

The UNIVARIATE Procedure
Variable: fixed_acidity

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 8.31963727 | Sum Observations | 13303.1 |
| Std Deviation | 1.74109632 | Variance | 3.03141639 |
| Skewness | 0.98275144 | Kurtosis | 1.1321434 |
| Uncorrected SS | 115521.17 | Corrected SS | 4844.20339 |
| Coeff Variation | 20.9275508 | Std Error Mean | 0.04354102 |

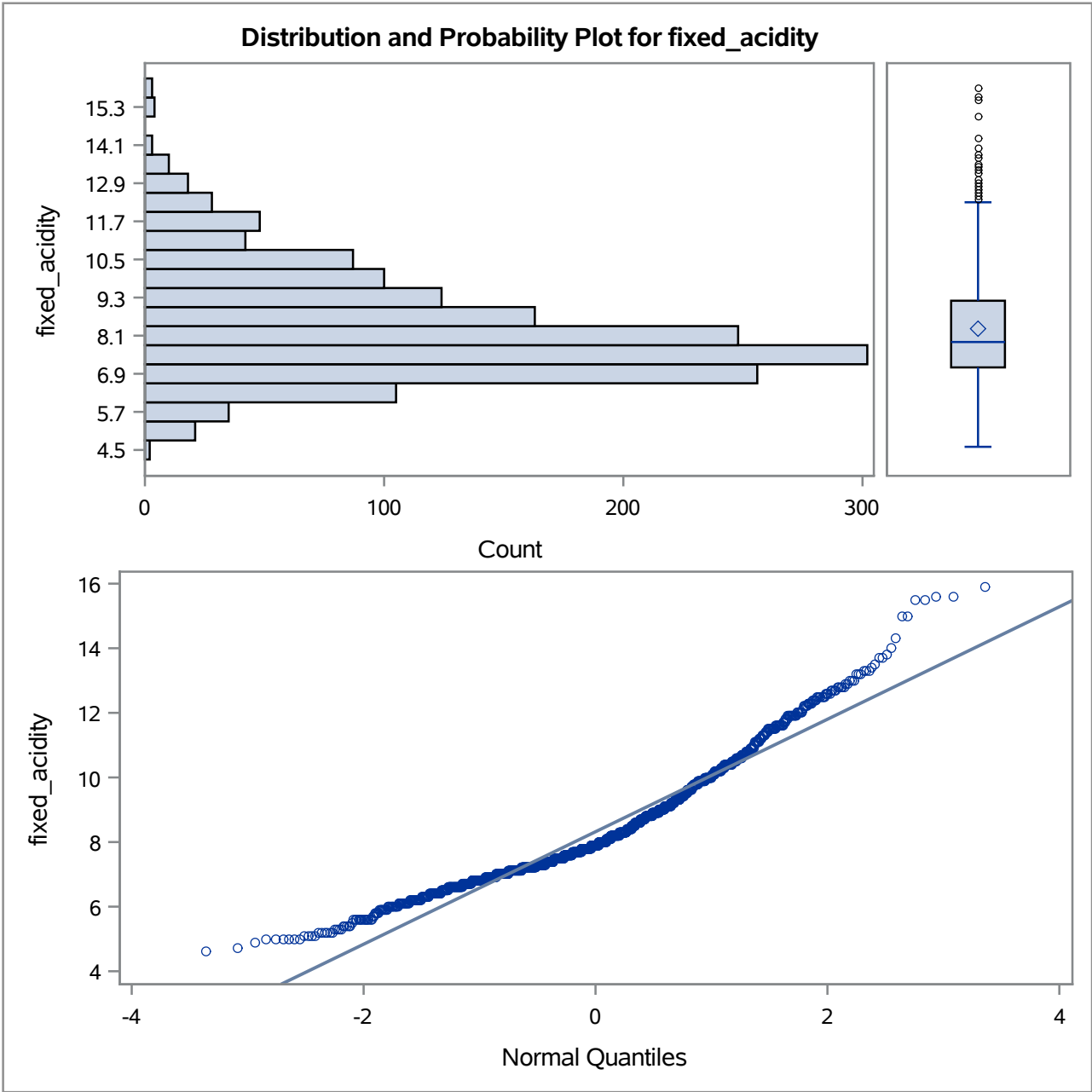
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|----------|
| Location | | Variability | |
| Mean | 8.319637 | Std Deviation | 1.74110 |
| Median | 7.900000 | Variance | 3.03142 |
| Mode | 7.200000 | Range | 11.30000 |
| | | Interquartile Range | 2.10000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 191.0759 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 15.9 |
| 99% | 13.3 |
| 95% | 11.8 |
| 90% | 10.7 |
| 75% Q3 | 9.2 |
| 50% Median | 7.9 |
| 25% Q1 | 7.1 |
| 10% | 6.5 |
| 5% | 6.1 |
| 1% | 5.2 |
| 0% Min | 4.6 |

