Exhibit No.:
Issues: Weather Normalization
Witness: Edward L. Spitznagel, Jr.
Exhibit Type: Direct
Sponsoring Party: Missouri-American Water Company
Case No.: Case No. WR-2003-
Date: May 19, 2003

MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. WR-2003-

DIRECT TESTIMONY

OF

EDWARD L. SPITZNAGEL

ON BEHALF OF
MISSOURI-AMERICAN WATER COMPANY

JEFFERSON CITY, MISSOURI

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

IN THE MATTER OF THE MISSOURI-AMERICAN WATER COMPANY FOR AUTHORITY TO FILE TARIFFS REFLECTING INCREASED RATES FOR WATER AND SEWER SERVICE	)))))))	**CASE NO. WR-2003-**

AFFIDAVIT OF EDWARD L. SPITZNAGEL, JR.

Edward L. Spitznagel, Jr., being first duly sworn, deposes and says that he is the witness who sponsors the accompanying testimony and schedule(s) entitled "Direct Testimony of Edward L. Spitznagel, Jr."; that said testimony was prepared by him and/or under his direction and supervision; that if inquires were made as to the facts in said testimony and schedules, he would respond as therein set forth; and that the aforesaid testimony and schedules are true and correct to the best of his knowledge.

Edward L. Spitznagel, Jr.
Edward L. Spitznagel, Jr.

State of Missouri
County of Saint Louis
SUBSCRIBED and sworn to
before me this 13th day of May 2003.

Mary Withington
Notary Public

My commission expires: February 22, 2004

MARY WITHINGTON
Notary Public – Notary Seal
State of Missouri
County of St. Louis
My Commission Expires 02/22/2004

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DIRECT TESTIMONY

EDWARD L. SPITZNAGEL, JR.

WITNESS INTRODUCTION

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND EMPLOYER.

A. My name is Edward L. Spitznagel, Jr., and my business address is Campus Box 1146, One Brookings Drive, St Louis, Missouri 63130. I am employed by Washington University.

Q. WHAT IS YOUR PRESENT POSITION?

A. I am Professor of Mathematics in the College of Arts and Sciences at Washington University. I also hold a joint appointment in the Division of Biostatistics of the Washington University School of Medicine.

Q. PLEASE REVIEW YOUR EDUCATIONAL BACKGROUND AND WORK EXPERIENCE.

A. I hold a Bachelor of Science, summa cum laude, in mathematics, awarded in 1962 by Xavier University, Cincinnati, Ohio. I hold a Master of Science (1963) and Ph.D. (1965) in mathematics awarded by the University of Chicago. I have served on the Faculty of Arts and Sciences of Washington University since 1969. I have held a joint appointment in the Division of Biostatistics since 1978. From 1965 to 1969, I was on the faculty of Northwestern University.

Attached to my testimony is Schedule ELS-1, which provides a more detailed listing of my education and qualifications in the area of mathematics and statistics.

PURPOSE AND SCOPE

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS CASE?

A. I have been employed by Missouri-American Water Company to make weather-normalized predictions of water utilization for the period January 2003 to December 2003.

Q. WHAT IS WEATHER NORMALIZATION?

A. From one year to the next, variations in temperature and precipitation lead to changes in water consumption. More water will generally be used during hotter, drier periods. The regulatory question is how to reflect those weather-related differences when setting rates.

For ratemaking purposes, revenues need to be set at as "normal" a level as possible, factoring out the potential or actual results of unusual weather conditions. This can be accomplished by building statistical models that predict water utilization from meteorological data and other possible predictors. An estimate of future utilization can then be made by using a long-term average of meteorological data and known values of the other predictors.

Q. WHAT ARE EXAMPLES OF THESE OTHER NON-METEOROLOGICAL PREDICTORS?

A. One is the year itself. Due to gradual introduction of water-conserving plumbing fixtures and appliances, in many regions use of water appears to be slowly declining over time. In other regions where the growth has led to new homes with

expansive lawns and/or larger commercial establishments, the use of water can increase over time.

Another is the month of the year. While water utilization increases during the warmer, drier summer months, analysis of variance shows that month as a categorical variable is a powerful predictor even after temperature and moisture have been included in the model.

Q. WHAT MODEL FOR WATER UTILIZATION DID YOU EMPLOY?

A. In a previous case before the Public Service Commission of the Commonwealth of Kentucky (1997), I screened a large number of candidate predictors by examining data from fourteen different operating systems in five states: Kentucky, Missouri, Ohio, Tennessee, and Virginia. Five of these fourteen operations were located in Missouri: Brunswick, Cottleville (St. Charles), Mexico, Parkville, and Warrensburg. I also received data from two other Missouri operations: Joplin and St. Joseph. Since these two systems were billed on a quarterly basis at that time of my study, they could not provide records on the numbers of customers billed in each billing cycle, so it was not possible to compute consumption on a per-customer basis.

I used as candidate predictors only those variables that correlated consistently with utilization for most or all of these operating companies.

Q. WHAT WERE SOME OF THE VARIABLES THAT MET THIS CRITERION?

A. For heat, both mean temperature and cooling degree days correlated strongly with utilization. For moisture, the Palmer Drought Severity Index correlated strongly with

utilization. Rainfall and the available soil moisture index used in Missouri at that time did not correlate nearly as well.

I then fitted the surviving candidates in a multivariate model to predict utilization. I found that calendar month was a strong predictor even in the presence of heat and moisture variables. Therefore, I included month as a categorical variable. With month included, I tested drought severity index, temperature, and calendar year as potential numeric predictors. I found that temperature was not a useful predictor in the presence of the other variables, so from that point onward, I did not use it.

For the months of January through April, there was no evidence that moisture predicted utilization. For the months of May through December, there was evidence of moisture predicting utilization, being a weak predictor in the months of May, June, November, and December, and a strong predictor for the months of July through October.

I tested truncated versions of the Palmer Drought Severity Index as predictors, finding that truncation at 0 yielded a slightly larger R-square than the non-truncated index and the index truncated at all other levels.

Month was a very strong predictor, both as a main effect and interacting with the drought severity index. Because of this, I estimated twelve separate predictive models, one for each month of the year.

Q. DID YOU RE-SCREEN FOR PREDICTORS IN THE PRESENT CASE?

A. For the present case, I screened those same predictors to estimate water utilization by fitting them to monthly or quarterly consumption data from January 1993 through December 2002, for six of the nine operating districts: Brunswick, Mexico, Parkville, Warrensburg, St. Charles County, and St. Louis County. In the case of Warrensburg, the numbers of commercial customers were too low during the ten-month period from October 1994 through July 1995. For Warrensburg commercial customers, I used the remaining 110 months of data. Jefferson City had only three years of billing information. The numbers of bills per cycle were not available for Joplin and St. Joseph, so these two companies' quarterly data could not be used. The only major difference I found was that the Palmer Drought Severity Index worked best with no truncation.

I then estimated monthly or quarterly consumption models for the six companies separately for residential and commercial customers, as well as for Other Public Authority customers of St. Louis County consumption. Each model potentially includes month as a categorical variable and separate monthly slopes for Palmer Drought Severity Index (for May through December) and year since 1990. Analyses of variance for these full models can be found in Schedule ELS-2. Both Type I (sequential) and Type III (partial) sums of squares and F-tests are given. The selection criterion for retaining a term in the model was based on its Type III sum of squares and F-test. If the drought severity index slopes as a group were not statistically significant, they were removed from the model. If the year since 1990

slopes as a group were not statistically significant, they were removed from the model. For Joplin and St. Joseph, I fitted models with the same predictors, except on an annual basis using the mean number of customers each year as the divisor to obtain the per-customer consumption.

Q. WHAT IS SERIAL CORRELATION?

A. Serial correlation is a positive or negative correlation of a time series with itself shifted in time. Formal statistical significance tests assume independence of the error term in the statistical model. That is, the error term is assumed not to have serial correlation.

Q. IS IT A PROBLEM IN THIS METHODOLOGY?

A. In these models, because of the use of monthly or quarterly data, there could be a slight positive correlation of the error term. This tends to increase the p-values (equivalent to making hypothesis tests slightly less significant). It does not cause the coefficient estimates to be biased. In the 1997 case before the Public Service Commission of the Commonwealth of Kentucky, I tested for this decreased statistical significance by using the SAS AUTOREG procedure. That was somewhat awkward because I needed to create individual dummy variables and it was hard to test them simultaneously as a set. In the current case, except for the St. Louis County quarterly-billed customers and the Joplin and St. Joseph customers, I have used the new MIXED procedure with an AR(1) (autoregressive order 1) error term. For the quarterly-billed customers, I used the SAS AUTOREG procedure in order to allow for an AR(3) error term. The results are displayed in Schedule ELS-3. Five models do not appear in Schedule ELS-3 because in

Schedule ELS-2 neither the drought severity index slopes nor the year since 1990 slopes were statistically significant. Since Joplin and St. Joseph were modeled on an annual basis, there is no problem with serial correlation, and hence they do not appear in Schedule ELS-3.

Q. DID ANY TERMS THAT WERE STATISTICALLY SIGNIFICANT IN SCHEDULE ELS-2 LOSE THAT SIGNIFICANCE IN SCHEDULE ELS-3 DUE TO SERIAL CORRELATION?

A. No, all terms that were statistically significant remained statistically significant. I therefore ran the reduced monthly, quarterly (for St. Louis County), and annual (for Joplin and St. Joseph) models with an option that their coefficients be printed. These coefficients appear in Schedule ELS-4.

Q. THE ST. JOSEPH COMMERCIAL MODEL INCLUDES YEAR SINCE 1990, YET THIS TERM WAS NOT STATISTICALLY SIGNIFICANT IN SCHEDULE ELS-2. PLEASE EXPLAIN THIS EXCEPTION.

A. The overall model for St. Joseph commercial customers was statistically significant, ($F = 6.66$, P-value = 0.0240) which indicates that consumption can be predicted from the drought severity index and/or year since 1990. However, neither of these terms is statistically significant in the presence of the other. This is due to the condition of co linearity, in which the explanatory variables are correlated with each other. That is, each variable can partly substitute for the other. Since I did not wish to lose the ability to predict utilization, I ran simple regressions of annual consumption on each of the drought severity index and year since 1990 by

themselves. Year since 1990 turned out to be the stronger predictor, with a P-value of 0.0065, which made it worthwhile to base a predictive model on it.

Q. ONCE YOU HAD ESTIMATED THE COEFFICIENTS IN THESE MODELS, HOW DID YOU PROJECT UTILIZATION FOR JANUARY 2003 THROUGH DECEMBER 2003?

A. For the six operating companies for which I was able to fit monthly or quarterly models, I inserted the thirty-year averages (from 1973 to 2002) of the Palmer Drought Severity Index for each of the months of April through December and the value 13 for the variable year since 1990 into those models. This resulted in twelve predicted values, one for each month of 2003. I then computed a weighted average of these values, with weights equal to the number of days in the month or quarter preceding the billing month. This weighted average is the projected daily per-customer consumption for the year 2003, for average weather. For Joplin and St. Joseph, I did the same computation, except on an annual basis. The resulting estimates are given in Schedule ELS-4. In that case, I did not need a weighted average since I was already estimating average daily consumption over an entire year.

Q. NOT ALL OF THE COEFFICIENT ESTIMATES IN SCHEDULE ELS-4 ARE STATISTICALLY SIGNIFICANT. IS THIS A PROBLEM?

A. No. The candidate categorical variables were obtained as described above, by examining data from all the different water systems, selecting those that correlated with utilization over most or all of those companies. They were then subjected to the further requirement that they had to be statistically significant in the predictive

model for residential, commercial, or other public authority within the given water system. Once those variables were selected, the resulting estimates based on their dummy codes will be unbiased. If the dummy codes were subject to further selection based on statistical significance, there is a chance that a small amount of bias could result.

Q. WHAT ARE YOUR PROJECTIONS OF DAILY UTILIZATION UNDER AVERAGE WEATHER BY CUSTOMER AND OPERATING DISTRICT?

A. These projections are given in Schedule ELS-5.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

Edward L. Spitznagel, Jr.

Born: Cincinnati, Ohio, September 4, 1941.

