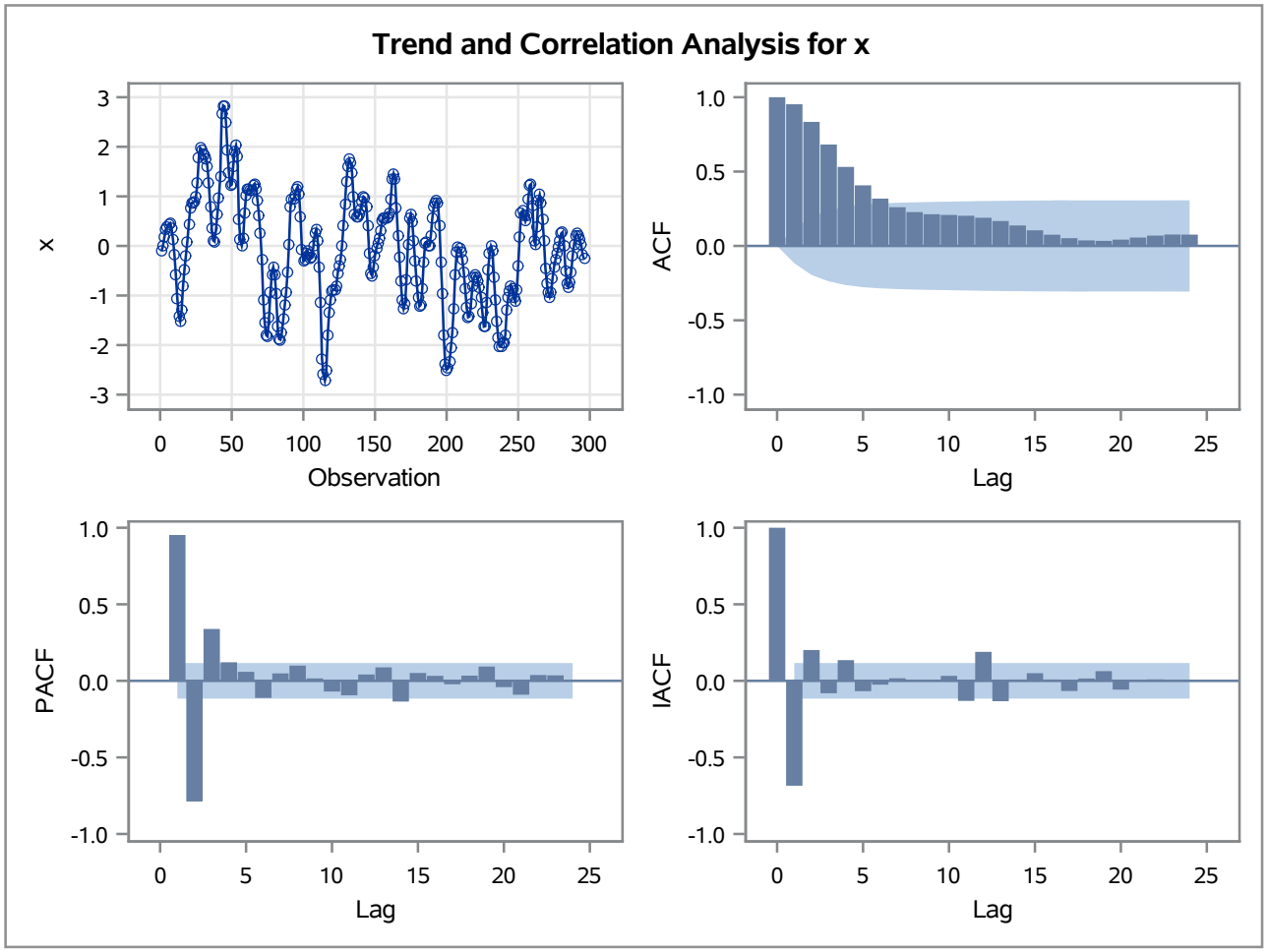
# Gas Furnace Data
# (Box and Jenkins, Series J)

## The ARIMA Procedure

| Name of Variable = x | |
|---|---|
| Mean of Working Series | -0.05683 |
| Standard Deviation | 1.070952 |
| Number of Observations | 296 |

| Autocorrelation Check for White Noise | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| To Lag | Chi-Square | DF | Pr > ChiSq | Autocorrelations | | | | | |
| 6 | 786.35 | 6 | <.0001 | 0.952 | 0.834 | 0.682 | 0.531 | 0.408 | 0.318 |
| 12 | 874.07 | 12 | <.0001 | 0.260 | 0.228 | 0.213 | 0.208 | 0.203 | 0.189 |
| 18 | 895.24 | 18 | <.0001 | 0.167 | 0.138 | 0.105 | 0.075 | 0.052 | 0.037 |
| 24 | 902.52 | 24 | <.0001 | 0.034 | 0.042 | 0.056 | 0.069 | 0.077 | 0.076 |



# Gas Furnace Data
# (Box and Jenkins, Series J)

## The ARIMA Procedure

| Conditional Least Squares Estimation | | | | | |
|---|---|---|---|---|---|
| Parameter | Estimate | Standard Error | t Value | Approx Pr > \|t\| | Lag |
| MU | -0.12280 | 0.10902 | -1.13 | 0.2609 | 0 |
| AR1,1 | 1.97607 | 0.05499 | 35.94 | <.0001 | 1 |
| AR1,2 | -1.37499 | 0.09967 | -13.80 | <.0001 | 2 |
| AR1,3 | 0.34336 | 0.05502 | 6.24 | <.0001 | 3 |

