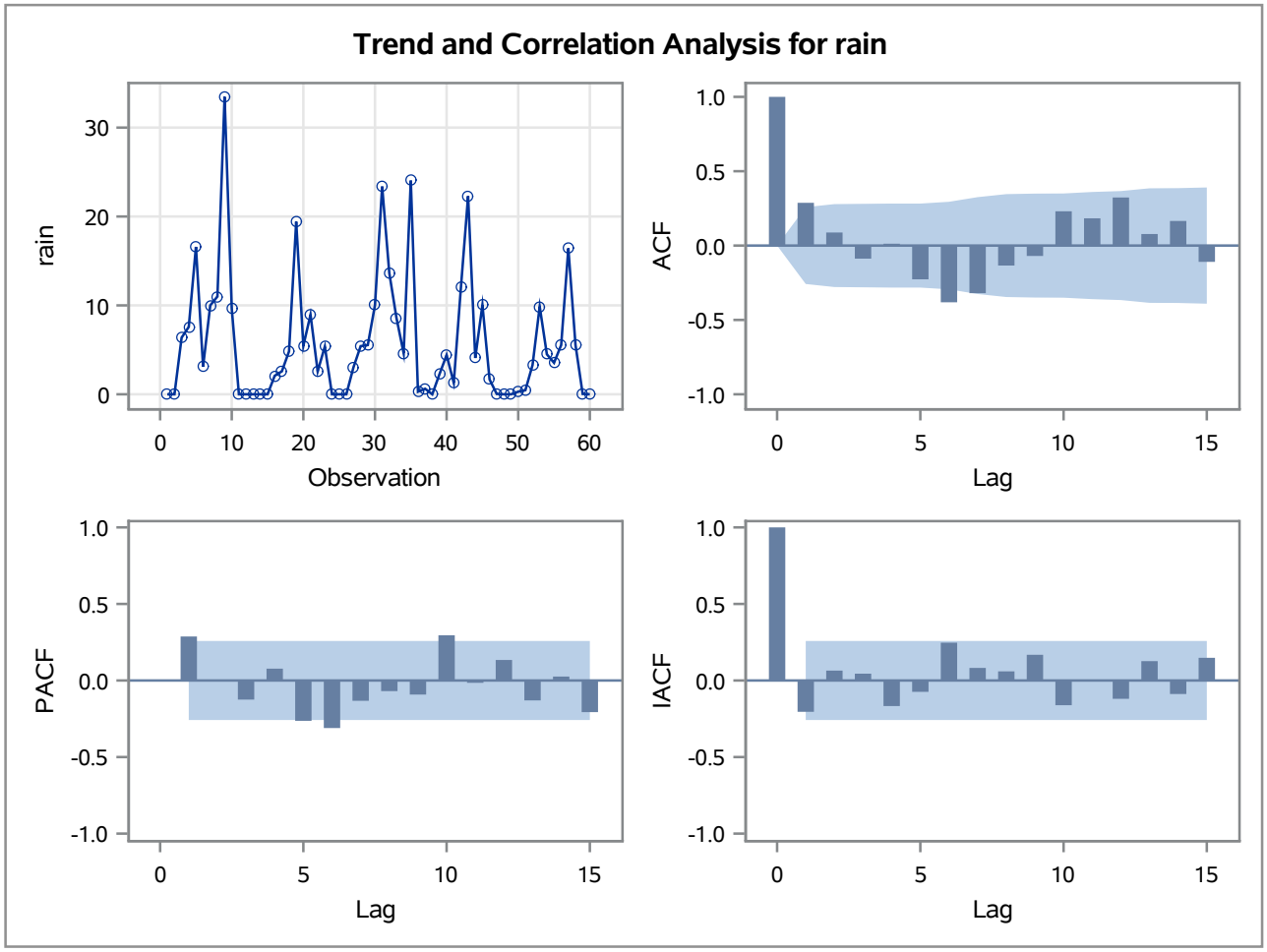
Name of Variable = rain	
Mean of Working Series	5.931944
Standard Deviation	7.186866
Number of Observations	60

Autocorrelation Check for White Noise									
To Lag	**Chi-Square**	**DF**	**Pr > ChiSq**	**Autocorrelations**					
6	19.71	6	0.0031	0.287	0.088	-0.088	0.012	-0.227	-0.381
12	43.15	12	<.0001	-0.320	-0.134	-0.070	0.231	0.183	0.323



Warning: The model defined by the new estimates is unstable. The iteration process has been terminated.

Warning: Estimates may not have converged.

ARIMA Estimation Optimization Summary	
Estimation Method	Maximum Likelihood
Parameters Estimated	9
Termination Criteria	Maximum Relative Change in Estimates
Iteration Stopping Value	0.001
Criteria Value	10.61544
Maximum Absolute Value of Gradient	332.036

ARIMA Estimation Optimization Summary	
R-Square Change from Last Iteration	0.317028
Objective Function	Log Gaussian Likelihood
Objective Function Value	-190.825
Marquardt's Lambda Coefficient	0.0001
Numerical Derivative Perturbation Delta	0.001
Iterations	17
Warning Message	Estimates may not have converged.

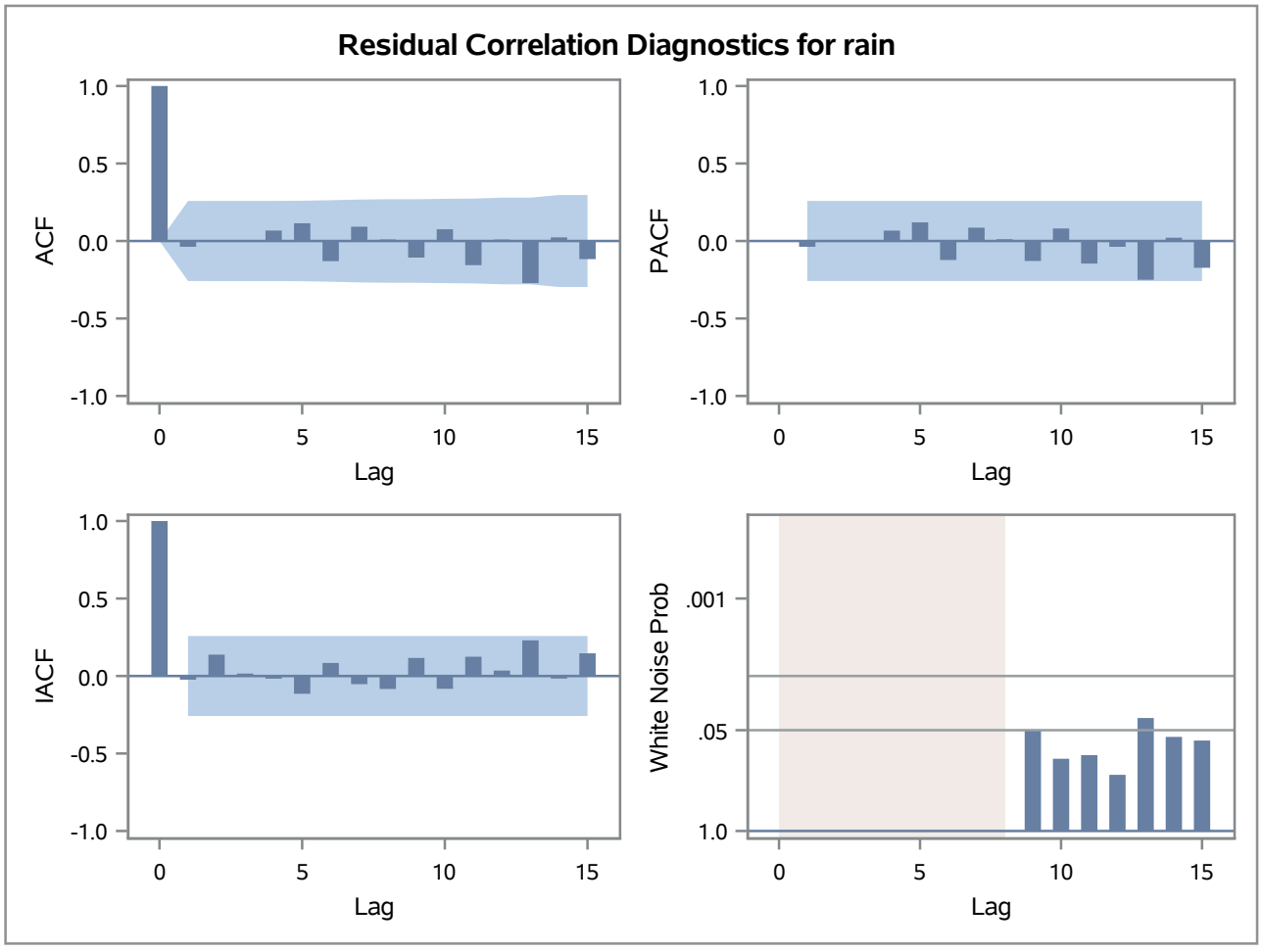
Maximum Likelihood Estimation					
Parameter	**Estimate**	**Standard Error**	**t Value**	**Approx Pr > |t|**	**Lag**
MU	6.02291	0.68561	8.78	<.0001	0
MA1,1	1.17314	9.81378	0.12	0.9048	1
MA1,2	-0.21093	7.26747	-0.03	0.9768	2
MA1,3	-0.47787	5.58956	-0.09	0.9319	3
AR1,1	1.19975	0.36218	3.31	0.0009	1
AR1,2	-0.30858	0.64536	-0.48	0.6325	2
AR1,3	-0.48308	0.42854	-1.13	0.2596	3
AR1,4	0.32307	0.19737	1.64	0.1017	4
AR1,5	-0.29276	0.13647	-2.15	0.0319	5

