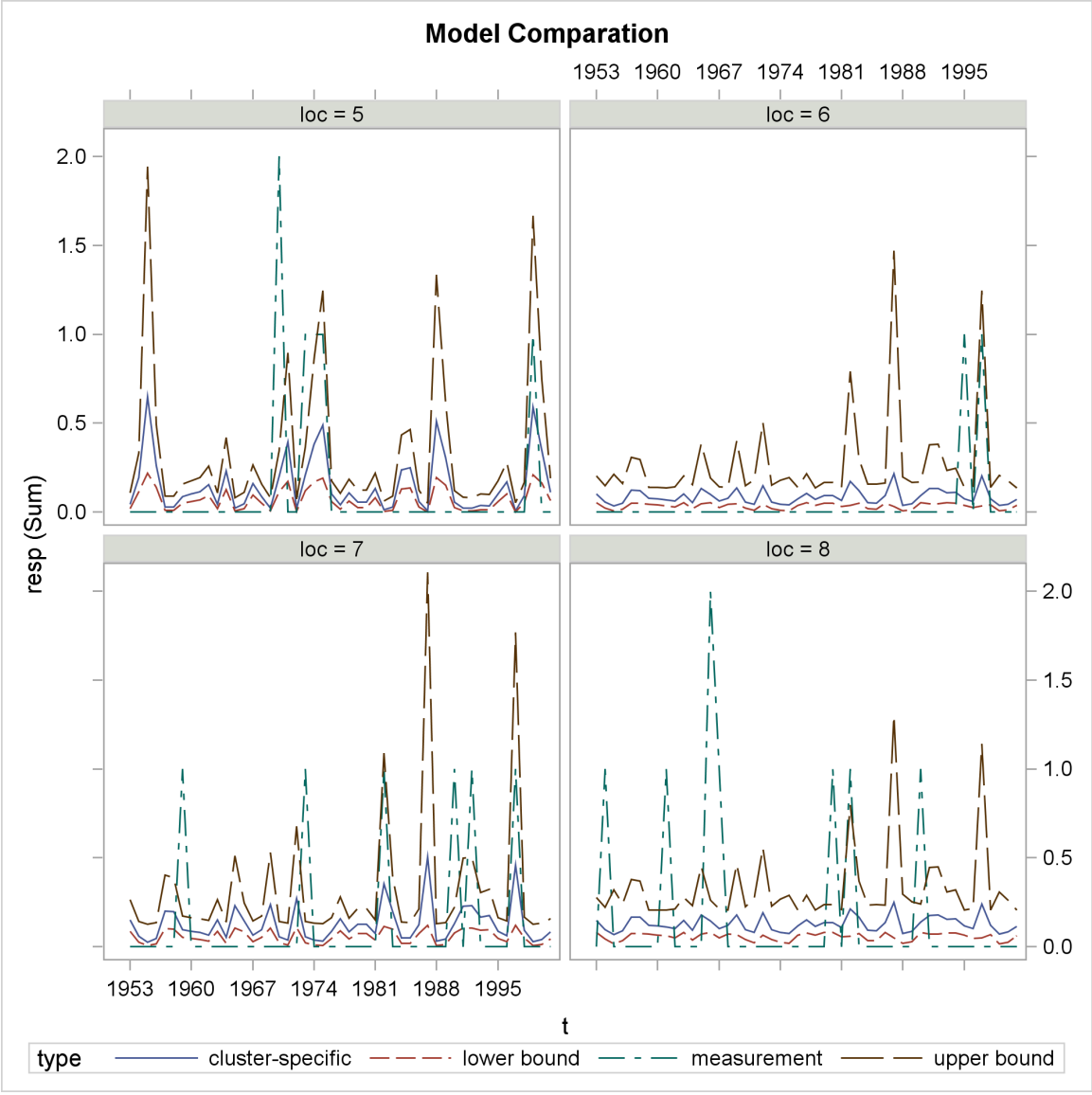

Figure 2: *continued*