The UNIVARIATE Procedure
Variable: fixed_acidity

| Extreme Observations | | | |
|----------------------|------|---------|-----|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 4.6 | 46 | 15.5 | 555 |
| 4.7 | 96 | 15.5 | 556 |
| 4.9 | 822 | 15.6 | 443 |
| 5.0 | 1322 | 15.6 | 558 |
| 5.0 | 1271 | 15.9 | 653 |



The UNIVARIATE Procedure
Variable: volatile_acidity

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 0.52782051 | Sum Observations | 843.985 |
| Std Deviation | 0.1790597 | Variance | 0.03206238 |
| Skewness | 0.67159257 | Kurtosis | 1.22554225 |
| Uncorrected SS | 496.708275 | Corrected SS | 51.2356795 |
| Coeff Variation | 33.9243549 | Std Error Mean | 0.00447789 |

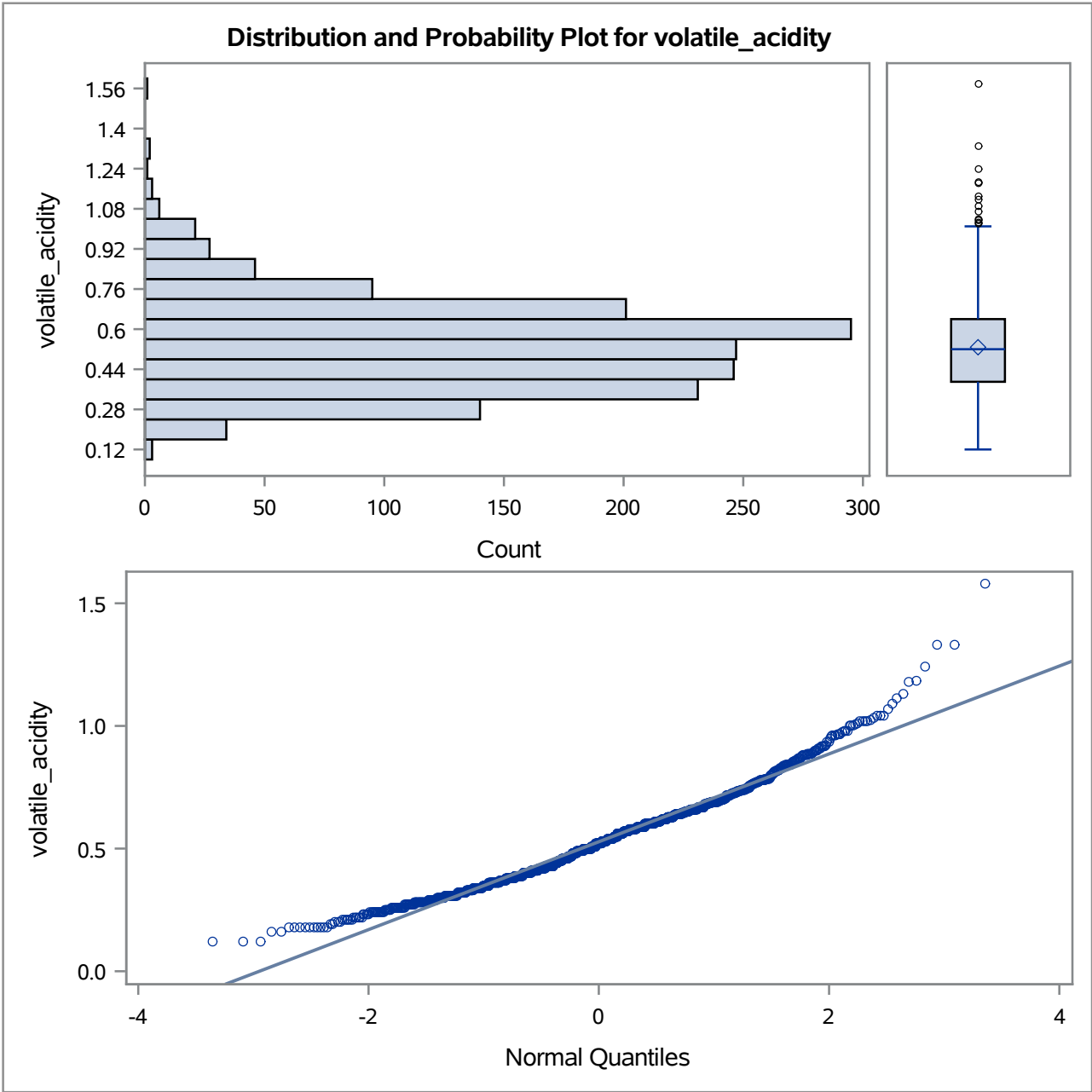
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 0.527821 | Std Deviation | 0.17906 |
| Median | 0.520000 | Variance | 0.03206 |
| Mode | 0.600000 | Range | 1.46000 |
| | | Interquartile Range | 0.25000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 117.8725 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 1.580 |
| 99% | 1.020 |
| 95% | 0.840 |
| 90% | 0.745 |
| 75% Q3 | 0.640 |
| 50% Median | 0.520 |
| 25% Q1 | 0.390 |
| 10% | 0.310 |
| 5% | 0.270 |
| 1% | 0.190 |
| 0% Min | 0.120 |