Education:

Xavier University, 1959-1962
Awarded Bachelor of Science Degree (Summa Cum Laude), 1962

University of Chicago, 1962-1965
Awarded Master of Science Degree, 1963
Awarded Ph.D. in Mathematics, 1965

Scholarships and Fellowships:

Xavier University, 1959-1962
Honorary Woodrow Wilson Fellow, 1962-1963
National Science Foundation Fellow, 1962-1965

Positions:

Assistant Professor of Mathematics
Northwestern University, 1965-1969

Associate Professor of Mathematics
Washington University, 1969-1980

Professor of Mathematics
Washington University, 1980-present

Joint appointment, Division of Biostatistics,
Washington University School of Medicine, 1978-present

Consulting Experience:

Litton Industries (USACDCEC, Fort Ord, CA)
Price Waterhouse (Advanced Auditing Methods, NY)
Mallinckrodt, Inc.
St. Louis County Juvenile Court
Monsanto Company
American Red Cross
Carboline Corporation
Regional Justice Information Service
Harris-Stowe State College
Equal Employment Opportunity Commission
American Optometric Association
Petrolite Corporation
U.S. Army Atmospheric Sciences Laboratory (White Sands, NM)
St. Louis County Water Company
Gateway Medical Research, Inc.
MasterCard
Missouri-American Water Company
Capital City Water Company
Kentucky-American Water Company
Tennessee-American Water Company
Anheuser-Busch, Inc.
Santa Clara County Mental Health Administration (San Jose, CA)

Publications:

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20. K.W.I.C. indexes with SAS. *Proceedings of the Third Annual Conference of SAS Users Group International,* 267-270 (1978).

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23. Interfacing SAS with Mark IV. *Proceedings of the Fourth Annual Conference of SAS Users Group International,* 41-44 (1979).

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99. Subjective reports of withdrawal among cocaine users: recommendations for DSM-IV. *Drug and Alcohol Dependence* **33**, 97-104 (1993). (With Cottler et al.)

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Full model regressions by month: Brunswick, JAN1993-DEC2002 1
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions by month: Brunswick, JAN1993-DEC2002 2
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	8921.21963	287.78128	1.83	0.0147
Error	88	13820.04403	157.04595		
Corrected Total	119	22741.26366			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.392292	9.904740	12.53180	126.5232

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	5072.461292	461.132845	2.94	0.0024
pdsi*month	8	2337.893603	292.236700	1.86	0.0764
since_90*month	12	1510.864738	125.905395	0.80	0.6477

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	1973.991842	179.453804	1.14	0.3389
pdsi*month	8	1442.623584	180.327948	1.15	0.3398
since_90*month	12	1510.864738	125.905395	0.80	0.6477

Full model regressions by month: Brunswick, JAN1993-DEC2002 3
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions by month: Brunswick, JAN1993-DEC2002 4
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	87311.3774	2816.4960	3.57	<.0001
Error	88	69504.5197	789.8241		
Corrected Total	119	156815.8971			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.556776	13.58533	28.10381	206.8687

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	59743.25619	5431.20511	6.88	<.0001
pdsi*month	8	8053.16849	1006.64606	1.27	0.2671
since_90*month	12	19514.95272	1626.24606	2.06	0.0280

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	9566.85463	869.71406	1.10	0.3700
pdsi*month	8	4971.30155	621.41269	0.79	0.6155
since_90*month	12	19514.95272	1626.24606	2.06	0.0280

Full model regressions by year: Joplin, JAN1993-DEC2002 5
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The GLM Procedure

Number of observations 10

Full model regressions by year: Joplin, JAN1993-DEC2002 6
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	226.4066403	113.2033201	1.93	0.2155
Error	7	411.2844305	58.7549186		
Corrected Total	9	637.6910707			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.355041	3.872354	7.665176	197.9462

Source	DF	Type I SS	Mean Square	F Value	Pr > F
pdsi	1	215.4763291	215.4763291	3.67	0.0970
since_90	1	10.9303112	10.9303112	0.19	0.6792

Source	DF	Type III SS	Mean Square	F Value	Pr > F
pdsi	1	147.8497537	147.8497537	2.52	0.1567
since_90	1	10.9303112	10.9303112	0.19	0.6792

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	205.3622456	11.49844461	17.86	<.0001
pdsi	-3.6236849	2.28434784	-1.59	0.1567
since_90	-0.5523970	1.28072871	-0.43	0.6792

Full model regressions by year: Joplin, JAN1993-DEC2002 7
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The GLM Procedure

Number of observations 10

Full model regressions by year: Joplin, JAN1993-DEC2002 8
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	525.713426	262.856713	0.61	0.5693
Error	7	3010.506554	430.072365		
Corrected Total	9	3536.219980			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.148665	2.394198	20.73819	866.1851

Source	DF	Type I SS	Mean Square	F Value	Pr > F
pdsi	1	390.2009183	390.2009183	0.91	0.3726
since_90	1	135.5125074	135.5125074	0.32	0.5921

Source	DF	Type III SS	Mean Square	F Value	Pr > F
pdsi	1	18.1452161	18.1452161	0.04	0.8431
since_90	1	135.5125074	135.5125074	0.32	0.5921

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	852.7441087	31.10912180	27.41	<.0001
pdsi	-1.2694663	6.18031895	-0.21	0.8431
since_90	1.9450229	3.46502042	0.56	0.5921

Full model regressions by month: Mexico, JAN1993-DEC2002 9
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions by month: Mexico, JAN1993-DEC2002 10
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	27754.43542	895.30437	4.08	<.0001
Error	88	19297.31370	219.28766		
Corrected Total	119	47051.74912			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.589870	9.433098	14.80836	156.9830

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	14912.73433	1355.70312	6.18	<.0001
pdsi*month	8	2049.15895	256.14487	1.17	0.3275
since_90*month	12	10792.54215	899.37851	4.10	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	9021.34492	820.12227	3.74	0.0002
pdsi*month	8	3832.07742	479.00968	2.18	0.0361
since_90*month	12	10792.54215	899.37851	4.10	<.0001

Full model regressions by month: Mexico, JAN1993-DEC2002 11
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions by month: Mexico, JAN1993-DEC2002 12
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	437345.460	14107.918	1.98	0.0069
Error	88	627044.511	7125.506		
Corrected Total	119	1064389.971			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.410888	14.55205	84.41271	580.0745

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	298458.9393	27132.6308	3.81	0.0002
pdsi*month	8	43151.9560	5393.9945	0.76	0.6412
since_90*month	12	95734.5649	7977.8804	1.12	0.3549

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	59732.08309	5430.18937	0.76	0.6763
pdsi*month	8	22334.10720	2791.76340	0.39	0.9223
since_90*month	12	95734.56488	7977.88041	1.12	0.3549

Full model regressions by month: Parkville, JAN1993-DEC2002 13
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions by month: Parkville, JAN1993-DEC2002 14
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	419389.4385	13528.6916	11.08	<.0001
Error	88	107416.8799	1220.6464		
Corrected Total	119	526806.3183			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.796098	12.52692	34.93775	278.9014

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	324458.8239	29496.2567	24.16	<.0001
pdsi*month	8	70522.8042	8815.3505	7.22	<.0001
since_90*month	12	24407.8104	2033.9842	1.67	0.0882

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	15898.87886	1445.35262	1.18	0.3097
pdsi*month	8	27356.06056	3419.50757	2.80	0.0082
since_90*month	12	24407.81042	2033.98420	1.67	0.0882

Full model regressions by month: Parkville, JAN1993-DEC2002 15
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions by month: Parkville, JAN1993-DEC2002 16
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	3035556.183	97921.167	7.31	<.0001
Error	88	1179118.809	13399.077		
Corrected Total	119	4214674.992			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.720235	13.77484	115.7544	840.3318

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	1865363.507	169578.501	12.66	<.0001
pdsi*month	8	720368.661	90046.083	6.72	<.0001
since_90*month	12	449824.014	37485.335	2.80	0.0028

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	58411.4621	5310.1329	0.40	0.9541
pdsi*month	8	104699.4757	13087.4345	0.98	0.4595
since_90*month	12	449824.0145	37485.3345	2.80	0.0028

Full model regressions by month: St Charles, JAN1993-DEC2002 17
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions by month: St Charles, JAN1993-DEC2002 18
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	613743.2826	19798.1704	30.12	<.0001
Error	88	57852.8127	657.4183		
Corrected Total	119	671596.0953			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.913858	9.561567	25.64017	268.1587

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	559912.2575	50901.1143	77.43	<.0001
pdsi*month	8	44700.4555	5587.5569	8.50	<.0001
since_90*month	12	9130.5697	760.8808	1.16	0.3263

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	45654.94515	4150.44956	6.31	<.0001
pdsi*month	8	32316.14890	4039.51861	6.14	<.0001
since_90*month	12	9130.56966	760.88080	1.16	0.3263

Full model regressions by month: St Charles, JAN1993-DEC2002 19
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions by month: St Charles, JAN1993-DEC2002 20
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	7689956.959	248063.128	13.06	<.0001
Error	88	1671575.615	18995.177		
Corrected Total	119	9361532.573			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.821442	10.67010	137.8230	1291.675

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	6821697.695	620154.336	32.65	<.0001
pdsi*month	8	818893.728	102361.716	5.39	<.0001
since_90*month	12	49365.536	4113.795	0.22	0.9973

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	876743.2014	79703.9274	4.20	<.0001
pdsi*month	8	698669.5386	87333.6923	4.60	0.0001
since_90*month	12	49365.5358	4113.7946	0.22	0.9973

Full model regressions by year: St Joseph, JAN1993-DEC2002 21
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The GLM Procedure

Number of observations 10

Full model regressions by year: St Joseph, JAN1993-DEC2002 22
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	384.9903956	192.4951978	4.21	0.0631
Error	7	320.1426202	45.7346600		
Corrected Total	9	705.1330159			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.545983	3.744343	6.762741	180.6122

Source	DF	Type I SS	Mean Square	F Value	Pr > F
pdsi	1	68.8122812	68.8122812	1.50	0.2596
since_90	1	316.1781144	316.1781144	6.91	0.0339

Source	DF	Type III SS	Mean Square	F Value	Pr > F
pdsi	1	322.0073366	322.0073366	7.04	0.0328
since_90	1	316.1781144	316.1781144	6.91	0.0339

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	207.3052768	9.66262342	21.45	<.0001
pdsi	-3.7914158	1.42886520	-2.65	0.0328
since_90	-2.5991555	0.98852827	-2.63	0.0339

Full model regressions by year: St Joseph, JAN1993-DEC2002 23
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The GLM Procedure

Number of observations 10

Full model regressions by year: St Joseph, JAN1993-DEC2002 24
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	6969.37832	3484.68916	6.66	0.0240
Error	7	3663.78930	523.39847		
Corrected Total	9	10633.16762			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.655438	2.748822	22.87790	832.2802

Source	DF	Type I SS	Mean Square	F Value	Pr > F
pdsi	1	4526.960212	4526.960212	8.65	0.0217
since_90	1	2442.418109	2442.418109	4.67	0.0676

Source	DF	Type III SS	Mean Square	F Value	Pr > F
pdsi	1	330.073800	330.073800	0.63	0.4532
since_90	1	2442.418109	2442.418109	4.67	0.0676

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	785.3893751	32.68801523	24.03	<.0001
pdsi	-3.8386106	4.83375635	-0.79	0.4532
since_90	7.2239773	3.34412568	2.16	0.0676

Full model regressions for customers billed monthly: St Louis, JAN1993-DEC20 25
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions for customers billed monthly: St Louis, JAN1993-DEC20 26
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	444949701.2	14353216.2	2.96	<.0001
Error	88	427346141.8	4856206.2		
Corrected Total	119	872295843.0			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.510090	13.00755	2203.680	16941.55

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	174352494.1	15850226.7	3.26	0.0009
pdsi*month	8	37058406.6	4632300.8	0.95	0.4772
since_90*month	12	233538800.5	19461566.7	4.01	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	36098889.8	3281717.3	0.68	0.7578
pdsi*month	8	35889171.3	4486146.4	0.92	0.5010
since_90*month	12	233538800.5	19461566.7	4.01	<.0001