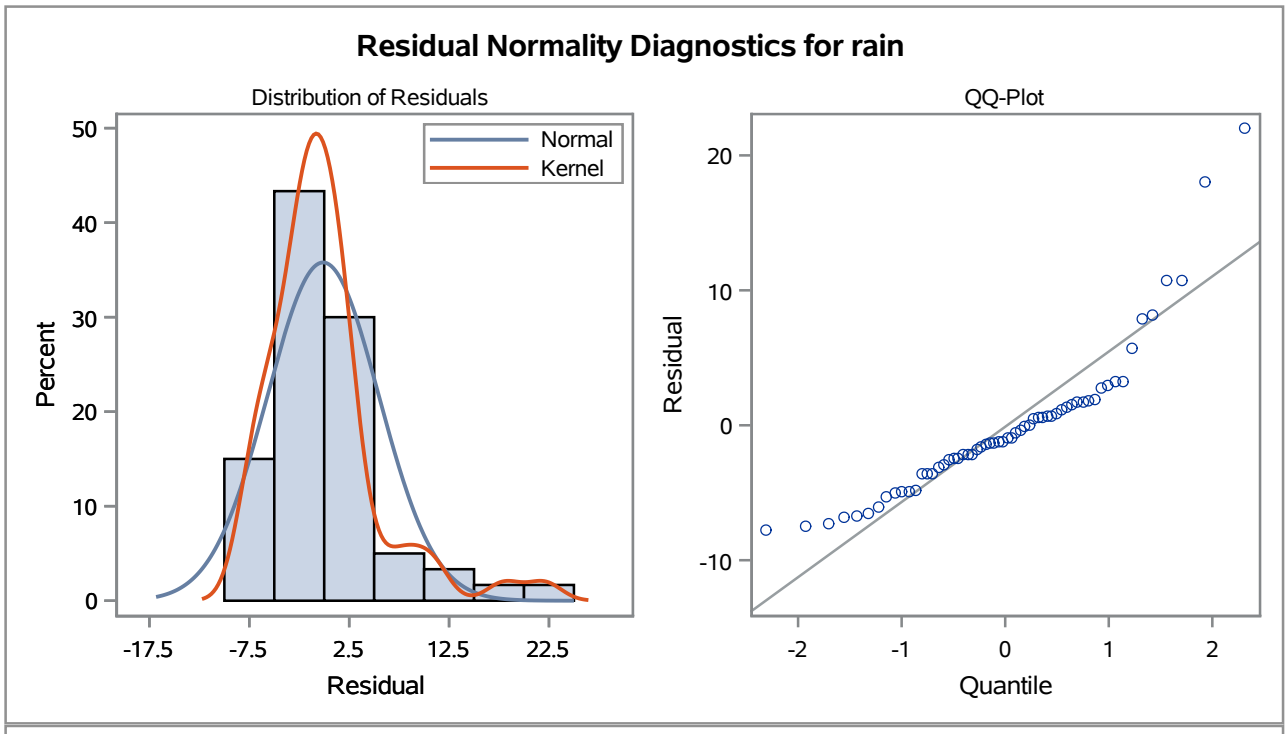
Constant Estimate	3.382486
Variance Estimate	35.95339
Std Error Estimate	5.996115
AIC	399.6491
SBC	418.4982
Number of Residuals	60

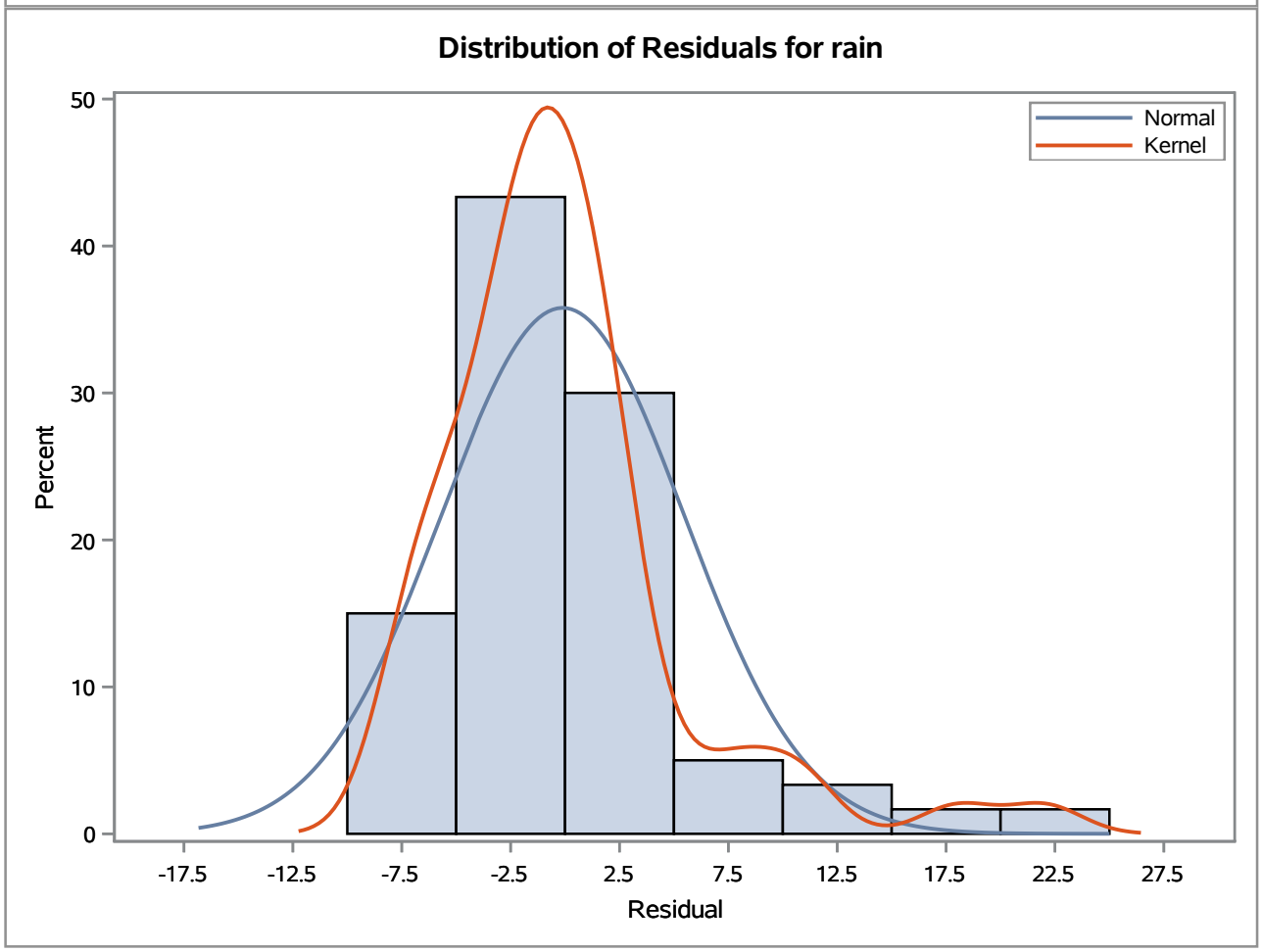
Correlations of Parameter Estimates									
Parameter	**MU**	**MA1,1**	**MA1,2**	**MA1,3**	**AR1,1**	**AR1,2**	**AR1,3**	**AR1,4**	**AR1,5**
MU	1.000	-0.035	0.035	0.036	-0.003	-0.004	0.003	0.014	-0.023
MA1,1	-0.035	1.000	-0.999	-0.994	0.253	-0.210	0.133	0.018	0.144
MA1,2	0.035	-0.999	1.000	0.987	-0.299	0.259	-0.180	-0.015	-0.139
MA1,3	0.036	-0.994	0.987	1.000	-0.151	0.106	-0.035	-0.030	-0.146
AR1,1	-0.003	0.253	-0.299	-0.151	1.000	-0.965	0.843	-0.017	0.064
AR1,2	-0.004	-0.210	0.259	0.106	-0.965	1.000	-0.934	0.043	0.086
AR1,3	0.003	0.133	-0.180	-0.035	0.843	-0.934	1.000	-0.333	0.003