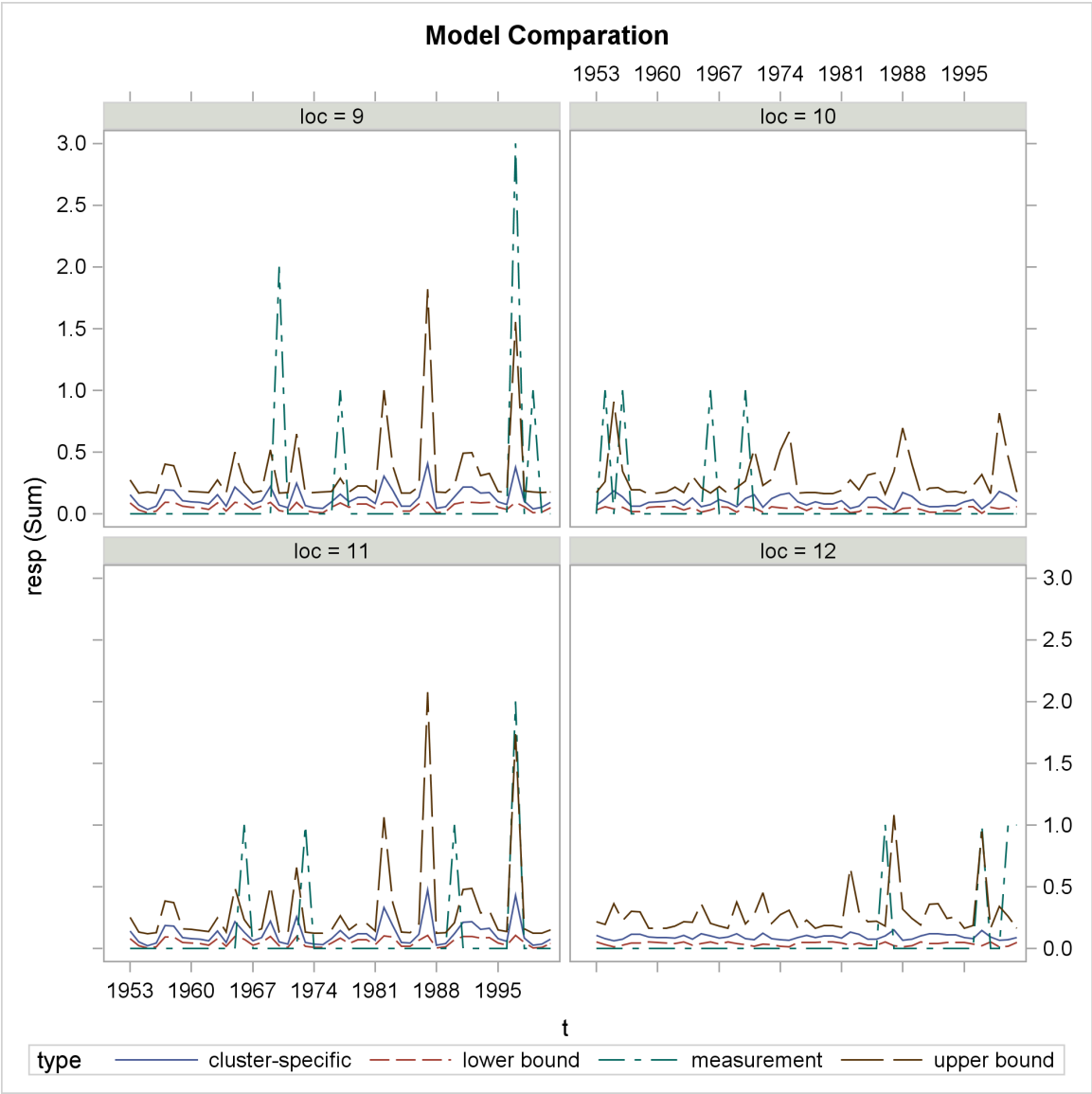

Figure 2: *continued*

