| Name of Variable = sales | |
|---|---|
| Period(s) of Differencing | 1 |
| Mean of Working Series | 1628.263 |
| Standard Deviation | 26754.34 |
| Number of Observations | 47 |
| Observation(s) eliminated by differencing | 1 |

| Autocorrelation Check for White Noise | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| To Lag | Chi-Square | DF | Pr > ChiSq | Autocorrelations | | | | | |
| 6 | 19.93 | 6 | 0.0029 | -0.395 | -0.127 | 0.177 | -0.112 | -0.183 | 0.357 |



Trend and Correlation Analysis for sales(1)
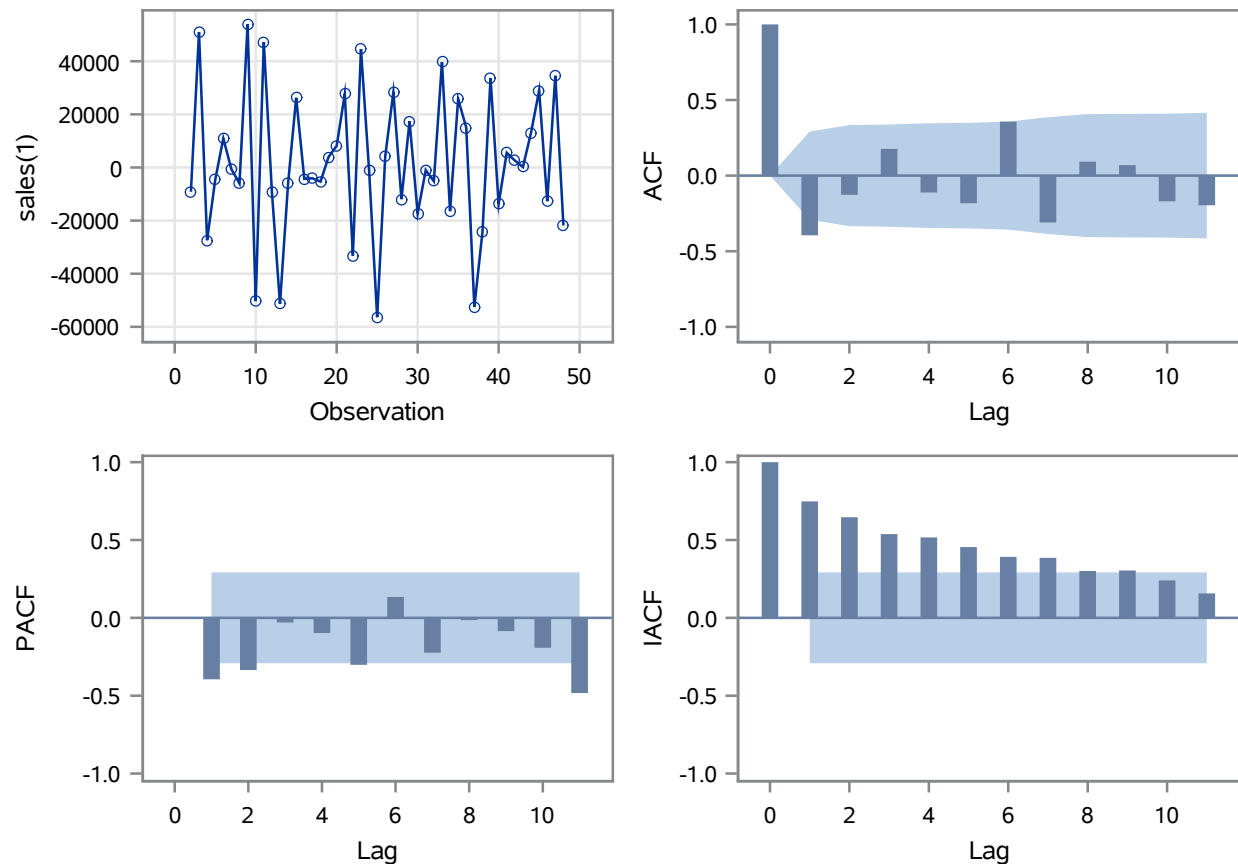
**Warning:** The model defined by the new estimates is unstable. The iteration process has been terminated.

