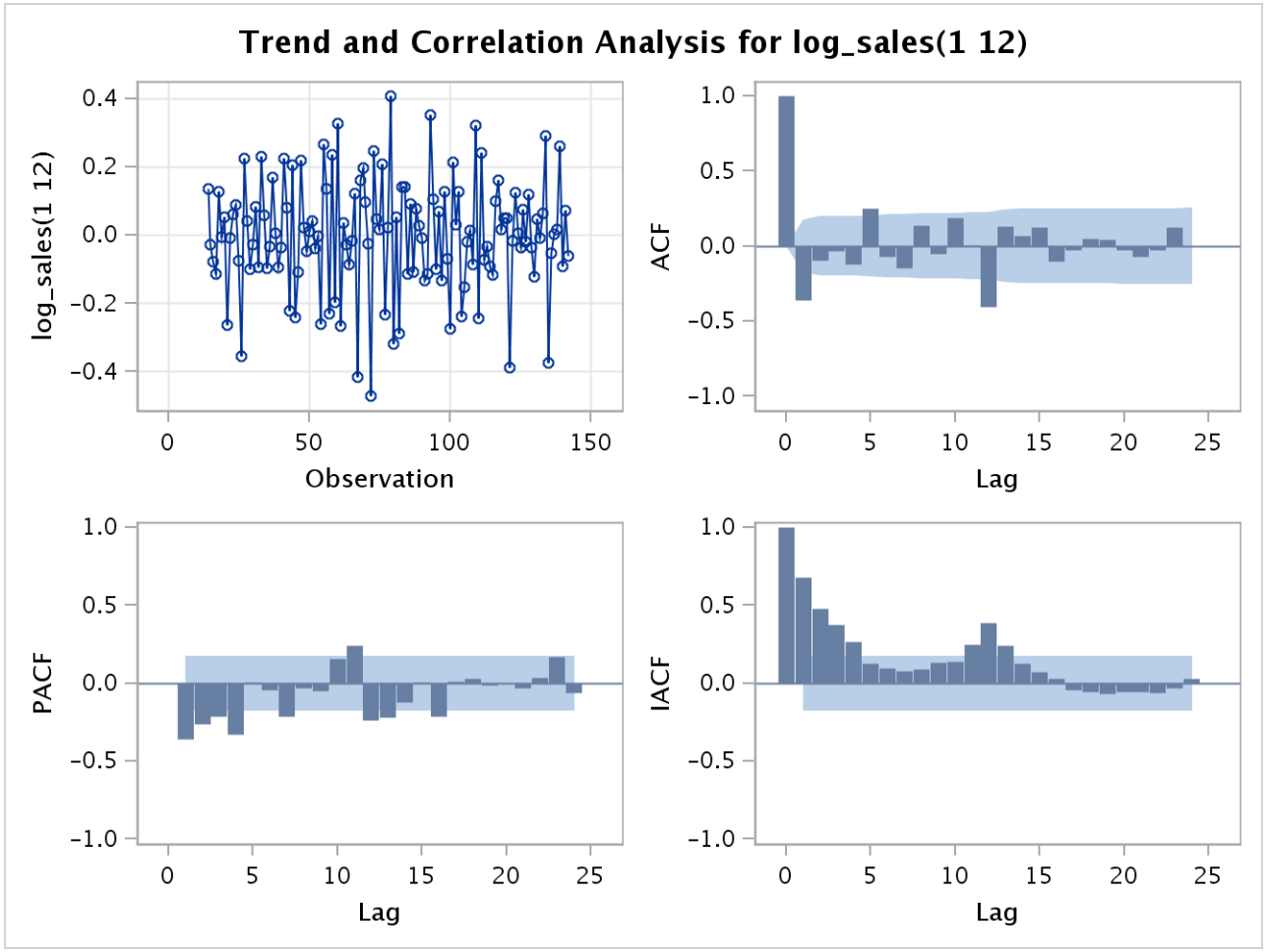
The SAS System

The ARIMA Procedure

Name of Variable = log_sales	
Period(s) of Differencing	1,12
Mean of Working Series	-0.00025
Standard Deviation	0.166026
Number of Observations	129
Observation(s) eliminated by differencing	13

Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	29.93	6	<.0001	-0.362	-0.098	-0.034	-0.124	0.249	-0.072
12	64.97	12	<.0001	-0.149	0.137	-0.056	0.189	0.007	-0.406
18	72.45	18	<.0001	0.130	0.064	0.124	-0.105	-0.026	0.048
24	76.15	24	<.0001	0.043	-0.029	-0.071	-0.031	0.122	-0.005



The SAS System

The ARIMA Procedure

Conditional Least Squares Estimation					
Parameter	Estimate	Standard Error	t Value	Approx Pr > |t|	Lag
MU	-0.0005585	0.0007340	-0.76	0.4481	0
MA1,1	0.78686	0.05565	14.14	<.0001	1
MA2,1	0.75201	0.06917	10.87	<.0001	12

Constant Estimate	-0.00056
Variance Estimate	0.01364
Std Error Estimate	0.11679
AIC	-184.973
SBC	-176.394
Number of Residuals	129

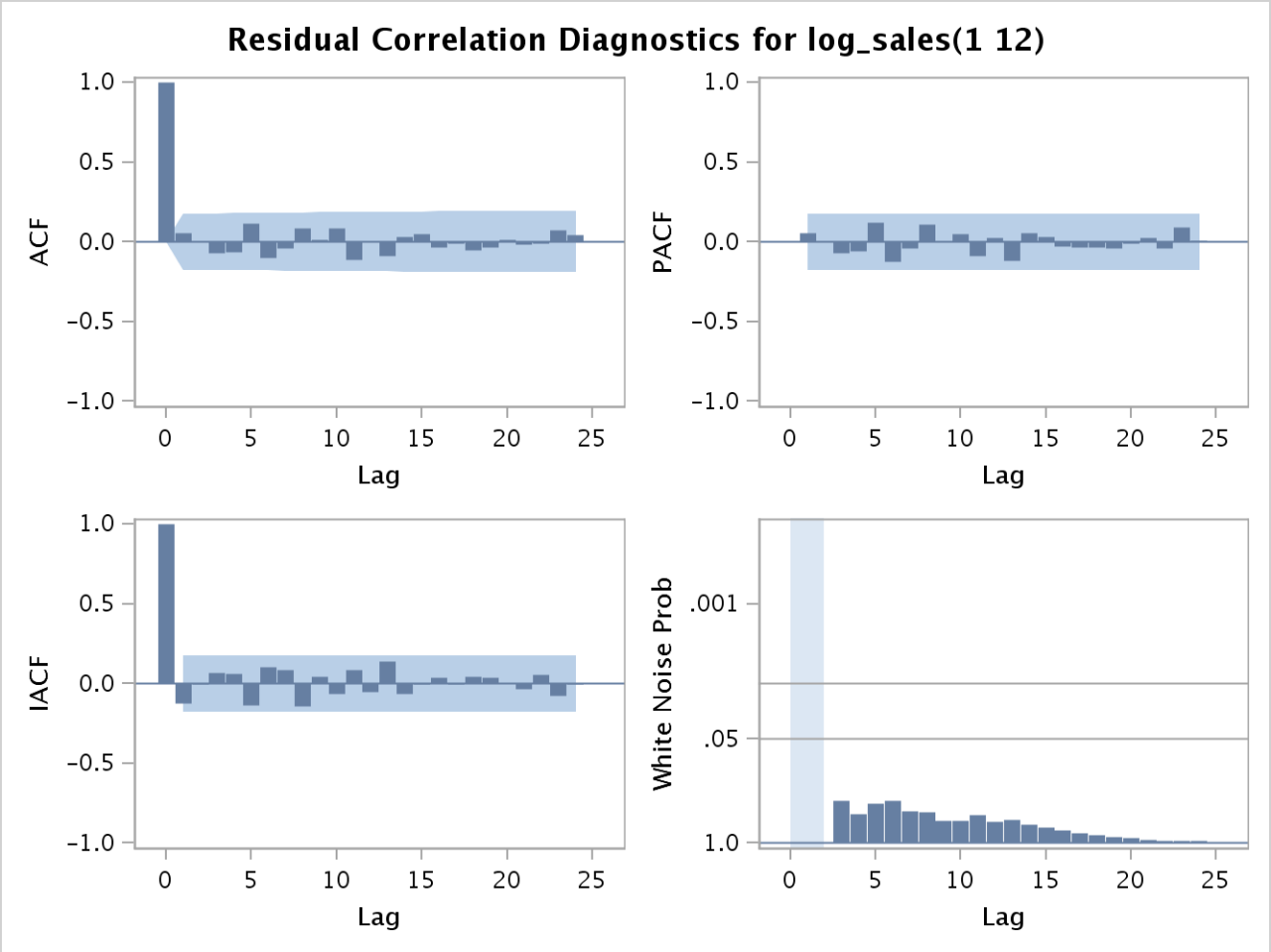
*** AIC and SBC do not include log determinant.**

Correlations of Parameter Estimates			
Parameter	MU	MA1,1	MA2,1
MU	1.000	-0.053	-0.052
MA1,1	-0.053	1.000	-0.035
MA2,1	-0.052	-0.035	1.000

Autocorrelation Check of Residuals									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	4.86	4	0.3023	0.057	0.002	-0.069	-0.065	0.116	-0.100
12	8.89	10	0.5422	-0.041	0.083	0.013	0.084	-0.112	-0.000
18	11.22	16	0.7956	-0.092	0.028	0.048	-0.035	-0.013	-0.053
24	12.58	22	0.9443	-0.036	0.010	-0.020	-0.014	0.069	0.043

