# Exercise 10.11/8th edition

| Obs | year | quarter | sales_index | Q1 | Q2 | Q3 | t |
|---|---|---|---|---|---|---|---|
| **1** | 2014 | 1 | 438 | 1 | 0 | 0 | 1 |
| **2** | 2014 | 2 | 398 | 0 | 1 | 0 | 2 |
| **3** | 2014 | 3 | 252 | 0 | 0 | 1 | 3 |
| **4** | 2014 | 4 | 160 | 0 | 0 | 0 | 4 |
| **5** | 2015 | 1 | 464 | 1 | 0 | 0 | 5 |
| **6** | 2015 | 2 | 429 | 0 | 1 | 0 | 6 |
| **7** | 2015 | 3 | 376 | 0 | 0 | 1 | 7 |
| **8** | 2015 | 4 | 216 | 0 | 0 | 0 | 8 |
| **9** | 2016 | 1 | 523 | 1 | 0 | 0 | 9 |
| **10** | 2016 | 2 | 496 | 0 | 1 | 0 | 10 |
| **11** | 2016 | 3 | 425 | 0 | 0 | 1 | 11 |
| **12** | 2016 | 4 | 318 | 0 | 0 | 0 | 12 |
| **13** | 2017 | 1 | 593 | 1 | 0 | 0 | 13 |
| **14** | 2017 | 2 | 576 | 0 | 1 | 0 | 14 |
| **15** | 2017 | 3 | 456 | 0 | 0 | 1 | 15 |
| **16** | 2017 | 4 | 398 | 0 | 0 | 0 | 16 |
| **17** | 2018 | 1 | 636 | 1 | 0 | 0 | 17 |
| **18** | 2018 | 2 | 640 | 0 | 1 | 0 | 18 |
| **19** | 2018 | 3 | 526 | 0 | 0 | 1 | 19 |
| **20** | 2018 | 4 | 498 | 0 | 0 | 0 | 20 |
| **21** | 2019 | 1 | . | 1 | 0 | 0 | 21 |
| **22** | 2019 | 2 | . | 0 | 1 | 0 | 22 |
| **23** | 2019 | 3 | . | 0 | 0 | 1 | 23 |
| **24** | 2019 | 4 | . | 0 | 0 | 0 | 24 |

## The REG Procedure
## Model: MODEL1
## Dependent Variable: sales_index

| | |
|---|---|
| **Number of Observations Read** | 24 |
| **Number of Observations Used** | 20 |
| **Number of Observations with Missing Values** | 4 |

| Analysis of Variance | | | | | |
|---|---|---|---|---|---|
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr > F** |
| **Model** | 4 | 318560 | 79640 | 117.82 | <.0001 |
| **Error** | 15 | 10139 | 675.96667 | | |
| **Corrected Total** | 19 | 328700 | | | |

| | | | |
|---|---|---|---|
| **Root MSE** | 25.99936 | **R-Square** | 0.9692 |
| **Dependent Mean** | 440.90000 | **Adj R-Sq** | 0.9609 |
| **Coeff Var** | 5.89688 | | |

| Parameter Estimates | | | | | |
|---|---|---|---|---|---|
| **Variable** | **DF** | **Parameter Estimate** | **Standard Error** | **t Value** | **Pr > \|t\|** |
| **Intercept** | 1 | 119.85000 | 16.94951 | 7.07 | <.0001 |
| **t** | 1 | 16.51250 | 1.02771 | 16.07 | <.0001 |
| **Q1** | 1 | 262.33750 | 16.72999 | 15.68 | <.0001 |
| **Q2** | 1 | 222.82500 | 16.57140 | 13.45 | <.0001 |
| **Q3** | 1 | 105.51250 | 16.47552 | 6.40 | <.0001 |

## The REG Procedure
## Model: MODEL1
## Dependent Variable: sales_index

| | |
|---|---|
| **Durbin-Watson D** | 1.986 |
| **Pr < DW** | 0.4717 |
| **Pr > DW** | 0.5283 |
| **Number of Observations** | 20 |
| **1st Order Autocorrelation** | -0.182 |

**Note:** Pr<DW is the p-value for testing positive autocorrelation, and Pr>DW is the p-value for testing negative autocorrelation.