The UNIVARIATE Procedure
Variable: volatile_acidity

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.12 | 951 | 1.185 | 691 |
| 0.12 | 950 | 1.240 | 673 |
| 0.12 | 949 | 1.330 | 127 |
| 0.16 | 1567 | 1.330 | 128 |
| 0.16 | 1287 | 1.580 | 1300 |



The UNIVARIATE Procedure
Variable: citric_acid

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 0.27097561 | Sum Observations | 433.29 |
| Std Deviation | 0.19480114 | Variance | 0.03794748 |
| Skewness | 0.3183373 | Kurtosis | -0.7889975 |
| Uncorrected SS | 178.0511 | Corrected SS | 60.640078 |
| Coeff Variation | 71.8888086 | Std Error Mean | 0.00487155 |

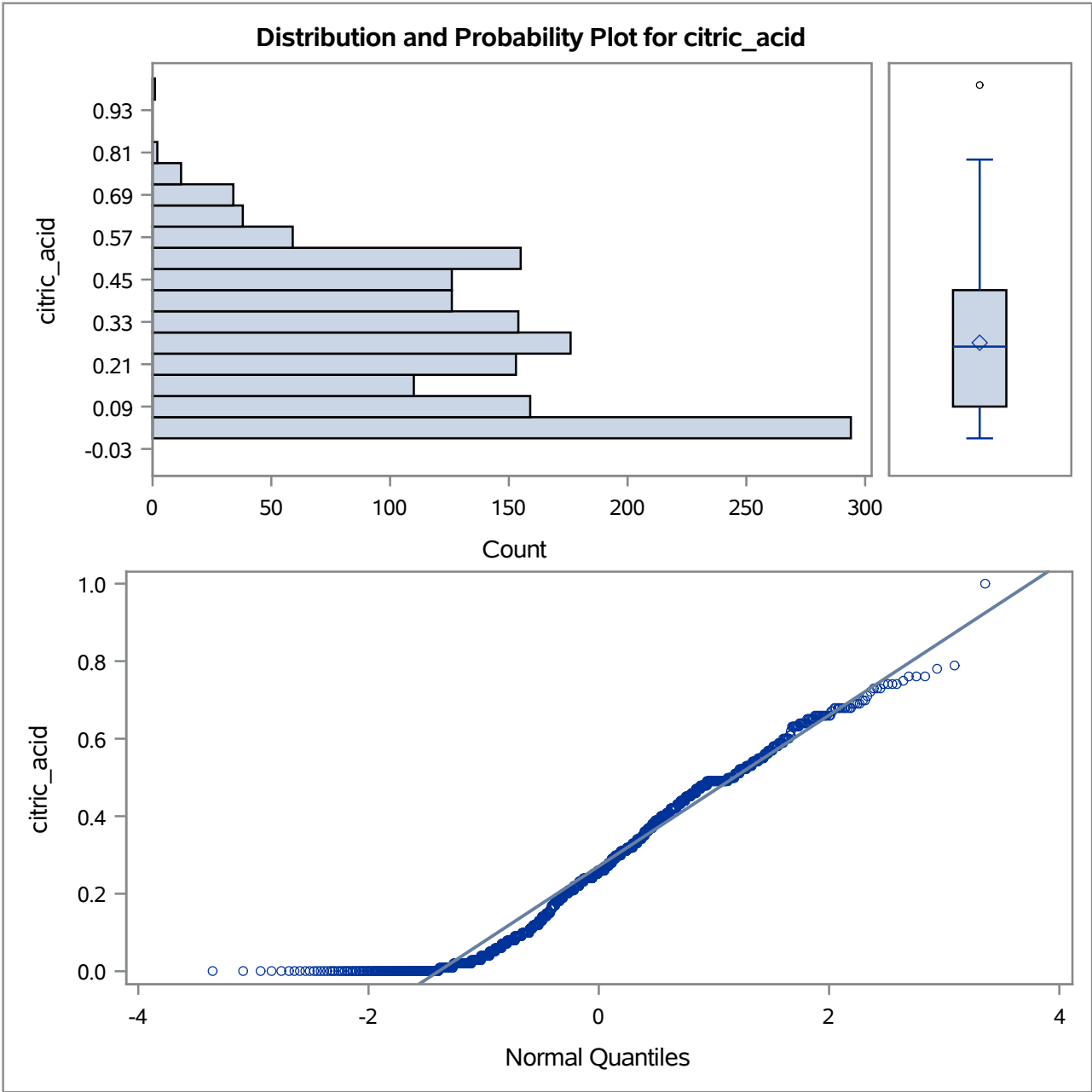
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 0.270976 | Std Deviation | 0.19480 |
| Median | 0.260000 | Variance | 0.03795 |
| Mode | 0.000000 | Range | 1.00000 |
| | | Interquartile Range | 0.33000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 55.62409 | Pr > t | <.0001 |
| Sign | M | 733.5 | Pr >= M | <.0001 |
| Signed Rank | S | 538389 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 1.00 |
| 99% | 0.71 |
| 95% | 0.60 |
| 90% | 0.53 |
| 75% Q3 | 0.42 |
| 50% Median | 0.26 |
| 25% Q1 | 0.09 |
| 10% | 0.01 |
| 5% | 0.00 |
| 1% | 0.00 |
| 0% Min | 0.00 |

The UNIVARIATE Procedure
Variable: citric_acid

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0 | 1554 | 0.76 | 396 |
| 0 | 1552 | 0.76 | 443 |
| 0 | 1551 | 0.78 | 1575 |
| 0 | 1462 | 0.79 | 354 |
| 0 | 1456 | 1.00 | 152 |



The UNIVARIATE Procedure
Variable: residual_sugar

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 2.5388055 | Sum Observations | 4059.55 |
| Std Deviation | 1.40992806 | Variance | 1.98789713 |
| Skewness | 4.54065543 | Kurtosis | 28.6175954 |
| Uncorrected SS | 13483.0675 | Corrected SS | 3176.65962 |
| Coeff Variation | 55.5350954 | Std Error Mean | 0.03525922 |