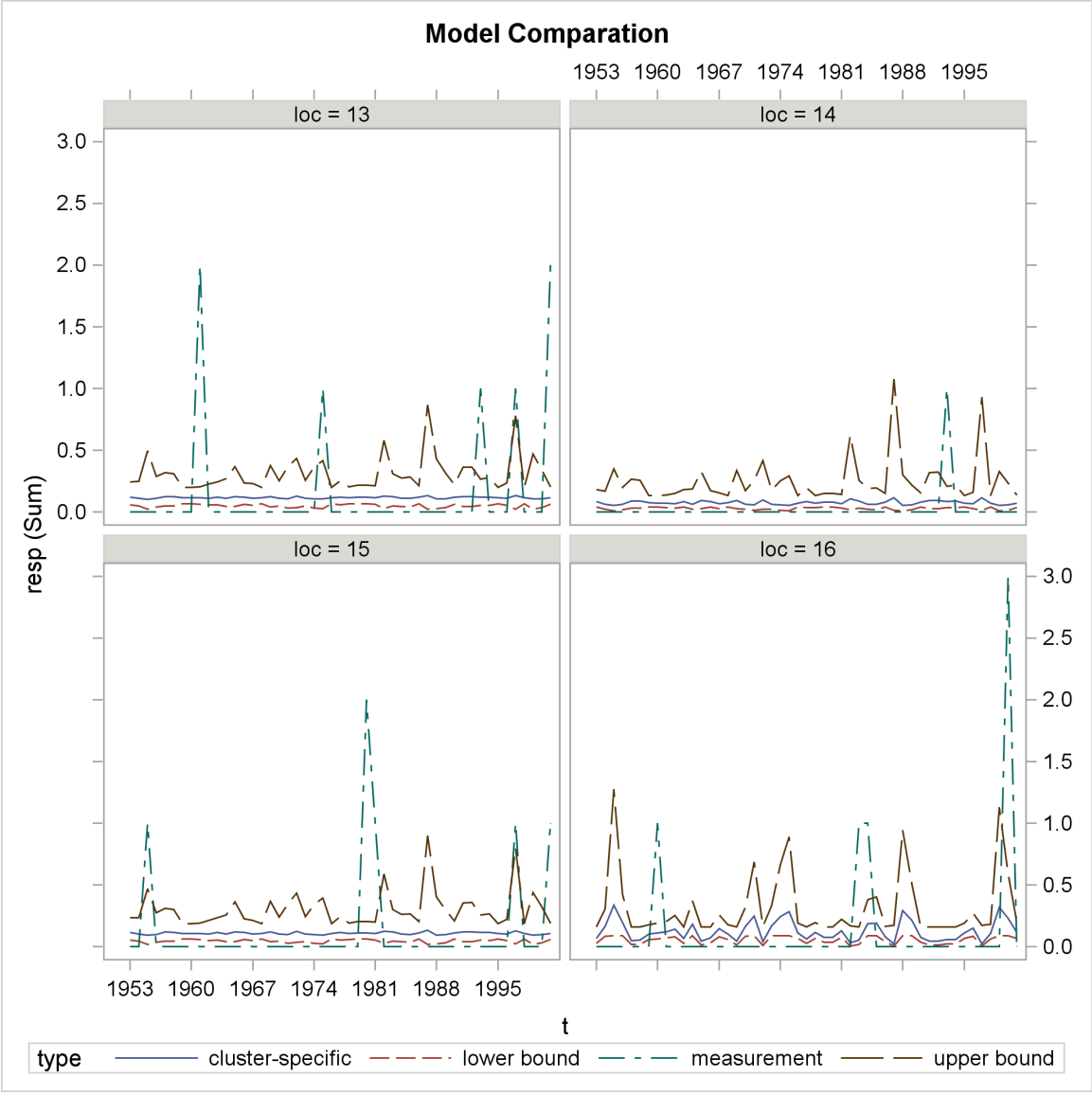

Figure 2: *continued*