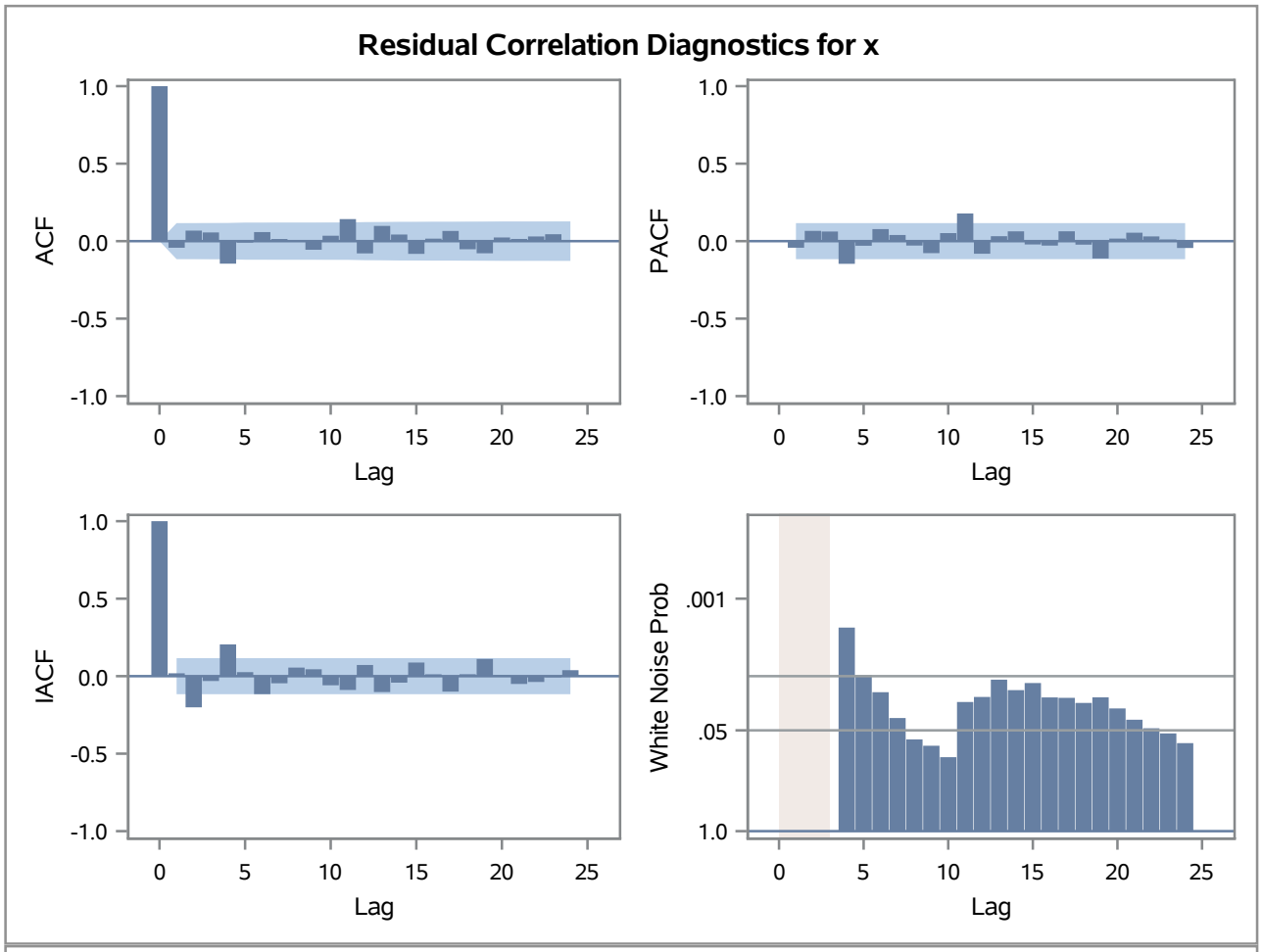
| | |
|---|---|
| Constant Estimate | -0.00682 |
| Variance Estimate | 0.035797 |
| Std Error Estimate | 0.1892 |
| AIC | -141.667 |
| SBC | -126.906 |
| Number of Residuals | 296 |

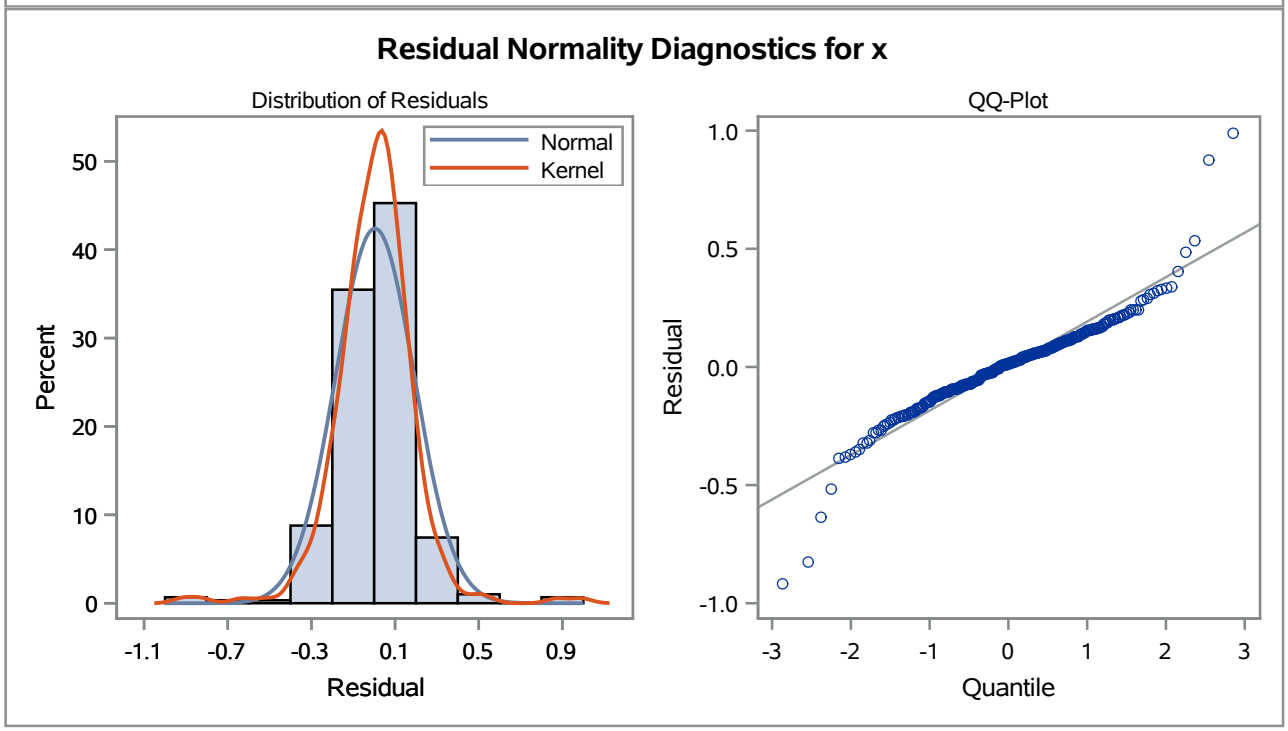
*** AIC and SBC do not include log determinant.**