**Warning:** Estimates may not have converged.

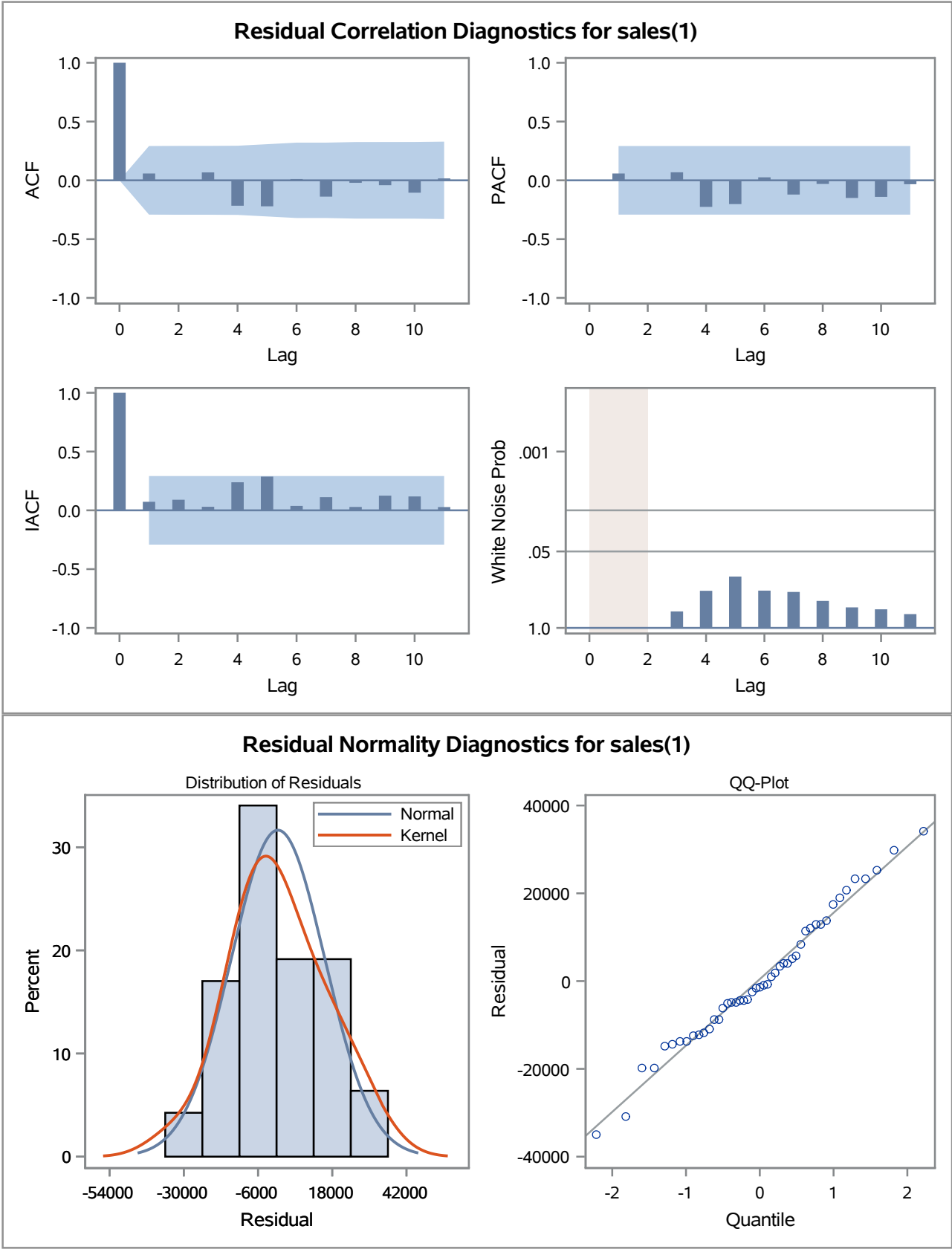| ARIMA Estimation Optimization Summary | |
|---|---|
| Estimation Method | Maximum Likelihood |
| Parameters Estimated | 3 |
| Termination Criteria | Maximum Relative Change in Estimates |
| Iteration Stopping Value | 0.001 |
| Criteria Value | 52.486 |