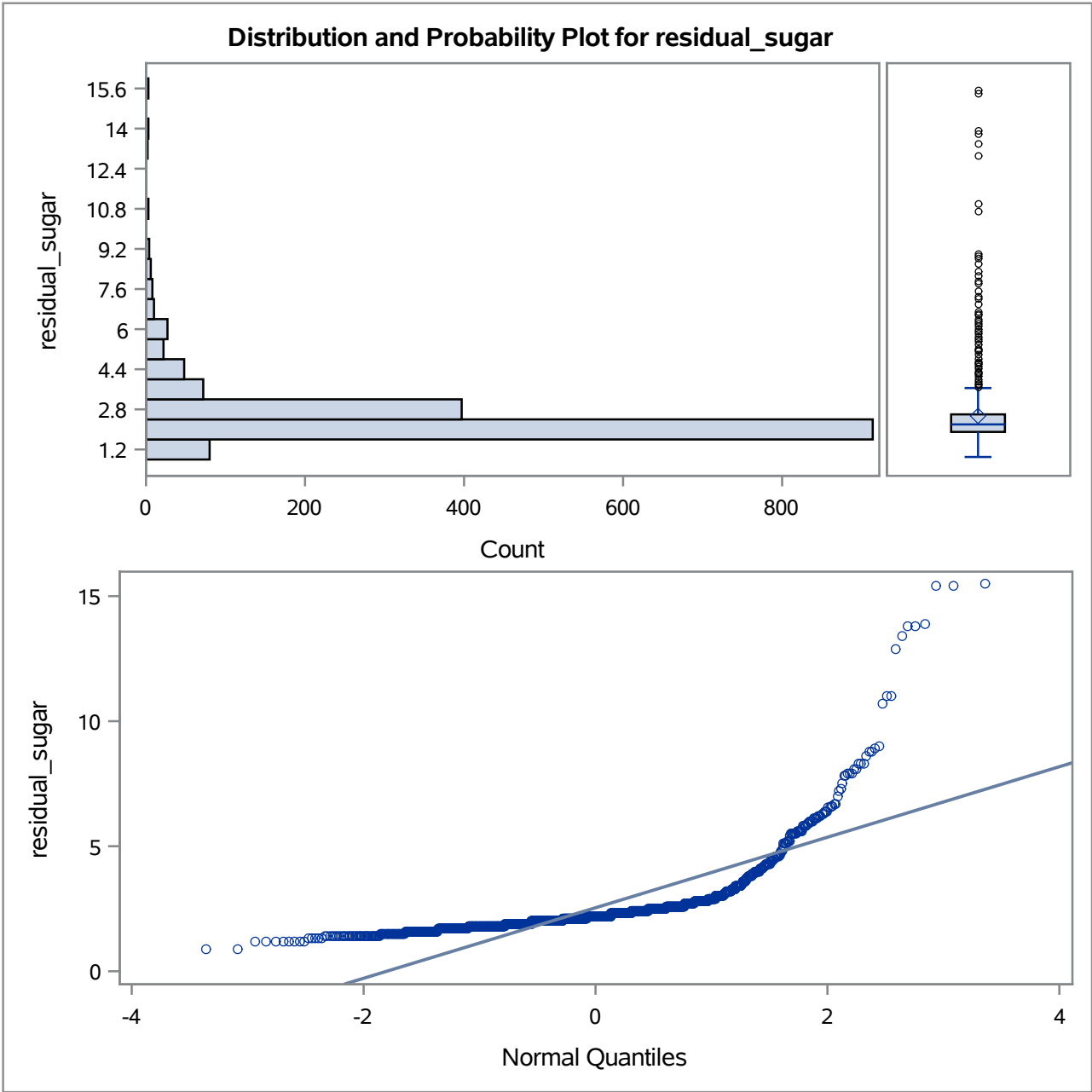
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|----------|
| Location | | Variability | |
| Mean | 2.538806 | Std Deviation | 1.40993 |
| Median | 2.200000 | Variance | 1.98790 |
| Mode | 2.000000 | Range | 14.60000 |
| | | Interquartile Range | 0.70000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 72.00401 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 15.5 |
| 99% | 8.6 |
| 95% | 5.1 |
| 90% | 3.6 |
| 75% Q3 | 2.6 |
| 50% Median | 2.2 |
| 25% Q1 | 1.9 |
| 10% | 1.7 |
| 5% | 1.5 |
| 1% | 1.4 |
| 0% Min | 0.9 |