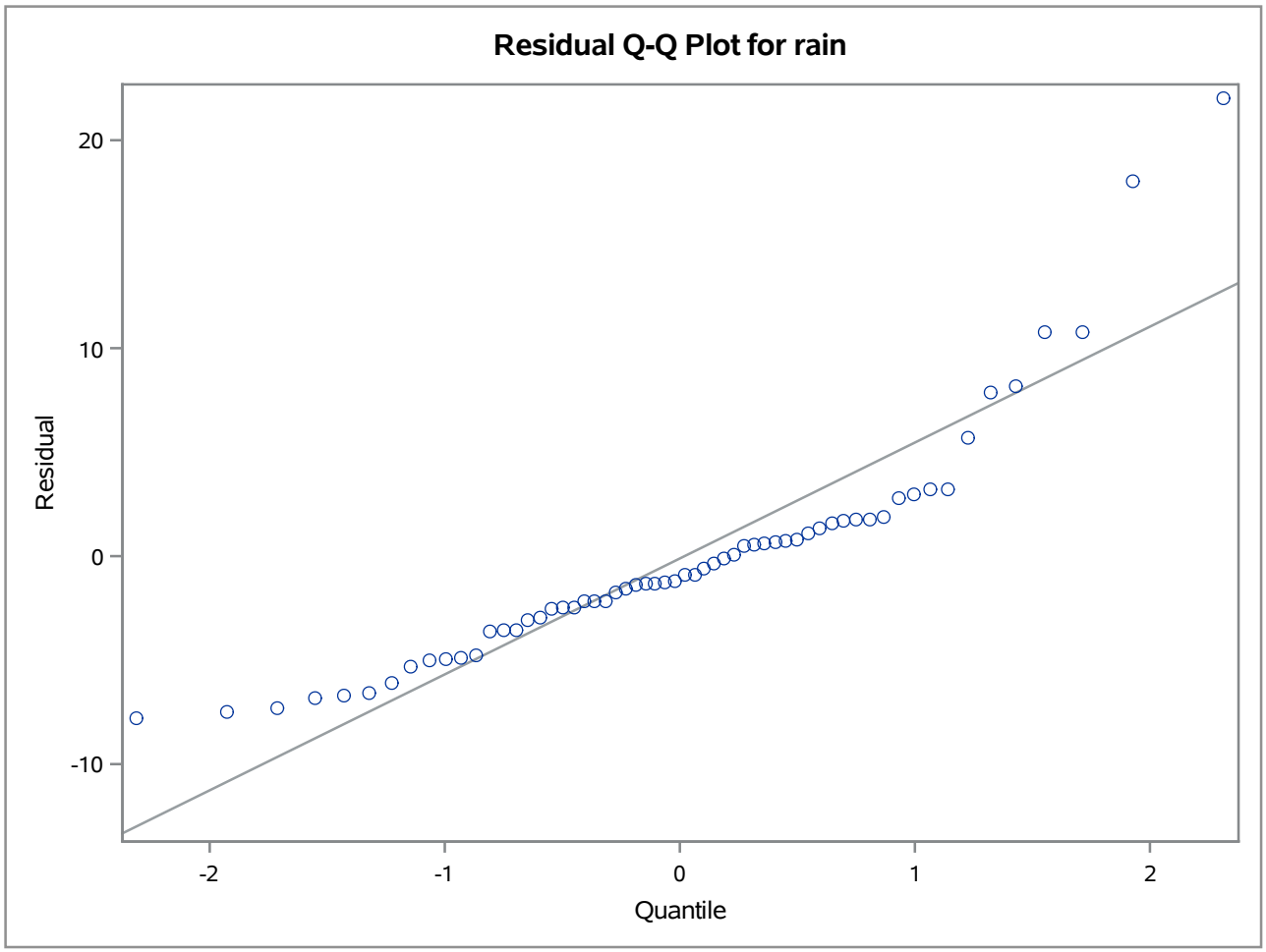
Correlations of Parameter Estimates									
Parameter	**MU**	**MA1,1**	**MA1,2**	**MA1,3**	**AR1,1**	**AR1,2**	**AR1,3**	**AR1,4**	**AR1,5**
AR1,4	0.014	0.018	-0.015	-0.030	-0.017	0.043	-0.333	1.000	-0.740
AR1,5	-0.023	0.144	-0.139	-0.146	0.064	0.086	0.003	-0.740	1.000

Autocorrelation Check of Residuals									
To Lag	**Chi-Square**	**DF**	**Pr > ChiSq**	**Autocorrelations**					
6	.	0	.	-0.037	-0.000	-0.003	0.067	0.115	-0.130
12	6.13	4	0.1897	0.091	0.009	-0.106	0.076	-0.155	0.010
18	14.25	10	0.1617	-0.272	0.023	-0.118	0.003	-0.093	-0.063
24	18.80	16	0.2791	0.006	-0.164	-0.044	0.137	0.007	-0.011




Residual Normality Diagnostics for rain
Distribution of Residuals
Normal
Kernel
Percent
Residual
QQ-Plot
Residual
Quantile


Distribution of Residuals for rain
Normal
Kernel
Percent
Residual



Model for variable rain	
Estimated Mean	6.022905

Autoregressive Factors	
Factor 1:	1 - 1.19975 B**(1) + 0.30858 B**(2) + 0.48308 B**(3) - 0.32307 B**(4) + 0.29276 B**(5)

Moving Average Factors	
Factor 1:	1 - 1.17314 B**(1) + 0.21093 B**(2) + 0.47787 B**(3)

Name of Variable = pollution	
Mean of Working Series	94.20369
Standard Deviation	27.42528
Number of Observations	60

Autocorrelation Check for White Noise									
To Lag	**Chi-Square**	**DF**	**Pr > ChiSq**	**Autocorrelations**					
6	17.55	6	0.0075	0.127	-0.028	-0.041	-0.061	-0.214	-0.435
12	26.25	12	0.0099	-0.151	0.049	-0.026	-0.113	0.110	0.254

Correlation of pollution and rain	
Number of Observations	60
Variance of transformed series pollution	837.1362
Variance of transformed series rain	50.16757

Both series have been prewhitened.