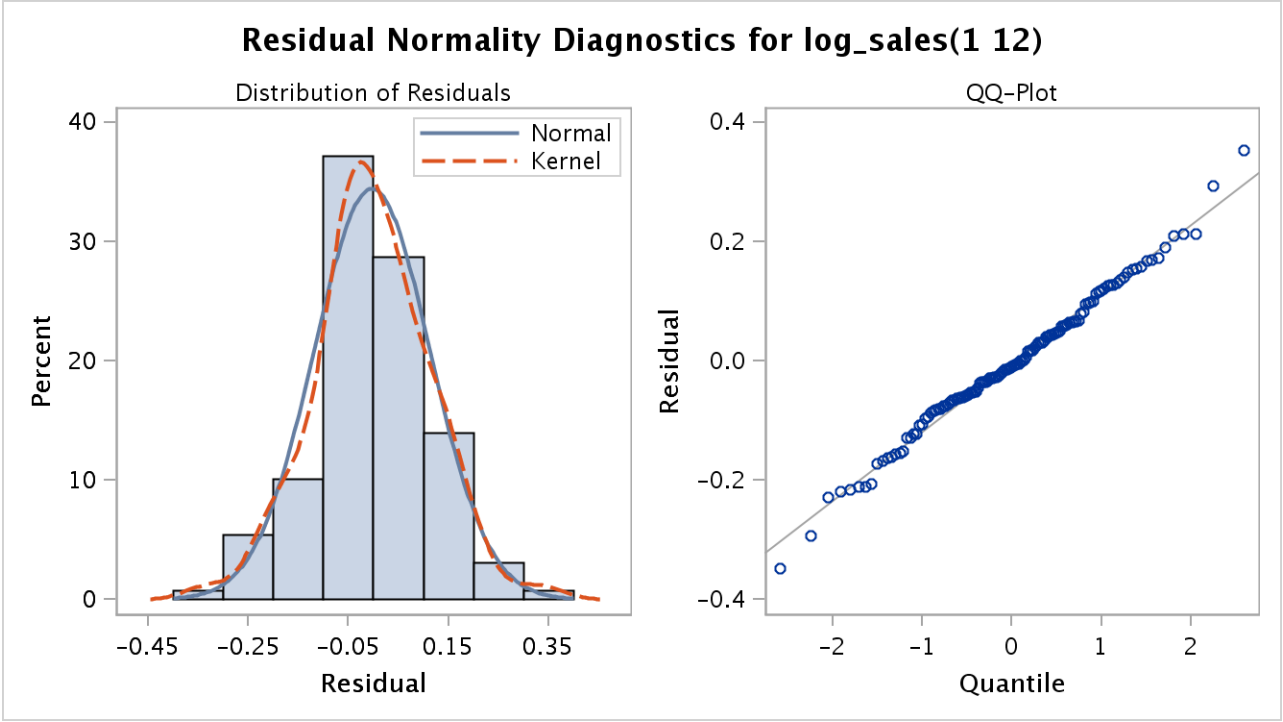
The SAS System

The ARIMA Procedure



The SAS System

The ARIMA Procedure



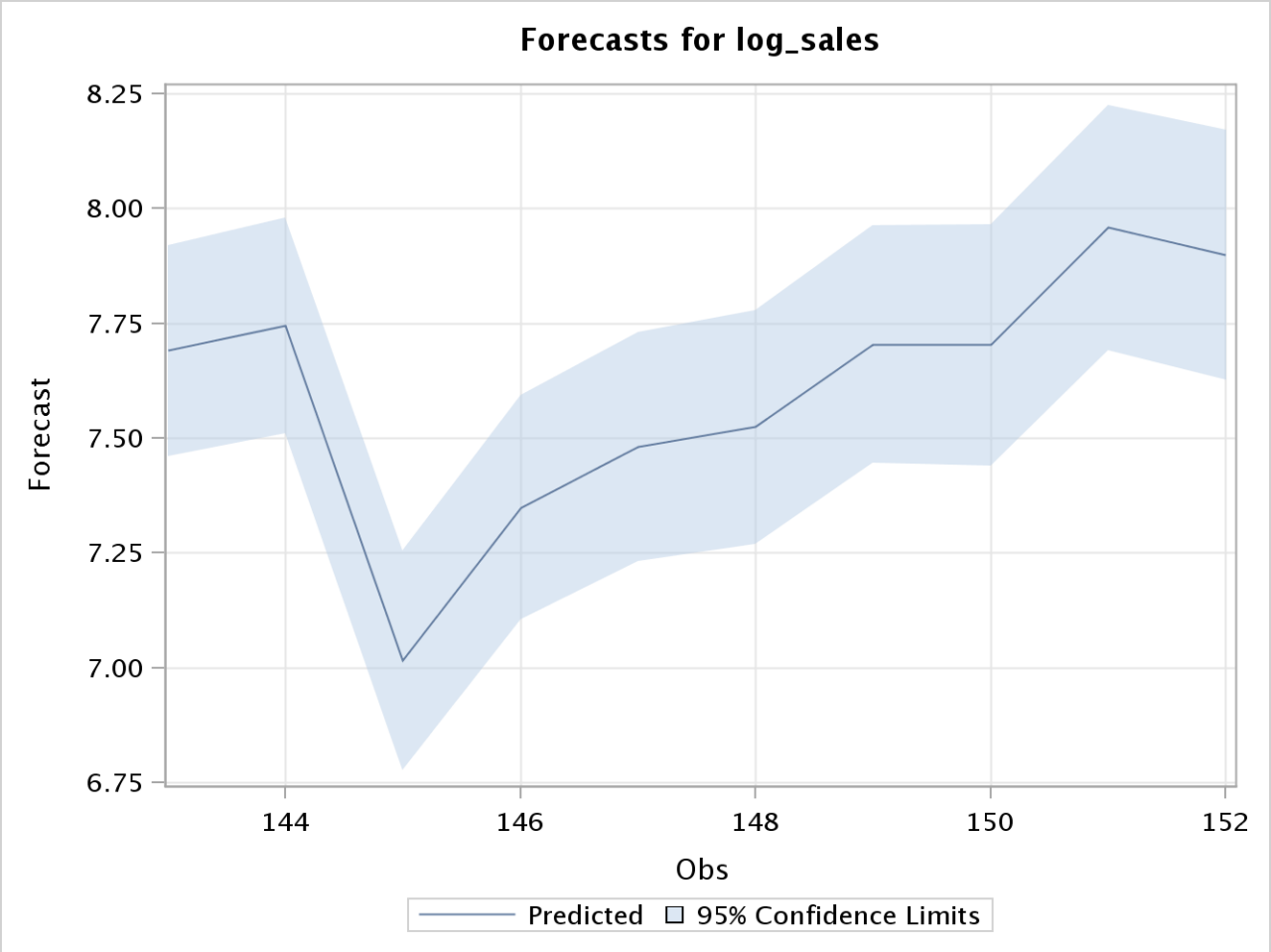
Model for variable log_sales	
Estimated Mean	-0.00056
Period(s) of Differencing	1,12

Moving Average Factors	
Factor 1:	1 - 0.78686 B**(1)
Factor 2:	1 - 0.75201 B**(12)

Forecasts for variable log_sales				
Obs	**Forecast**	**Std Error**	**95% Confidence Limits**	
143	7.6902	0.1168	7.4613	7.9191
144	7.7455	0.1194	7.5115	7.9796
145	7.0168	0.1220	6.7778	7.2559
146	7.3491	0.1245	7.1051	7.5931
147	7.4812	0.1270	7.2323	7.7300
148	7.5241	0.1294	7.2705	7.7777
149	7.7043	0.1317	7.4461	7.9625
150	7.7031	0.1341	7.4403	7.9659
151	7.9581	0.1364	7.6908	8.2254
152	7.8995	0.1386	7.6278	8.1712

The SAS System

The ARIMA Procedure

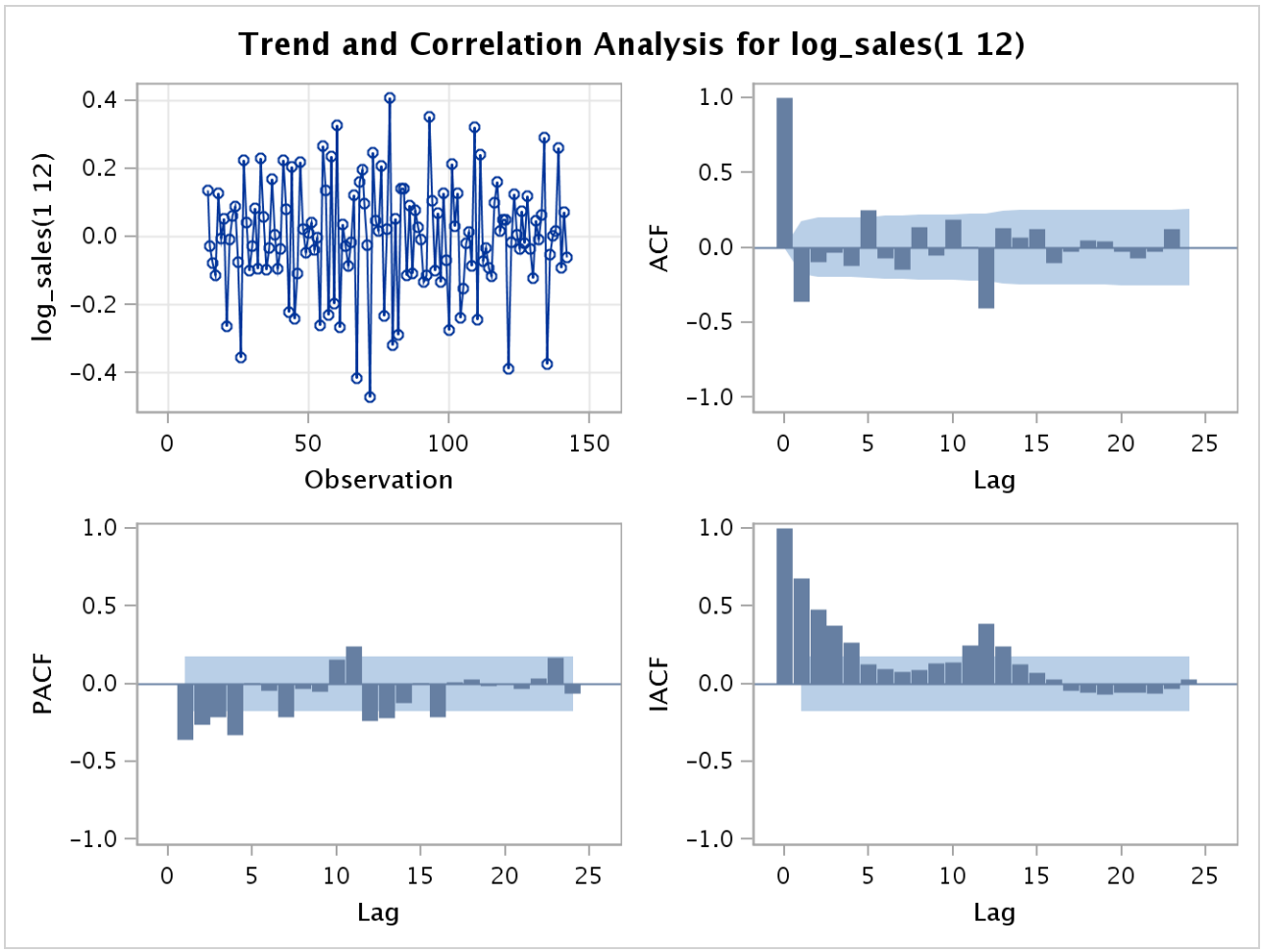


The SAS System

The ARIMA Procedure

Name of Variable = log_sales	
Period(s) of Differencing	1,12
Mean of Working Series	-0.00025
Standard Deviation	0.166026
Number of Observations	129
Observation(s) eliminated by differencing	13

Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	29.93	6	<.0001	-0.362	-0.098	-0.034	-0.124	0.249	-0.072
12	64.97	12	<.0001	-0.149	0.137	-0.056	0.189	0.007	-0.406
18	72.45	18	<.0001	0.130	0.064	0.124	-0.105	-0.026	0.048
24	76.15	24	<.0001	0.043	-0.029	-0.071	-0.031	0.122	-0.005



The SAS System

The ARIMA Procedure

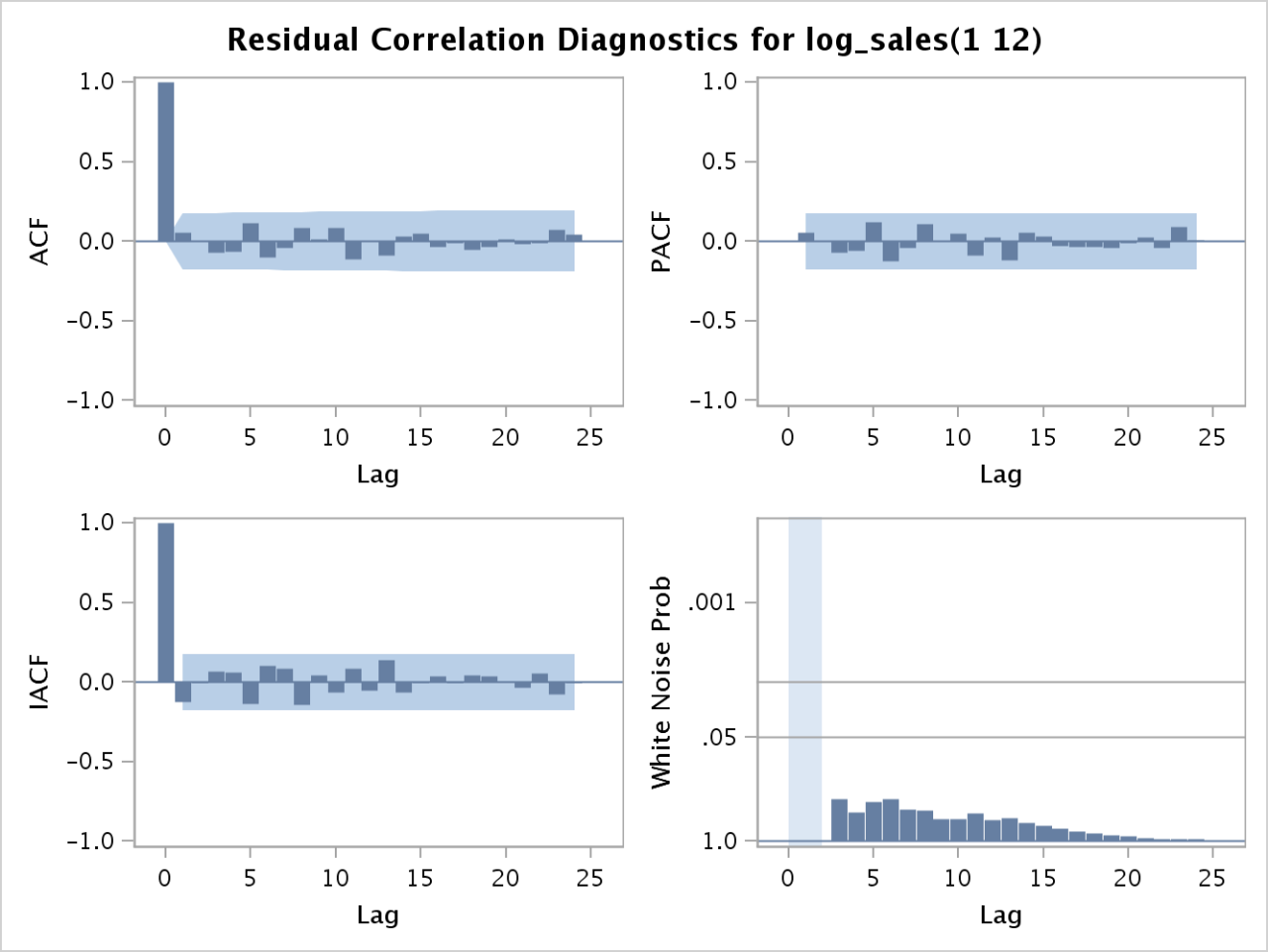
Conditional Least Squares Estimation					
Parameter	Estimate	Standard Error	t Value	Approx Pr > |t|	Lag
MU	-0.0005585	0.0007340	-0.76	0.4481	0
MA1,1	0.78686	0.05565	14.14	<.0001	1
MA2,1	0.75201	0.06917	10.87	<.0001	12