| Correlations of Parameter Estimates | | | | |
|---|---|---|---|---|
| Parameter | MU | AR1,1 | AR1,2 | AR1,3 |
| MU | 1.000 | -0.017 | 0.014 | -0.016 |
| AR1,1 | -0.017 | 1.000 | -0.941 | 0.790 |
| AR1,2 | 0.014 | -0.941 | 1.000 | -0.941 |
| AR1,3 | -0.016 | 0.790 | -0.941 | 1.000 |

| Autocorrelation Check of Residuals | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| To Lag | Chi-Square | DF | Pr > ChiSq | Autocorrelations | | | | | | |
| 6 | 10.30 | 3 | 0.0162 | -0.042 | 0.068 | 0.056 | -0.145 | -0.009 | 0.059 | |
| 12 | 19.89 | 9 | 0.0186 | 0.014 | 0.002 | -0.055 | 0.035 | 0.143 | -0.079 | |
| 18 | 27.92 | 15 | 0.0221 | 0.099 | 0.043 | -0.082 | 0.017 | 0.066 | -0.052 | |
| 24 | 31.05 | 21 | 0.0729 | -0.078 | 0.024 | 0.015 | 0.030 | 0.045 | 0.004 | |
| 30 | 34.58 | 27 | 0.1499 | -0.007 | -0.004 | 0.073 | -0.038 | -0.062 | 0.003 | |
| 36 | 38.84 | 33 | 0.2231 | 0.010 | 0.002 | 0.082 | 0.045 | 0.056 | -0.023 | |
| 42 | 41.18 | 39 | 0.3753 | 0.002 | 0.033 | -0.061 | -0.003 | -0.006 | -0.043 | |
| 48 | 42.73 | 45 | 0.5687 | 0.018 | 0.051 | -0.012 | 0.015 | -0.027 | 0.020 | |

The ARIMA Procedure




| Model for variable x | |
|---|---|
| Estimated Mean | -0.1228 |

# Gas Furnace Data
# (Box and Jenkins, Series J)

## The ARIMA Procedure

| Autoregressive Factors | |
|---|---|
| **Factor 1:** | 1 - 1.97607 B**(1) + 1.37499 B**(2) - 0.34336 B**(3) |

| Name of Variable = y | |
|---|---|
| **Mean of Working Series** | 53.50912 |
| **Standard Deviation** | 3.196707 |
| **Number of Observations** | 296 |

| Autocorrelation Check for White Noise | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **To Lag** | **Chi-Square** | **DF** | **Pr > ChiSq** | **Autocorrelations** | | | | | |
| **6** | 1023.15 | 6 | <.0001 | 0.971 | 0.896 | 0.793 | 0.680 | 0.574 | 0.485 |
| **12** | 1227.65 | 12 | <.0001 | 0.416 | 0.366 | 0.330 | 0.307 | 0.288 | 0.269 |

| Correlation of y and x | |
|---|---|
| **Number of Observations** | 296 |
| **Variance of transformed series y** | 0.131438 |
| **Variance of transformed series x** | 0.035357 |