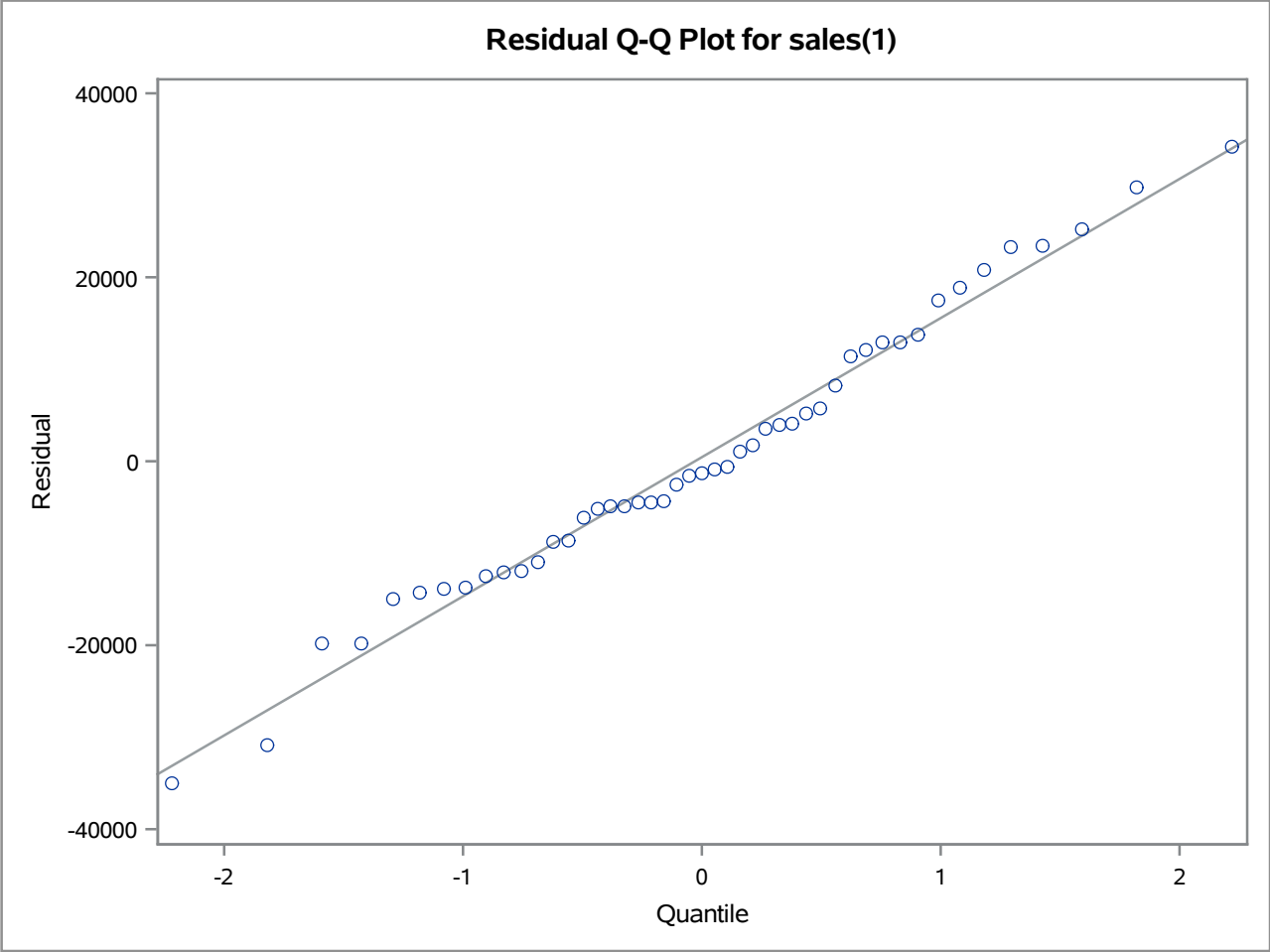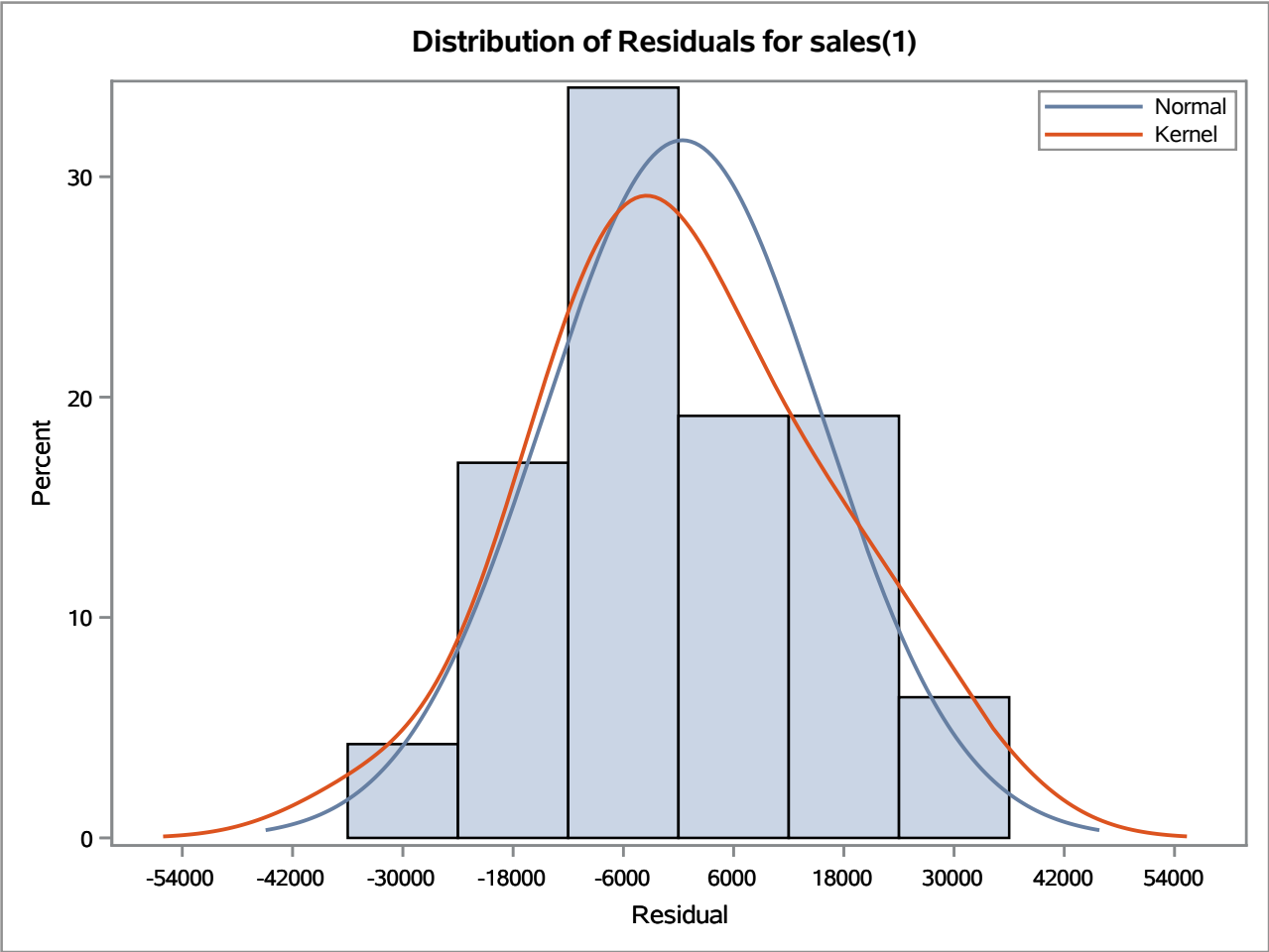| ARIMA Estimation Optimization Summary | |
|---|---|
| Maximum Absolute Value of Gradient | 1.0479E9 |
| R-Square Change from Last Iteration | 0.089593 |
| Objective Function | Log Gaussian Likelihood |
| Objective Function Value | -528.35 |
| Marquardt's Lambda Coefficient | 0.00001 |
| Numerical Derivative Perturbation Delta | 0.001 |
| Iterations | 5 |
| Warning Message | Estimates may not have converged. |