Constant Estimate	-0.00056
Variance Estimate	0.01364
Std Error Estimate	0.11679
AIC	-184.973
SBC	-176.394
Number of Residuals	129

*** AIC and SBC do not include log determinant.**

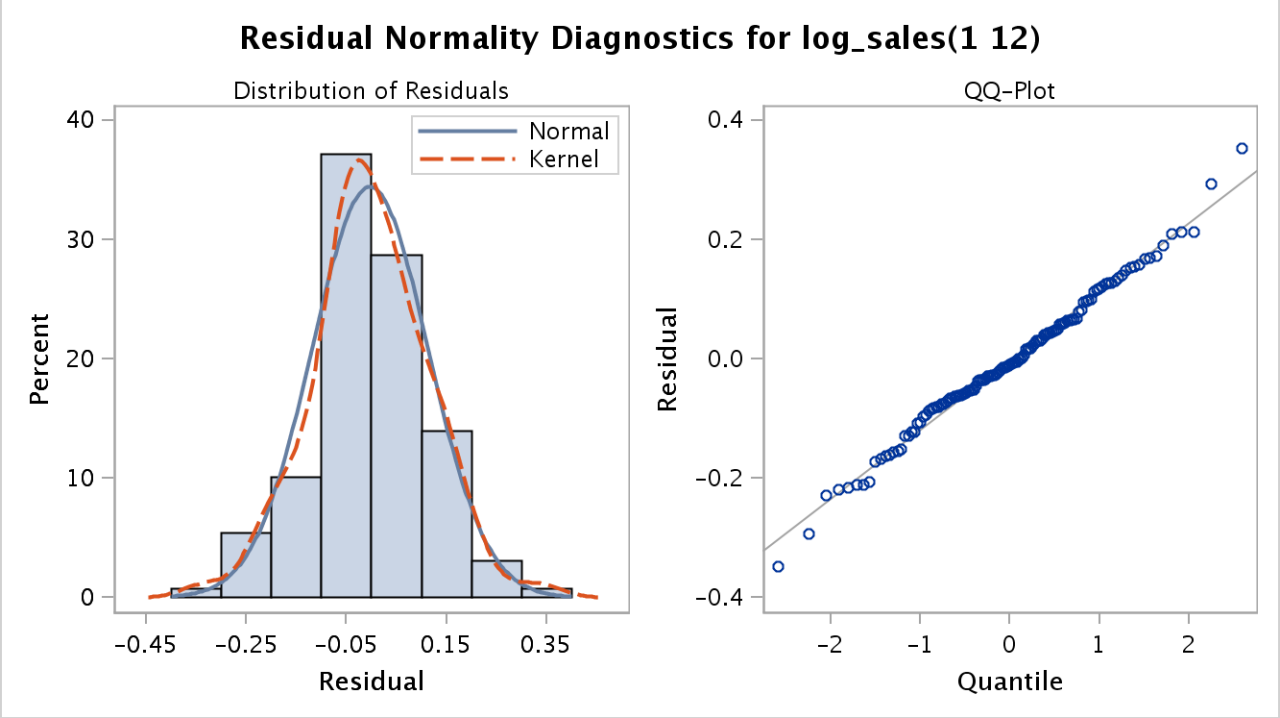
Correlations of Parameter Estimates			
Parameter	MU	MA1,1	MA2,1
MU	1.000	-0.053	-0.052
MA1,1	-0.053	1.000	-0.035
MA2,1	-0.052	-0.035	1.000

Autocorrelation Check of Residuals									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	4.86	4	0.3023	0.057	0.002	-0.069	-0.065	0.116	-0.100
12	8.89	10	0.5422	-0.041	0.083	0.013	0.084	-0.112	-0.000
18	11.22	16	0.7956	-0.092	0.028	0.048	-0.035	-0.013	-0.053
24	12.58	22	0.9443	-0.036	0.010	-0.020	-0.014	0.069	0.043


Residual Correlation Diagnostics for log_sales(1 12)
ACF
PACF
IACF
White Noise Prob
Lag
1.0
0.5
0.0
-0.5
-1.0
.001
.05
0
5
10
15
20
25

The SAS System

The ARIMA Procedure



Model for variable log_sales	
Estimated Mean	-0.00056
Period(s) of Differencing	1,12

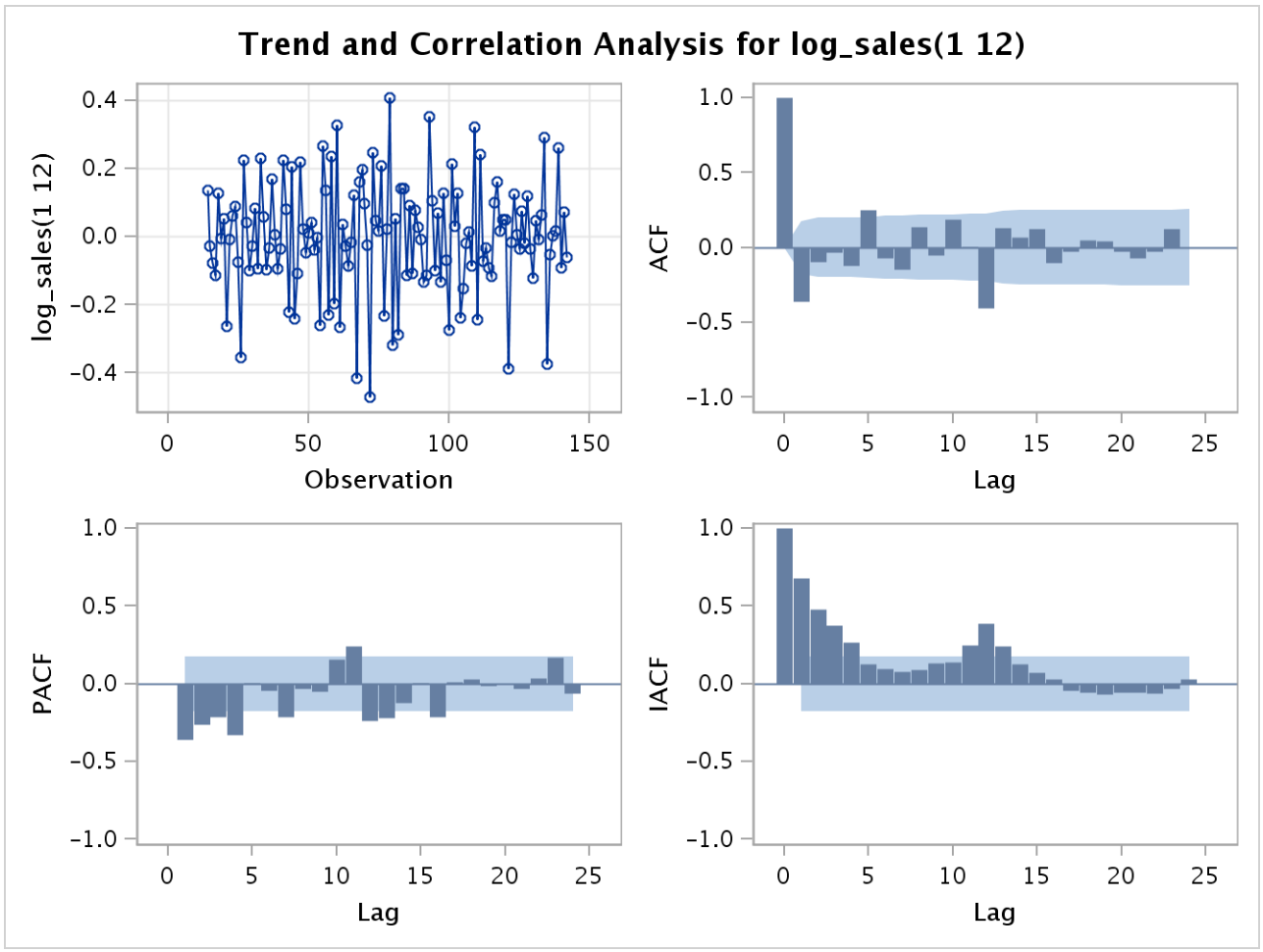
Moving Average Factors	
Factor 1:	1 - 0.78686 B**(1)
Factor 2:	1 - 0.75201 B**(12)

The SAS System

The ARIMA Procedure

Name of Variable = log_sales	
Period(s) of Differencing	1,12
Mean of Working Series	-0.00025
Standard Deviation	0.166026
Number of Observations	129
Observation(s) eliminated by differencing	13

Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	29.93	6	<.0001	-0.362	-0.098	-0.034	-0.124	0.249	-0.072
12	64.97	12	<.0001	-0.149	0.137	-0.056	0.189	0.007	-0.406
18	72.45	18	<.0001	0.130	0.064	0.124	-0.105	-0.026	0.048
24	76.15	24	<.0001	0.043	-0.029	-0.071	-0.031	0.122	-0.005



The SAS System

The ARIMA Procedure

Conditional Least Squares Estimation					
Parameter	Estimate	Standard Error	t Value	Approx Pr > |t|	Lag
MU	-0.0003446	0.0054268	-0.06	0.9495	0
AR1,1	-0.46702	0.08014	-5.83	<.0001	1
AR2,1	-0.53971	0.08133	-6.64	<.0001	12

Constant Estimate	-0.00078
Variance Estimate	0.018271
Std Error Estimate	0.135171
AIC	-147.262
SBC	-138.683
Number of Residuals	129

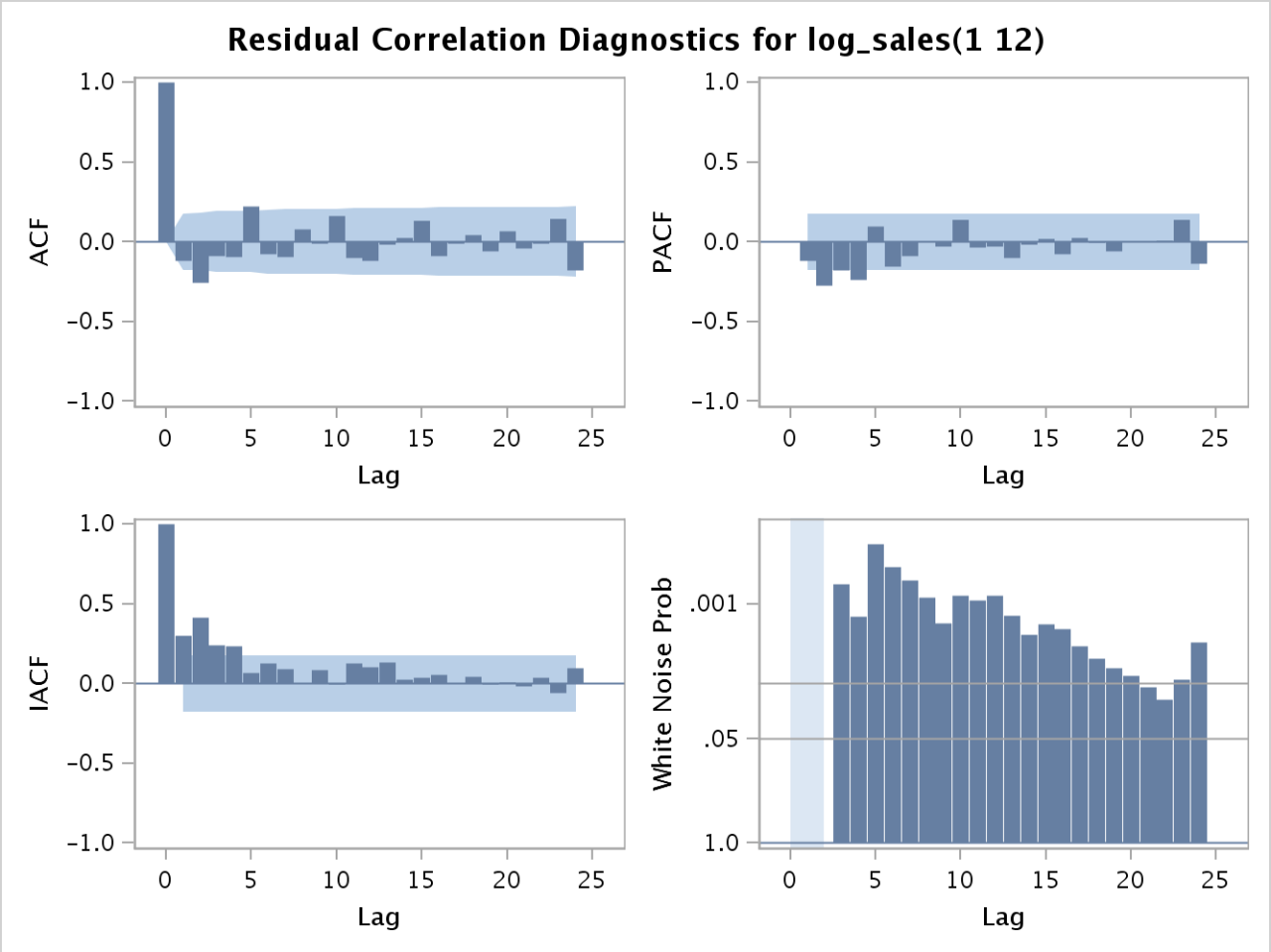
*** AIC and SBC do not include log determinant.**