Full model regressions for customers billed monthly: St Louis, JAN1993-DEC20 27
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions for customers billed monthly: St Louis, JAN1993-DEC20 28
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	3657958069	117998647	69.04	<.0001
Error	88	150396963	1709056		
Corrected Total	119	3808355032			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.960509	9.119407	1307.309	14335.46

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	3406141773	309649252	181.18	<.0001
pdsi*month	8	188681876	23585235	13.80	<.0001
since_90*month	12	63134420	5261202	3.08	0.0011

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	306521330.6	27865575.5	16.30	<.0001
pdsi*month	8	151640541.4	18955067.7	11.09	<.0001
since_90*month	12	63134420.1	5261201.7	3.08	0.0011

Full model regressions for customers billed quarterly: St Louis, JAN1993-DEC2 29
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions for customers billed quarterly: St Louis, JAN1993-DEC2 30
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	263630.4413	8504.2078	47.80	<.0001
Error	88	15655.1481	177.8994		
Corrected Total	119	279285.5895			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.943946	4.839892	13.33789	275.5825

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	244041.3920	22185.5811	124.71	<.0001
avg_pdsi*month	8	17712.4813	2214.0602	12.45	<.0001
since_90*month	12	1876.5681	156.3807	0.88	0.5708

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	22533.11046	2048.46459	11.51	<.0001
avg_pdsi*month	8	13647.95322	1705.99415	9.59	<.0001
since_90*month	12	1876.56808	156.38067	0.88	0.5708

Full model regressions for customers billed quarterly: St Louis, JAN1993-DEC2 31
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions for customers billed quarterly: St Louis, JAN1993-DEC2 32
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	4360140.082	140649.680	55.11	<.0001
Error	88	224575.308	2551.992		
Corrected Total	119	4584715.390			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.951017	5.014470	50.51725	1007.429

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	3854926.365	350447.851	137.32	<.0001
avg_pdsi*month	8	123814.558	15476.820	6.06	<.0001
since_90*month	12	381399.159	31783.263	12.45	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	113826.8951	10347.8996	4.05	<.0001
avg_pdsi*month	8	16030.0453	2003.7557	0.79	0.6169
since_90*month	12	381399.1586	31783.2632	12.45	<.0001

Full model regressions for Other Public Authorities: St Louis, JAN1993-DEC20 33
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions for Other Public Authorities: St Louis, JAN1993-DEC20 34
OPA MONTHLY 00:11 Wednesday, May 7, 2003

The GLM Procedure

Dependent Variable: opam_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	19681608451	634890595	30.63	<.0001
Error	88	1823966402	20726891		
Corrected Total	119	21505574853			

R-Square	Coeff Var	Root MSE	opam_gallons Mean
0.915186	29.39318	4552.680	15488.90

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	18530070710	1684551883	81.27	<.0001
pdsi*month	8	870760106	108845013	5.25	<.0001
since_90*month	12	280777635	23398136	1.13	0.3477

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	1934435546	175857777	8.48	<.0001
pdsi*month	8	716302185	89537773	4.32	0.0002
since_90*month	12	280777635	23398136	1.13	0.3477

Full model regressions for Other Public Authorities: St Louis, JAN1993-DEC20 35
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions for Other Public Authorities: St Louis, JAN1993-DEC20 36
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The GLM Procedure

Dependent Variable: opaq_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	35	39188011.07	1119657.46	8.47	<.0001
Error	84	11109360.05	132254.29		
Corrected Total	119	50297371.12			

R-Square	Coeff Var	Root MSE	opaq_gallons Mean
0.779126	31.27016	363.6678	1162.987

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	29264470.02	2660406.37	20.12	<.0001
avg_pdsi*month	12	2316098.88	193008.24	1.46	0.1563
since_90*month	12	7607442.16	633953.51	4.79	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	1428333.314	129848.483	0.98	0.4694
avg_pdsi*month	12	748317.871	62359.823	0.47	0.9260
since_90*month	12	7607442.165	633953.514	4.79	<.0001

Full model regressions by month: Warrensburg, JAN1993-DEC2002 37
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

Full model regressions by month: Warrensburg, JAN1993-DEC2002 38
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	53283.02134	1718.80714	4.64	<.0001
Error	88	32617.96055	370.65864		
Corrected Total	119	85900.98189			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.620284	10.58625	19.25250	181.8633

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	39740.75298	3612.79573	9.75	<.0001
pdsi*month	8	6722.06208	840.25776	2.27	0.0297
since_90*month	12	6820.20628	568.35052	1.53	0.1274

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	6821.482790	620.134799	1.67	0.0928
pdsi*month	8	6030.424670	753.803084	2.03	0.0514
since_90*month	12	6820.206279	568.350523	1.53	0.1274

Full model regressions by month: Warrensburg, JAN1993-DEC2002 39
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 120

NOTE: Due to missing values, only 110 observations can be used in this analysis.

Full model regressions by month: Warrensburg, JAN1993-DEC2002 40
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	459299.9061	14816.1260	2.97	<.0001
Error	78	388938.0304	4986.3850		
Corrected Total	109	848237.9365			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.541475	8.219568	70.61434	859.1004

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	226104.4726	20554.9521	4.12	<.0001
pdsi*month	8	83530.4648	10441.3081	2.09	0.0462
since_90*month	12	149664.9687	12472.0807	2.50	0.0078

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	43744.9547	3976.8141	0.80	0.6419
pdsi*month	8	36502.4375	4562.8047	0.92	0.5087
since_90*month	12	149664.9687	12472.0807	2.50	0.0078

Mixed model regressions by month: Brunswick, JAN1993-DEC2002 1
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The Mixed Procedure

Model Information

Data Set	WORK.PREDICT
Dependent Variable	com_gallons
Covariance Structure	Autoregressive
Subject Effect	Intercept
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Dimensions

Covariance Parameters	2
Columns in X	25
Columns in Z	0
Subjects	1
Max Obs Per Subject	120
Observations Used	120
Observations Not Used	0
Total Observations	120

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	991.79343393	
1	2	989.15867603	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
AR(1)	Intercept	-0.1643
Residual		775.51

Fit Statistics

-2 Res Log Likelihood	989.2
AIC (smaller is better)	993.2
AICC (smaller is better)	993.3
BIC (smaller is better)	998.3

Mixed model regressions by month: Brunswick, JAN1993-DEC2002 2
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The Mixed Procedure

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
1	2.63	0.1045

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
month	11	96	1.27	0.2521
since_90*month	12	96	2.93	0.0017

Mixed model regressions by month: Mexico, JAN1993-DEC2002 3
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The Mixed Procedure

Model Information

Data Set	WORK.PREDICT
Dependent Variable	res_gallons
Covariance Structure	Autoregressive
Subject Effect	Intercept
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Dimensions

Covariance Parameters	2
Columns in X	37
Columns in Z	0
Subjects	1
Max Obs Per Subject	120
Observations Used	120
Observations Not Used	0
Total Observations	120

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	831.97172907	
1	2	827.56836844	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
AR(1)	Intercept	-0.2219
Residual		218.93

Fit Statistics

-2 Res Log Likelihood	827.6
AIC (smaller is better)	831.6
AICC (smaller is better)	831.7
BIC (smaller is better)	836.5

Mixed model regressions by month: Mexico, JAN1993-DEC2002 4
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The Mixed Procedure

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
1	4.40	0.0359

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
month	11	88	4.21	<.0001
pdsi*month	8	88	2.79	0.0084
since_90*month	12	88	4.95	<.0001

Mixed model regressions by month: Parkville, JAN1993-DEC2002 5
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The Mixed Procedure

Model Information

Data Set	WORK.PREDICT
Dependent Variable	res_gallons
Covariance Structure	Autoregressive
Subject Effect	Intercept
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Dimensions

Covariance Parameters	2
Columns in X	25
Columns in Z	0
Subjects	1
Max Obs Per Subject	120
Observations Used	120
Observations Not Used	0
Total Observations	120

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1061.71382812	
1	2	1060.51379780	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
AR(1)	Intercept	-0.1161
Residual		1319.71

Fit Statistics

-2 Res Log Likelihood	1060.5
AIC (smaller is better)	1064.5
AICC (smaller is better)	1064.6
BIC (smaller is better)	1069.7

The Mixed Procedure

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
1	1.20	0.2733

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
month	11	100	29.31	<.0001
pdsi*month	8	100	8.52	<.0001

Mixed model regressions by month: Parkville, JAN1993-DEC2002 7
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The Mixed Procedure

Model Information

Data Set	WORK.PREDICT
Dependent Variable	com_gallons
Covariance Structure	Autoregressive
Subject Effect	Intercept
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Dimensions

Covariance Parameters	2
Columns in X	25
Columns in Z	0
Subjects	1
Max Obs Per Subject	120
Observations Used	120
Observations Not Used	0
Total Observations	120

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1265.11689875	
1	2	1261.30731383	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
AR(1)	Intercept	0.1985
Residual		13375

Fit Statistics

-2 Res Log Likelihood	1261.3
AIC (smaller is better)	1265.3
AICC (smaller is better)	1265.4
BIC (smaller is better)	1270.4

Mixed model regressions by month: Parkville, JAN1993-DEC2002 8
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The Mixed Procedure

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
1	3.81	0.0510

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
month	11	96	0.32	0.9799
since_90*month	12	96	4.65	<.0001

Mixed model regressions by month: St Charles, JAN1993-DEC2002 9
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The Mixed Procedure

Model Information

Data Set	WORK.PREDICT
Dependent Variable	res_gallons
Covariance Structure	Autoregressive
Subject Effect	Intercept
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Dimensions

Covariance Parameters	2
Columns in X	25
Columns in Z	0
Subjects	1
Max Obs Per Subject	120
Observations Used	120
Observations Not Used	0
Total Observations	120

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	991.21348044	
1	2	988.10257286	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
AR(1)	Intercept	0.1754
Residual		669.23

Fit Statistics

-2 Res Log Likelihood	988.1
AIC (smaller is better)	992.1
AICC (smaller is better)	992.2
BIC (smaller is better)	997.3

Mixed model regressions by month: St Charles, JAN1993-DEC2002 10
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The Mixed Procedure

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
1	3.11	0.0778

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
month	11	100	54.26	<.0001
pdsi*month	8	100	6.64	<.0001

The Mixed Procedure

Model Information

Data Set	WORK.PREDICT
Dependent Variable	com_gallons
Covariance Structure	Autoregressive
Subject Effect	Intercept
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Dimensions

Covariance Parameters	2
Columns in X	25
Columns in Z	0
Subjects	1
Max Obs Per Subject	120
Observations Used	120
Observations Not Used	0
Total Observations	120

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1315.83168402	
1	2	1281.00635570	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
AR(1)	Intercept	0.5558
Residual		17375

Fit Statistics

-2 Res Log Likelihood	1281.0
AIC (smaller is better)	1285.0
AICC (smaller is better)	1285.1
BIC (smaller is better)	1290.2

The Mixed Procedure

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
1	34.83	<.0001

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
month	11	100	20.03	<.0001
pdsi*month	8	100	4.14	0.0003

Mixed model regressions for monthly billed customers: St Louis, JAN1993-DEC20 13
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The Mixed Procedure

Model Information

Data Set	WORK.PREDICT
Dependent Variable	res_gallons
Covariance Structure	Autoregressive
Subject Effect	Intercept
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Dimensions

Covariance Parameters	2
Columns in X	25
Columns in Z	0
Subjects	1
Max Obs Per Subject	120
Observations Used	120
Observations Not Used	0
Total Observations	120

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1830.40296162	
1	2	1779.81604884	0.00000004
2	1	1779.81601899	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
AR(1)	Intercept	0.6745
Residual		5196334

Fit Statistics

-2 Res Log Likelihood	1779.8
AIC (smaller is better)	1783.8
AICC (smaller is better)	1783.9
BIC (smaller is better)	1788.9

Mixed model regressions for monthly billed customers: St Louis, JAN1993-DEC20 14
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The Mixed Procedure

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
1	50.59	<.0001

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
month	11	96	3.49	0.0004
since_90*month	12	96	2.78	0.0027

Mixed model regressions for monthly billed customers: St Louis, JAN1993-DEC20 15
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The Mixed Procedure