**Both series have been prewhitened.**

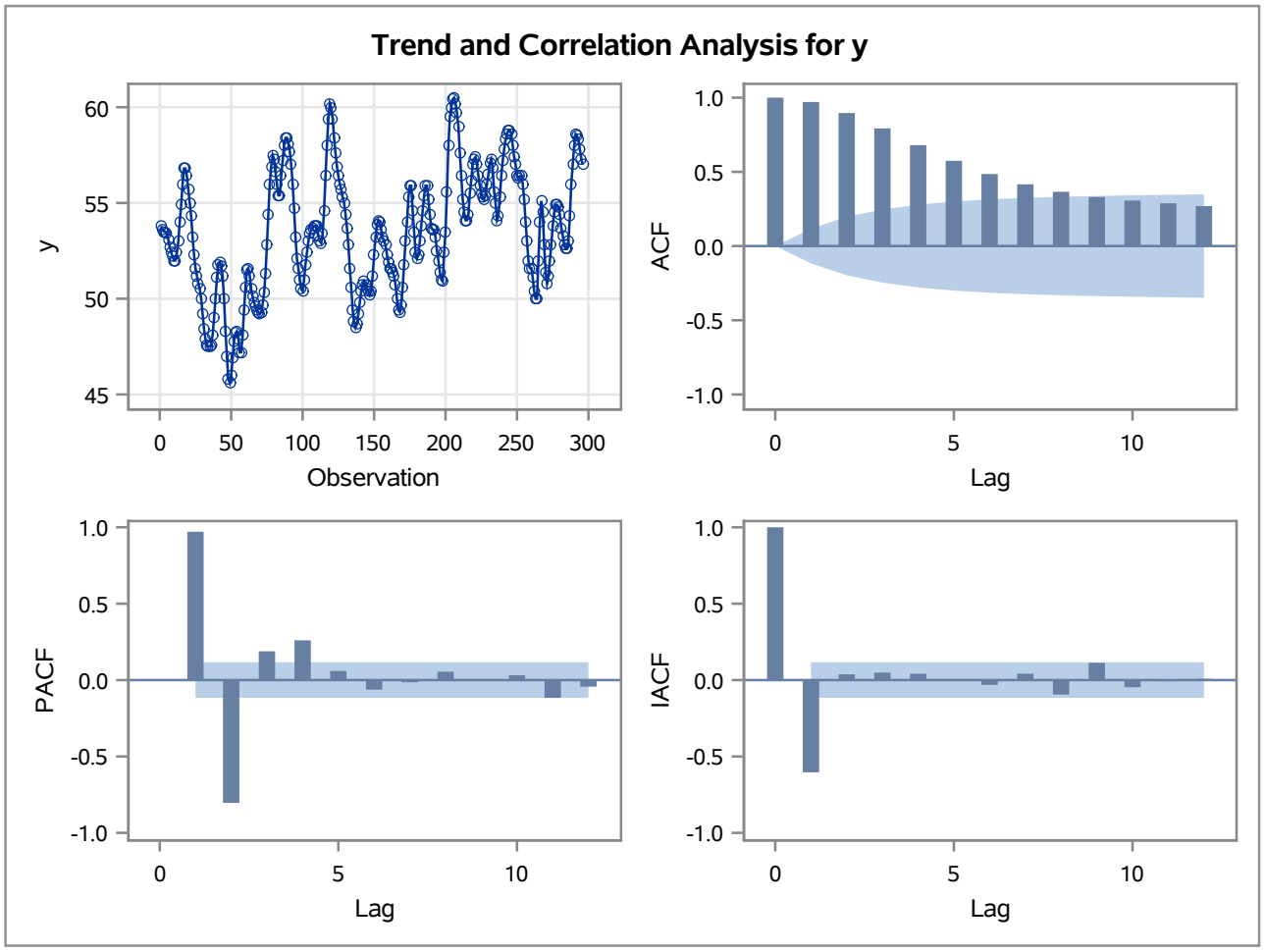
| Crosscorrelation Check Between Series | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **To Lag** | **Chi-Square** | **DF** | **Pr > ChiSq** | **Crosscorrelations** | | | | | |
| **5** | 117.75 | 6 | <.0001 | -0.005 | 0.057 | -0.025 | -0.282 | -0.330 | -0.453 |
| **11** | 148.57 | 12 | <.0001 | -0.266 | -0.168 | -0.025 | 0.033 | -0.052 | -0.031 |