Correlations of Parameter Estimates			
Parameter	MU	AR1,1	AR2,1
MU	1.000	-0.002	0.010
AR1,1	-0.002	1.000	0.165
AR2,1	0.010	0.165	1.000

Autocorrelation Check of Residuals										
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	20.80	4	0.0003	-0.121	-0.258	-0.091	-0.093	0.224	-0.080
12	30.23	10	0.0008	-0.096	0.077	-0.013	0.164	-0.100	-0.120
18	34.33	16	0.0049	-0.018	0.023	0.129	-0.089	-0.012	0.044
24	44.49	22	0.0031	-0.062	0.065	-0.043	-0.010	0.146	-0.180

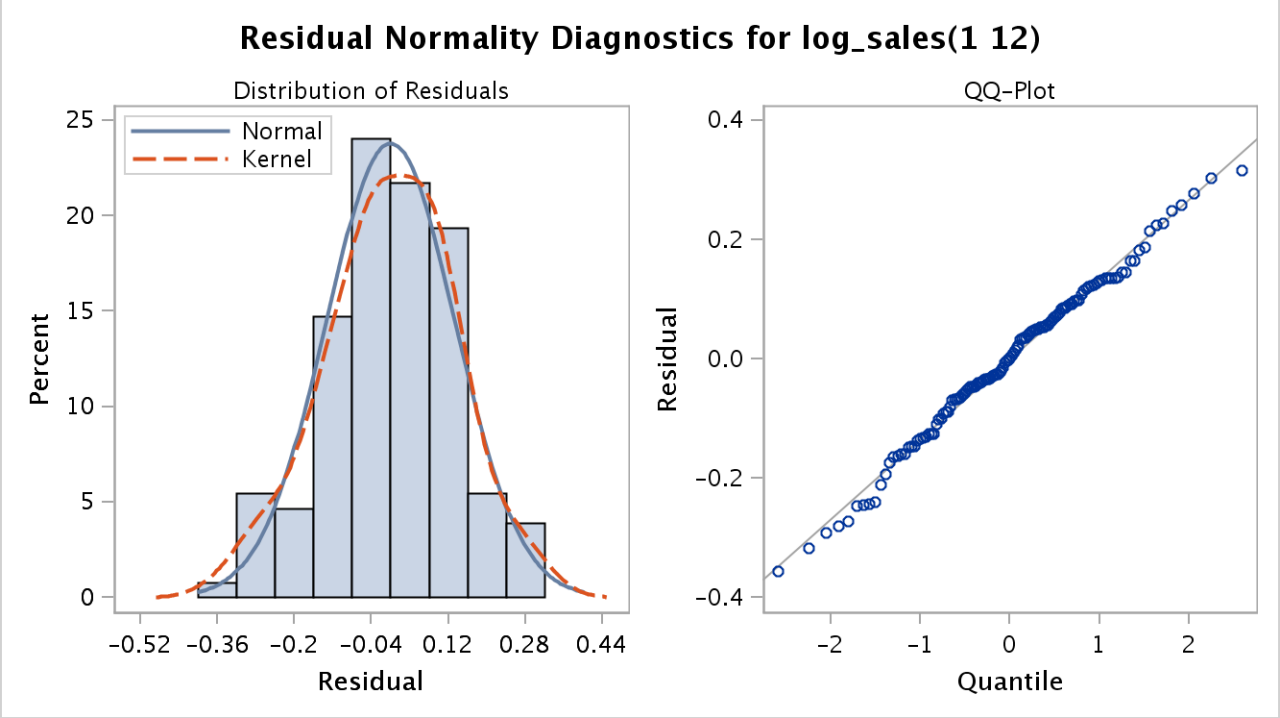
The SAS System

The ARIMA Procedure



The SAS System

The ARIMA Procedure



Model for variable log_sales	
Estimated Mean	-0.00034
Period(s) of Differencing	1,12

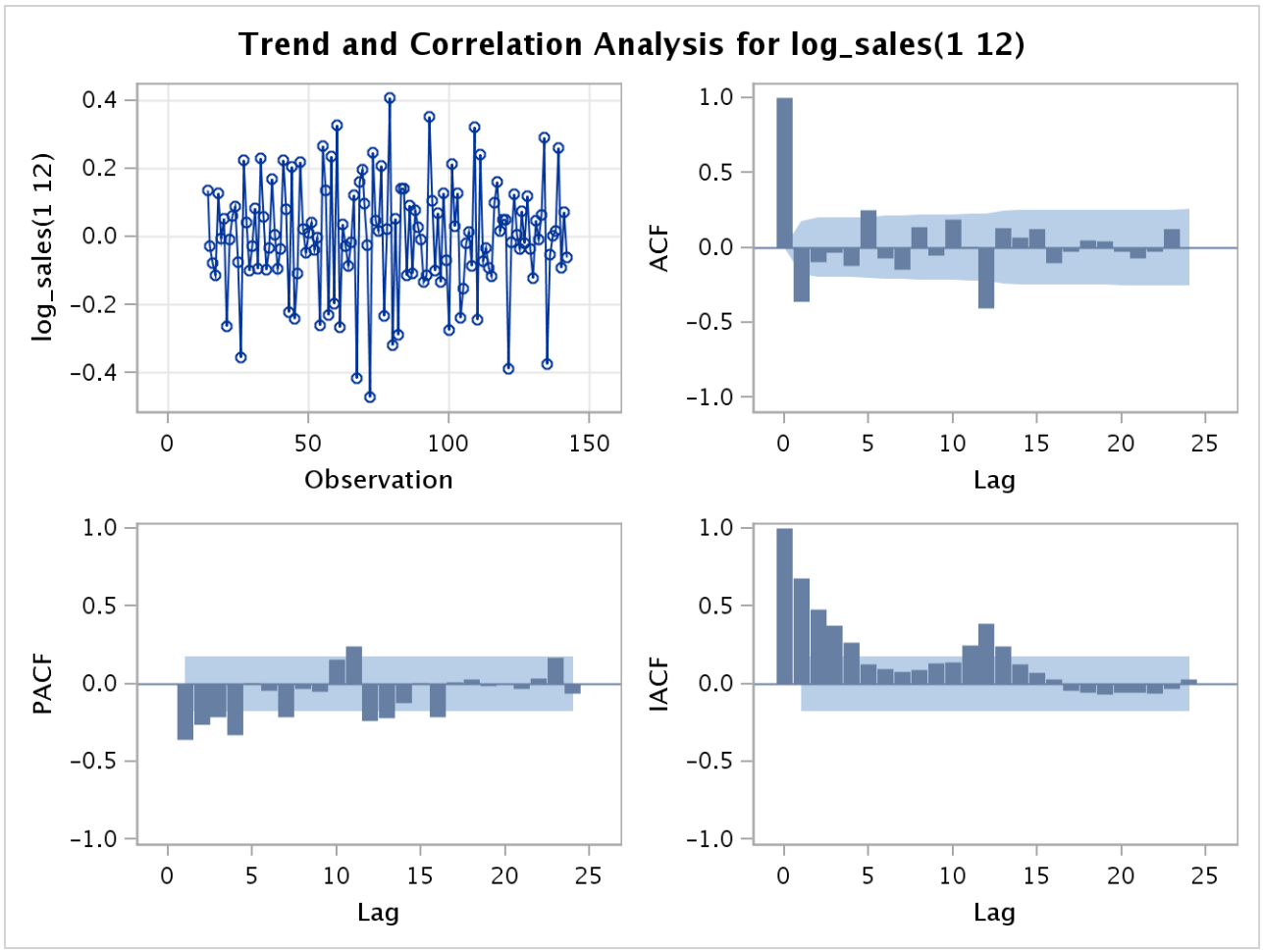
Autoregressive Factors	
Factor 1:	1 + 0.46702 B**(1)
Factor 2:	1 + 0.53971 B**(12)

The SAS System

The ARIMA Procedure

Name of Variable = log_sales	
Period(s) of Differencing	1,12
Mean of Working Series	-0.00025
Standard Deviation	0.166026
Number of Observations	129
Observation(s) eliminated by differencing	13

Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	29.93	6	<.0001	-0.362	-0.098	-0.034	-0.124	0.249	-0.072
12	64.97	12	<.0001	-0.149	0.137	-0.056	0.189	0.007	-0.406
18	72.45	18	<.0001	0.130	0.064	0.124	-0.105	-0.026	0.048
24	76.15	24	<.0001	0.043	-0.029	-0.071	-0.031	0.122	-0.005



The SAS System

The ARIMA Procedure

Conditional Least Squares Estimation					
Parameter	Estimate	Standard Error	t Value	Approx Pr > |t|	Lag
MU	-0.0006015	0.0006041	-1.00	0.3213	0
MA1,1	0.83886	0.06318	13.28	<.0001	1
MA2,1	0.80134	0.09099	8.81	<.0001	12
AR1,1	0.12061	0.11670	1.03	0.3034	1
AR2,1	0.07301	0.13674	0.53	0.5944	12

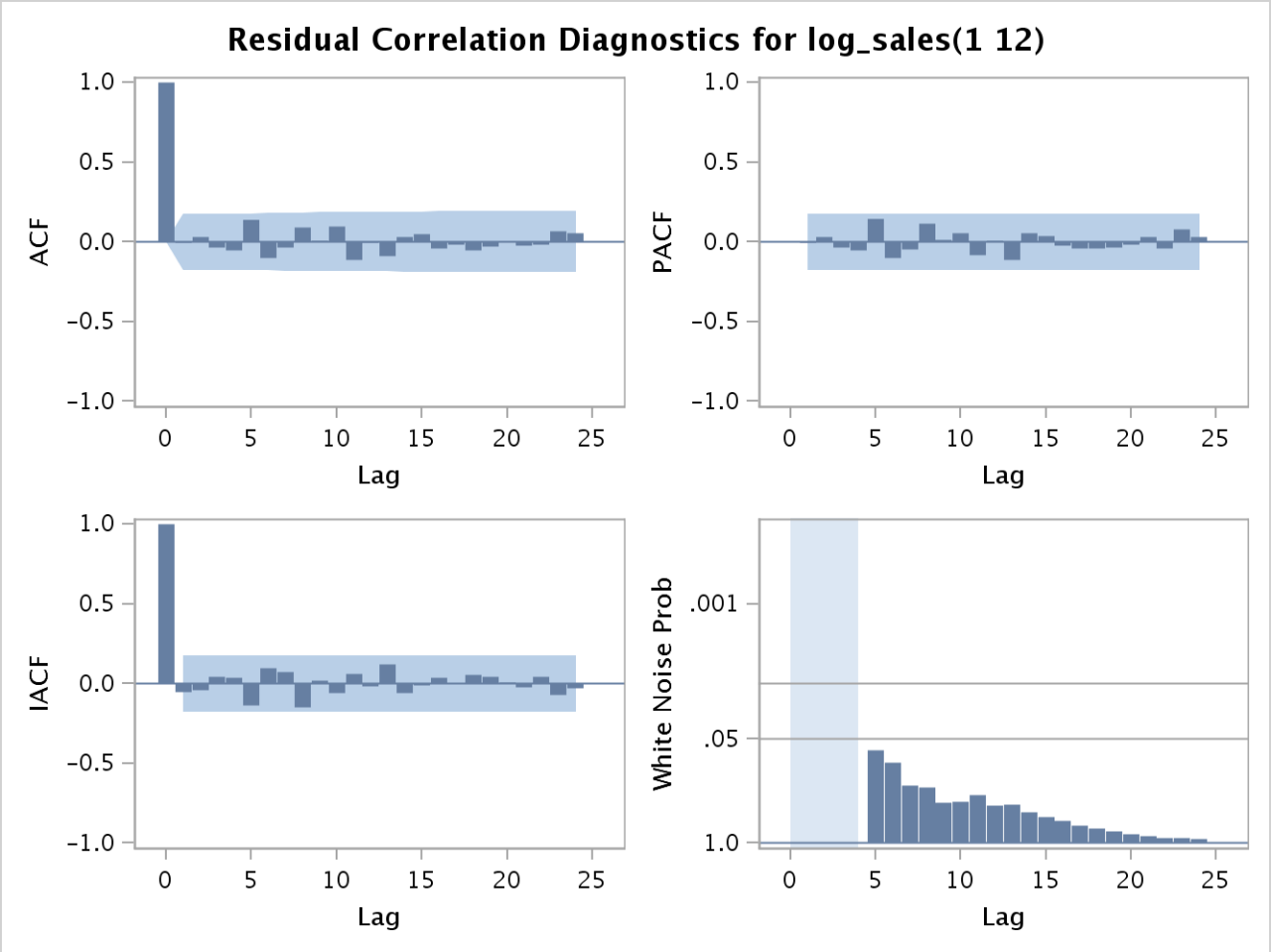
Constant Estimate	-0.00049
Variance Estimate	0.013767
Std Error Estimate	0.117333
AIC	-181.84
SBC	-167.541
Number of Residuals	129