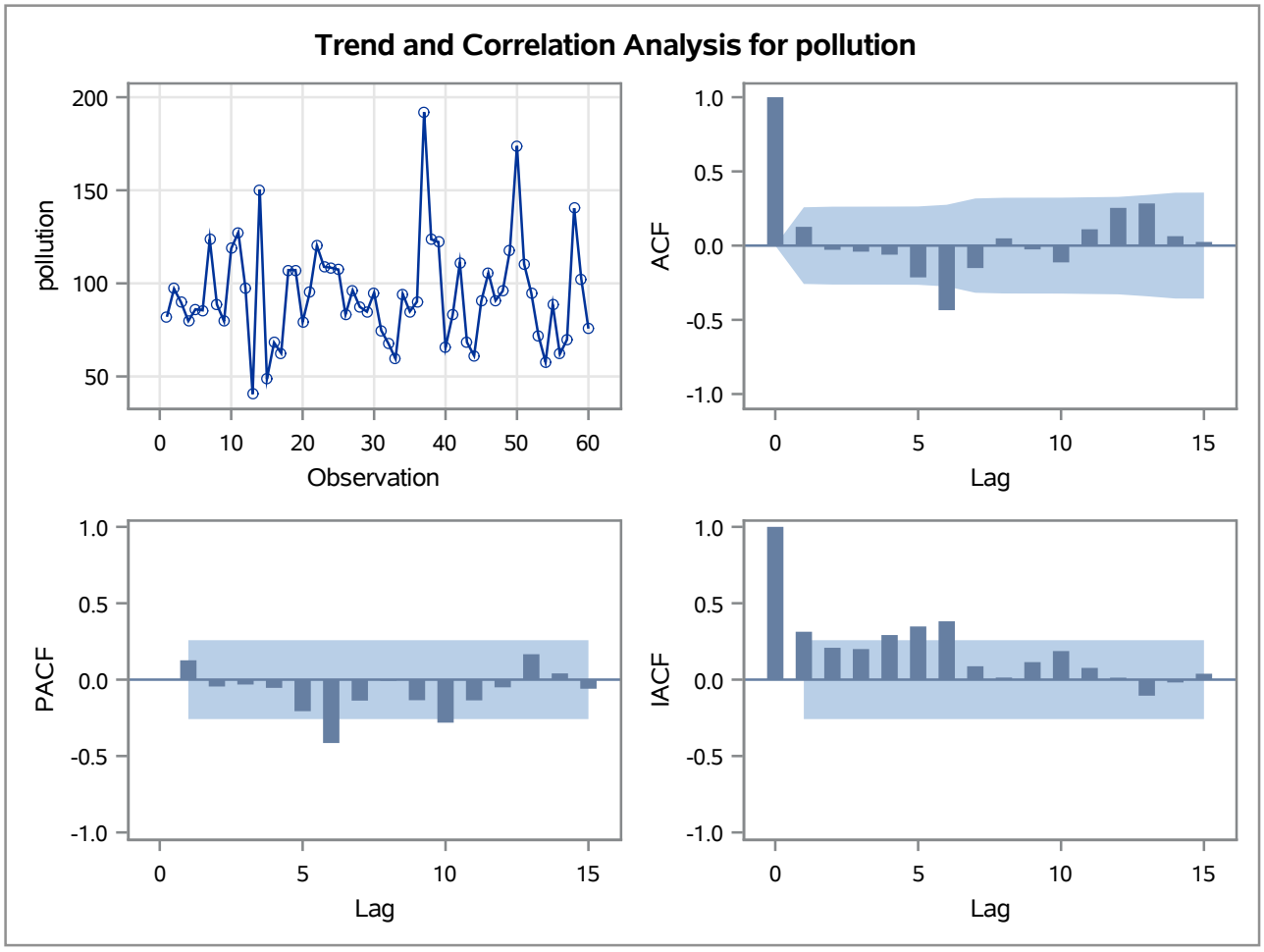
Crosscorrelation Check Between Series									
To Lag	Chi-Square	DF	Pr > ChiSq	Crosscorrelations					
5	15.26	6	0.0183	0.208	0.041	0.192	-0.227	-0.321	-0.132
11	24.35	12	0.0182	-0.176	0.105	0.030	0.209	0.227	0.117

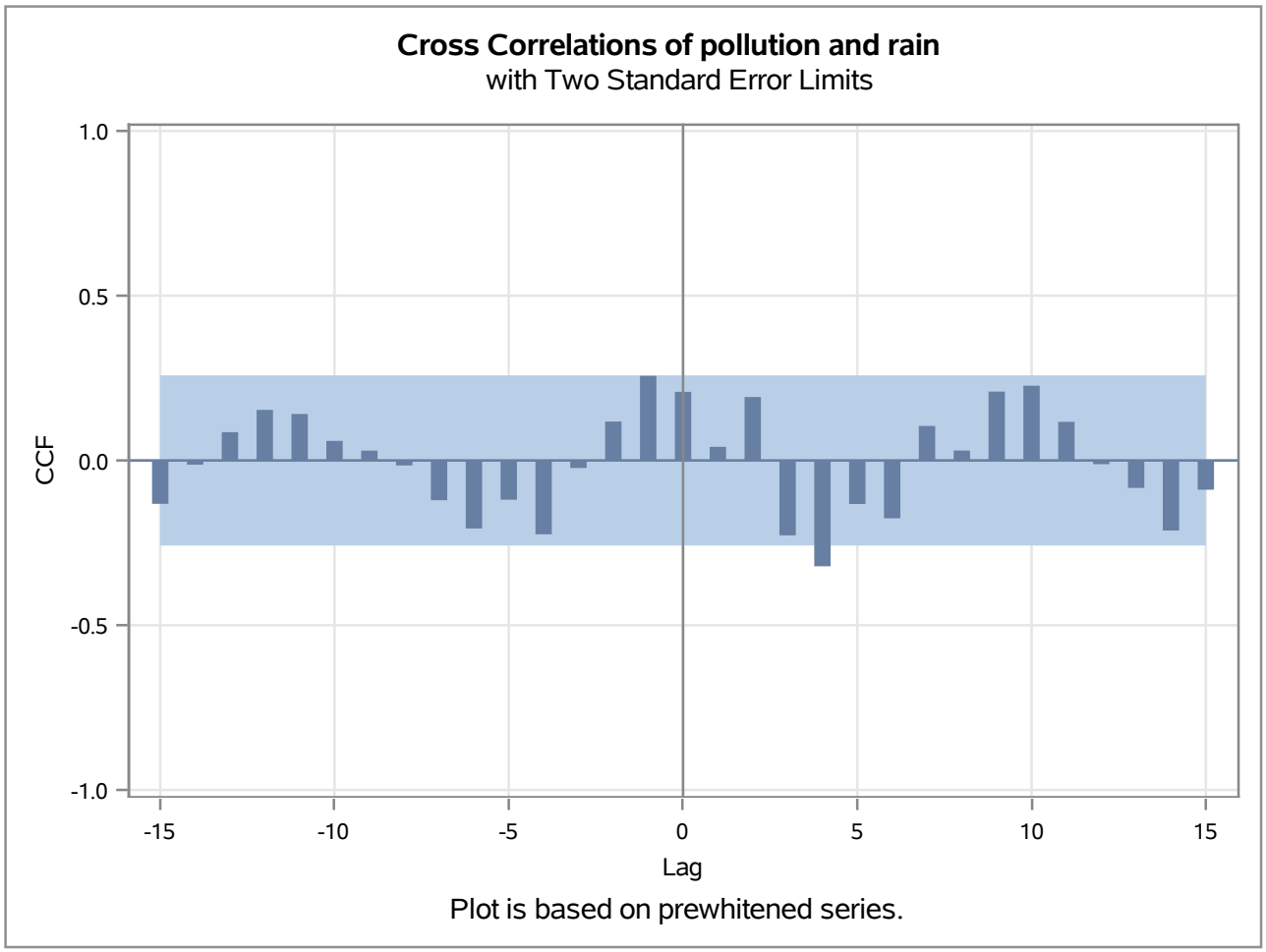
Both variables have been prewhitened by the following filter:

Prewhitening Filter

Autoregressive Factors	
Factor 1:	1 - 1.19975 B**(1) + 0.30858 B**(2) + 0.48308 B**(3) - 0.32307 B**(4) + 0.29276 B**(5)

Moving Average Factors	
Factor 1:	1 - 1.17314 B**(1) + 0.21093 B**(2) + 0.47787 B**(3)



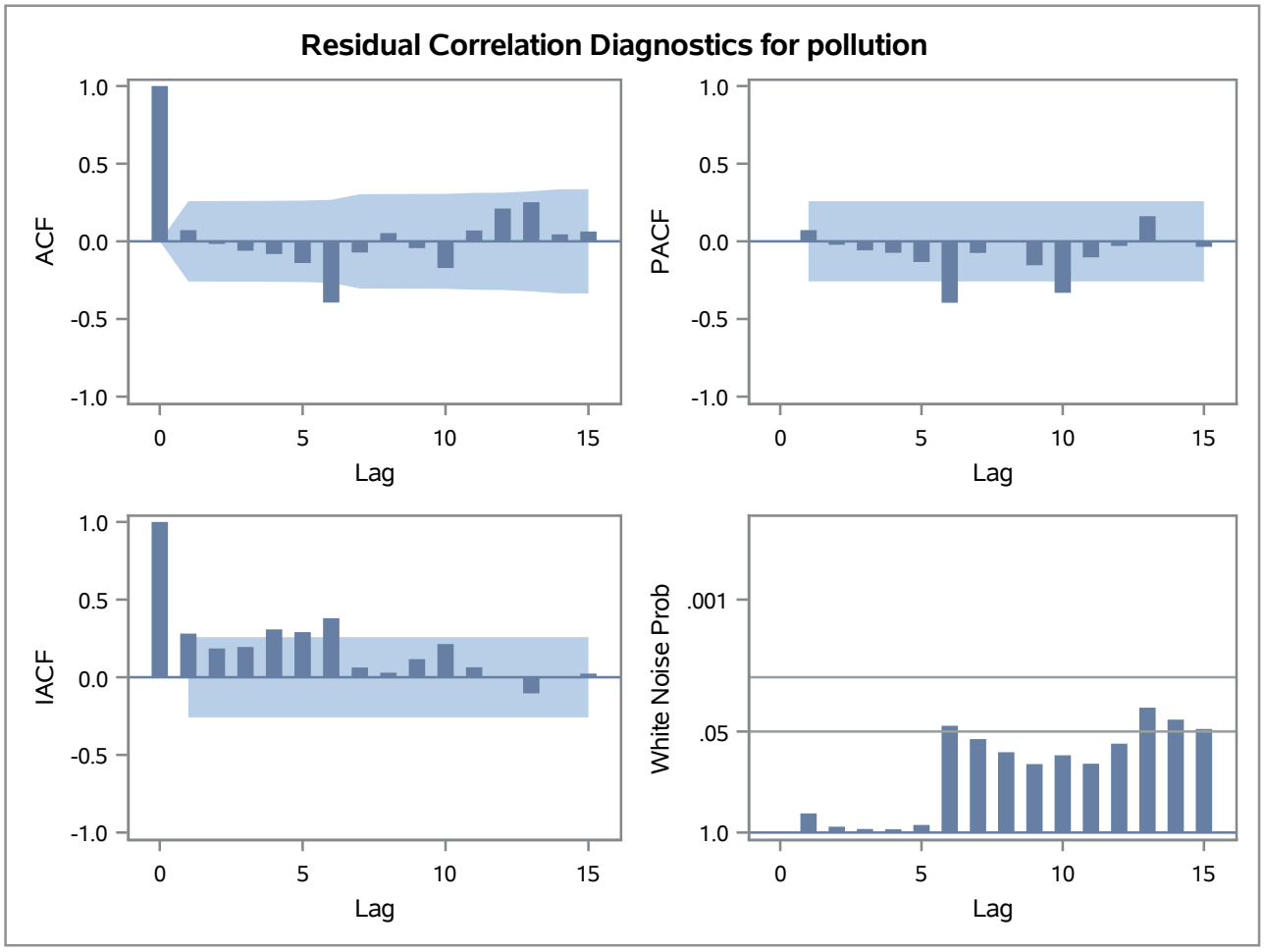


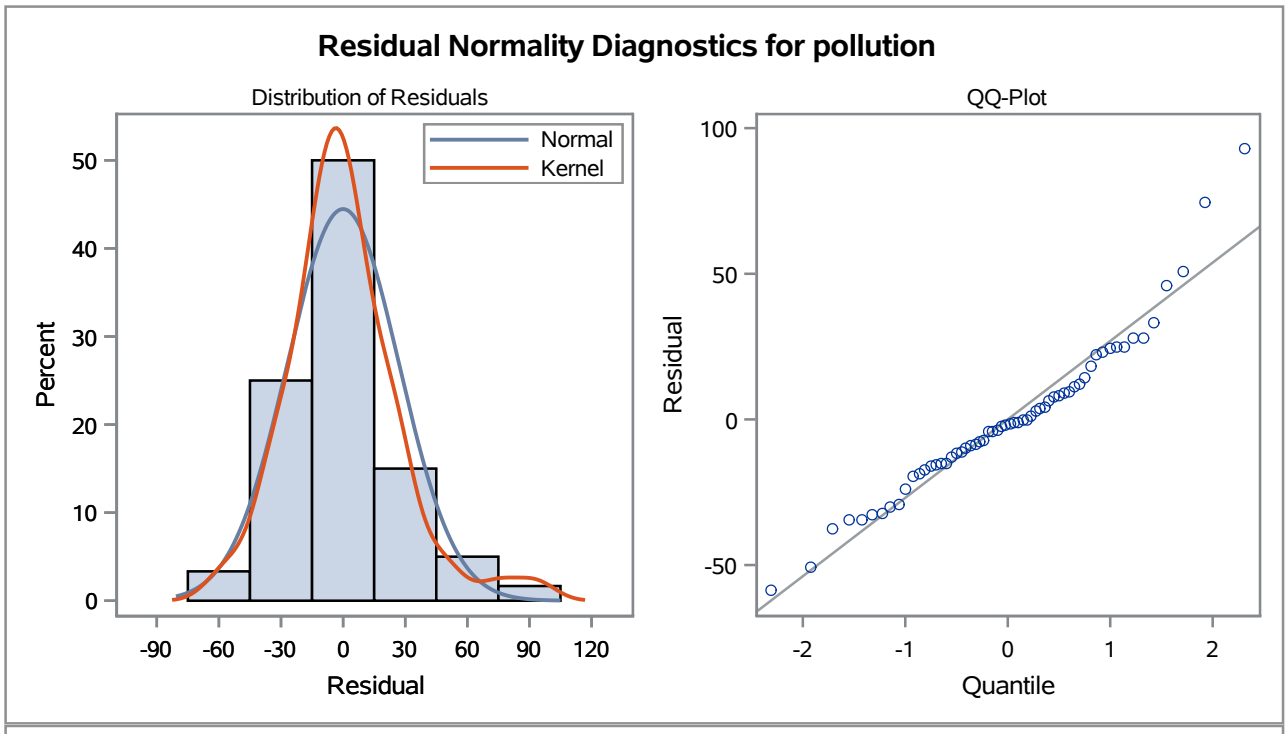
Maximum Likelihood Estimation							
Parameter	Estimate	Standard Error	t Value	Approx Pr > |t|	Lag	Variable	Shift
MU	99.40738	4.54428	21.88	<.0001	0	pollution	0
NUM1	-0.87723	0.48765	-1.80	0.0720	0	rain	0