Model Information

Data Set	WORK.PREDICT
Dependent Variable	com_gallons
Covariance Structure	Autoregressive
Subject Effect	Intercept
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Dimensions

Covariance Parameters	2
Columns in X	37
Columns in Z	0
Subjects	1
Max Obs Per Subject	120
Observations Used	120
Observations Not Used	0
Total Observations	120

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1620.54567738	
1	2	1620.13042264	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
AR(1)	Intercept	0.06824
Residual		1708641

Fit Statistics

-2 Res Log Likelihood	1620.1
AIC (smaller is better)	1624.1
AICC (smaller is better)	1624.3
BIC (smaller is better)	1629.1

Mixed model regressions for monthly billed customers: St Louis, JAN1993-DEC20 16
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The Mixed Procedure

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
1	0.42	0.5193

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
month	11	88	14.86	<.0001
pdsi*month	8	88	10.82	<.0001
since_90*month	12	88	3.09	0.0011

AR(3) regressions for quarterly billed customers: St Louis, JAN1993-DEC2002 17
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The AUTOREG Procedure

Dependent Variable res_gallons

Ordinary Least Squares Estimates

SSE	17531.7162	DFE	100
MSE	175.31716	Root MSE	13.24074
SBC	1034.4081	AIC	978.658264
Regress R-Square	0.9372	Total R-Square	0.9372
Durbin-Watson	0.9156		

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	254.2996	4.5208	56.25	<.0001
jan	1	-15.1840	6.1619	-2.46	0.0154
feb	1	5.1138	6.1619	0.83	0.4086
mar	1	-28.0687	6.1619	-4.56	<.0001
apr	1	-39.5463	6.1619	-6.42	<.0001
may	1	-0.1517	7.1781	-0.02	0.9832
jun	1	-10.6011	7.7775	-1.36	0.1759
jul	1	26.7931	8.1500	3.29	0.0014
aug	1	109.0608	7.7372	14.10	<.0001
sep	1	105.7981	7.1783	14.74	<.0001
oct	1	108.9449	6.7963	16.03	<.0001
nov	1	50.9870	6.5127	7.83	<.0001
may_avg_pdsi	1	0.2404	2.4688	0.10	0.9226
jun_avg_pdsi	1	1.1404	2.9019	0.39	0.6952
jul_avg_pdsi	1	3.1920	3.1013	1.03	0.3058
aug_avg_pdsi	1	-10.0127	2.7825	-3.60	0.0005
sep_avg_pdsi	1	-11.5724	2.3023	-5.03	<.0001
oct_avg_pdsi	1	-13.6732	2.0115	-6.80	<.0001
nov_avg_pdsi	1	-5.4464	1.7378	-3.13	0.0023
dec_avg_pdsi	1	-4.0887	1.7328	-2.36	0.0202

Test 1

Source	DF	Mean Square	F Value	Pr > F
Numerator	8	2214.060160	12.63	<.0001
Denominator	100	175.317162		

Estimates of Autocorrelations

Lag	Covariance	Correlation	-1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
0	146.1	1.000000	|**********|
1	79.0126	0.540820	|********** |
2	39.9924	0.273737	|***** |
3	19.4233	0.132947	|*** |

Preliminary MSE 103.3

AR(3) regressions for quarterly billed customers: St Louis, JAN1993-DEC2002 18
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The AUTOREG Procedure

Estimates of Autoregressive Parameters

Lag	Coefficient	Standard Error	t Value
1	-0.554977	0.101532	-5.47
2	0.022821	0.116098	0.20
3	0.006629	0.101532	0.07

Yule-Walker Estimates

SSE	12098.7932	DFE	97
MSE	124.72983	Root MSE	11.16825
SBC	1004.6094	AIC	940.497094
Regress R-Square	0.9133	Total R-Square	0.9567
Durbin-Watson	1.9286		

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	252.7240	4.3878	57.60	<.0001
jan	1	-13.9530	4.4029	-3.17	0.0020
feb	1	6.5030	5.3039	1.23	0.2231
mar	1	-26.5848	5.7122	-4.65	<.0001
apr	1	-38.0150	5.8961	-6.45	<.0001
may	1	2.3942	6.6919	0.36	0.7213
jun	1	-5.4121	7.3498	-0.74	0.4633
jul	1	31.2240	7.7139	4.05	0.0001
aug	1	110.2787	7.3204	15.06	<.0001
sep	1	106.2854	6.6111	16.08	<.0001
oct	1	109.3775	5.7743	18.94	<.0001
nov	1	51.5372	4.4077	11.69	<.0001
may_avg_pdsi	1	-0.4243	2.0250	-0.21	0.8345
jun_avg_pdsi	1	-1.0751	2.6082	-0.41	0.6811
jul_avg_pdsi	1	1.5297	2.8591	0.54	0.5939
aug_avg_pdsi	1	-9.8001	2.6340	-3.72	0.0003
sep_avg_pdsi	1	-10.8900	2.2162	-4.91	<.0001
oct_avg_pdsi	1	-12.8657	1.9613	-6.56	<.0001
nov_avg_pdsi	1	-4.5881	1.6608	-2.76	0.0069
dec_avg_pdsi	1	-2.4649	1.4594	-1.69	0.0944

Test 1

Source	DF	Mean Square	F Value	Pr > F
Numerator	8	886.937446	7.11	<.0001
Denominator	97	124.729827		

AR(3) regressions for quarterly billed customers: St Louis, JAN1993-DEC2002 19
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The AUTOREG Procedure

Dependent Variable com_gallons

Ordinary Least Squares Estimates

SSE	240605.353	DFE	96
MSE	2506	Root MSE	50.06302
SBC	1367.85564	AIC	1300.95584
Regress R-Square	0.9475	Total R-Square	0.9475
Durbin-Watson	1.2624		

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	851.8252	44.2660	19.24	<.0001
jan	1	-81.3605	62.6015	-1.30	0.1968
feb	1	-27.2124	62.6015	-0.43	0.6648
mar	1	-58.5664	62.6015	-0.94	0.3519
apr	1	-65.3661	62.6015	-1.04	0.2990
may	1	-30.7993	62.6015	-0.49	0.6239
jun	1	-64.6511	62.6015	-1.03	0.3043
jul	1	83.4818	62.6015	1.33	0.1855
aug	1	142.4691	62.6015	2.28	0.0251
sep	1	159.5561	62.6015	2.55	0.0124
oct	1	156.9483	62.6015	2.51	0.0139
nov	1	41.5494	62.6015	0.66	0.5085
jan_since_90	1	10.3835	5.5118	1.88	0.0626
feb_since_90	1	6.0575	5.5118	1.10	0.2745
mar_since_90	1	1.4982	5.5118	0.27	0.7863
apr_since_90	1	-0.6998	5.5118	-0.13	0.8992
may_since_90	1	8.1912	5.5118	1.49	0.1405
jun_since_90	1	19.8525	5.5118	3.60	0.0005
jul_since_90	1	15.4248	5.5118	2.80	0.0062
aug_since_90	1	39.4784	5.5118	7.16	<.0001
sep_since_90	1	32.5517	5.5118	5.91	<.0001
oct_since_90	1	33.9894	5.5118	6.17	<.0001
nov_since_90	1	32.7934	5.5118	5.95	<.0001
dec_since_90	1	15.3060	5.5118	2.78	0.0066

Test 1

Source	DF	Mean Square	F Value	Pr > F
Numerator	12	40765	16.27	<.0001
Denominator	96	2506.305764		

Estimates of Autocorrelations

Lag	Covariance	Correlation	-1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
0	2005.0	1.000000	|********************|
1	737.0	0.367564	|******* |
2	646.0	0.322182	|****** |
3	356.9	0.178025	|**** |

AR(3) regressions for quarterly billed customers: St Louis, JAN1993-DEC2002 20
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The AUTOREG Procedure

Preliminary MSE 1652.9

Estimates of Autoregressive Parameters

Lag	Coefficient	Standard Error	t Value
1	-0.286561	0.103693	-2.76
2	-0.214306	0.105552	-2.03
3	-0.006929	0.103693	-0.07

Yule-Walker Estimates

SSE	197934.446	DFE	93
MSE	2128	Root MSE	46.13380
SBC	1359.03258	AIC	1283.7703
Regress R-Square	0.9233	Total R-Square	0.9568
Durbin-Watson	2.0010		

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	857.1742	43.8147	19.56	<.0001
jan	1	-92.2514	52.7933	-1.75	0.0839
feb	1	-35.7032	54.1496	-0.66	0.5113
mar	1	-65.9694	57.9843	-1.14	0.2582
apr	1	-71.8866	59.2059	-1.21	0.2278
may	1	-36.7437	60.0523	-0.61	0.5421
jun	1	-70.1212	60.1505	-1.17	0.2467
jul	1	78.4602	59.7801	1.31	0.1926
aug	1	137.9467	58.5510	2.36	0.0206
sep	1	155.7586	56.9462	2.74	0.0075
oct	1	154.0106	51.8988	2.97	0.0038
nov	1	40.5351	50.3808	0.80	0.4231
jan_since_90	1	11.3096	5.4864	2.06	0.0421
feb_since_90	1	6.5850	5.5334	1.19	0.2371
mar_since_90	1	1.8468	5.5830	0.33	0.7416
apr_since_90	1	-0.4948	5.5962	-0.09	0.9297
may_since_90	1	8.3058	5.6027	1.48	0.1416
jun_since_90	1	19.8967	5.6048	3.55	0.0006
jul_since_90	1	15.4082	5.6048	2.75	0.0072
aug_since_90	1	39.3991	5.6027	7.03	<.0001
sep_since_90	1	32.3874	5.5962	5.79	<.0001
oct_since_90	1	33.7265	5.5830	6.04	<.0001
nov_since_90	1	32.3150	5.5334	5.84	<.0001
dec_since_90	1	14.7136	5.4864	2.68	0.0087

Test 1

Source	DF	Mean Square	F Value	Pr > F
Numerator	12	15356	7.21	<.0001
Denominator	93	2128.327374		

Mixed model regressions for Other Public Authorities: St Louis, JAN1993-DEC20 21
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The Mixed Procedure

Model Information

Data Set	WORK.PREDICT
Dependent Variable	opam_gallons
Covariance Structure	Autoregressive
Subject Effect	Intercept
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Dimensions

Covariance Parameters	2
Columns in X	25
Columns in Z	0
Subjects	1
Max Obs Per Subject	120
Observations Used	120
Observations Not Used	0
Total Observations	120

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	2026.73946596	
1	2	2026.64959633	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
AR(1)	Intercept	0.03003
Residual		21046875

Fit Statistics

-2 Res Log Likelihood	2026.6
AIC (smaller is better)	2030.6
AICC (smaller is better)	2030.8
BIC (smaller is better)	2035.9

Mixed model regressions for Other Public Authorities: St Louis, JAN1993-DEC20 22
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The Mixed Procedure

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
1	0.09	0.7643

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
month	11	100	64.22	<.0001
pdsi*month	8	100	5.01	<.0001

Mixed model regressions for Other Public Authorities: St Louis, JAN1993-DEC20 23
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The AUTOREG Procedure

Dependent Variable opaq_gallons

Ordinary Least Squares Estimates

SSE	11857677.9	DFE	96
MSE	123517	Root MSE	351.45053
SBC	1835.56438	AIC	1768.66458
Regress R-Square	0.7642	Total R-Square	0.7642
Durbin-Watson	2.2126		

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	1120	310.7543	3.60	0.0005
jan	1	-654.8180	439.4729	-1.49	0.1395
feb	1	-702.5323	439.4729	-1.60	0.1132
mar	1	-1092	439.4729	-2.48	0.0147
apr	1	-637.3999	439.4729	-1.45	0.1502
may	1	-733.5753	439.4729	-1.67	0.0983
jun	1	-777.6178	439.4729	-1.77	0.0800
jul	1	-142.6520	439.4729	-0.32	0.7462
aug	1	-5.5831	439.4729	-0.01	0.9899
sep	1	-871.8333	439.4729	-1.98	0.0501
oct	1	-187.5842	439.4729	-0.43	0.6705
nov	1	-385.6566	439.4729	-0.88	0.3824
jan_since_90	1	11.9609	38.6934	0.31	0.7579
feb_since_90	1	40.0536	38.6934	1.04	0.3032
mar_since_90	1	87.7500	38.6934	2.27	0.0256
apr_since_90	1	-4.0991	38.6934	-0.11	0.9159
may_since_90	1	61.8139	38.6934	1.60	0.1134
jun_since_90	1	124.0340	38.6934	3.21	0.0018
jul_since_90	1	56.8719	38.6934	1.47	0.1449
aug_since_90	1	115.1465	38.6934	2.98	0.0037
sep_since_90	1	227.9319	38.6934	5.89	<.0001
oct_since_90	1	57.7429	38.6934	1.49	0.1389
nov_since_90	1	103.0662	38.6934	2.66	0.0091
dec_since_90	1	11.9268	38.6934	0.31	0.7586