*** AIC and SBC do not include log determinant.**

Correlations of Parameter Estimates					
Parameter	MU	MA1,1	MA2,1	AR1,1	AR2,1
MU	1.000	-0.075	-0.084	-0.051	-0.051
MA1,1	-0.075	1.000	0.142	0.626	0.227
MA2,1	-0.084	0.142	1.000	0.222	0.704
AR1,1	-0.051	0.626	0.222	1.000	0.288
AR2,1	-0.051	0.227	0.704	0.288	1.000

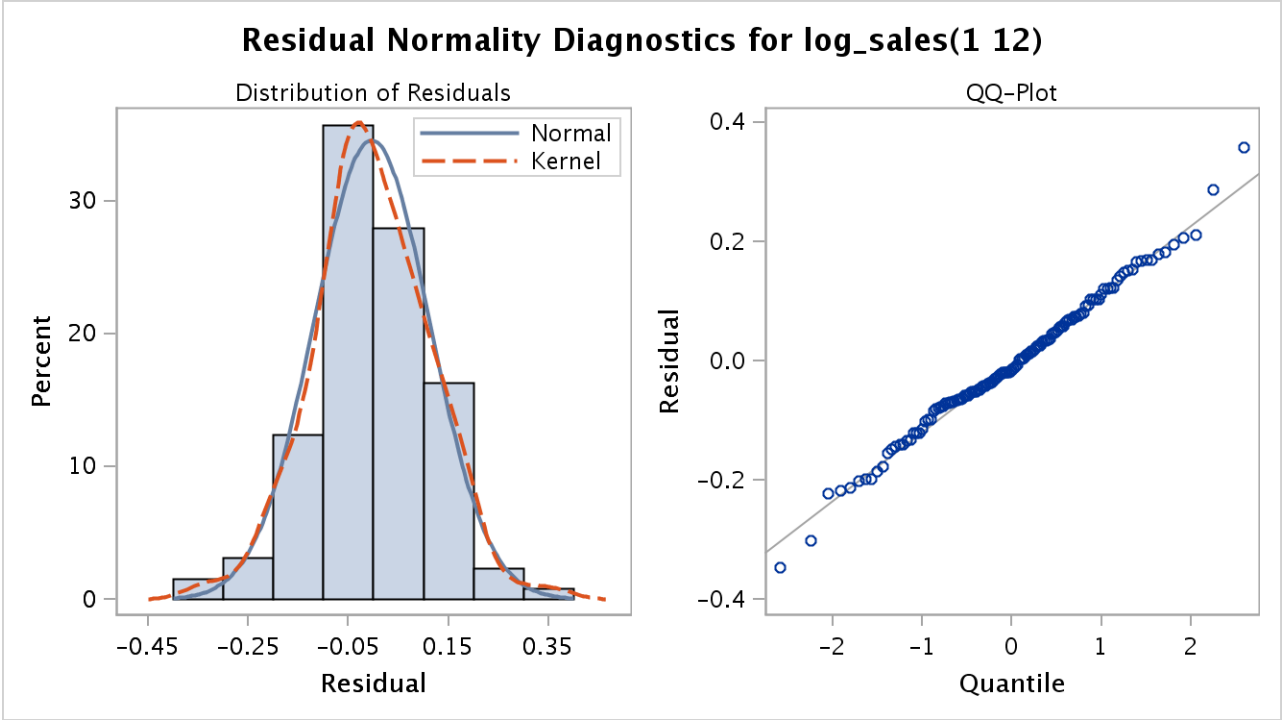
Autocorrelation Check of Residuals									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	4.61	2	0.0996	-0.003	0.031	-0.035	-0.049	0.141	-0.097
12	9.01	8	0.3416	-0.033	0.092	0.006	0.095	-0.111	-0.004
18	11.45	14	0.6501	-0.090	0.033	0.047	-0.042	-0.017	-0.055
24	12.85	20	0.8839	-0.029	0.001	-0.027	-0.021	0.064	0.052

The ARIMA Procedure



The SAS System

The ARIMA Procedure



Model for variable log_sales	
Estimated Mean	-0.0006
Period(s) of Differencing	1,12

Autoregressive Factors	
Factor 1:	1 - 0.12061 B**(1)
Factor 2:	1 - 0.07301 B**(12)

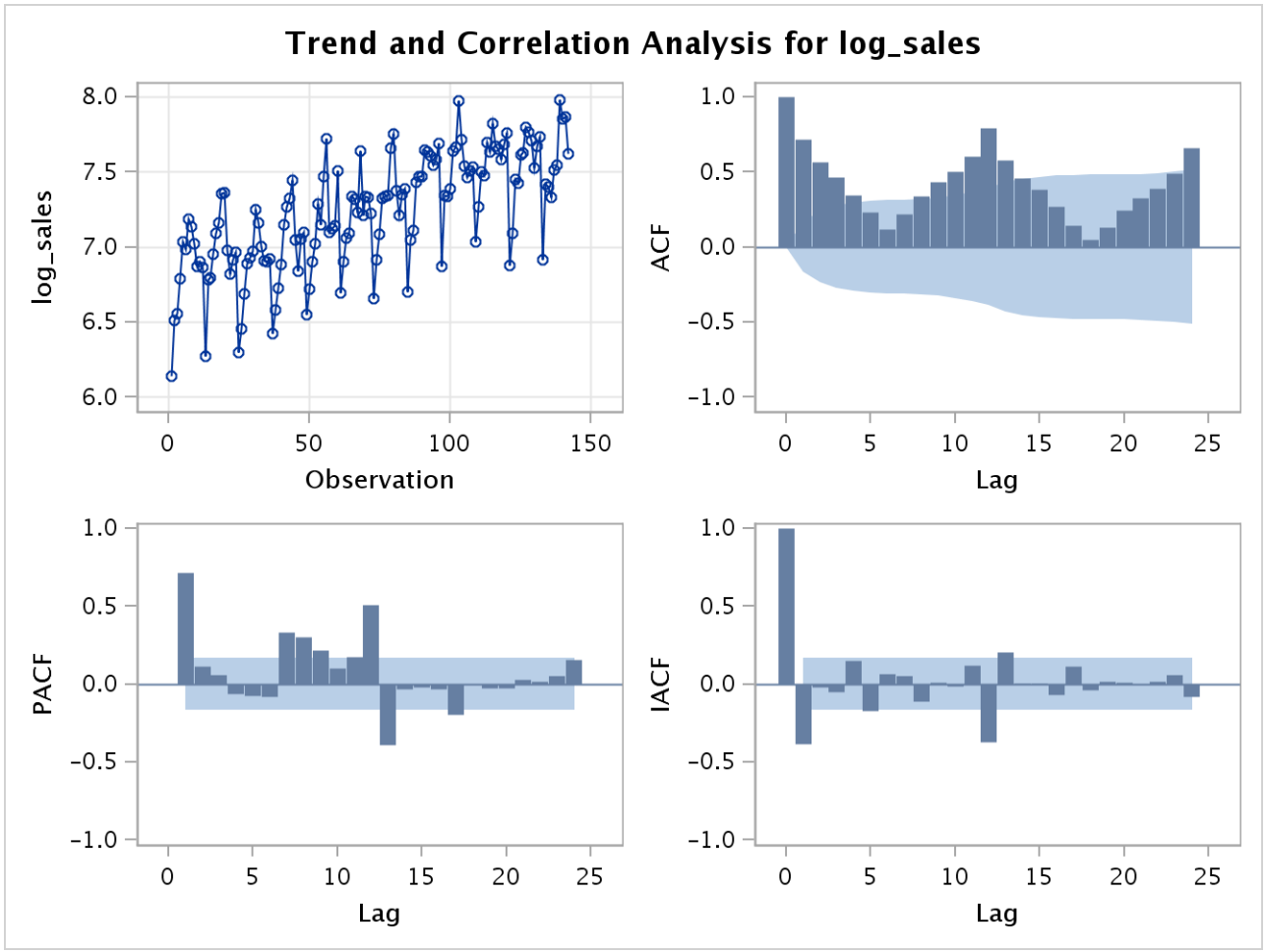
Moving Average Factors	
Factor 1:	1 - 0.83886 B**(1)
Factor 2:	1 - 0.80134 B**(12)

The SAS System

The ARIMA Procedure

Name of Variable = log_sales	
Mean of Working Series	7.229675
Standard Deviation	0.380116
Number of Observations	142

Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	179.65	6	<.0001	0.714	0.563	0.466	0.345	0.228	0.120
12	427.17	12	<.0001	0.215	0.338	0.430	0.502	0.604	0.792
18	552.34	18	<.0001	0.579	0.457	0.379	0.270	0.140	0.046
24	725.40	24	<.0001	0.130	0.241	0.325	0.390	0.491	0.659



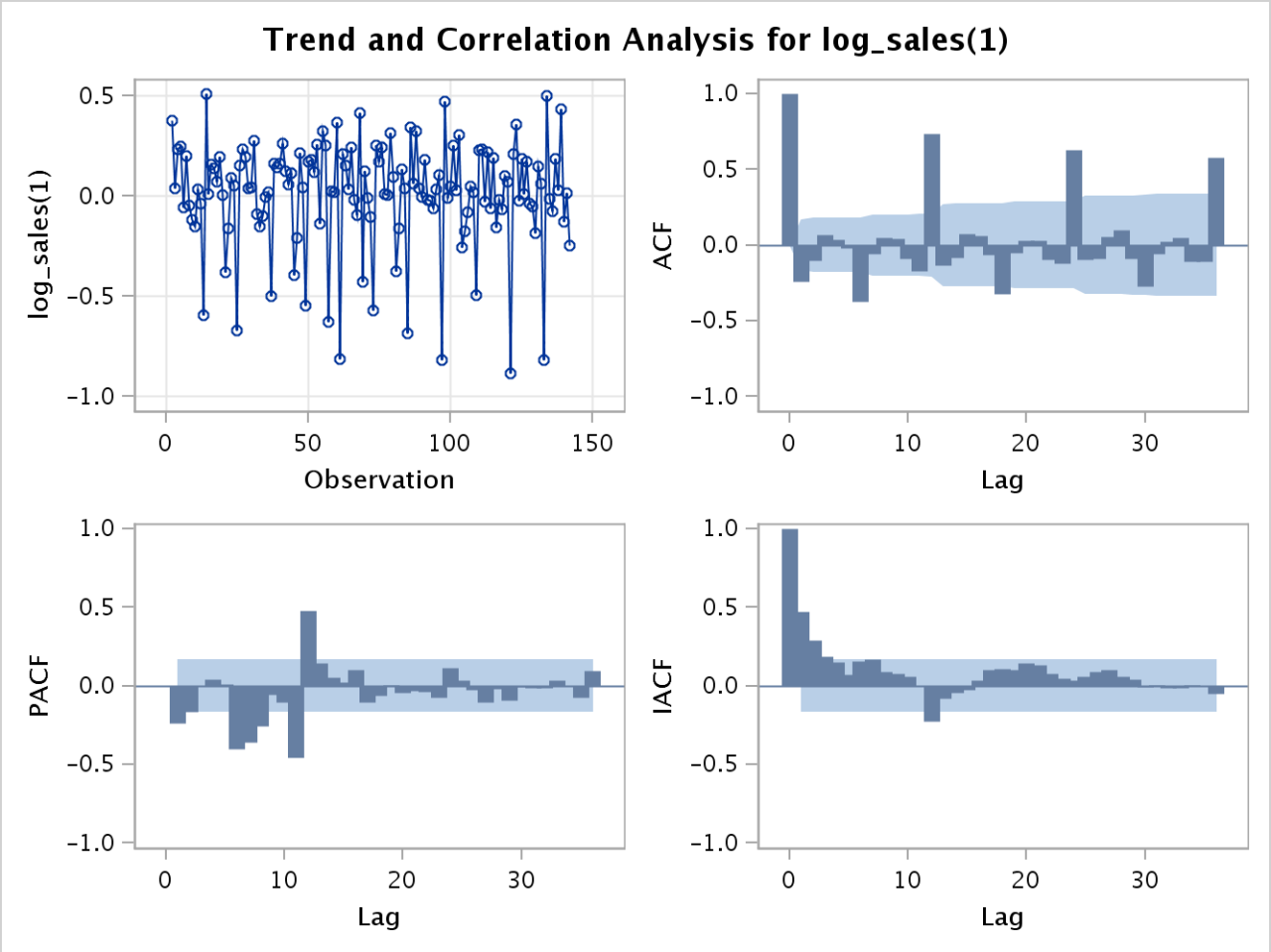
The SAS System

The ARIMA Procedure

Warning: The value of NLAG is larger than 25% of the series length. The asymptotic approximations used for correlation based statistics and confidence intervals may be poor.