| Maximum Likelihood Estimation | | | | | |
|---|---|---|---|---|---|
| Parameter | Estimate | Standard Error | t Value | Approx Pr > \|t\| | Lag |
| MU | 1224.1 | 1154.9 | 1.06 | 0.2892 | 0 |
| MA1,1 | 0.66469 | 0.09772 | 6.80 | <.0001 | 1 |
| MA2,1 | -0.99924 | 90.45867 | -0.01 | 0.9912 | 12 |

| | |
|---|---|
| Constant Estimate | 1224.113 |
| Variance Estimate | 2.3936E8 |
| Std Error Estimate | 15471.21 |
| AIC | 1062.7 |
| SBC | 1068.25 |
| Number of Residuals | 47 |

| Correlations of Parameter Estimates | | | |
|---|---|---|---|
| Parameter | MU | MA1,1 | MA2,1 |
| MU | 1.000 | 0.083 | 0.046 |
| MA1,1 | 0.083 | 1.000 | -0.030 |
| MA2,1 | 0.046 | -0.030 | 1.000 |

| Autocorrelation Check of Residuals | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| To Lag | Chi-Square | DF | Pr > ChiSq | Autocorrelations | | | | | |
| 6 | 5.66 | 4 | 0.2264 | 0.060 | -0.006 | 0.066 | -0.217 | -0.223 | 0.009 |
| 12 | 9.24 | 10 | 0.5099 | -0.140 | -0.024 | -0.043 | -0.107 | 0.015 | 0.154 |
| 18 | 10.94 | 16 | 0.8134 | 0.059 | -0.081 | -0.063 | -0.040 | -0.019 | 0.085 |
| 24 | 23.98 | 22 | 0.3483 | -0.131 | 0.053 | -0.033 | -0.071 | 0.024 | 0.328 |