**Both variables have been prewhitened by the following filter:**

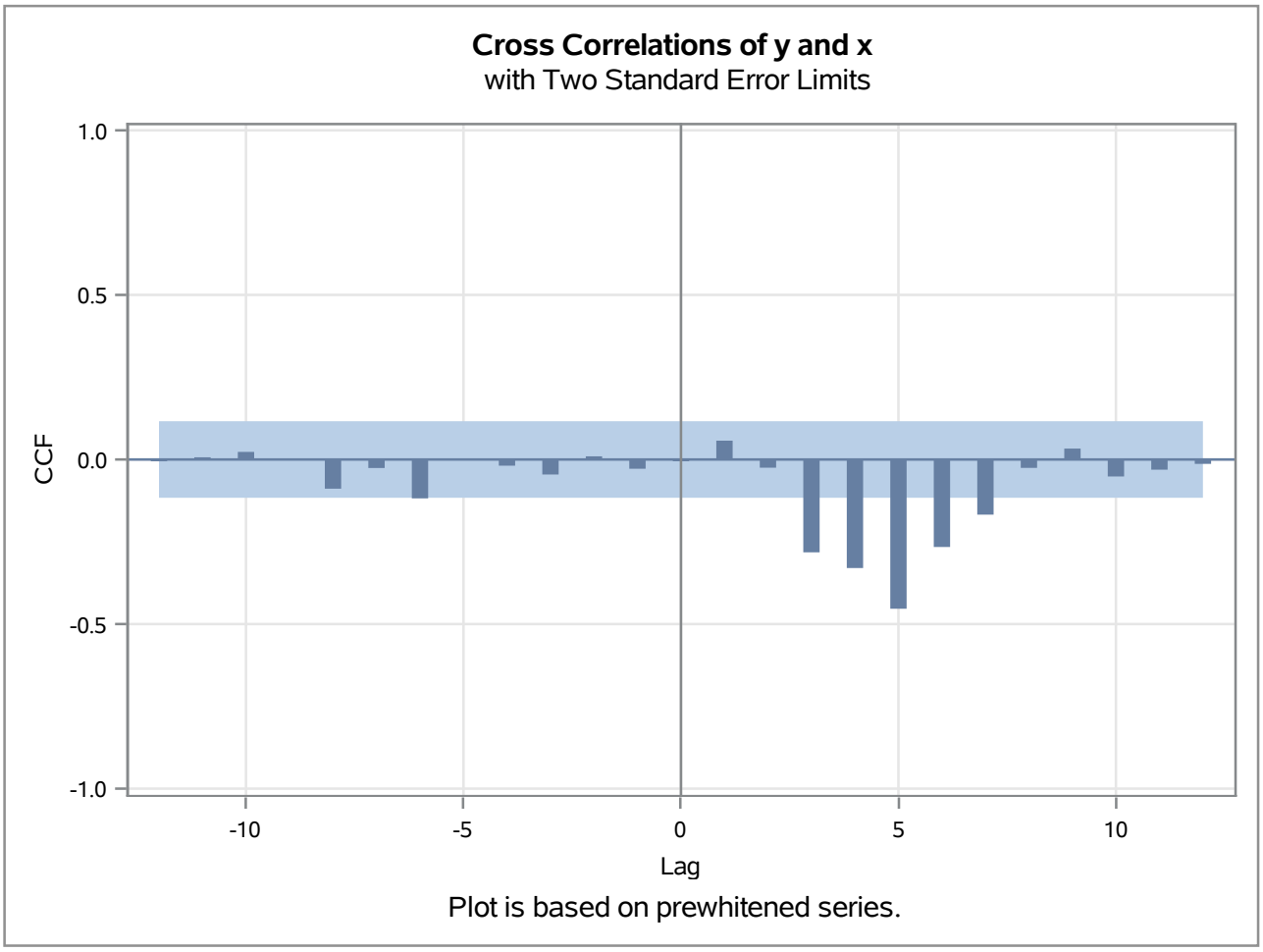
## Prewhitening Filter

| Autoregressive Factors | |
|---|---|
| **Factor 1:** | 1 - 1.97607 B**(1) + 1.37499 B**(2) - 0.34336 B**(3) |

The ARIMA Procedure



The ARIMA Procedure




| Conditional Least Squares Estimation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Parameter | Estimate | Standard Error | t Value | Approx Pr > \|t\| | Lag | Variable | Shift |
| MU | 53.32256 | 0.04926 | 1082.51 | <.0001 | 0 | y | 0 |
| NUM1 | -0.56467 | 0.22405 | -2.52 | 0.0123 | 0 | x | 3 |
| NUM1,1 | 0.42623 | 0.46472 | 0.92 | 0.3598 | 1 | x | 3 |
| NUM1,2 | 0.29914 | 0.35506 | 0.84 | 0.4002 | 2 | x | 3 |
| DEN1,1 | 0.60073 | 0.04101 | 14.65 | <.0001 | 1 | x | 3 |

| | |
|---|---|
| Constant Estimate | 53.32256 |
| Variance Estimate | 0.702625 |
| Std Error Estimate | 0.838227 |
| AIC | 728.0754 |
| SBC | 746.442 |
| Number of Residuals | 291 |

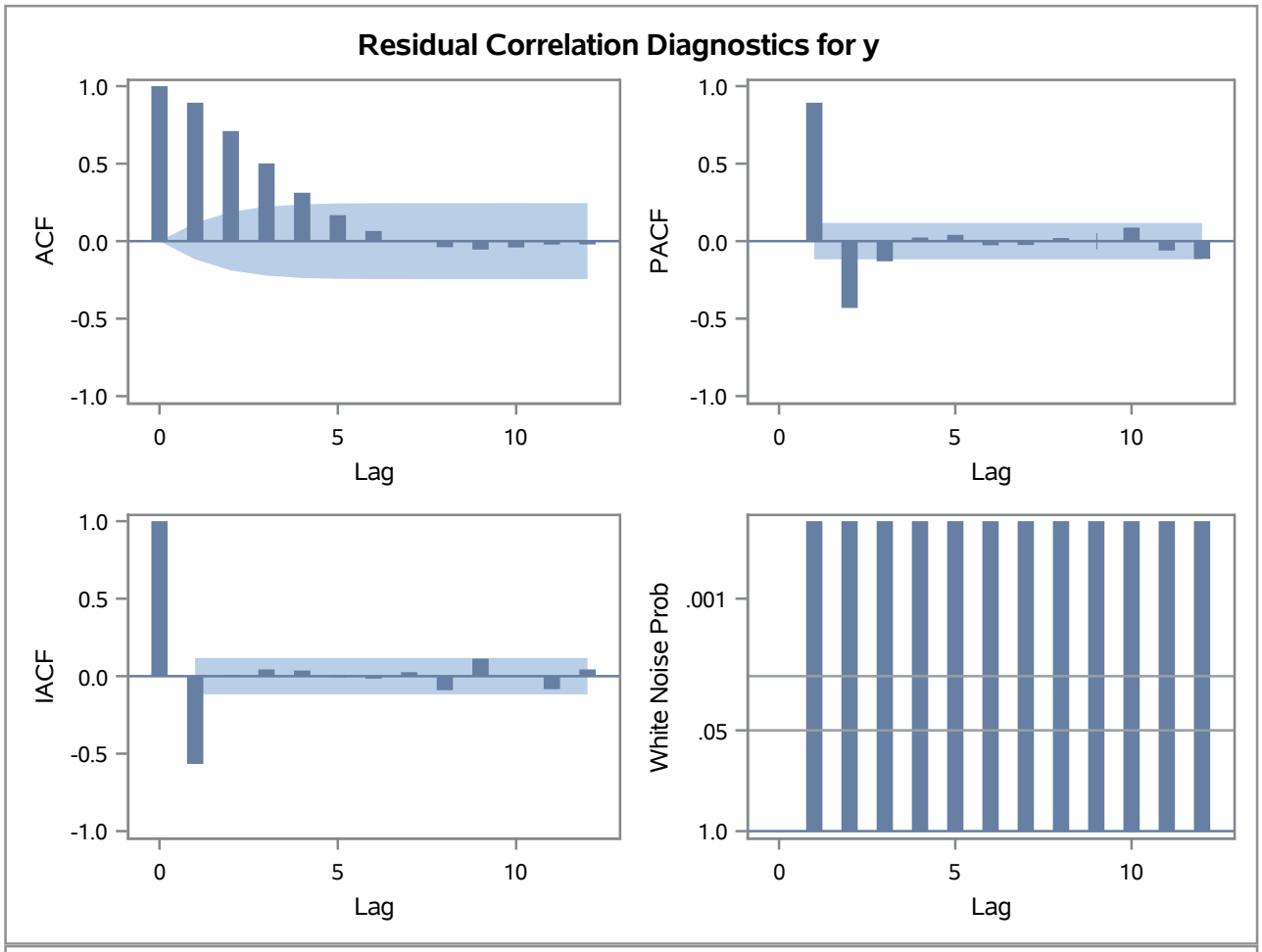
* AIC and SBC do not include log determinant.