Name of Variable = log_sales	
Period(s) of Differencing	1
Mean of Working Series	0.010527
Standard Deviation	0.271498
Number of Observations	141
Observation(s) eliminated by differencing	1

Autocorrelation Check for White Noise									
To Lag	**Chi-Square**	**DF**	**Pr > ChiSq**	**Autocorrelations**					
6	31.48	6	<.0001	-0.240	-0.100	0.065	0.034	-0.023	-0.374
12	122.91	12	<.0001	-0.062	0.048	0.042	-0.089	-0.172	0.735
18	146.28	18	<.0001	-0.136	-0.088	0.075	0.063	-0.066	-0.322
24	218.84	24	<.0001	-0.055	0.027	0.029	-0.095	-0.125	0.626
30	239.26	30	<.0001	-0.099	-0.090	0.056	0.099	-0.092	-0.272
36	308.42	36	<.0001	-0.058	0.022	0.046	-0.111	-0.109	0.575


Trend and Correlation Analysis for log_sales(1)
log_sales(1)
Observation
ACF
Lag
PACF
Lag
IACF
Lag

The SAS System

The ARIMA Procedure

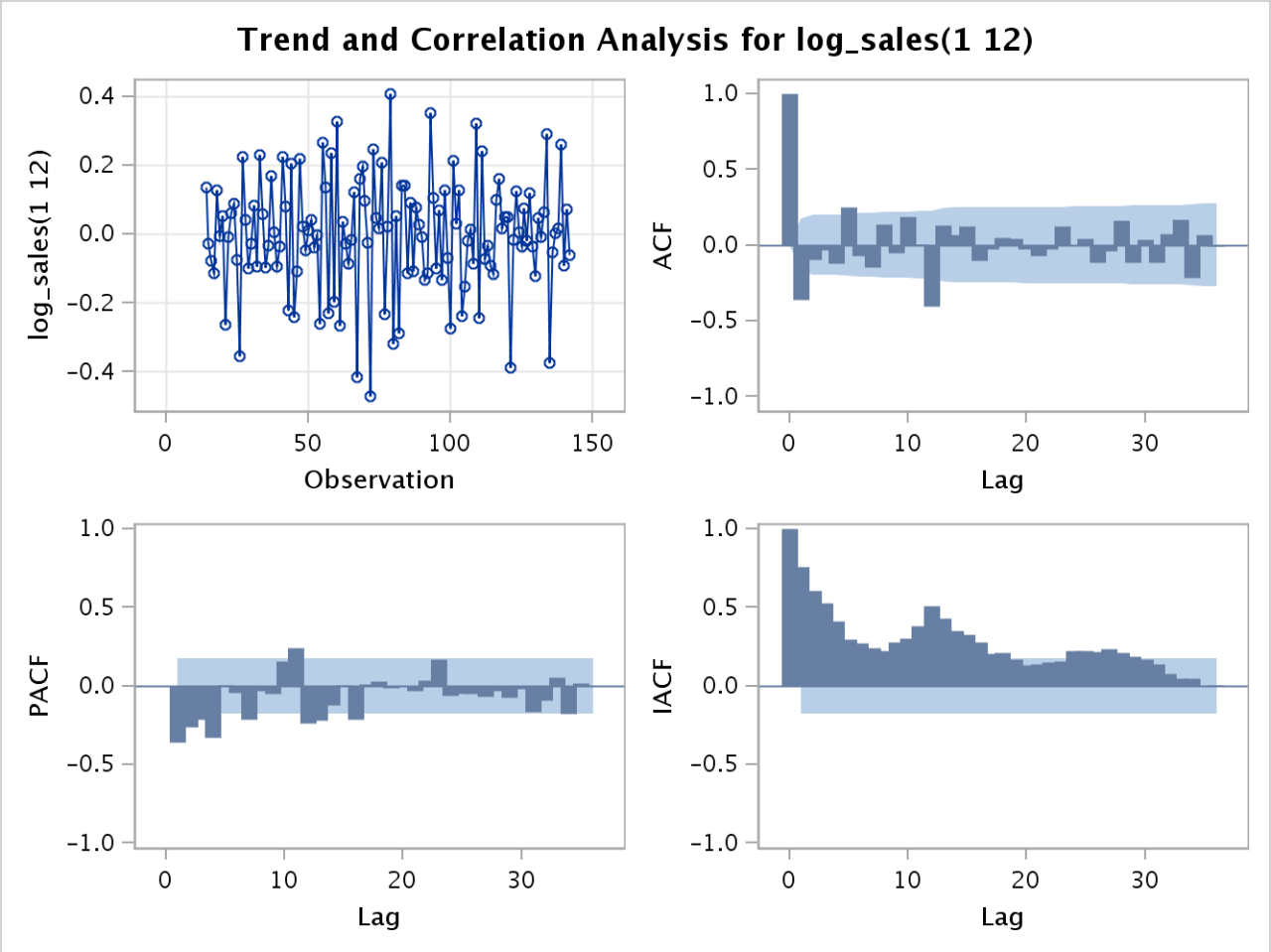
Warning: The value of NLAG is larger than 25% of the series length. The asymptotic approximations used for correlation based statistics and confidence intervals may be poor.

Name of Variable = log_sales	
Period(s) of Differencing	1,12
Mean of Working Series	-0.00025
Standard Deviation	0.166026
Number of Observations	129
Observation(s) eliminated by differencing	13

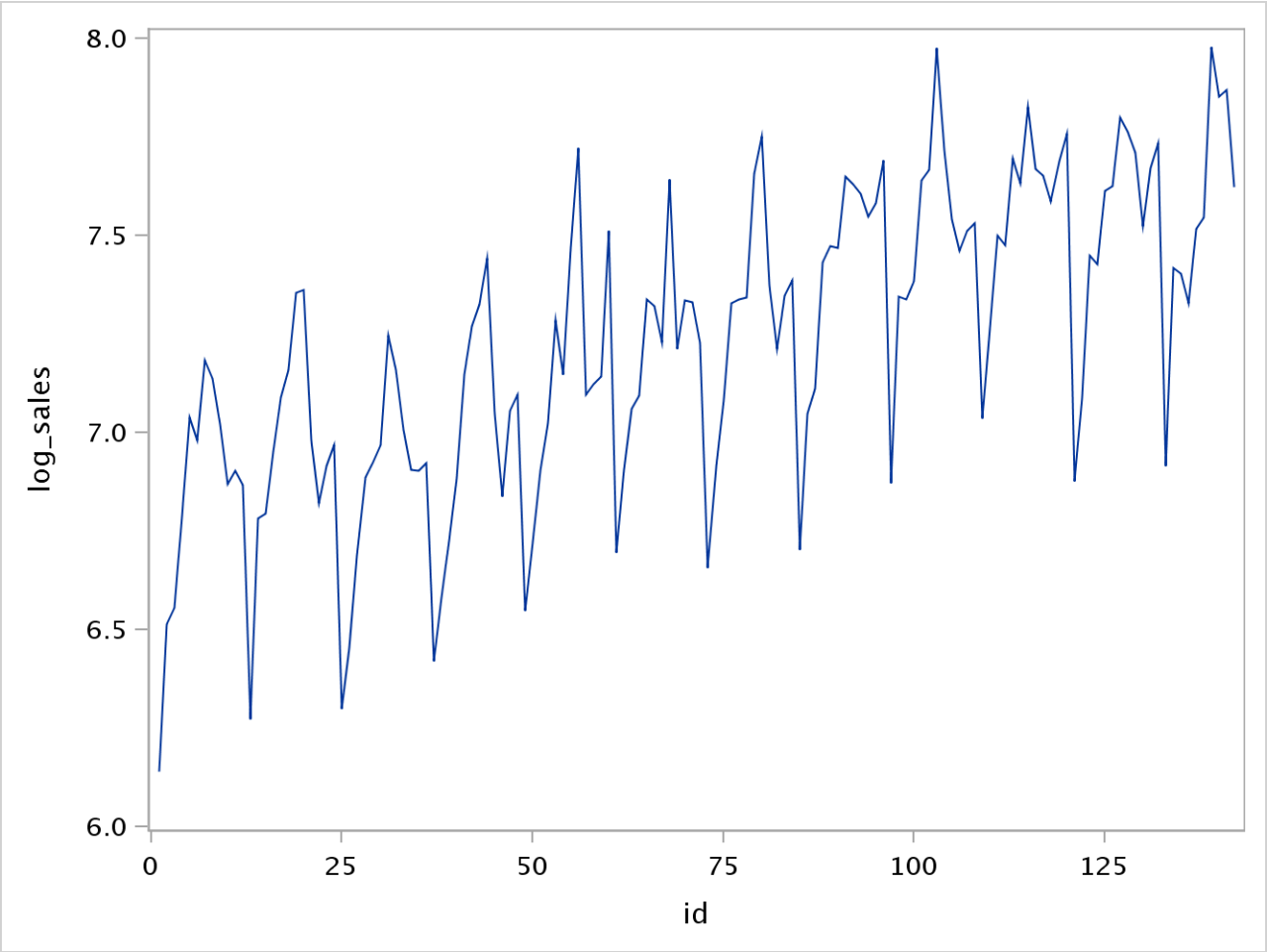
Autocorrelation Check for White Noise									
To Lag	**Chi-Square**	**DF**	**Pr > ChiSq**	**Autocorrelations**					
6	29.93	6	<.0001	-0.362	-0.098	-0.034	-0.124	0.249	-0.072
12	64.97	12	<.0001	-0.149	0.137	-0.056	0.189	0.007	-0.406
18	72.45	18	<.0001	0.130	0.064	0.124	-0.105	-0.026	0.048
24	76.15	24	<.0001	0.043	-0.029	-0.071	-0.031	0.122	-0.005
30	85.91	30	<.0001	0.045	-0.119	-0.041	0.158	-0.119	0.038
36	103.27	36	<.0001	-0.114	0.074	0.166	-0.219	0.066	-0.008