The UNIVARIATE Procedure
Variable: residual_sugar

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.9 | 1019 | 13.8 | 1477 |
| 0.9 | 1018 | 13.9 | 1575 |
| 1.2 | 1375 | 15.4 | 1435 |
| 1.2 | 1322 | 15.4 | 1436 |
| 1.2 | 1317 | 15.5 | 481 |



The UNIVARIATE Procedure
Variable: chlorides

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 0.08746654 | Sum Observations | 139.859 |
| Std Deviation | 0.0470653 | Variance | 0.00221514 |
| Skewness | 5.68034657 | Kurtosis | 41.7157872 |
| Uncorrected SS | 15.772781 | Corrected SS | 3.53979796 |
| Coeff Variation | 53.8094924 | Std Error Mean | 0.001177 |

| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 0.087467 | Std Deviation | 0.04707 |
| Median | 0.079000 | Variance | 0.00222 |
| Mode | 0.080000 | Range | 0.59900 |
| | | Interquartile Range | 0.02000 |

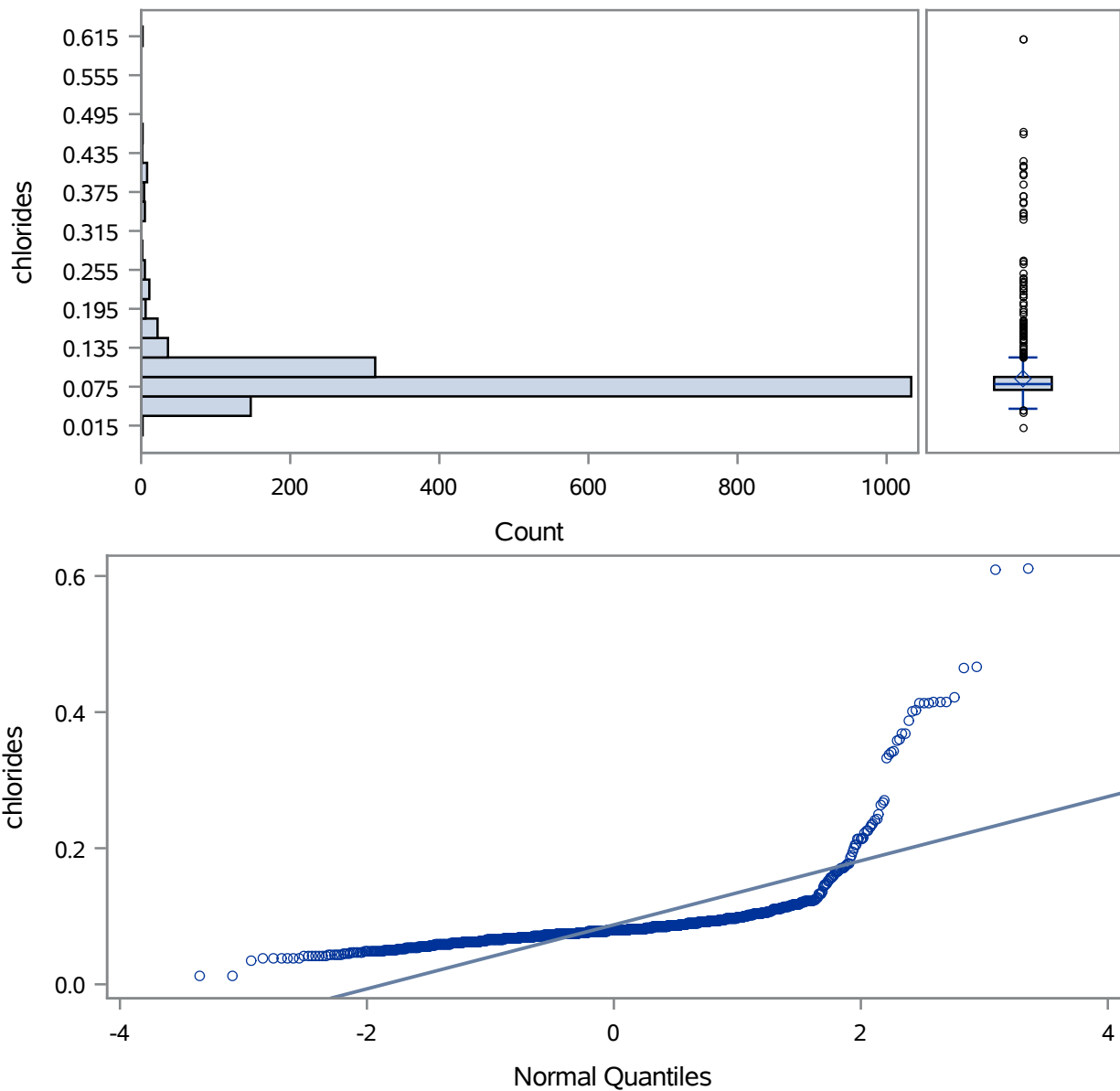
| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 74.31309 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 0.611 |
| 99% | 0.368 |
| 95% | 0.127 |
| 90% | 0.109 |
| 75% Q3 | 0.090 |
| 50% Median | 0.079 |
| 25% Q1 | 0.070 |
| 10% | 0.060 |
| 5% | 0.054 |
| 1% | 0.042 |
| 0% Min | 0.012 |