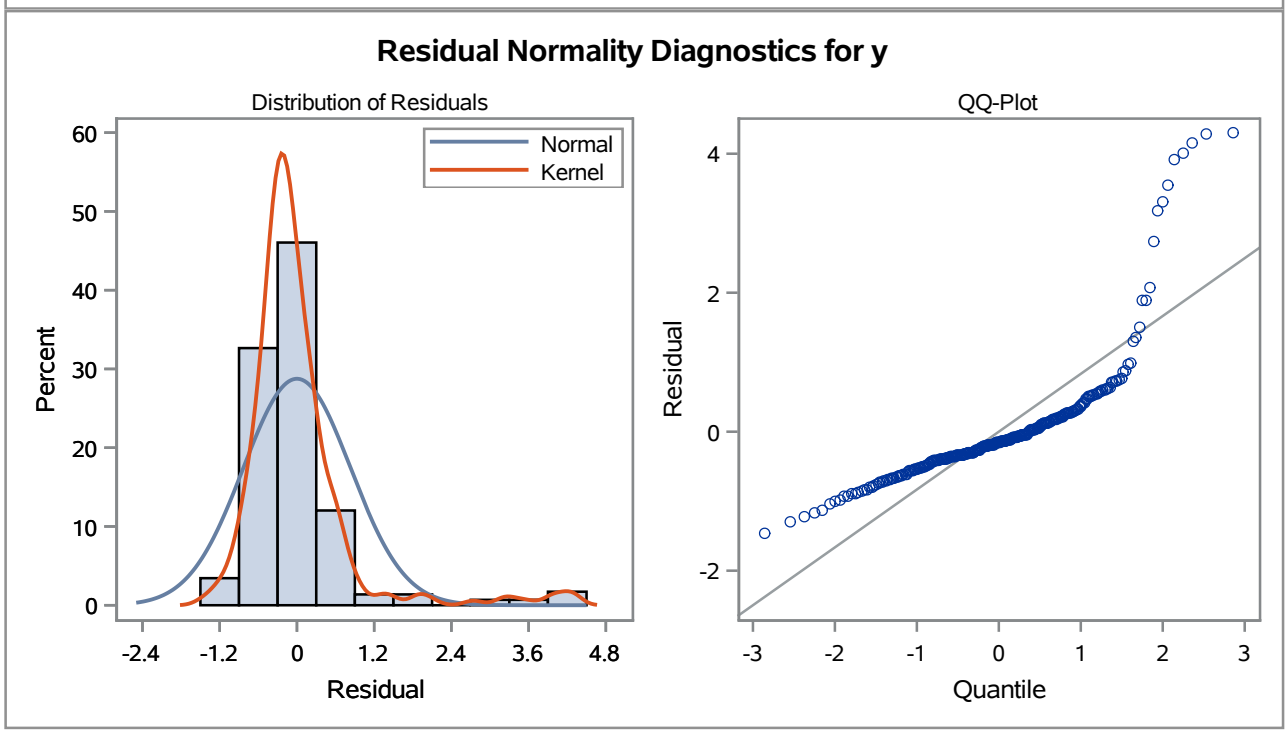
## The ARIMA Procedure

| Correlations of Parameter Estimates | | | | | | |
|---|---|---|---|---|---|---|
| Variable | Parameter | y MU | x NUM1 | x NUM1,1 | x NUM1,2 | x DEN1,1 |
| y | MU | 1.000 | 0.011 | 0.006 | 0.003 | -0.022 |
| x | NUM1 | 0.011 | 1.000 | 0.974 | -0.864 | 0.563 |
| x | NUM1,1 | 0.006 | 0.974 | 1.000 | -0.942 | 0.657 |
| x | NUM1,2 | 0.003 | -0.864 | -0.942 | 1.000 | -0.853 |
| x | DEN1,1 | -0.022 | 0.563 | 0.657 | -0.853 | 1.000 |

| Autocorrelation Check of Residuals | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| To Lag | Chi-Square | DF | Pr > ChiSq | Autocorrelations | | | | | |
| 6 | 496.43 | 6 | <.0001 | 0.893 | 0.710 | 0.501 | 0.312 | 0.168 | 0.065 |
| 12 | 498.57 | 12 | <.0001 | -0.002 | -0.039 | -0.054 | -0.041 | -0.022 | -0.021 |
| 18 | 539.05 | 18 | <.0001 | -0.045 | -0.083 | -0.131 | -0.169 | -0.195 | -0.194 |
| 24 | 561.31 | 24 | <.0001 | -0.162 | -0.101 | -0.026 | 0.048 | 0.106 | 0.141 |
| 30 | 585.29 | 30 | <.0001 | 0.158 | 0.155 | 0.131 | 0.082 | 0.014 | -0.036 |
| 36 | 592.04 | 36 | <.0001 | -0.048 | -0.018 | 0.039 | 0.071 | 0.080 | 0.068 |
| 42 | 593.11 | 42 | <.0001 | 0.043 | 0.025 | 0.015 | 0.006 | 0.007 | 0.019 |
| 48 | 601.45 | 48 | <.0001 | 0.042 | 0.067 | 0.083 | 0.082 | 0.061 | 0.022 |