The SAS System

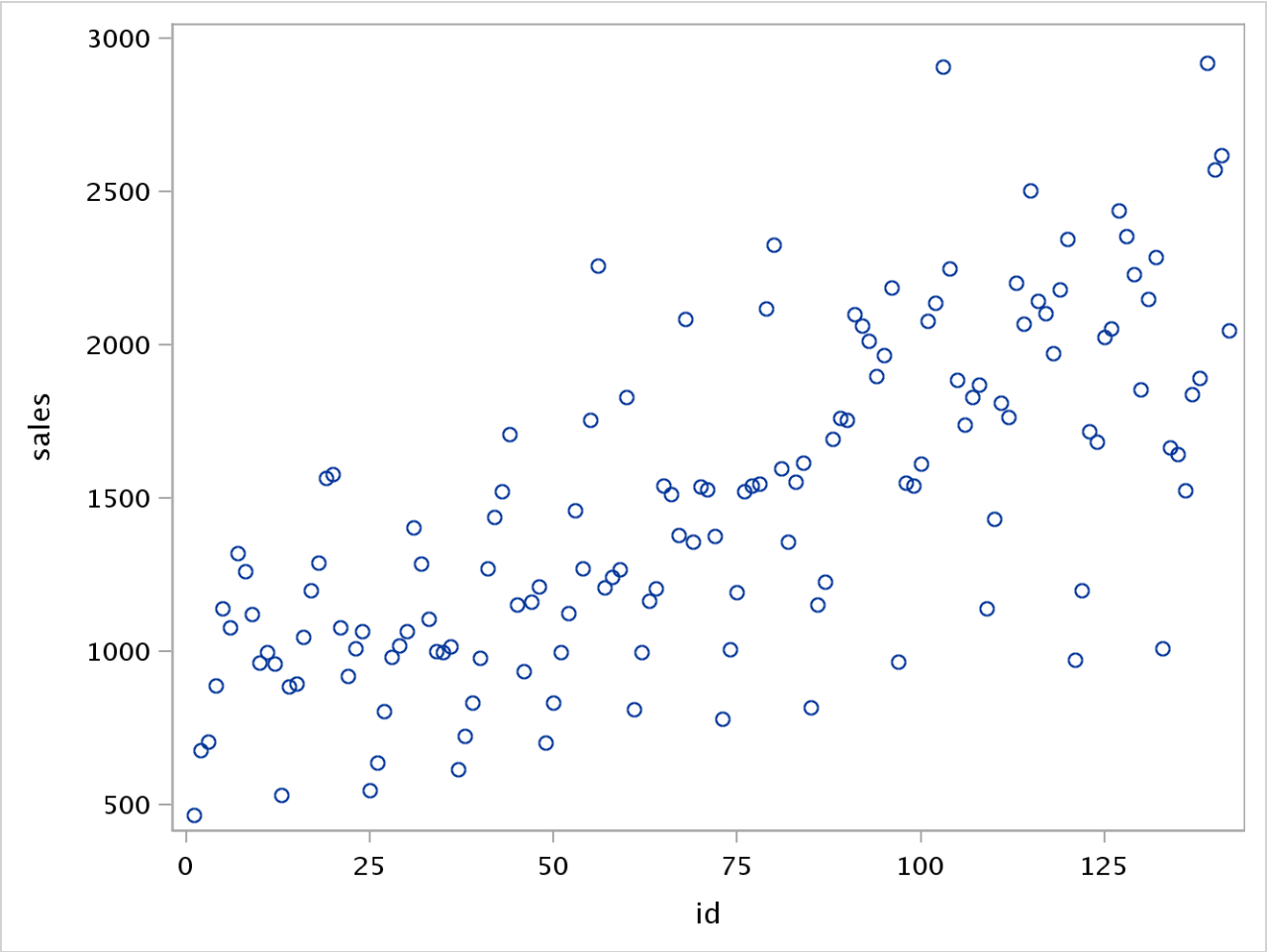
The ARIMA Procedure



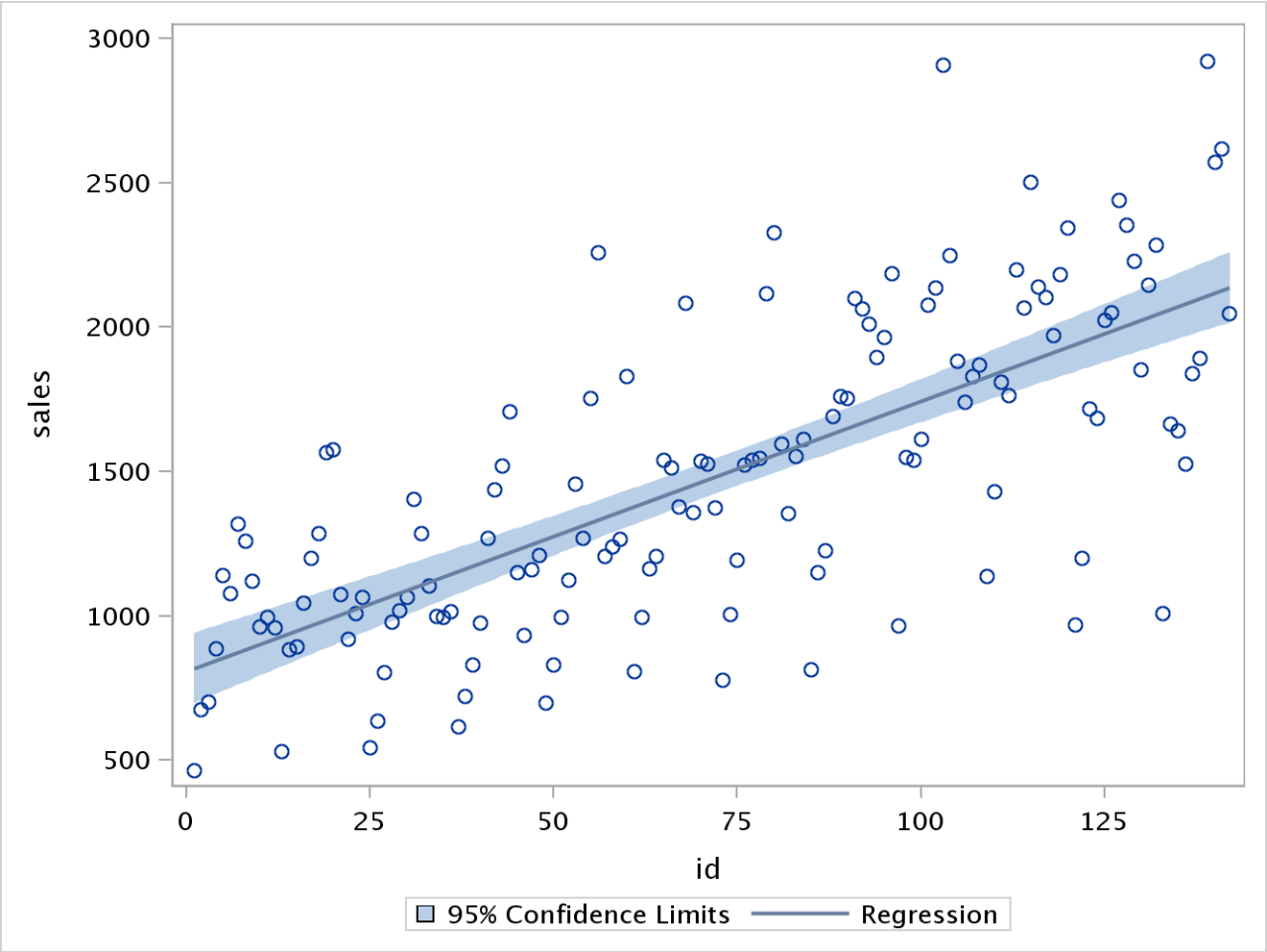
Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales



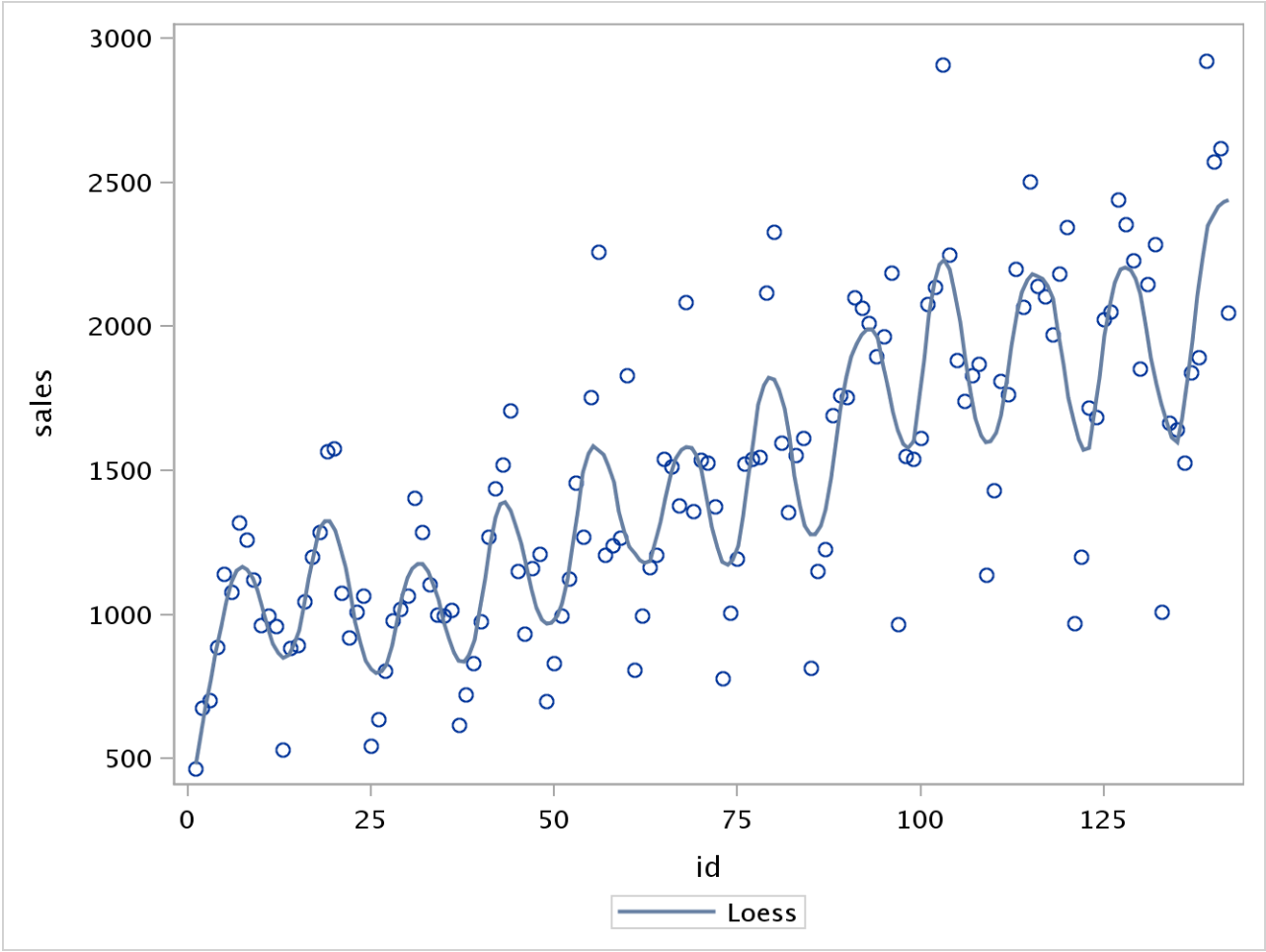
Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales



Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales



Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales



Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales

The UNIVARIATE Procedure
Variable: sales

Moments			
N	142	**Sum Weights**	142
Mean	1477.76761	**Sum Observations**	209843
Std Deviation	532.914397	**Variance**	283997.754
Skewness	0.39355684	**Kurtosis**	-0.5064445
Uncorrected SS	350142871	**Corrected SS**	40043683.3
Coeff Variation	36.0621247	**Std Error Mean**	44.7211827

Basic Statistical Measures			
Location		**Variability**	
Mean	1477.768	**Std Deviation**	532.91440
Median	1433.500	**Variance**	283998
Mode	996.000	**Range**	2456
		Interquartile Range	850.00000

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	33.04402	**Pr > |t|**	<.0001
Sign	**M**	71	**Pr >= |M|**	<.0001
Signed Rank	**S**	5076.5	**Pr >= |S|**	<.0001

Quantiles (Definition 5)	
Quantile	**Estimate**
100% Max	2920.0
99%	2907.0
95%	2344.0
90%	2186.0
75% Q3	1868.0
50% Median	1433.5
25% Q1	1018.0
10%	832.0
5%	703.0
1%	530.0
0% Min	464.0

Extreme Observations			
Lowest		**Highest**	
Value	**Obs**	**Value**	**Obs**
464	1	2503	115
530	13	2572	140
544	25	2617	141

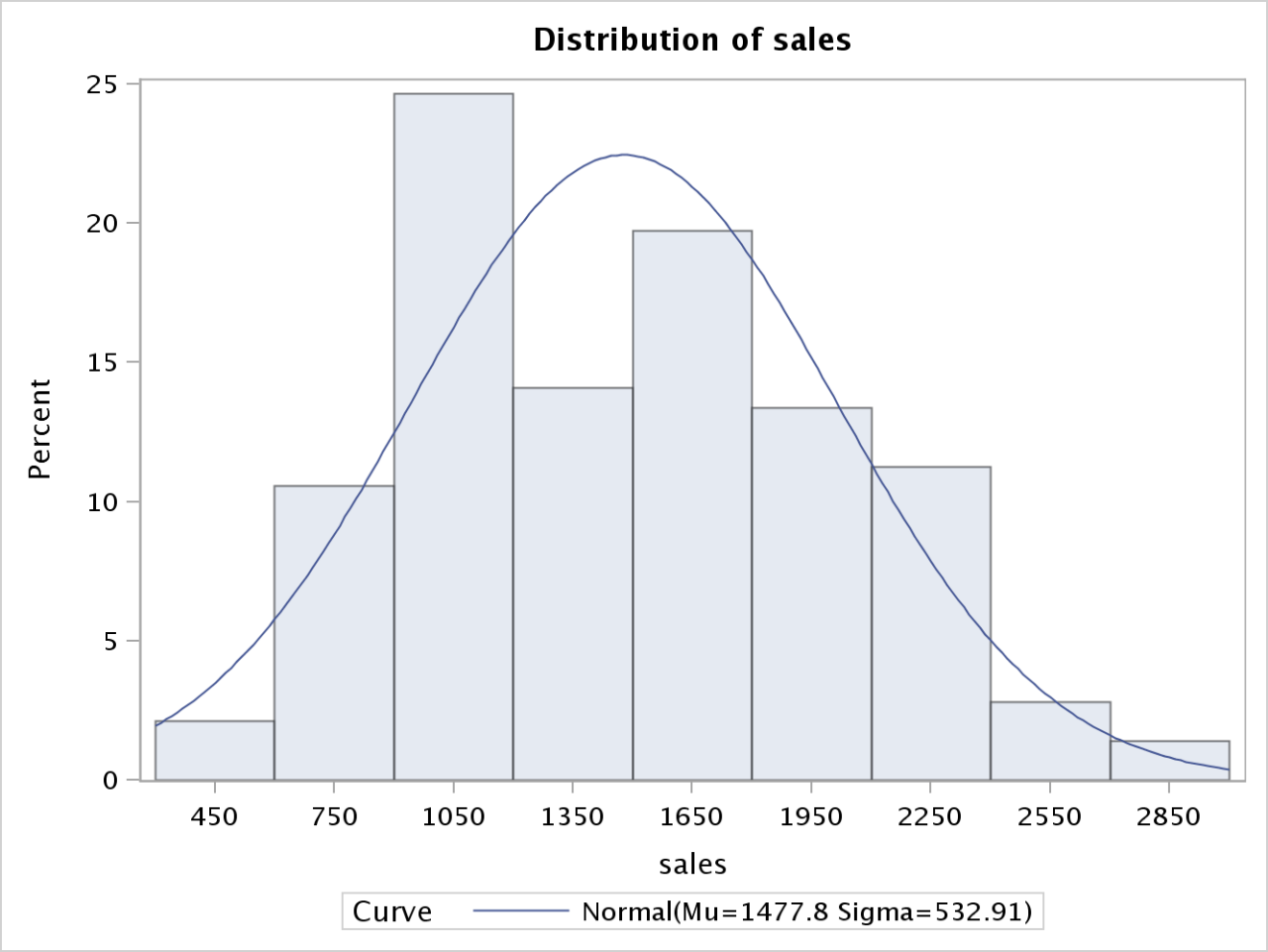
Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales

The UNIVARIATE Procedure
Variable: sales

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
615	37	2907	103
635	26	2920	139

Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales

The UNIVARIATE Procedure



Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales

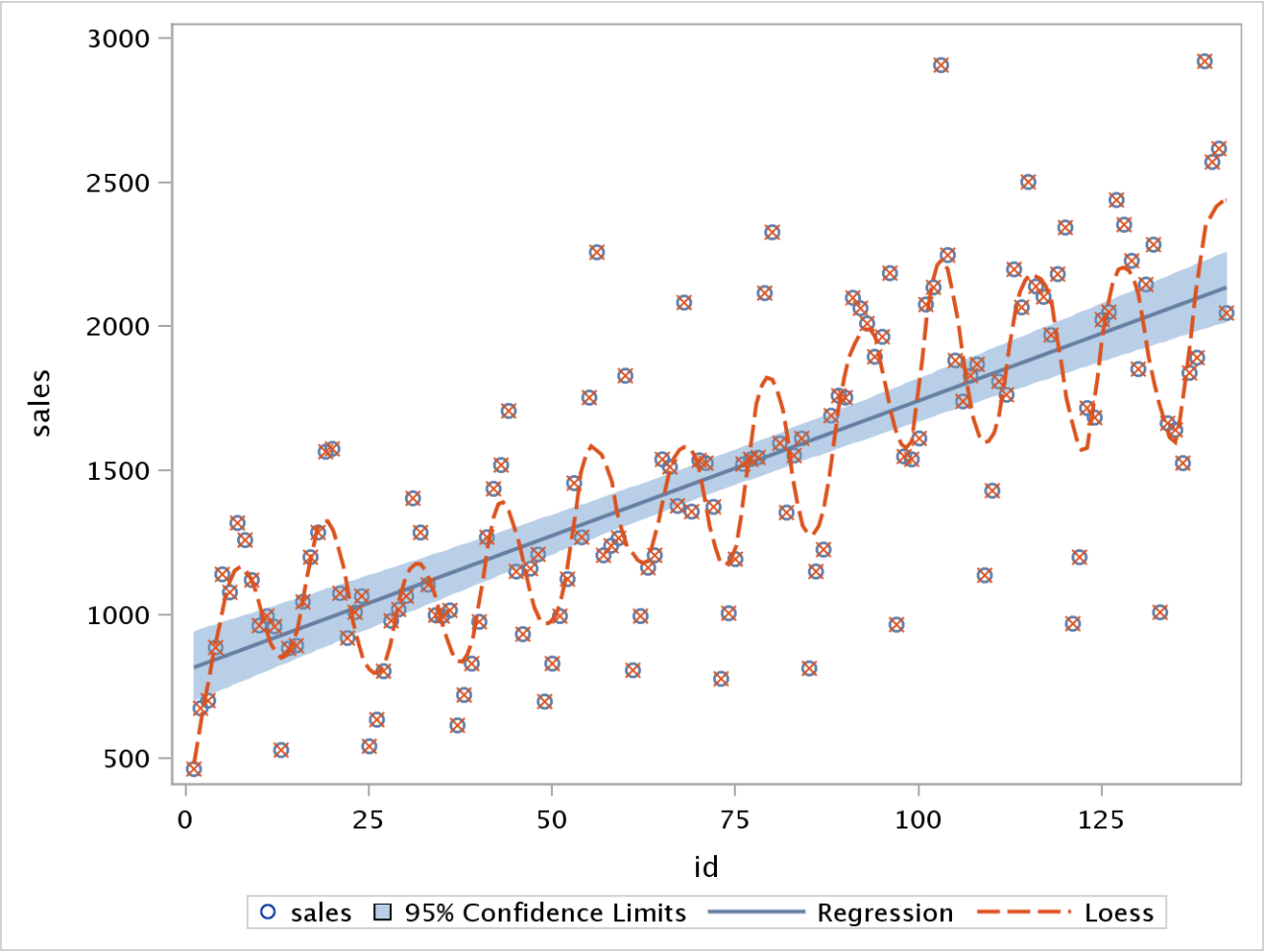
The UNIVARIATE Procedure
Fitted Normal Distribution for sales

Parameters for Normal Distribution		
Parameter	**Symbol**	**Estimate**
Mean	Mu	1477.768
Std Dev	Sigma	532.9144

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.09052151	**Pr > D**	<0.010
Cramer-von Mises	**W-Sq**	0.20582199	**Pr > W-Sq**	<0.005
Anderson-Darling	**A-Sq**	1.19854028	**Pr > A-Sq**	<0.005

Quantiles for Normal Distribution		
	Quantile	
Percent	**Observed**	**Estimated**
1.0	530.000	238.023
5.0	703.000	601.201
10.0	832.000	794.810
25.0	1018.000	1118.322
50.0	1433.500	1477.768
75.0	1868.000	1837.213
90.0	2186.000	2160.725
95.0	2344.000	2354.334
99.0	2907.000	2717.512

Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales



Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales

The UNIVARIATE Procedure
Variable: log_sales

Moments			
N	142	**Sum Weights**	142
Mean	7.22967451	**Sum Observations**	1026.61378
Std Deviation	0.3814615	**Variance**	0.14551287
Skewness	-0.3724246	**Kurtosis**	-0.3224906
Uncorrected SS	7442.6008	**Corrected SS**	20.5173152
Coeff Variation	5.27633017	**Std Error Mean**	0.03201154

Basic Statistical Measures			
Location		**Variability**	
Mean	7.229675	**Std Deviation**	0.38146
Median	7.267871	**Variance**	0.14551
Mode	6.903747	**Range**	1.83945
		Interquartile Range	0.60703

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	225.8459	**Pr > |t|**	<.0001
Sign	**M**	71	**Pr >= |M|**	<.0001
Signed Rank	**S**	5076.5	**Pr >= |S|**	<.0001

Quantiles (Definition 5)	
Quantile	**Estimate**
100% Max	7.97934
99%	7.97488
95%	7.75961
90%	7.68983
75% Q3	7.53262
50% Median	7.26787
25% Q1	6.92560
10%	6.72383
5%	6.55536
1%	6.27288
0% Min	6.13988

Extreme Observations			
Lowest		**Highest**	
Value	**Obs**	**Value**	**Obs**
6.13988	1	7.82525	115
6.27288	13	7.85244	140
6.29895	25	7.86978	141

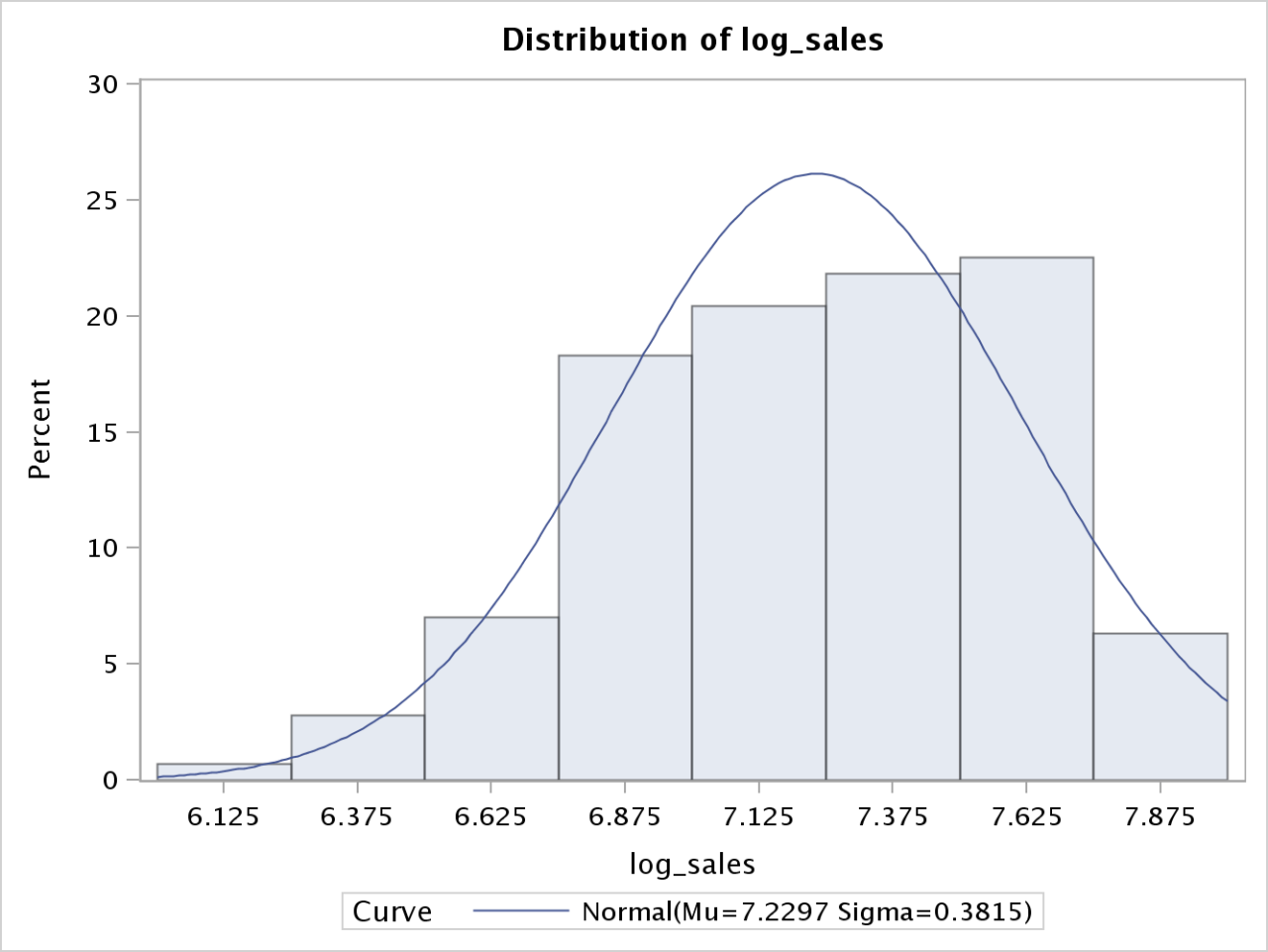
Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales

The UNIVARIATE Procedure
Variable: log_sales

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
6.42162	37	7.97488	103
6.45362	26	7.97934	139

Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales

The UNIVARIATE Procedure



Time Series Plot of the Australian Wine Sales dataset
Time Series Variable is Log of Sales

The UNIVARIATE Procedure
Fitted Normal Distribution for log_sales

Parameters for Normal Distribution		
Parameter	**Symbol**	**Estimate**
Mean	Mu	7.229675
Std Dev	Sigma	0.381461

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.08138476	**Pr > D**	0.021
Cramer-von Mises	**W-Sq**	0.12239057	**Pr > W-Sq**	0.057
Anderson-Darling	**A-Sq**	0.78744187	**Pr > A-Sq**	0.042

Quantiles for Normal Distribution		
	Quantile	
Percent	**Observed**	**Estimated**
1.0	6.27288	6.34226
5.0	6.55536	6.60223
10.0	6.72383	6.74081
25.0	6.92560	6.97238
50.0	7.26787	7.22967
75.0	7.53262	7.48697
90.0	7.68983	7.71854
95.0	7.75961	7.85712
99.0	7.97488	8.11709