## The GLM Procedure

| Class Level Information | | |
|---|---|---|
| **Class** | **Levels** | **Values** |
| **Q1** | 2 | 0 1 |
| **Q2** | 2 | 0 1 |
| **Q3** | 2 | 0 1 |

| | |
|---|---|
| **Number of Observations Read** | 24 |
| **Number of Observations Used** | 20 |

## The GLM Procedure

### Dependent Variable: sales_index

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 4 | 318560.3000 | 79640.0750 | 117.82 | <.0001 |
| **Error** | 15 | 10139.5000 | 675.9667 | | |
| **Corrected Total** | 19 | 328699.8000 | | | |

| R-Square | Coeff Var | Root MSE | sales_index Mean |
|---|---|---|---|
| 0.969153 | 5.896883 | 25.99936 | 440.9000 |

| Source | DF | Type I SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **t** | 1 | 114343.4586 | 114343.4586 | 169.16 | <.0001 |
| **Q1** | 1 | 81883.0096 | 81883.0096 | 121.13 | <.0001 |
| **Q2** | 1 | 94609.9092 | 94609.9092 | 139.96 | <.0001 |
| **Q3** | 1 | 27723.9226 | 27723.9226 | 41.01 | <.0001 |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **t** | 1 | 174504.1000 | 174504.1000 | 258.15 | <.0001 |
| **Q1** | 1 | 166209.1204 | 166209.1204 | 245.88 | <.0001 |
| **Q2** | 1 | 122217.7985 | 122217.7985 | 180.80 | <.0001 |
| **Q3** | 1 | 27723.9226 | 27723.9226 | 41.01 | <.0001 |

## The GLM Procedure

| Observation | | Observed | Predicted | Residual | 95% Confidence Limits for Individual Predicted Value | |
|---|---|---|---|---|---|---|
| 1 | | 438.0000000 | 398.7000000 | 39.3000000 | 335.5156717 | 461.8843283 |
| 2 | | 398.0000000 | 375.7000000 | 22.3000000 | 312.5156717 | 438.8843283 |
| 3 | | 252.0000000 | 274.9000000 | -22.9000000 | 211.7156717 | 338.0843283 |
| 4 | | 160.0000000 | 185.9000000 | -25.9000000 | 122.7156717 | 249.0843283 |
| 5 | | 464.0000000 | 464.7500000 | -0.7500000 | 403.4153712 | 526.0846288 |
| 6 | | 429.0000000 | 441.7500000 | -12.7500000 | 380.4153712 | 503.0846288 |
| 7 | | 376.0000000 | 340.9500000 | 35.0500000 | 279.6153712 | 402.2846288 |
| 8 | | 216.0000000 | 251.9500000 | -35.9500000 | 190.6153712 | 313.2846288 |
| 9 | | 523.0000000 | 530.8000000 | -7.8000000 | 470.0944609 | 591.5055391 |
| 10 | | 496.0000000 | 507.8000000 | -11.8000000 | 447.0944609 | 568.5055391 |
| 11 | | 425.0000000 | 407.0000000 | 18.0000000 | 346.2944609 | 467.7055391 |
| 12 | | 318.0000000 | 318.0000000 | 0.0000000 | 257.2944609 | 378.7055391 |
| 13 | | 593.0000000 | 596.8500000 | -3.8500000 | 535.5153712 | 658.1846288 |
| 14 | | 576.0000000 | 573.8500000 | 2.1500000 | 512.5153712 | 635.1846288 |
| 15 | | 456.0000000 | 473.0500000 | -17.0500000 | 411.7153712 | 534.3846288 |
| 16 | | 398.0000000 | 384.0500000 | 13.9500000 | 322.7153712 | 445.3846288 |
| 17 | | 636.0000000 | 662.9000000 | -26.9000000 | 599.7156717 | 726.0843283 |
| 18 | | 640.0000000 | 639.9000000 | 0.1000000 | 576.7156717 | 703.0843283 |
| 19 | | 526.0000000 | 539.1000000 | -13.1000000 | 475.9156717 | 602.2843283 |
| 20 | | 498.0000000 | 450.1000000 | 47.9000000 | 386.9156717 | 513.2843283 |
| 21 | * | . | 728.9500000 | . | 662.7976725 | 795.1023275 |
| 22 | * | . | 705.9500000 | . | 639.7976725 | 772.1023275 |
| 23 | * | . | 605.1500000 | . | 538.9976725 | 671.3023275 |
| 24 | * | . | 516.1500000 | . | 449.9976725 | 582.3023275 |

*** Observation was not used in this analysis**

| | |
|---|---|
| Sum of Residuals | 0.00000 |
| Sum of Squared Residuals | 10139.50000 |
| Sum of Squared Residuals - Error SS | 0.00000 |
| PRESS Statistic | 19243.56985 |
| First Order Autocorrelation | -0.18232 |
| Durbin-Watson D | 1.98602 |