The ARIMA Procedure



## The ARIMA Procedure

| Crosscorrelation Check of Residuals with Input x | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| To Lag | Chi-Square | DF | Pr > ChiSq | Crosscorrelations | | | | | |
| 5 | 0.61 | 3 | 0.8935 | -0.024 | 0.011 | 0.020 | 0.012 | -0.018 | -0.024 |
| 11 | 1.17 | 9 | 0.9989 | -0.006 | 0.011 | 0.024 | 0.025 | -0.019 | -0.016 |
| 17 | 2.80 | 15 | 0.9997 | 0.014 | 0.030 | 0.036 | 0.039 | -0.008 | -0.042 |
| 23 | 19.51 | 21 | 0.5523 | -0.075 | -0.108 | -0.124 | -0.122 | -0.095 | -0.041 |
| 29 | 20.44 | 27 | 0.8119 | -0.039 | -0.014 | 0.009 | -0.021 | -0.030 | -0.005 |
| 35 | 24.53 | 33 | 0.8563 | -0.023 | -0.032 | -0.074 | -0.037 | 0.015 | 0.076 |
| 41 | 30.95 | 39 | 0.8175 | 0.108 | 0.090 | 0.046 | 0.020 | 0.002 | 0.010 |
| 47 | 31.94 | 45 | 0.9286 | 0.009 | -0.011 | -0.040 | -0.029 | -0.003 | 0.028 |

| Model for variable y | |
|---|---|
| Estimated Intercept | 53.32256 |

| Input Number 1 | |
|---|---|
| Input Variable | x |
| Shift | 3 |

| Numerator Factors | |
|---|---|
| Factor 1: | -0.5647 - 0.42623 B**(1) - 0.29914 B**(2) |

| Denominator Factors | |
|---|---|
| Factor 1: | 1 - 0.60073 B**(1) |

| Conditional Least Squares Estimation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Parameter | Estimate | Standard Error | t Value | Approx Pr > \|t\| | Lag | Variable | Shift |
| MU | 53.26304 | 0.11929 | 446.48 | <.0001 | 0 | y | 0 |
| AR1,1 | 1.53291 | 0.04754 | 32.25 | <.0001 | 1 | y | 0 |
| AR1,2 | -0.63297 | 0.05006 | -12.64 | <.0001 | 2 | y | 0 |
| NUM1 | -0.53522 | 0.07482 | -7.15 | <.0001 | 0 | x | 3 |
| NUM1,1 | 0.37603 | 0.10287 | 3.66 | 0.0003 | 1 | x | 3 |
| NUM1,2 | 0.51895 | 0.10783 | 4.81 | <.0001 | 2 | x | 3 |
| DEN1,1 | 0.54841 | 0.03822 | 14.35 | <.0001 | 1 | x | 3 |

## The ARIMA Procedure

| | |
|---|---|
| **Constant Estimate** | 5.329425 |
| **Variance Estimate** | 0.058828 |
| **Std Error Estimate** | 0.242544 |
| **AIC** | 8.292809 |
| **SBC** | 34.00607 |
| **Number of Residuals** | 291 |