Test 1

Source	DF	Mean Square	F Value	Pr > F
Numerator	12	764602	6.19	<.0001
Denominator	96	123517		

Estimates of Autocorrelations

Lag	Covariance	Correlation	-1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
0	98814.0	1.000000	|********************|
1	-11178.4	-0.113126	**| |
2	-7360.0	-0.074483	*| |
3	33100.4	0.334977	|******* |

Mixed model regressions for Other Public Authorities: St Louis, JAN1993-DEC20 24
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The AUTOREG Procedure

Preliminary MSE 86725.5

Estimates of Autoregressive Parameters

Lag	Coefficient	Standard Error	t Value
1	0.094622	0.098158	0.96
2	0.048713	0.098517	0.49
3	-0.322419	0.098158	-3.28

Yule-Walker Estimates

SSE	10366448.4	DFE	93
MSE	111467	Root MSE	333.86702
SBC	1834.15659	AIC	1758.89431
Regress R-Square	0.8014	Total R-Square	0.7939
Durbin-Watson	1.9350		

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	1132	312.3289	3.62	0.0005
jan	1	-697.5809	463.7899	-1.50	0.1359
feb	1	-739.8848	459.0639	-1.61	0.1104
mar	1	-1047	375.1571	-2.79	0.0064
apr	1	-663.3240	458.9520	-1.45	0.1517
may	1	-755.0075	457.6357	-1.65	0.1024
jun	1	-768.9114	399.9085	-1.92	0.0576
jul	1	-160.4224	457.0398	-0.35	0.7264
aug	1	-20.5308	461.3232	-0.04	0.9646
sep	1	-873.8692	357.8447	-2.44	0.0165
oct	1	-201.2831	458.0922	-0.44	0.6614
nov	1	-396.5544	466.3353	-0.85	0.3973
jan_since_90	1	17.1025	39.0278	0.44	0.6622
feb_since_90	1	44.2985	39.0686	1.13	0.2598
mar_since_90	1	78.3837	39.0754	2.01	0.0478
apr_since_90	1	-1.7606	39.5327	-0.04	0.9646
may_since_90	1	63.4108	39.5476	1.60	0.1122
jun_since_90	1	120.6589	39.5468	3.05	0.0030
jul_since_90	1	57.8560	39.5468	1.46	0.1468
aug_since_90	1	115.6837	39.5476	2.93	0.0043
sep_since_90	1	226.4546	39.5327	5.73	<.0001
oct_since_90	1	58.0798	39.0754	1.49	0.1406
nov_since_90	1	103.0282	39.0686	2.64	0.0098
dec_since_90	1	10.4714	39.0278	0.27	0.7891

Test 1

Source	DF	Mean Square	F Value	Pr > F
Numerator	12	627151	5.63	<.0001
Denominator	93	111467		

Mixed model regressions by month: Warrensburg, JAN1993-DEC2002 25
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The Mixed Procedure

Model Information

Data Set	WORK.PREDICT
Dependent Variable	com_gallons
Covariance Structure	Autoregressive
Subject Effect	Intercept
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Dimensions

Covariance Parameters	2
Columns in X	25
Columns in Z	0
Subjects	1
Max Obs Per Subject	110
Observations Used	110
Observations Not Used	10
Total Observations	120

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1053.99384137	
1	2	1053.56447204	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
AR(1)	Intercept	0.07287
Residual		4948.03

Fit Statistics

-2 Res Log Likelihood	1053.6
AIC (smaller is better)	1057.6
AICC (smaller is better)	1057.7
BIC (smaller is better)	1062.5

Mixed model regressions by month: Warrensburg, JAN1993-DEC2002 26
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The Mixed Procedure

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
1	0.43	0.5123

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
month	11	86	1.05	0.4128
since_90*month	12	86	3.04	0.0013

Reduced model regressions by month: Brunswick, JAN1993-DEC2002 1
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions by month: Brunswick, JAN1993-DEC2002 2
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	5072.46129	461.13284	2.82	0.0029
Error	108	17668.80237	163.60002		
Corrected Total	119	22741.26366			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.223051	10.10931	12.79062	126.5232

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	5072.461292	461.132845	2.82	0.0029

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	5072.461292	461.132845	2.82	0.0029

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		125.7934333 B	4.04474995	31.10	<.0001
month	1	-0.1918527 B	5.72014024	-0.03	0.9733
month	2	8.8800183 B	5.72014024	1.55	0.1235
month	3	-3.2849272 B	5.72014024	-0.57	0.5670
month	4	-12.1056591 B	5.72014024	-2.12	0.0366
month	5	-1.6529333 B	5.72014024	-0.29	0.7732
month	6	-4.2771108 B	5.72014024	-0.75	0.4562
month	7	5.3452000 B	5.72014024	0.93	0.3522
month	8	4.1228892 B	5.72014024	0.72	0.4726
month	9	14.3893409 B	5.72014024	2.52	0.0134
month	10	-0.6352333 B	5.72014024	-0.11	0.9118
month	11	-1.8320462 B	5.72014024	-0.32	0.7494
month	12	0.0000000 B	.	.	.

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions by month: Brunswick, JAN1993-DEC2002 3
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	126.5558607	37.7148537	113.6877742	140.1827742

Reduced model regressions by month: Brunswick, JAN1993-DEC2002 4
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions by month: Brunswick, JAN1993-DEC2002 5
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	23	82340.0758	3580.0033	4.61	<.0001
Error	96	74475.8213	775.7898		
Corrected Total	119	156815.8971			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.525075	13.46409	27.85300	206.8687

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	59743.25619	5431.20511	7.00	<.0001
since_90*month	12	22596.81965	1883.06830	2.43	0.0085

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	10887.61787	989.78344	1.28	0.2501
since_90*month	12	22596.81965	1883.06830	2.43	0.0085

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		227.5528788	B	24.62776025	9.24	<.0001
month	1	-26.8364389	B	34.82891255	-0.77	0.4429
month	2	30.9256549	B	34.82891255	0.89	0.3768
month	3	13.2968698	B	34.82891255	0.38	0.7035
month	4	-39.9858348	B	34.82891255	-1.15	0.2538
month	5	16.1736909	B	34.82891255	0.46	0.6434
month	6	-25.6867380	B	34.82891255	-0.74	0.4626
month	7	45.2421455	B	34.82891255	1.30	0.1971
month	8	24.5254907	B	34.82891255	0.70	0.4830
month	9	44.2390978	B	34.82891255	1.27	0.2071
month	10	-4.5512182	B	34.82891255	-0.13	0.8963
month	11	-0.7934536	B	34.82891255	-0.02	0.9819
month	12	0.0000000	B	.	.	.
since_90*month	1	-2.9345748		3.06651476	-0.96	0.3410
since_90*month	2	-9.3304927		3.06651476	-3.04	0.0030
since_90*month	3	-5.7357097		3.06651476	-1.87	0.0645
since_90*month	4	-1.8304145		3.06651476	-0.60	0.5520
since_90*month	5	-5.8044182		3.06651476	-1.89	0.0614
since_90*month	6	3.7651554		3.06651476	1.23	0.2225
since_90*month	7	-3.2731232		3.06651476	-1.07	0.2885
since_90*month	8	-1.5558514		3.06651476	-0.51	0.6131
since_90*month	9	-7.0144829		3.06651476	-2.29	0.0244
since_90*month	10	-2.3482303		3.06651476	-0.77	0.4457
since_90*month	11	-3.4440782		3.06651476	-1.12	0.2642
since_90*month	12	-3.7949616		3.06651476	-1.24	0.2189

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions by month: Brunswick, JAN1993-DEC2002 6
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	187.1349552	187.0011986	137.1821290	250.8131613

Reduced model regressions by year: Joplin, JAN1993-DEC2002 7
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The GLM Procedure

Number of observations 11

NOTE: Due to missing values, only 10 observations can be used in this analysis.

The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	391826.8815	391826.8815	5530.02	<.0001
Error	9	637.6911	70.8546		
Uncorrected Total	10	392464.5726			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.000000	4.252426	8.417515	197.9462

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Intercept	1	391826.8815	391826.8815	5530.02	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Intercept	1	391826.8815	391826.8815	5530.02	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	197.9461749	2.66185205	74.36	<.0001

Reduced model regressions by year: Joplin, JAN1993-DEC2002 9
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
1	197.9461749	.	197.9461749	197.9461749

The GLM Procedure

Number of observations 11

NOTE: Due to missing values, only 10 observations can be used in this analysis.

Reduced model regressions by year: Joplin, JAN1993-DEC2002 11
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	7502766.881	7502766.881	19095.2	<.0001
Error	9	3536.220	392.913		
Uncorrected Total	10	7506303.101			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.000000	2.288430	19.82204	866.1851

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Intercept	1	7502766.881	7502766.881	19095.2	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Intercept	1	7502766.881	7502766.881	19095.2	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	866.1851350	6.26827992	138.19	<.0001

Reduced model regressions by year: Joplin, JAN1993-DEC2002 12
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
1	866.1851350	.	866.1851350	866.1851350

Reduced model regressions by month: Mexico, JAN1993-DEC2002 13
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions by month: Mexico, JAN1993-DEC2002 14
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	27754.43542	895.30437	4.08	<.0001
Error	88	19297.31370	219.28766		
Corrected Total	119	47051.74912			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.589870	9.433098	14.80836	156.9830

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	14912.73433	1355.70312	6.18	<.0001
pdsi*month	8	2049.15895	256.14487	1.17	0.3275
since_90*month	12	10792.54215	899.37851	4.10	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	9021.34492	820.12227	3.74	0.0002
pdsi*month	8	3832.07742	479.00968	2.18	0.0361
since_90*month	12	10792.54215	899.37851	4.10	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		150.1820495	B	14.95756558	10.04	<.0001
month	1	40.7178977	B	19.87892966	2.05	0.0435
month	2	25.8529359	B	19.87892966	1.30	0.1968
month	3	27.3846138	B	19.87892966	1.38	0.1718
month	4	-21.8770759	B	19.87892966	-1.10	0.2741
month	5	12.1696637	B	23.12059467	0.53	0.6000
month	6	-27.4690210	B	26.97261538	-1.02	0.3113
month	7	86.3061606	B	23.09906319	3.74	0.0003
month	8	57.1493322	B	22.66138270	2.52	0.0135
month	9	42.9469498	B	21.35888538	2.01	0.0474
month	10	29.8994477	B	20.74513990	1.44	0.1531
month	11	10.4414398	B	21.04132800	0.50	0.6210
month	12	0.0000000	B	.	.	.
pdsi*month	1	0.0000000	B	.	.	.
pdsi*month	2	0.0000000	B	.	.	.
pdsi*month	3	0.0000000	B	.	.	.
pdsi*month	4	0.0000000	B	.	.	.
pdsi*month	5	0.3496581	B	3.41242107	0.10	0.9186
pdsi*month	6	6.2980935	B	4.44862682	1.42	0.1604
pdsi*month	7	-5.9499680	B	3.29326326	-1.81	0.0742
pdsi*month	8	-7.5691054	B	2.96095717	-2.56	0.0123
pdsi*month	9	-4.1637044	B	2.11212625	-1.97	0.0518
pdsi*month	10	-0.4673934	B	2.09195738	-0.22	0.8237
pdsi*month	11	-0.3308375	B	1.96785205	-0.17	0.8669
pdsi*month	12	2.7615263	B	2.11981585	1.30	0.1961
since_90*month	1	-5.1374467		1.63034726	-3.15	0.0022
since_90*month	2	-3.8978905		1.63034726	-2.39	0.0189