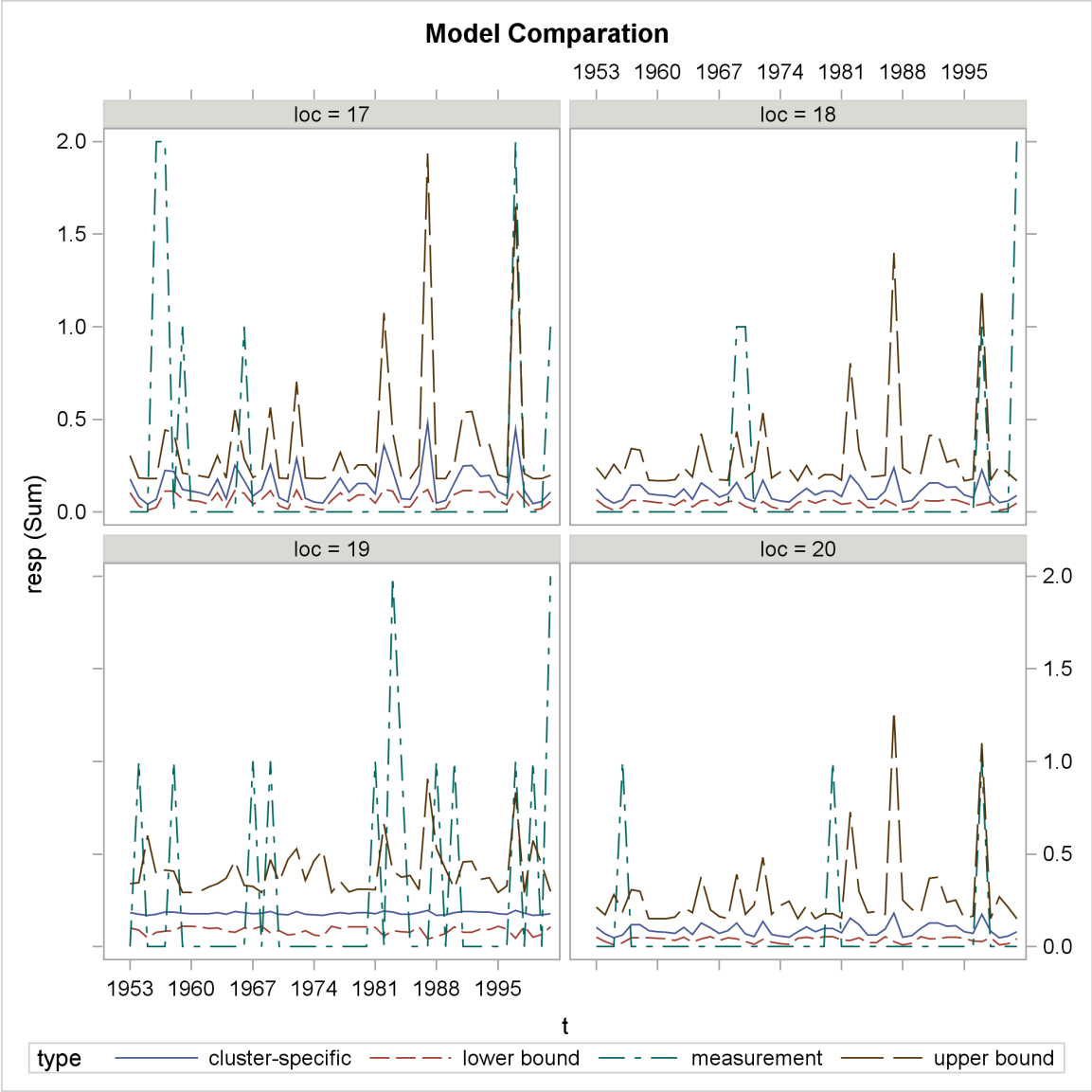

Figure 2: *continued*