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

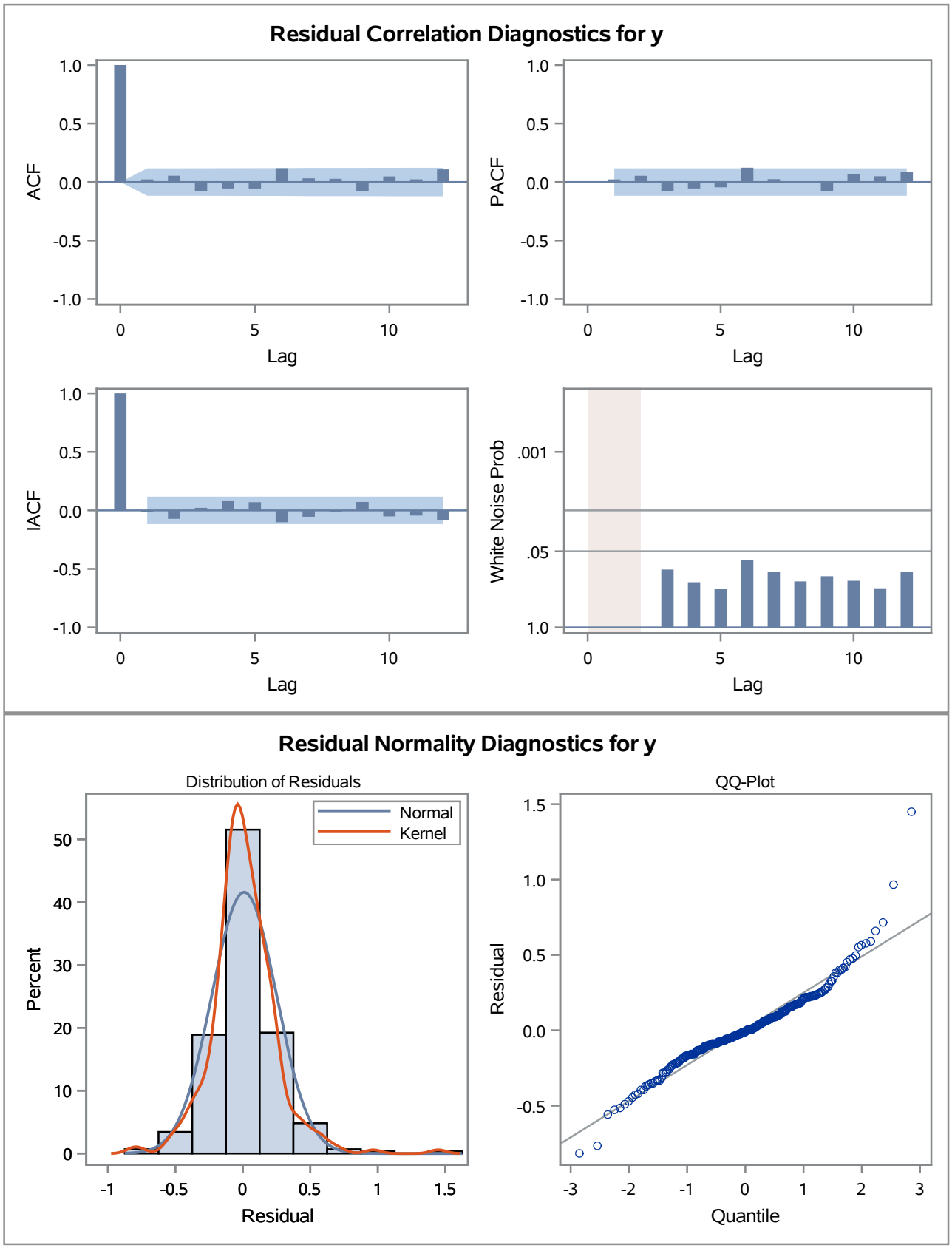
**Correlations of Parameter Estimates**

| Variable | Parameter | y MU | y AR1,1 | y AR1,2 | x NUM1 | x NUM1,1 | x NUM1,2 | x DEN1,1 |
|---|---|---|---|---|---|---|---|---|
| y | MU | 1.000 | -0.063 | 0.047 | -0.008 | -0.016 | 0.017 | -0.049 |
| y | AR1,1 | -0.063 | 1.000 | -0.927 | -0.003 | 0.007 | -0.002 | 0.015 |
| y | AR1,2 | 0.047 | -0.927 | 1.000 | 0.023 | -0.005 | 0.005 | -0.022 |
| x | NUM1 | -0.008 | -0.003 | 0.023 | 1.000 | 0.713 | -0.178 | -0.013 |
| x | NUM1,1 | -0.016 | 0.007 | -0.005 | 0.713 | 1.000 | -0.467 | -0.039 |
| x | NUM1,2 | 0.017 | -0.002 | 0.005 | -0.178 | -0.467 | 1.000 | -0.720 |
| x | DEN1,1 | -0.049 | 0.015 | -0.022 | -0.013 | -0.039 | -0.720 | 1.000 |

**Autocorrelation Check of Residuals**

| To Lag | Chi-Square | DF | Pr > ChiSq | Autocorrelations | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **6** | 8.61 | 4 | 0.0717 | 0.024 | 0.055 | -0.073 | -0.054 | -0.054 | 0.119 |
| **12** | 15.43 | 10 | 0.1172 | 0.032 | 0.028 | -0.081 | 0.047 | 0.022 | 0.107 |
| **18** | 21.13 | 16 | 0.1734 | -0.038 | 0.052 | -0.093 | -0.013 | -0.073 | -0.005 |
| **24** | 27.52 | 22 | 0.1922 | -0.118 | -0.002 | -0.007 | 0.076 | 0.024 | -0.004 |
| **30** | 36.94 | 28 | 0.1202 | 0.034 | -0.021 | 0.020 | 0.094 | -0.118 | 0.065 |
| **36** | 44.26 | 34 | 0.1119 | -0.025 | -0.057 | 0.113 | 0.022 | 0.030 | 0.065 |
| **42** | 45.62 | 40 | 0.2500 | -0.017 | -0.036 | -0.029 | -0.013 | -0.033 | 0.017 |
| **48** | 48.60 | 46 | 0.3688 | 0.024 | 0.069 | 0.024 | 0.017 | 0.022 | -0.044 |

The ARIMA Procedure



## The ARIMA Procedure

| Crosscorrelation Check of Residuals with Input x | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| To Lag | Chi-Square | DF | Pr > ChiSq | Crosscorrelations | | | | | |
| 5 | 0.93 | 3 | 0.8191 | 0.008 | 0.004 | 0.010 | 0.008 | -0.045 | 0.030 |
| 11 | 6.60 | 9 | 0.6784 | 0.075 | -0.024 | -0.019 | -0.026 | -0.111 | 0.013 |
| 17 | 13.86 | 15 | 0.5365 | 0.050 | 0.043 | 0.014 | 0.014 | -0.141 | -0.028 |
| 23 | 18.55 | 21 | 0.6142 | -0.074 | -0.078 | 0.023 | -0.016 | 0.021 | 0.060 |
| 29 | 27.99 | 27 | 0.4112 | -0.071 | -0.001 | 0.038 | -0.156 | 0.031 | 0.035 |
| 35 | 35.18 | 33 | 0.3654 | -0.014 | 0.015 | -0.039 | 0.028 | 0.046 | 0.142 |
| 41 | 37.15 | 39 | 0.5544 | 0.031 | -0.029 | -0.070 | -0.006 | 0.012 | -0.004 |
| 47 | 42.42 | 45 | 0.5818 | 0.036 | -0.038 | -0.053 | 0.107 | 0.029 | 0.021 |

| Model for variable y | |
|---|---|
| Estimated Intercept | 53.26304 |

| Autoregressive Factors | |
|---|---|
| Factor 1: | 1 - 1.53291 B**(1) + 0.63297 B**(2) |

| Input Number 1 | |
|---|---|
| Input Variable | x |
| Shift | 3 |

| Numerator Factors | |
|---|---|
| Factor 1: | -0.5352 - 0.37603 B**(1) - 0.51895 B**(2) |

| Denominator Factors | |
|---|---|
| Factor 1: | 1 - 0.54841 B**(1) |