The GLM Procedure

Dependent Variable: res_gallons

Parameter	Estimate	Standard Error	t Value	Pr > |t|
since_90*month 3	-3.4397832	1.63034726	-2.11	0.0377
since_90*month 4	1.2572336	1.63034726	0.77	0.4427
since_90*month 5	-1.5371106	1.78676188	-0.86	0.3920
since_90*month 6	4.2706468	2.21586168	1.93	0.0572
since_90*month 7	-7.2041710	1.81823599	-3.96	0.0002
since_90*month 8	-2.6547508	1.80067748	-1.47	0.1440
since_90*month 9	-1.9356392	1.76250024	-1.10	0.2751
since_90*month 10	-3.3479084	1.69170582	-1.98	0.0509
since_90*month 11	-1.6693079	1.74799083	-0.95	0.3422
since_90*month 12	0.7303599	1.80970268	0.40	0.6875

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions by month: Mexico, JAN1993-DEC2002 16
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	146.5302001	101.5565809	124.1131398	183.2888063

Reduced model regressions by month: Mexico, JAN1993-DEC2002 17
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions by month: Mexico, JAN1993-DEC2002 18
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	298458.939	27132.631	3.83	0.0001
Error	108	765931.032	7091.954		
Corrected Total	119	1064389.971			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.280404	14.51775	84.21374	580.0745

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	298458.9393	27132.6308	3.83	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	298458.9393	27132.6308	3.83	0.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		566.6064000	B	26.63072285	21.28	<.0001
month	1	-5.4326258	B	37.66152944	-0.14	0.8856
month	2	-32.0480452	B	37.66152944	-0.85	0.3967
month	3	-0.6357929	B	37.66152944	-0.02	0.9866
month	4	-22.2347871	B	37.66152944	-0.59	0.5562
month	5	-19.5525667	B	37.66152944	-0.52	0.6047
month	6	-4.8460452	B	37.66152944	-0.13	0.8979
month	7	82.8788333	B	37.66152944	2.20	0.0299
month	8	72.4272129	B	37.66152944	1.92	0.0571
month	9	129.2058903	B	37.66152944	3.43	0.0009
month	10	-35.3377333	B	37.66152944	-0.94	0.3502
month	11	-2.8072387	B	37.66152944	-0.07	0.9407
month	12	0.0000000	B	.	.	.

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions by month: Mexico, JAN1993-DEC2002 19
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	580.2613288	288.5924460	531.2686667	695.8122903

Reduced model regressions by month: Parkville, JAN1993-DEC2002 20
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions by month: Parkville, JAN1993-DEC2002 21
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	394981.6280	20788.5067	15.77	<.0001
Error	100	131824.6903	1318.2469		
Corrected Total	119	526806.3183			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.749766	13.01810	36.30767	278.9014

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	324458.8239	29496.2567	22.38	<.0001
pdsi*month	8	70522.8042	8815.3505	6.69	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	350872.5931	31897.5085	24.20	<.0001
pdsi*month	8	70522.8042	8815.3505	6.69	<.0001

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		246.2537903 B	12.54011014	19.64	<.0001
month	1	-20.6087903 B	17.00232492	-1.21	0.2283
month	2	-18.0532097 B	17.00232492	-1.06	0.2909
month	3	1.1133845 B	17.00232492	0.07	0.9479
month	4	-16.6685968 B	17.00232492	-0.98	0.3293
month	5	44.5802643 B	21.31980535	2.09	0.0391
month	6	85.6002553 B	25.77446900	3.32	0.0013
month	7	162.1795648 B	20.74524642	7.82	<.0001
month	8	155.7014554 B	19.95752486	7.80	<.0001
month	9	125.8710760 B	18.41463476	6.84	<.0001
month	10	68.3064834 B	18.39275851	3.71	0.0003
month	11	-2.7035099 B	18.11616703	-0.15	0.8817
month	12	0.0000000 B	.	.	.
pdsi*month	1	0.0000000 B	.	.	.
pdsi*month	2	0.0000000 B	.	.	.
pdsi*month	3	0.0000000 B	.	.	.
pdsi*month	4	0.0000000 B	.	.	.
pdsi*month	5	-13.2785256 B	5.37972944	-2.47	0.0153
pdsi*month	6	-15.4068600 B	8.01125762	-1.92	0.0573
pdsi*month	7	-15.4561385 B	5.03021034	-3.07	0.0027
pdsi*month	8	-20.7030670 B	5.15590356	-4.02	0.0001
pdsi*month	9	-14.3731054 B	4.18984725	-3.43	0.0009
pdsi*month	10	-10.6755781 B	4.39005358	-2.43	0.0168
pdsi*month	11	-1.0256805 B	4.13645167	-0.25	0.8047
pdsi*month	12	-2.6672728 B	4.22343732	-0.63	0.5291

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions by month: Parkville, JAN1993-DEC2002 22
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	286.6441758	340.7148117	225.6450000	391.1637480

The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions by month: Parkville, JAN1993-DEC2002 24
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	23	2930856.707	127428.552	9.53	<.0001
Error	96	1283818.285	13373.107		
Corrected Total	119	4214674.992			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.695393	13.76149	115.6422	840.3318

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	1865363.507	169578.501	12.68	<.0001
since_90*month	12	1065493.200	88791.100	6.64	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	38588.837	3508.076	0.26	0.9911
since_90*month	12	1065493.200	88791.100	6.64	<.0001

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		573.3440727 B	102.2513487	5.61	<.0001
month	1	136.0662499 B	144.6052441	0.94	0.3491
month	2	65.1634874 B	144.6052441	0.45	0.6533
month	3	132.3342600 B	144.6052441	0.92	0.3624
month	4	8.7666545 B	144.6052441	0.06	0.9518
month	5	44.3237758 B	144.6052441	0.31	0.7599
month	6	1.5614991 B	144.6052441	0.01	0.9914
month	7	52.2835636 B	144.6052441	0.36	0.7185
month	8	15.1252997 B	144.6052441	0.10	0.9169
month	9	101.0293408 B	144.6052441	0.70	0.4865
month	10	118.7648424 B	144.6052441	0.82	0.4135
month	11	14.1065314 B	144.6052441	0.10	0.9225
month	12	0.0000000 B	.	.	.
since_90*month	1	7.8584086	12.7317818	0.62	0.5385
since_90*month	2	8.6414780	12.7317818	0.68	0.4989
since_90*month	3	14.6524658	12.7317818	1.15	0.2526
since_90*month	4	17.4895288	12.7317818	1.37	0.1727
since_90*month	5	19.5357758	12.7317818	1.53	0.1282
since_90*month	6	40.1873216	12.7317818	3.16	0.0021
since_90*month	7	49.9690929	12.7317818	3.92	0.0002
since_90*month	8	64.6245181	12.7317818	5.08	<.0001
since_90*month	9	45.2024008	12.7317818	3.55	0.0006
since_90*month	10	27.4908202	12.7317818	2.16	0.0333
since_90*month	11	21.4387195	12.7317818	1.68	0.0955
since_90*month	12	18.1530747	12.7317818	1.43	0.1572

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions by month: Parkville, JAN1993-DEC2002 25
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	994.7076572	1244.79	750.8467742	1428.59

The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions by month: St Charles, JAN1993-DEC2002 27
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	604612.7129	31821.7217	47.51	<.0001
Error	100	66983.3824	669.8338		
Corrected Total	119	671596.0953			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.900262	9.651431	25.88115	268.1587

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	559912.2575	50901.1143	75.99	<.0001
pdsi*month	8	44700.4555	5587.5569	8.34	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	511181.9595	46471.0872	69.38	<.0001
pdsi*month	8	44700.4555	5587.5569	8.34	<.0001

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		220.4702999 B	8.45180842	26.09	<.0001
month	1	-3.7017838 B	11.76505198	-0.31	0.7537
month	2	-22.7746870 B	11.76505198	-1.94	0.0557
month	3	-8.2030204 B	11.76505198	-0.70	0.4873
month	4	-12.9419773 B	11.76505198	-1.10	0.2740
month	5	20.7916527 B	15.49519931	1.34	0.1827
month	6	67.0969213 B	14.79442267	4.54	<.0001
month	7	168.5769357 B	14.79750955	11.39	<.0001
month	8	216.9379475 B	14.30840388	15.16	<.0001
month	9	166.3964000 B	12.60013637	13.21	<.0001
month	10	83.8545234 B	12.52218494	6.70	<.0001
month	11	2.8168454 B	12.28465669	0.23	0.8191
month	12	0.0000000 B	.	.	.
pdsi*month	1	0.0000000 B	.	.	.
pdsi*month	2	0.0000000 B	.	.	.
pdsi*month	3	0.0000000 B	.	.	.
pdsi*month	4	0.0000000 B	.	.	.
pdsi*month	5	-2.6245292 B	5.44192436	-0.48	0.6307
pdsi*month	6	-0.9585636 B	5.72057774	-0.17	0.8673
pdsi*month	7	-9.3875996 B	5.16098695	-1.82	0.0719
pdsi*month	8	-29.3131273 B	4.68546560	-6.26	<.0001
pdsi*month	9	-14.1280725 B	3.41465831	-4.14	<.0001
pdsi*month	10	-8.5304766 B	3.52358338	-2.42	0.0173
pdsi*month	11	-3.2381742 B	3.20781900	-1.01	0.3152
pdsi*month	12	-0.5356011 B	3.33770131	-0.16	0.8728

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions by month: St Charles, JAN1993-DEC2002 28
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	271.9436549	422.7762709	197.6956129	407.0888005

Reduced model regressions by month: St Charles, JAN1993-DEC2002 29
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions by month: St Charles, JAN1993-DEC2002 30
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	7640591.423	402136.391	23.37	<.0001
Error	100	1720941.150	17209.412		
Corrected Total	119	9361532.573			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.816169	10.15617	131.1846	1291.675

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	6821697.695	620154.336	36.04	<.0001
pdsi*month	8	818893.728	102361.716	5.95	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	6398471.759	581679.251	33.80	<.0001
pdsi*month	8	818893.728	102361.716	5.95	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		1075.190236	B	42.83996596	25.10	<.0001
month	1	31.532086	B	59.63391513	0.53	0.5981
month	2	-44.342140	B	59.63391513	-0.74	0.4589
month	3	15.509707	B	59.63391513	0.26	0.7953
month	4	28.953086	B	59.63391513	0.49	0.6284
month	5	138.835147	B	78.54103851	1.77	0.0802
month	6	285.520788	B	74.98898839	3.81	0.0002
month	7	547.946398	B	75.00463492	7.31	<.0001
month	8	798.848446	B	72.52548857	11.01	<.0001
month	9	695.848963	B	63.86673550	10.90	<.0001
month	10	360.478531	B	63.47162045	5.68	<.0001
month	11	148.579743	B	62.26765302	2.39	0.0189
month	12	0.000000	B	.	.	.
pdsi*month	1	0.000000	B	.	.	.
pdsi*month	2	0.000000	B	.	.	.
pdsi*month	3	0.000000	B	.	.	.
pdsi*month	4	0.000000	B	.	.	.
pdsi*month	5	-14.183045	B	27.58366525	-0.51	0.6083
pdsi*month	6	-8.517791	B	28.99608502	-0.29	0.7696
pdsi*month	7	-9.423482	B	26.15966835	-0.36	0.7194
pdsi*month	8	-92.444451	B	23.74937728	-3.89	0.0002
pdsi*month	9	-82.574838	B	17.30799355	-4.77	<.0001
pdsi*month	10	-24.634183	B	17.86010571	-1.38	0.1709
pdsi*month	11	-42.437456	B	16.25958016	-2.61	0.0104
pdsi*month	12	-11.672051	B	16.91791902	-0.69	0.4918

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions by month: St Charles, JAN1993-DEC2002 31
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	1304.91	1473.24	1030.85	1778.42

Reduced model regressions by year: St Joseph, JAN1993-DEC2002 32
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The GLM Procedure

Number of observations 11

NOTE: Due to missing values, only 10 observations can be used in this analysis.