## Residual Correlation Diagnostics for sales(1)



## Residual Normality Diagnostics for sales(1)

## Distribution of Residuals for sales(1)



## Residual Q-Q Plot for sales(1)

| Model for variable sales | |
|---|---|
| Estimated Mean | 1224.113 |
| Period(s) of Differencing | 1 |

| Moving Average Factors | |
|---|---|
| Factor 1: | 1 - 0.66469 B**(1) |
| Factor 2: | 1 + 0.99924 B**(12) |

**Warning:** The ID value for observation 3 is the same as the ID value for the last observation according to ID variable ORDER_DATE.

**Warning:** There are gaps in the interval for observation 5 according to ID variable ORDER_DATE.

**Warning:** The ID value for observation 6 is the same as the ID value for the last observation according to ID variable ORDER_DATE.

**Warning:** There are gaps in the interval for observation 8 according to ID variable ORDER_DATE.

**Warning:** The ID value for observation 9 is the same as the ID value for the last observation according to ID variable ORDER_DATE.

**Warning:** There are gaps in the interval for observation 10 according to ID variable ORDER_DATE.

**Warning:** The ID value for observation 12 is the same as the ID value for the last observation according to ID variable ORDER_DATE.

**Warning:** There are gaps in the interval for observation 13 according to ID variable ORDER_DATE.

**Warning:** The ID value for observation 15 is the same as the ID value for the last observation according to ID variable ORDER_DATE.

**Warning:** There are gaps in the interval for observation 16 according to ID variable ORDER_DATE.

**Warning:** The ID value for observation 18 is the same as the ID value for the last observation according to ID variable ORDER_DATE.

**Warning:** There are gaps in the interval for observation 19 according to ID variable ORDER_DATE.

**Note:** Further warnings will not be printed.

**Warning:** The ID value for observation 21 is the same as the ID value for the last observation according to ID variable ORDER_DATE.

**Warning:** The ID value for observation 27 is the same as the ID value for the last observation according to ID variable ORDER_DATE.

**Warning:** The ID value for observation 30 is the same as the ID value for the last observation according to ID variable ORDER_DATE.

| Forecasts for variable sales | | | | | | |
|---|---|---|---|---|---|---|
| Obs | Forecast | Std Error | 95% Confidence Limits | | Actual | Residual |
| 37 | 60984.7321 | 15471.206 | 30661.7255 | 91307.7386 | 44703.1420 | -16281.5901 |
| 38 | 65538.3883 | 16317.804 | 33556.0808 | 97520.6959 | 20283.5134 | -45254.8749 |
| 39 | 86981.4557 | 17122.594 | 53421.7884 | 120541.1230 | 53908.9620 | -33072.4937 |
| 40 | 73927.1858 | 17891.219 | 38861.0406 | 108993.3311 | 40112.4209 | -33814.7649 |
| 41 | 88491.0929 | 18628.157 | 51980.5765 | 125001.6094 | 45651.2362 | -42839.8567 |
| 42 | 81561.5835 | 19337.030 | 43661.7012 | 119461.4659 | 48259.7487 | -33301.8348 |
| 43 | 79285.1774 | 20020.820 | 40045.0913 | 118525.2635 | 48428.3650 | -30856.8124 |
| 44 | 70440.1161 | 20682.015 | 29904.1120 | 110976.1202 | 61516.0860 | -8924.0301 |
| 45 | 100402.2360 | 21322.716 | 58610.4796 | 142193.9923 | 90488.7220 | -9913.5140 |
| 46 | 92695.0739 | 21944.720 | 49684.2128 | 135705.9349 | 77793.7552 | -14901.3187 |
| 47 | 102114.0321 | 22549.573 | 57917.6811 | 146310.3831 | 112326.4710 | 10212.4389 |
| 48 | 112265.6520 | 23138.620 | 66914.7897 | 157616.5143 | 90474.6008 | -21791.0512 |