The UNIVARIATE Procedure
Variable: chlorides

| Extreme Observations | | | |
|----------------------|------|---------|-----|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.012 | 838 | 0.422 | 693 |
| 0.012 | 837 | 0.464 | 82 |
| 0.034 | 696 | 0.467 | 107 |
| 0.038 | 1572 | 0.610 | 152 |
| 0.038 | 798 | 0.611 | 259 |

Distribution and Probability Plot for chlorides



The UNIVARIATE Procedure
Variable: free_sulfur_dioxide

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 15.8749218 | Sum Observations | 25384 |
| Std Deviation | 10.460157 | Variance | 109.414884 |
| Skewness | 1.25056729 | Kurtosis | 2.02356205 |
| Uncorrected SS | 577814 | Corrected SS | 174844.984 |
| Coeff Variation | 65.891077 | Std Error Mean | 0.26158568 |

| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|-----------|
| Location | | Variability | |
| Mean | 15.87492 | Std Deviation | 10.46016 |
| Median | 14.00000 | Variance | 109.41488 |
| Mode | 6.00000 | Range | 71.00000 |
| | | Interquartile Range | 14.00000 |

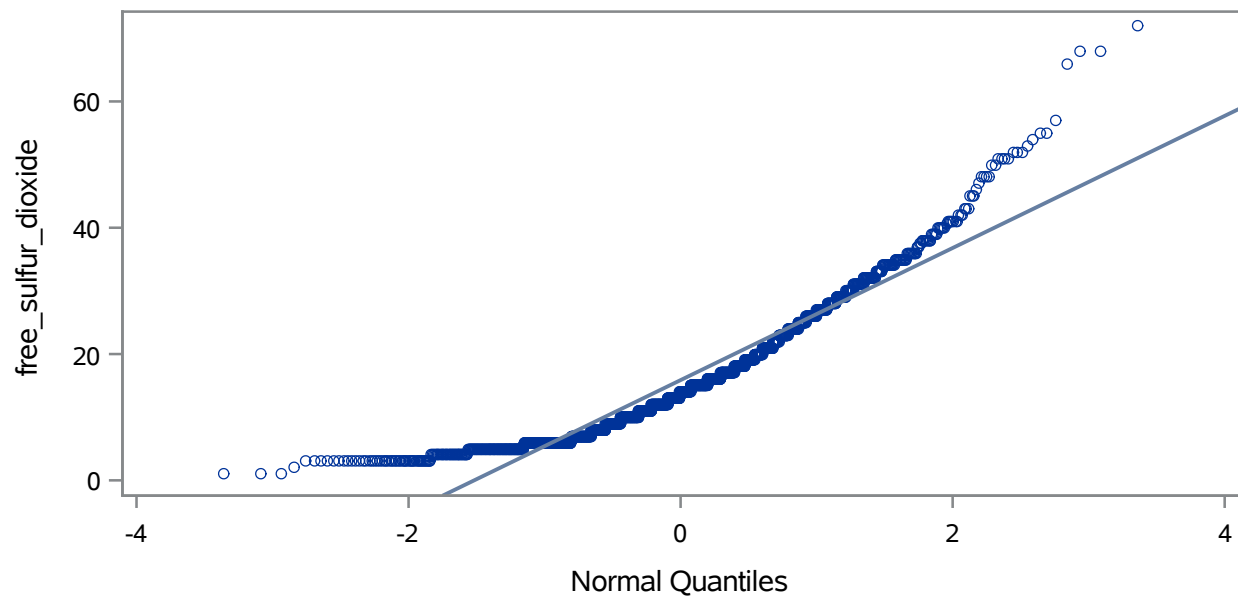