Reduced model regressions by year: St Joseph, JAN1993-DEC2002 33
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	384.9903956	192.4951978	4.21	0.0631
Error	7	320.1426202	45.7346600		
Corrected Total	9	705.1330159			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.545983	3.744343	6.762741	180.6122

Source	DF	Type I SS	Mean Square	F Value	Pr > F
pdsi	1	68.8122812	68.8122812	1.50	0.2596
since_90	1	316.1781144	316.1781144	6.91	0.0339

Source	DF	Type III SS	Mean Square	F Value	Pr > F
pdsi	1	322.0073366	322.0073366	7.04	0.0328
since_90	1	316.1781144	316.1781144	6.91	0.0339

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	207.3052768	9.66262342	21.45	<.0001
pdsi	-3.7914158	1.42886520	-2.65	0.0328
since_90	-2.5991555	0.98852827	-2.63	0.0339

Reduced model regressions by year: St Joseph, JAN1993-DEC2002 34
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
1	169.2436516	.	169.2436516	169.2436516

The GLM Procedure

Number of observations 11

NOTE: Due to missing values, only 10 observations can be used in this analysis.

Reduced model regressions by year: St Joseph, JAN1993-DEC2002 36
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	6639.30452	6639.30452	13.30	0.0065
Error	8	3993.86310	499.23289		
Corrected Total	9	10633.16762			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.624396	2.684615	22.34352	832.2802

Source	DF	Type I SS	Mean Square	F Value	Pr > F
since_90	1	6639.304521	6639.304521	13.30	0.0065

Source	DF	Type III SS	Mean Square	F Value	Pr > F
since_90	1	6639.304521	6639.304521	13.30	0.0065

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	764.9986757	19.75624834	38.72	<.0001
since_90	8.9708650	2.45994059	3.65	0.0065

Reduced model regressions by year: St Joseph, JAN1993-DEC2002 37
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
1	881.6199204	.	881.6199204	881.6199204

Reduced model regressions for customers billed monthly: St Louis,JAN1993-DEC2 38
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions for customers billed monthly: St Louis,JAN1993-DEC2 39
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	23	409060529.8	17785240.4	3.69	<.0001
Error	96	463235313.2	4825367.8		
Corrected Total	119	872295843.0			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.468947	12.96618	2196.672	16941.55

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	174352494.1	15850226.7	3.28	0.0007
since_90*month	12	234708035.7	19559003.0	4.05	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	49275901.4	4479627.4	0.93	0.5169
since_90*month	12	234708035.7	19559003.0	4.05	<.0001

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		20120.61176 B	1942.307987	10.36	<.0001
month	1	880.79065 B	2746.838297	0.32	0.7492
month	2	-2899.87425 B	2746.838297	-1.06	0.2937
month	3	1948.75944 B	2746.838297	0.71	0.4798
month	4	785.27812 B	2746.838297	0.29	0.7756
month	5	-1818.56247 B	2746.838297	-0.66	0.5095
month	6	-374.42087 B	2746.838297	-0.14	0.8919
month	7	3850.64058 B	2746.838297	1.40	0.1642
month	8	-960.76266 B	2746.838297	-0.35	0.7273
month	9	-252.66483 B	2746.838297	-0.09	0.9269
month	10	2119.97627 B	2746.838297	0.77	0.4421
month	11	-1232.29418 B	2746.838297	-0.45	0.6547
month	12	0.00000 B	.	.	.
since_90*month	1	-457.88111	241.845627	-1.89	0.0613
since_90*month	2	-272.13162	241.845627	-1.13	0.2633
since_90*month	3	-759.44856	241.845627	-3.14	0.0022
since_90*month	4	-621.76894	241.845627	-2.57	0.0117
since_90*month	5	-378.30211	241.845627	-1.56	0.1211
since_90*month	6	-396.18879	241.845627	-1.64	0.1047
since_90*month	7	-652.47348	241.845627	-2.70	0.0082
since_90*month	8	-193.10209	241.845627	-0.80	0.4266
since_90*month	9	-108.48484	241.845627	-0.45	0.6548
since_90*month	10	-646.38579	241.845627	-2.67	0.0088
since_90*month	11	-327.27056	241.845627	-1.35	0.1792
since_90*month	12	-545.98421	241.845627	-2.26	0.0262

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions for customers billed monthly: St Louis,JAN1993-DEC2 40
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	14510.00	9726.77	12196.54	18457.64

Reduced model regressions for customers billed monthly: St Louis,JAN1993-DEC2 41
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions for customers billed monthly: St Louis,JAN1993-DEC2 42
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	3657958069	117998647	69.04	<.0001
Error	88	150396963	1709056		
Corrected Total	119	3808355032			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.960509	9.119407	1307.309	14335.46

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	3406141773	309649252	181.18	<.0001
pdsi*month	8	188681876	23585235	13.80	<.0001
since_90*month	12	63134420	5261202	3.08	0.0011

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	306521330.6	27865575.5	16.30	<.0001
pdsi*month	8	151640541.4	18955067.7	11.09	<.0001
since_90*month	12	63134420.1	5261201.7	3.08	0.0011

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		10068.13034	B	1320.480584	7.62	<.0001
month	1	-822.48285	B	1754.947388	-0.47	0.6405
month	2	-1670.65882	B	1754.947388	-0.95	0.3437
month	3	-1065.46807	B	1754.947388	-0.61	0.5453
month	4	1192.13588	B	1754.947388	0.68	0.4987
month	5	-434.31230	B	2041.127360	-0.21	0.8320
month	6	2172.93263	B	2381.190623	0.91	0.3640
month	7	8592.20817	B	2039.226522	4.21	<.0001
month	8	16913.00956	B	2000.587308	8.45	<.0001
month	9	8990.75311	B	1885.600520	4.77	<.0001
month	10	6706.03221	B	1831.417974	3.66	0.0004
month	11	2609.69153	B	1857.565988	1.40	0.1636
month	12	0.00000	B	.	.	.
pdsi*month	1	0.00000	B	.	.	.
pdsi*month	2	0.00000	B	.	.	.
pdsi*month	3	0.00000	B	.	.	.
pdsi*month	4	0.00000	B	.	.	.
pdsi*month	5	-214.38453	B	301.254622	-0.71	0.4786
pdsi*month	6	330.88129	B	392.732715	0.84	0.4018
pdsi*month	7	279.94280	B	290.735158	0.96	0.3382
pdsi*month	8	-2183.50940	B	261.398583	-8.35	<.0001
pdsi*month	9	-361.69280	B	186.462275	-1.94	0.0556
pdsi*month	10	-562.75746	B	184.681731	-3.05	0.0030
pdsi*month	11	-317.51049	B	173.725491	-1.83	0.0710
pdsi*month	12	-121.33213	B	187.141127	-0.65	0.5184
since_90*month	1	-14.64330		143.929966	-0.10	0.9192
since_90*month	2	45.35590		143.929966	0.32	0.7534

Reduced model regressions for customers billed monthly: St Louis,JAN1993-DEC2 43
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The GLM Procedure

Dependent Variable: com_gallons

Parameter	Estimate	Standard Error	t Value	Pr > |t|
since_90*month 3	32.29061	143.929966	0.22	0.8230
since_90*month 4	-112.24311	143.929966	-0.78	0.4376
since_90*month 5	399.83360	157.738527	2.53	0.0130
since_90*month 6	466.76330	195.620224	2.39	0.0192
since_90*month 7	420.59859	160.517119	2.62	0.0103
since_90*month 8	-154.89963	158.967022	-0.97	0.3325
since_90*month 9	622.46969	155.596667	4.00	0.0001
since_90*month 10	60.33262	149.346809	0.40	0.6872
since_90*month 11	-25.71301	154.315750	-0.17	0.8680
since_90*month 12	-33.49035	159.763782	-0.21	0.8344

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions for customers billed monthly: St Louis,JAN1993-DEC2 44
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	15288.76	36266.87	8987.10	26861.64

Reduced model regressions, customers billed quarterly: St Louis, JAN1993-DEC2 45
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The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions, customers billed quarterly: St Louis, JAN1993-DEC2 46
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The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	261753.8733	13776.5196	78.58	<.0001
Error	100	17531.7162	175.3172		
Corrected Total	119	279285.5895			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.937227	4.804637	13.24074	275.5825

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	244041.3920	22185.5811	126.55	<.0001
avg_pdsi*month	8	17712.4813	2214.0602	12.63	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	220806.4741	20073.3158	114.50	<.0001
avg_pdsi*month	8	17712.4813	2214.0602	12.63	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		254.2995941	B	4.52075022	56.25	<.0001
month	1	-15.1840072	B	6.16189084	-2.46	0.0154
month	2	5.1137646	B	6.16189084	0.83	0.4086
month	3	-28.0687022	B	6.16189084	-4.56	<.0001
month	4	-39.5462944	B	6.16189084	-6.42	<.0001
month	5	-0.1516553	B	7.17806788	-0.02	0.9832
month	6	-10.6010867	B	7.77745584	-1.36	0.1759
month	7	26.7931196	B	8.15002036	3.29	0.0014
month	8	109.0608386	B	7.73723920	14.10	<.0001
month	9	105.7980802	B	7.17825498	14.74	<.0001
month	10	108.9449042	B	6.79625748	16.03	<.0001
month	11	50.9869882	B	6.51266658	7.83	<.0001
month	12	0.0000000	B	.	.	.
avg_pdsi*month	1	0.0000000	B	.	.	.
avg_pdsi*month	2	0.0000000	B	.	.	.
avg_pdsi*month	3	0.0000000	B	.	.	.
avg_pdsi*month	4	0.0000000	B	.	.	.
avg_pdsi*month	5	0.2404023	B	2.46880738	0.10	0.9226
avg_pdsi*month	6	1.1403892	B	2.90186456	0.39	0.6952
avg_pdsi*month	7	3.1919950	B	3.10129234	1.03	0.3058
avg_pdsi*month	8	-10.0126523	B	2.78254500	-3.60	0.0005
avg_pdsi*month	9	-11.5723900	B	2.30232149	-5.03	<.0001
avg_pdsi*month	10	-13.6732154	B	2.01152391	-6.80	<.0001
avg_pdsi*month	11	-5.4463829	B	1.73780501	-3.13	0.0023
avg_pdsi*month	12	-4.0886501	B	1.73284599	-2.36	0.0202

Reduced model regressions, customers billed quarterly: St Louis, JAN1993-DEC2 47
QUARTERLY RESIDENTIAL 02:56 Wednesday, May 7, 2003

The GLM Procedure

Dependent Variable: res_gallons

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions, customers billed quarterly: St Louis, JAN1993-DEC2 48
QUARTERLY RESIDENTIAL 02:56 Wednesday, May 7, 2003

The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	277.6197278	479.6789100	214.7532998	353.9084890

Reduced model regressions, customers billed quarterly: St Louis, JAN1993-DEC2 49
QUARTERLY COMMERCIAL 02:56 Wednesday, May 7, 2003

The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions, customers billed quarterly: St Louis, JAN1993-DEC2 50
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The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	23	4344110.036	188874.349	75.36	<.0001
Error	96	240605.353	2506.306		
Corrected Total	119	4584715.390			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.947520	4.969383	50.06302	1007.429

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	3854926.365	350447.851	139.83	<.0001
since_90*month	12	489183.671	40765.306	16.27	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	119991.6493	10908.3318	4.35	<.0001
since_90*month	12	489183.6713	40765.3059	16.27	<.0001

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		851.8251988 B	44.26596226	19.24	<.0001
month	1	-81.3604557 B	62.60152419	-1.30	0.1968
month	2	-27.2124281 B	62.60152419	-0.43	0.6648
month	3	-58.5663997 B	62.60152419	-0.94	0.3519
month	4	-65.3661210 B	62.60152419	-1.04	0.2990
month	5	-30.7992594 B	62.60152419	-0.49	0.6239
month	6	-64.6511099 B	62.60152419	-1.03	0.3043
month	7	83.4817962 B	62.60152419	1.33	0.1855
month	8	142.4691332 B	62.60152419	2.28	0.0251
month	9	159.5560838 B	62.60152419	2.55	0.0124
month	10	156.9482676 B	62.60152419	2.51	0.0139
month	11	41.5494138 B	62.60152419	0.66	0.5085
month	12	0.0000000 B	.	.	.
since_90*month	1	10.3835270	5.51175687	1.88	0.0626
since_90*month	2	6.0575059	5.51175687	1.10	0.2745
since_90*month	3	1.4982181	5.51175687	0.27	0.7863
since_90*month	4	-0.6997858	5.51175687	-0.13	0.8992
since_90*month	5	8.1912105	5.51175687	1.49	0.1405
since_90*month	6	19.8524519	5.51175687	3.60	0.0005
since_90*month	7	15.4248139	5.51175687	2.80	0.0062
since_90*month	8	39.4783702	5.51175687	7.16	<.0001
since_90*month	9	32.5517391	5.51175687	5.91	<.0001
since_90*month	10	33.9893538	5.51175687	6.17	<.0001
since_90*month	11	32.7933966	5.51175687	5.95	<.0001
since_90*month	12	15.3059647	5.51175687	2.78	0.0066