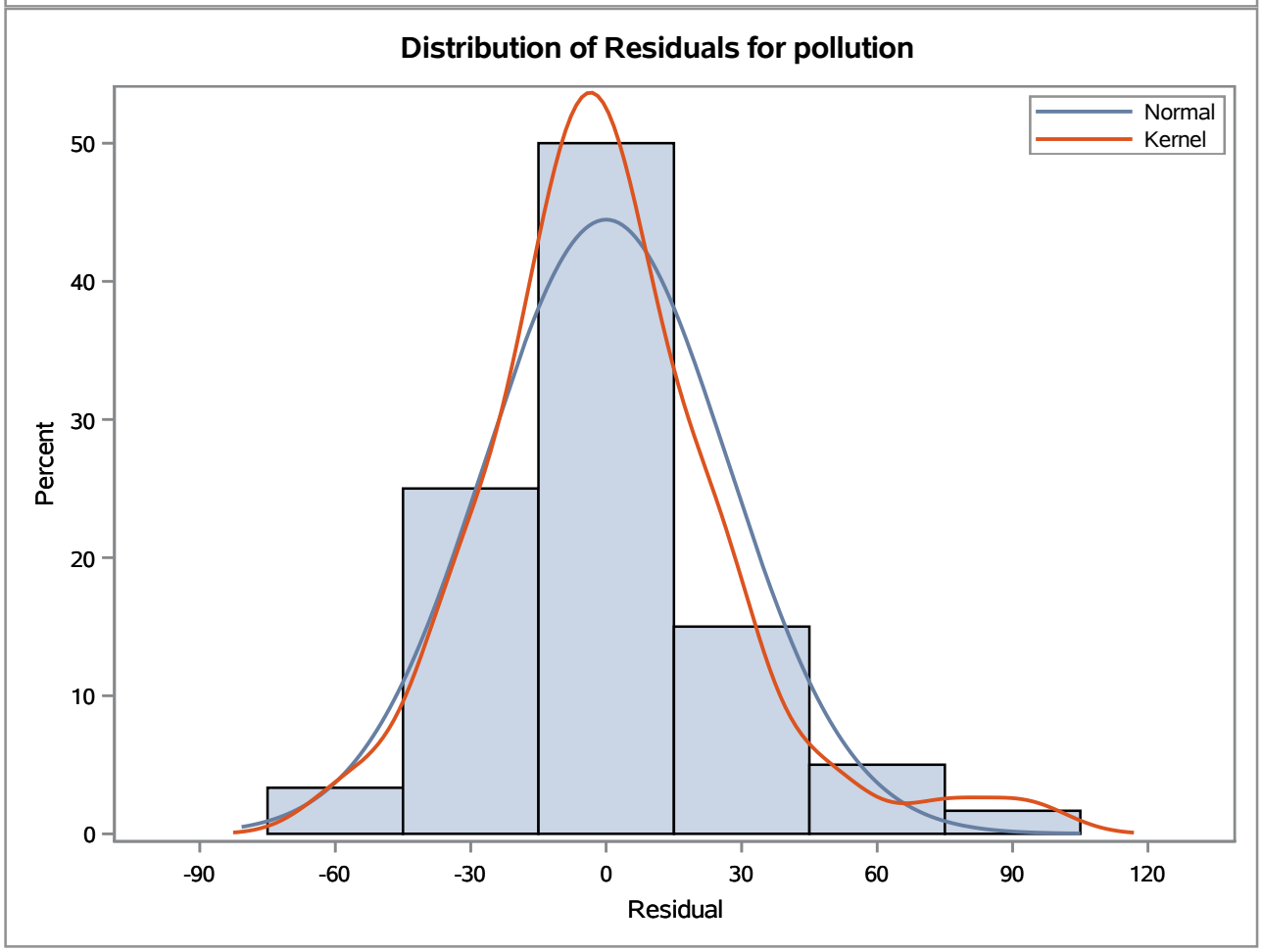
Constant Estimate	99.40738
Variance Estimate	736.964
Std Error Estimate	27.14708
AIC	568.3909
SBC	572.5796
Number of Residuals	60

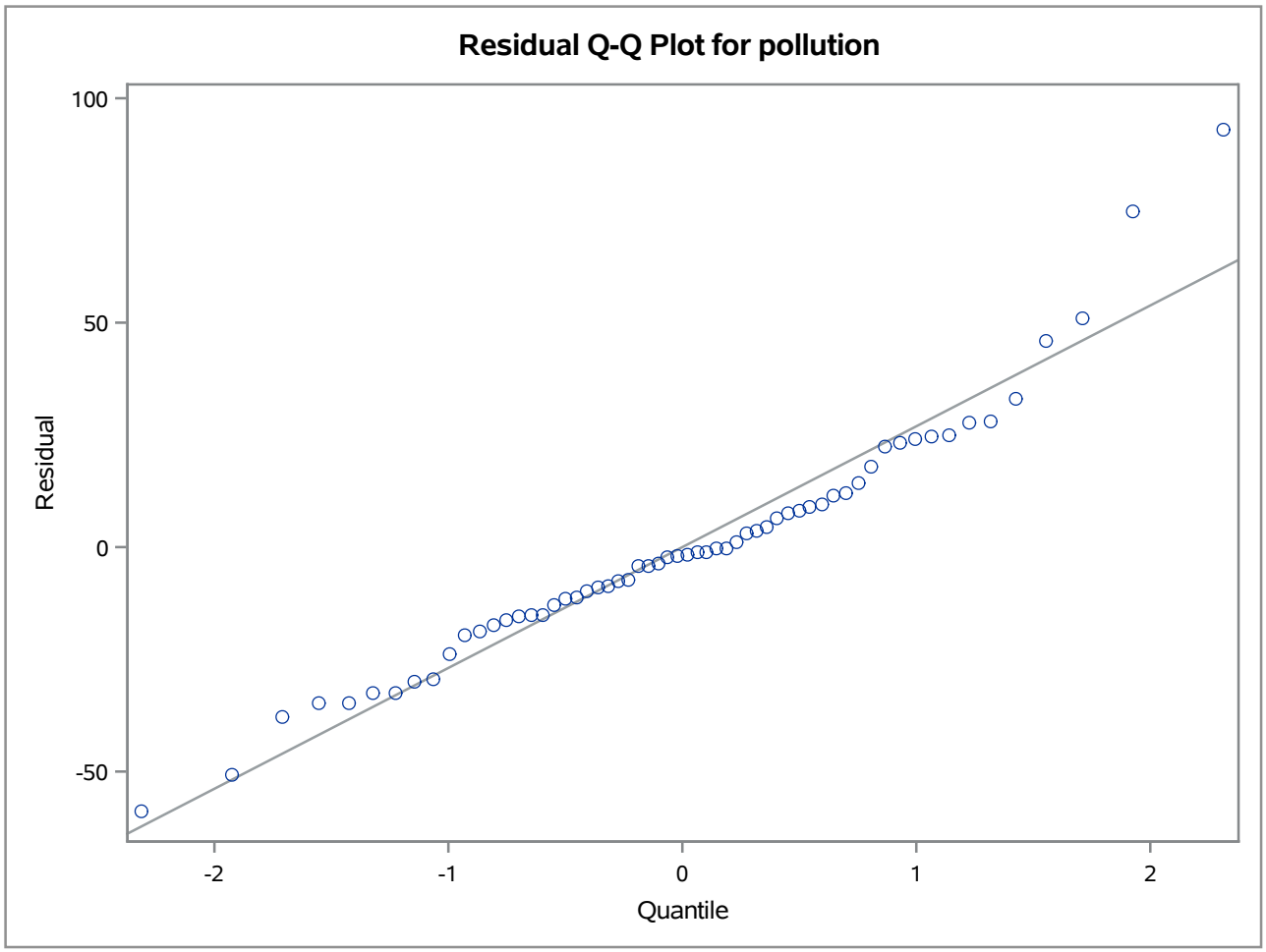
Correlations of Parameter Estimates			
Variable	Parameter	pollution MU	rain NUM1
pollution	MU	1.000	-0.637
rain	NUM1	-0.637	1.000