**Forecasts for sales**
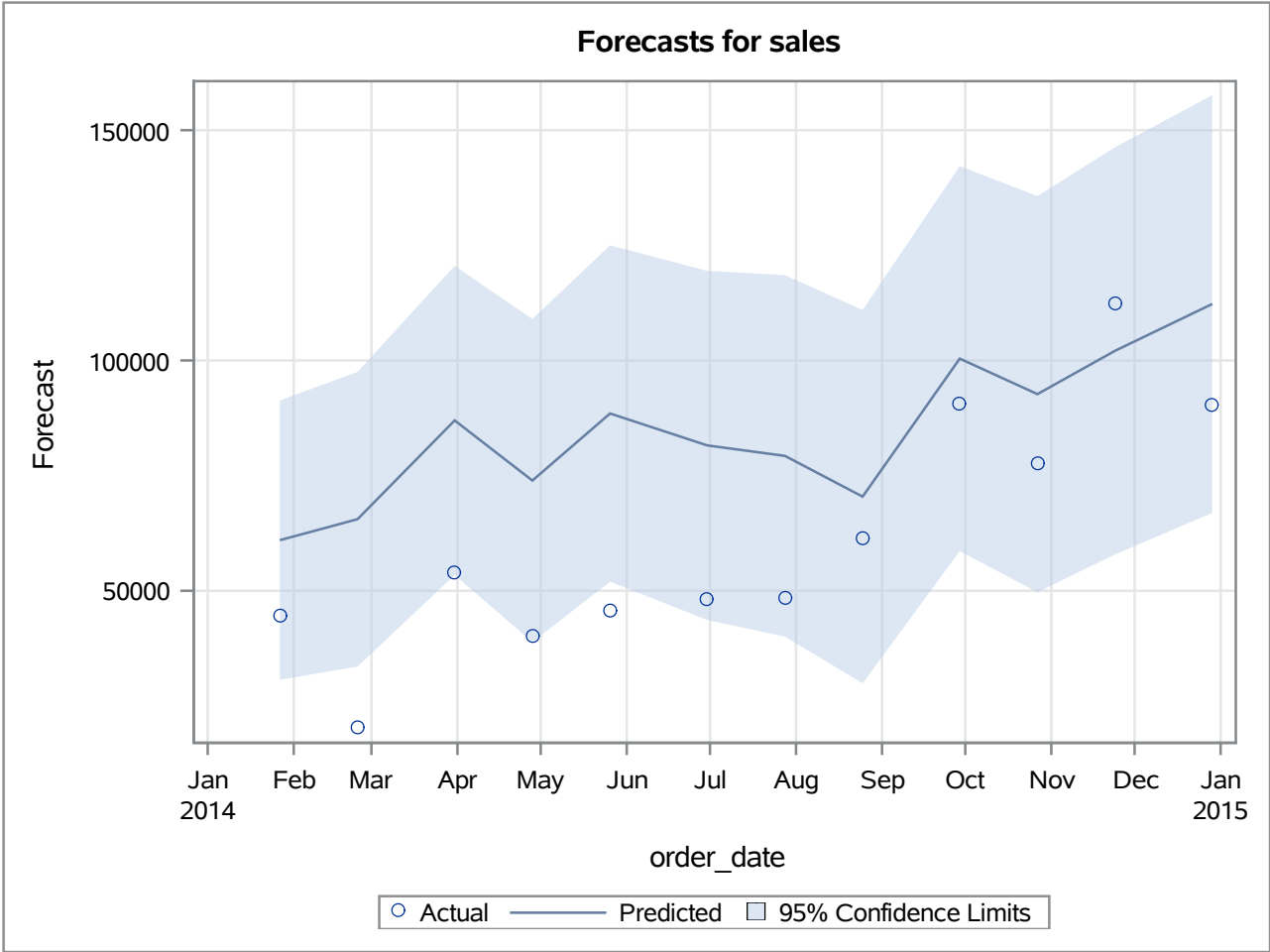


| Outlier Detection Summary | |
|---|---|
| **Maximum number searched** | 1 |
| **Number found** | 1 |
| **Significance used** | 0.05 |

| Outlier Details | | | | |
|---|---|---|---|---|
| **Obs** | **Type** | **Estimate** | **Chi-Square** | **Approx Prob>ChiSq** |
| **13** | Shift | -31679.2 | 4.64 | 0.0312 |

| Obs | rmse | mae | mape |
|---|---|---|---|
| **1** | 21674.77 | 17281.21 | 49.3501 |