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions, customers billed quarterly: St Louis, JAN1993-DEC2 51
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The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	1107.54	2492.90	777.3618619	1507.51

Reduced model regressions for Other Public Authorities: St Louis,JAN1993-DEC2 52
OPA MONTHLY 02:56 Wednesday, May 7, 2003

The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions for Other Public Authorities: St Louis,JAN1993-DEC2 53
OPA MONTHLY 02:56 Wednesday, May 7, 2003

The GLM Procedure

Dependent Variable: opam_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	19	19400830816	1021096359	48.51	<.0001
Error	100	2104744037	21047440		
Corrected Total	119	21505574853			

R-Square	Coeff Var	Root MSE	opam_gallons Mean
0.902130	29.61959	4587.749	15488.90

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	18530070710	1684551883	80.04	<.0001
pdsi*month	8	870760106	108845013	5.17	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	15562465164	1414769560	67.22	<.0001
pdsi*month	8	870760106	108845013	5.17	<.0001

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		5346.25235 B	1498.186058	3.57	0.0006
month	1	-1422.23738 B	2085.498862	-0.68	0.4968
month	2	-1268.45109 B	2085.498862	-0.61	0.5444
month	3	-1631.72671 B	2085.498862	-0.78	0.4358
month	4	150.25065 B	2085.498862	0.07	0.9427
month	5	5041.32291 B	2746.712941	1.84	0.0694
month	6	17270.68298 B	2622.491741	6.59	<.0001
month	7	31735.27515 B	2623.038927	12.10	<.0001
month	8	38716.07634 B	2536.338986	15.26	<.0001
month	9	30040.71022 B	2233.527748	13.45	<.0001
month	10	12664.17330 B	2219.709907	5.71	<.0001
month	11	5194.28701 B	2177.605130	2.39	0.0189
month	12	0.00000 B	.	.	.
pdsi*month	1	0.00000 B	.	.	.
pdsi*month	2	0.00000 B	.	.	.
pdsi*month	3	0.00000 B	.	.	.
pdsi*month	4	0.00000 B	.	.	.
pdsi*month	5	-533.56602 B	964.647422	-0.55	0.5814
pdsi*month	6	188.75830 B	1014.042130	0.19	0.8527
pdsi*month	7	-1550.59494 B	914.847842	-1.69	0.0932
pdsi*month	8	-4393.72299 B	830.555887	-5.29	<.0001
pdsi*month	9	-1561.75304 B	605.289805	-2.58	0.0113
pdsi*month	10	-433.38629 B	624.598101	-0.69	0.4894
pdsi*month	11	-983.11457 B	568.625015	-1.73	0.0869
pdsi*month	12	-125.30230 B	591.648239	-0.21	0.8327

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions for Other Public Authorities: St Louis,JAN1993-DEC2 54
OPA MONTHLY 02:56 Wednesday, May 7, 2003

The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	16036.71	75565.85	3714.53	39517.77

Reduced model regressions for Other Public Authorities: St Louis,JAN1993-DEC2 55
OPA QUARTERLY 02:56 Wednesday, May 7, 2003

The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions for Other Public Authorities: St Louis,JAN1993-DEC2 56
OPA QUARTERLY 02:56 Wednesday, May 7, 2003

The GLM Procedure

Dependent Variable: opaq_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	23	38439693.20	1671291.01	13.53	<.0001
Error	96	11857677.92	123517.48		
Corrected Total	119	50297371.12			

R-Square	Coeff Var	Root MSE	opaq_gallons Mean
0.764249	30.21965	351.4505	1162.987

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	29264470.02	2660406.37	21.54	<.0001
since_90*month	12	9175223.18	764601.93	6.19	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	1834050.397	166731.854	1.35	0.2097
since_90*month	12	9175223.178	764601.932	6.19	<.0001

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		1120.042639 B	310.7542603	3.60	0.0005
month	1	-654.817952 B	439.4728895	-1.49	0.1395
month	2	-702.532297 B	439.4728895	-1.60	0.1132
month	3	-1091.912001 B	439.4728895	-2.48	0.0147
month	4	-637.399884 B	439.4728895	-1.45	0.1502
month	5	-733.575302 B	439.4728895	-1.67	0.0983
month	6	-777.617750 B	439.4728895	-1.77	0.0800
month	7	-142.652032 B	439.4728895	-0.32	0.7462
month	8	-5.583060 B	439.4728895	-0.01	0.9899
month	9	-871.833305 B	439.4728895	-1.98	0.0501
month	10	-187.584159 B	439.4728895	-0.43	0.6705
month	11	-385.656624 B	439.4728895	-0.88	0.3824
month	12	0.000000 B	.	.	.
since_90*month	1	11.960866	38.6934304	0.31	0.7579
since_90*month	2	40.053572	38.6934304	1.04	0.3032
since_90*month	3	87.750031	38.6934304	2.27	0.0256
since_90*month	4	-4.099118	38.6934304	-0.11	0.9159
since_90*month	5	61.813883	38.6934304	1.60	0.1134
since_90*month	6	124.033961	38.6934304	3.21	0.0018
since_90*month	7	56.871909	38.6934304	1.47	0.1449
since_90*month	8	115.146540	38.6934304	2.98	0.0037
since_90*month	9	227.931916	38.6934304	5.89	<.0001
since_90*month	10	57.742872	38.6934304	1.49	0.1389
since_90*month	11	103.066188	38.6934304	2.66	0.0091
since_90*month	12	11.926801	38.6934304	0.31	0.7586

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions for Other Public Authorities: St Louis,JAN1993-DEC2 57
OPA QUARTERLY 02:56 Wednesday, May 7, 2003

The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	1576.84	7744.11	429.3542259	3211.32

Reduced model regressions by month: Warrensburg, JAN1993-DEC2002 58
RESIDENTIAL 02:56 Wednesday, May 7, 2003

The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 120 observations can be used in this analysis.

Reduced model regressions by month: Warrensburg, JAN1993-DEC2002 59
RESIDENTIAL 02:56 Wednesday, May 7, 2003

The GLM Procedure

Dependent Variable: res_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	39740.75298	3612.79573	8.45	<.0001
Error	108	46160.22891	427.40953		
Corrected Total	119	85900.98189			

R-Square	Coeff Var	Root MSE	res_gallons Mean
0.462634	11.36782	20.67389	181.8633

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	39740.75298	3612.79573	8.45	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	39740.75298	3612.79573	8.45	<.0001

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		172.8353000 B	6.53765651	26.44	<.0001
month	1	-9.2592677 B	9.24564251	-1.00	0.3188
month	2	-10.8592032 B	9.24564251	-1.17	0.2428
month	3	1.4979241 B	9.24564251	0.16	0.8716
month	4	-11.5937194 B	9.24564251	-1.25	0.2126
month	5	0.2058000 B	9.24564251	0.02	0.9823
month	6	12.0447645 B	9.24564251	1.30	0.1954
month	7	35.4548333 B	9.24564251	3.83	0.0002
month	8	39.5883129 B	9.24564251	4.28	<.0001
month	9	35.0082161 B	9.24564251	3.79	0.0003
month	10	20.0581333 B	9.24564251	2.17	0.0322
month	11	-3.8098484 B	9.24564251	-0.41	0.6811
month	12	0.0000000 B	.	.	.

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions by month: Warrensburg, JAN1993-DEC2002 60
RESIDENTIAL 02:56 Wednesday, May 7, 2003

The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	181.8714692	105.3335940	161.2415806	212.4236129

Reduced model regressions by month: Warrensburg, JAN1993-DEC2002 61
COMMERCIAL 02:56 Wednesday, May 7, 2003

The GLM Procedure

Class Level Information

Class	Levels	Values
month	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of observations 132

NOTE: Due to missing values, only 110 observations can be used in this analysis.

Reduced model regressions by month: Warrensburg, JAN1993-DEC2002 62
COMMERCIAL 02:56 Wednesday, May 7, 2003

The GLM Procedure

Dependent Variable: com_gallons

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	23	422797.4686	18382.4986	3.72	<.0001
Error	86	425440.4679	4946.9822		
Corrected Total	109	848237.9365			

R-Square	Coeff Var	Root MSE	com_gallons Mean
0.498442	8.187028	70.33479	859.1004

Source	DF	Type I SS	Mean Square	F Value	Pr > F
month	11	226104.4726	20554.9521	4.16	<.0001
since_90*month	12	196692.9960	16391.0830	3.31	0.0006

Source	DF	Type III SS	Mean Square	F Value	Pr > F
month	11	54181.5626	4925.5966	1.00	0.4570
since_90*month	12	196692.9960	16391.0830	3.31	0.0006

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		923.0941425 B	70.8434416	13.03	<.0001
month	1	-37.1904707 B	97.6180156	-0.38	0.7042
month	2	111.3728025 B	97.6180156	1.14	0.2571
month	3	61.7359466 B	97.6180156	0.63	0.5288
month	4	-16.2931937 B	97.6180156	-0.17	0.8678
month	5	21.7838183 B	97.6180156	0.22	0.8239
month	6	78.7561849 B	97.6180156	0.81	0.4220
month	7	-21.5465346 B	97.6180156	-0.22	0.8258
month	8	-86.6831571 B	94.2678834	-0.92	0.3604
month	9	35.3163385 B	94.2678834	0.37	0.7089
month	10	-72.4031849 B	100.1877559	-0.72	0.4718
month	11	116.0262920 B	100.1877559	1.16	0.2500
month	12	0.0000000 B	.	.	.
since_90*month	1	-11.1770389	8.0916478	-1.38	0.1708
since_90*month	2	-27.9351879	8.0916478	-3.45	0.0009
since_90*month	3	-15.3481990	8.0916478	-1.90	0.0612
since_90*month	4	-13.4328178	8.0916478	-1.66	0.1005
since_90*month	5	-14.2284569	8.0916478	-1.76	0.0822
since_90*month	6	-14.4353278	8.0916478	-1.78	0.0780
since_90*month	7	-0.3226686	8.0916478	-0.04	0.9683
since_90*month	8	7.8249912	7.7436051	1.01	0.3151
since_90*month	9	-1.4284555	7.7436051	-0.18	0.8541
since_90*month	10	5.2074091	8.4741390	0.61	0.5405
since_90*month	11	-26.2176925	8.4741390	-3.09	0.0027
since_90*month	12	-12.8486425	8.4741390	-1.52	0.1331

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

Reduced model regressions by month: Warrensburg, JAN1993-DEC2002 63
COMMERCIAL 02:56 Wednesday, May 7, 2003

The MEANS Procedure

Analysis Variable : p

N	Mean	Std Dev	Minimum	Maximum
12	804.1387932	530.9326305	671.3095028	939.8405591

Missouri-American Water Company
Summary of Weather Normalized and Usage Per Day Estimates
Schedule ELS-5

District	Monthly Residential	Commercial	Quarterly Residential	Commercial	Monthy OPA	Quarterly OPA
Brunswick	126.56	187.13				
Jefferson City	(1)	(1)				
Joplin	197.95	866.19				
Mexico	146.53	580.26				
Parkville Water	286.64	994.71				
St. Charles	271.94	1,304.91				
St. Joseph	169.24	881.62				
St. Louis	14,510.00	15,288.76	277.62	1,107.54	16,036.71	1,576.84
Warrensburg	181.87	804.14				

Note (1) : Sufficient historical data is not available to perform a meaningful analysis. Company is making a separate recommendation.
Usage amounts are in gallons per day.