Autocorrelation Check of Residuals									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	13.05	6	0.0422	0.072	-0.017	-0.060	-0.082	-0.140	-0.394
12	19.76	12	0.0717	-0.072	0.053	-0.044	-0.172	0.070	0.211
18	29.27	18	0.0452	0.252	0.045	0.063	0.094	-0.167	-0.097
24	37.60	24	0.0381	-0.066	0.027	-0.008	-0.262	0.065	-0.084




Residual Normality Diagnostics for pollution
Distribution of Residuals
Normal
Kernel
Percent
Residual
QQ-Plot
Residual
Quantile


Distribution of Residuals for pollution
Normal
Kernel
Percent
Residual



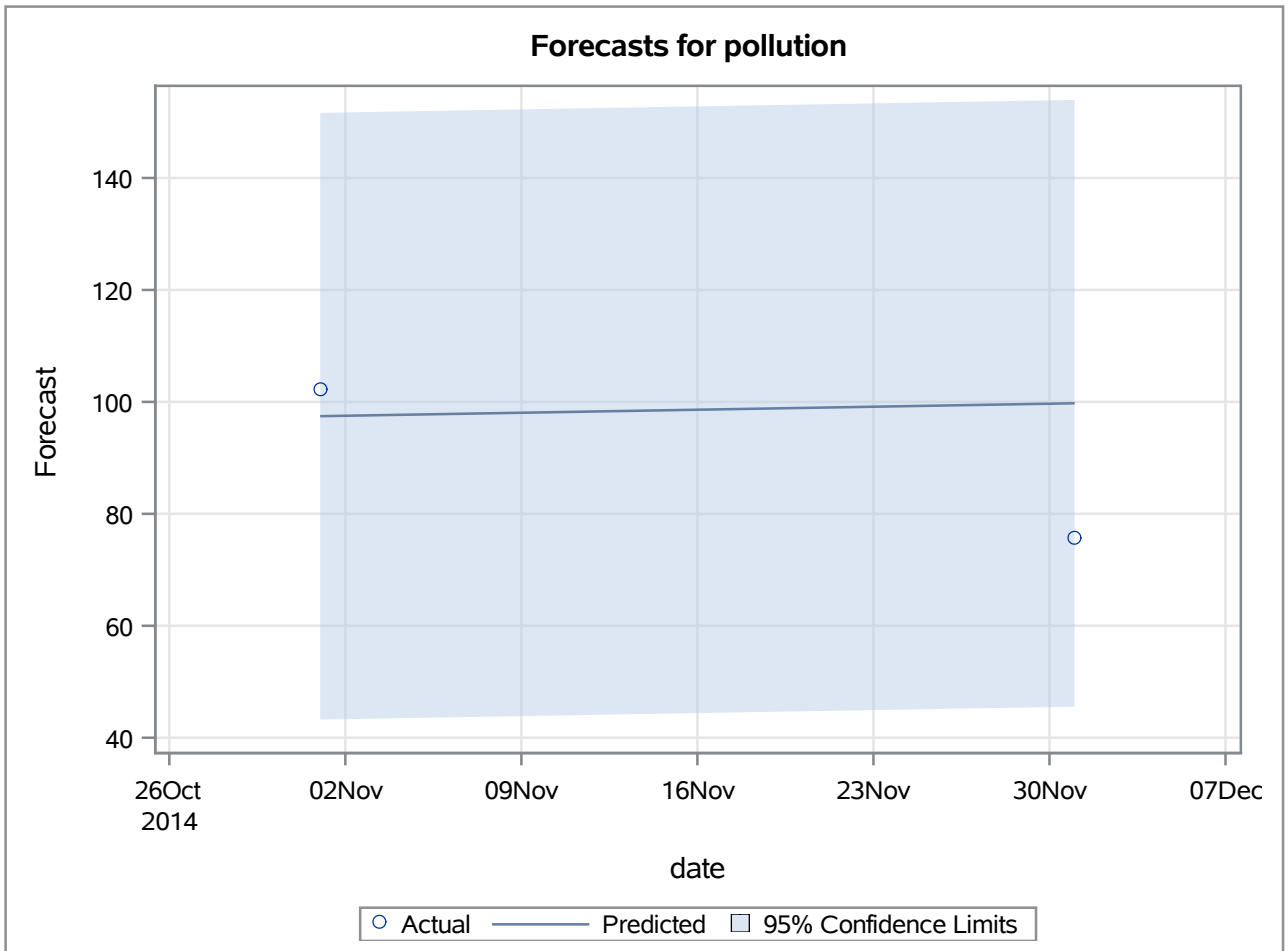
Crosscorrelation Check of Residuals with Input rain									
To Lag	Chi-Square	DF	Pr > ChiSq	Crosscorrelations					
5	8.50	6	0.2037	0.189	-0.076	0.291	-0.053	-0.086	0.075
11	11.28	12	0.5052	-0.024	0.148	-0.145	-0.049	0.015	-0.007
17	18.36	18	0.4319	-0.051	0.013	0.034	0.251	0.071	-0.214
23	20.00	24	0.6965	0.075	-0.005	0.027	-0.104	-0.096	0.031

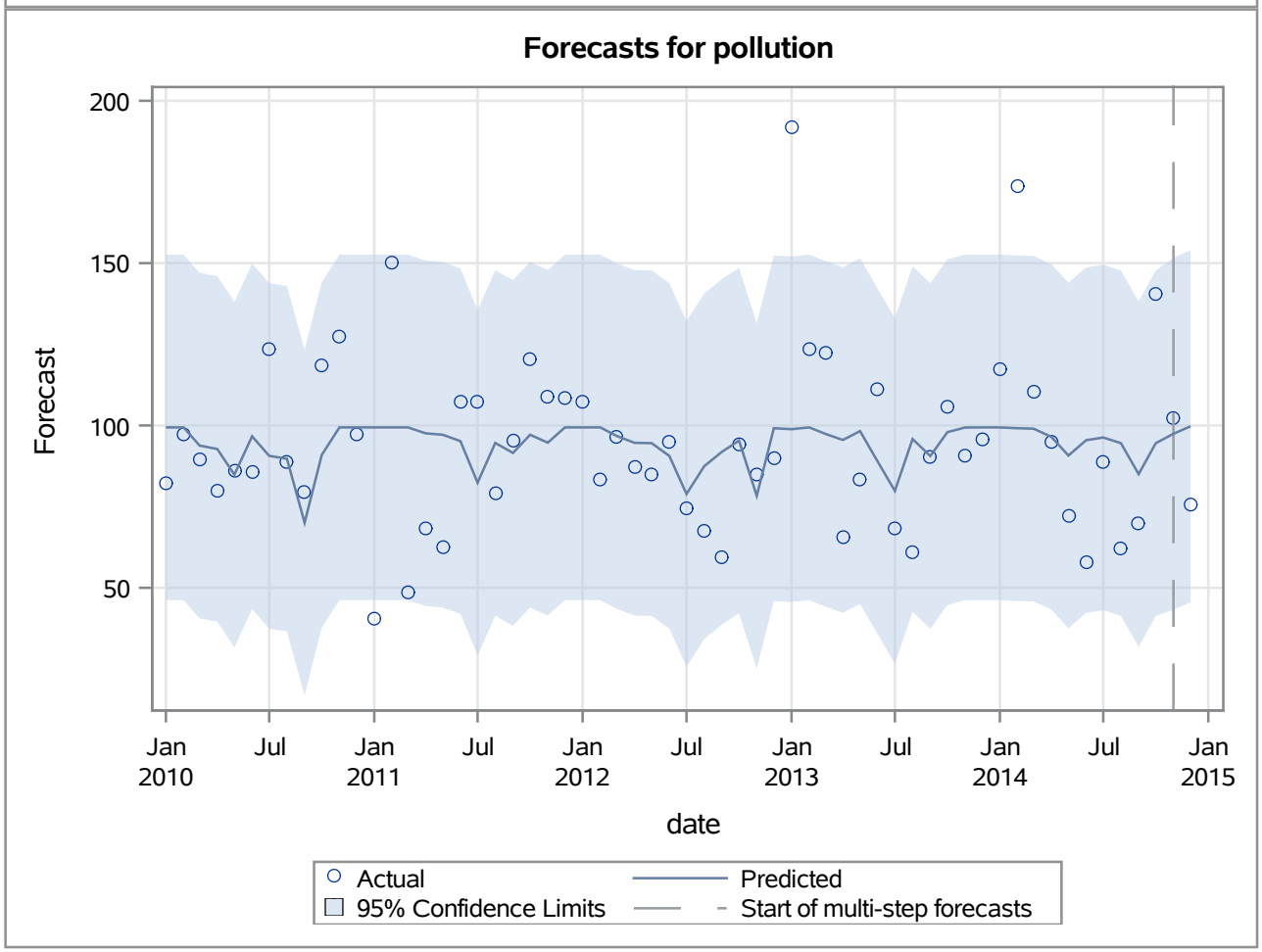
Model for variable pollution	
Estimated Intercept	99.40738

Input Number 1	
Input Variable	rain
Overall Regression Factor	-0.87723

Forecasts for variable pollution						
Obs	Forecast	Std Error	95% Confidence Limits		Actual	Residual
1	99.4074	27.1471	46.2001	152.6147	82.0264	-17.3810
2	99.4074	27.1471	46.2001	152.6147	97.0893	-2.3181
3	93.8150	27.1471	40.6077	147.0223	89.6734	-4.1416
4	92.7550	27.1471	39.5477	145.9623	79.8069	-12.9481
5	84.8600	27.1471	31.6527	138.0673	86.0820	1.2220
6	96.6660	27.1471	43.4587	149.8733	85.5375	-11.1285
7	90.6351	27.1471	37.4278	143.8424	123.6478	33.0128
8	89.7578	27.1471	36.5505	142.9651	88.6815	-1.0764
9	70.0567	27.1471	16.8494	123.2640	79.6319	9.5753
10	90.9275	27.1471	37.7202	144.1348	118.6626	27.7352
11	99.4074	27.1471	46.2001	152.6147	127.3778	27.9704
12	99.4074	27.1471	46.2001	152.6147	97.3333	-2.0740
13	99.4074	27.1471	46.2001	152.6147	40.5470	-58.8603
14	99.4074	27.1471	46.2001	152.6147	150.3214	50.9140
15	99.4074	27.1471	46.2001	152.6147	48.6546	-50.7528
16	97.5798	27.1471	44.3725	150.7871	68.1806	-29.3993
17	97.1412	27.1471	43.9339	150.3485	62.5121	-34.6291
18	95.1674	27.1471	41.9601	148.3747	107.1111	11.9437
19	82.3745	27.1471	29.1672	135.5818	107.1384	24.7640
20	94.6192	27.1471	41.4119	147.8265	79.2366	-15.3826
21	91.5488	27.1471	38.3415	144.7561	95.1403	3.5914
22	97.1412	27.1471	43.9339	150.3485	120.2406	23.0994
23	94.6923	27.1471	41.4850	147.8996	108.8708	14.1786
24	99.4074	27.1471	46.2001	152.6147	108.3737	8.9663
25	99.4074	27.1471	46.2001	152.6147	107.4435	8.0362
26	99.4074	27.1471	46.2001	152.6147	83.2730	-16.1344
27	96.7391	27.1471	43.5318	149.9464	96.3360	-0.4031
28	94.6557	27.1471	41.4484	147.8630	87.3972	-7.2585
29	94.5461	27.1471	41.3388	147.7534	84.7782	-9.7678
30	90.5985	27.1471	37.3912	143.8058	94.9861	4.3876
31	78.9021	27.1471	25.6948	132.1094	74.6707	-4.2314
32	87.4551	27.1471	34.2478	140.6624	67.7137	-19.7414
33	91.8778	27.1471	38.6705	145.0851	59.5014	-32.3764
34	95.3502	27.1471	42.1429	148.5575	94.3293	-1.0209
35	78.3173	27.1471	25.1100	131.5246	84.8806	6.5633
36	99.1515	27.1471	45.9442	152.3588	90.1169	-9.0346

Forecasts for variable pollution						
Obs	Forecast	Std Error	95% Confidence Limits		Actual	Residual
37	98.8591	27.1471	45.6518	152.0664	191.9745	93.1154
38	99.4074	27.1471	46.2001	152.6147	123.6176	24.2102
39	97.4336	27.1471	44.2263	150.6409	122.2379	24.8043
40	95.5329	27.1471	42.3256	148.7402	65.6542	-29.8788
41	98.2743	27.1471	45.0670	151.4816	83.1801	-15.0942
42	88.8440	27.1471	35.6367	142.0513	111.1069	22.2629
43	79.8524	27.1471	26.6451	133.0597	68.3347	-11.5177
44	95.8253	27.1471	42.6180	149.0326	61.1586	-34.6667
45	90.5985	27.1471	37.3912	143.8058	90.3694	-0.2291
46	97.9453	27.1471	44.7380	151.1526	105.5901	7.6447
47	99.3708	27.1471	46.1635	152.5781	90.7931	-8.5778
48	99.4074	27.1471	46.2001	152.6147	95.8629	-3.5445
49	99.4074	27.1471	46.2001	152.6147	117.4422	18.0348
50	99.1515	27.1471	45.9442	152.3588	173.8378	74.6863
51	99.0053	27.1471	45.7980	152.2126	110.3374	11.3321
52	96.5198	27.1471	43.3125	149.7271	94.8361	-1.6837
53	90.7447	27.1471	37.5374	143.9520	72.0605	-18.6842
54	95.4598	27.1471	42.2525	148.6671	57.6875	-37.7723
55	96.3005	27.1471	43.0932	149.5078	88.6142	-7.6863
56	94.5461	27.1471	41.3388	147.7534	62.0121	-32.5340
57	85.0062	27.1471	31.7989	138.2135	69.8056	-15.2006
58	94.5461	27.1471	41.3388	147.7534	140.3669	45.8209
59	97.4450	27.6520	43.2482	151.6419	102.3486	4.9036
60	99.7498	27.6523	45.5523	153.9474	75.6882	-24.0616


Forecasts for pollution
Forecast
140
120
100
80
60
40
26Oct
2014
02Nov
09Nov
16Nov
23Nov
30Nov
07Dec
date
Actual
Predicted
95% Confidence Limits


Forecasts for pollution
Forecast
200
150
100
50
Jan
2010
Jul
Jan
2011
Jul
Jan
2012
Jul
Jan
2013
Jul
Jan
2014
Jul
Jan
2015
date
Actual
95% Confidence Limits
Predicted
Start of multi-step forecasts

Outlier Detection Summary	
Maximum number searched	2
Number found	2
Significance used	0.05

Outlier Details

Obs	Type	Estimate	Chi-Square	Approx Prob>ChiSq
37	Additive	93.11535	17.14	<.0001
50	Additive	74.68628	12.50	0.0004