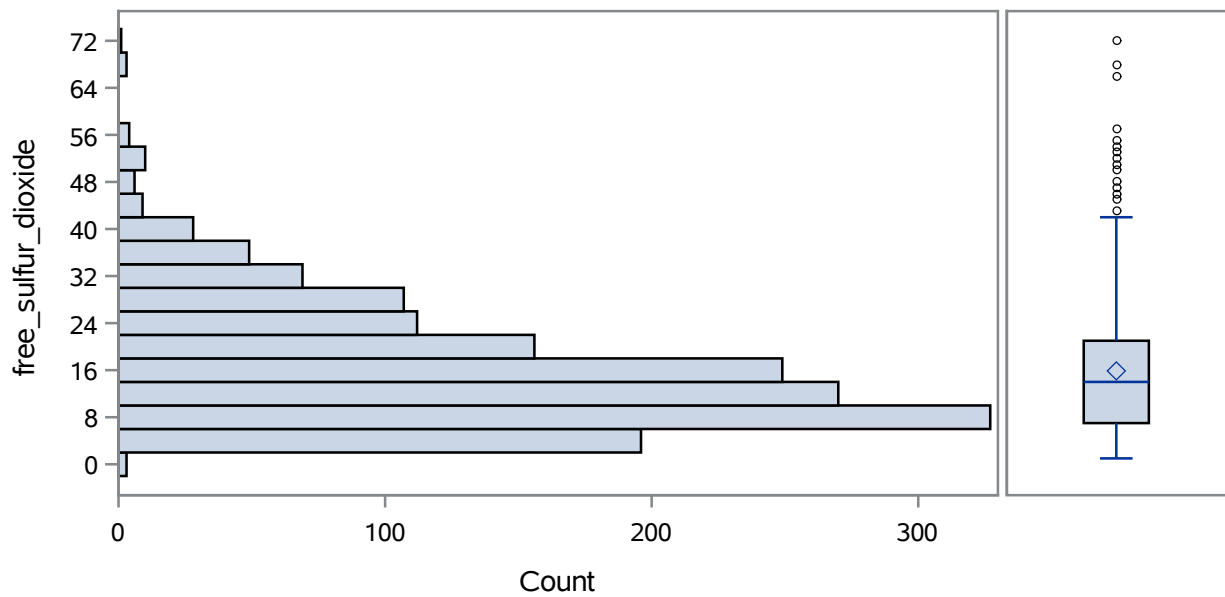
| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 60.68727 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 72 |
| 99% | 51 |
| 95% | 35 |
| 90% | 31 |
| 75% Q3 | 21 |
| 50% Median | 14 |
| 25% Q1 | 7 |
| 10% | 5 |
| 5% | 4 |
| 1% | 3 |
| 0% Min | 1 |

The UNIVARIATE Procedure
Variable: free_sulfur_dioxide

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 1 | 774 | 57 | 1132 |
| 1 | 536 | 66 | 1559 |
| 1 | 531 | 68 | 397 |
| 2 | 775 | 68 | 401 |
| 3 | 1483 | 72 | 1245 |

Distribution and Probability Plot for free_sulfur_dioxide



The UNIVARIATE Procedure
Variable: total_sulfur_dioxide

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 46.4677924 | Sum Observations | 74302 |
| Std Deviation | 32.8953245 | Variance | 1082.10237 |
| Skewness | 1.51553126 | Kurtosis | 3.80982449 |
| Uncorrected SS | 5181849.5 | Corrected SS | 1729199.59 |
| Coeff Variation | 70.7916662 | Std Error Mean | 0.82264023 |

| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|-----------|
| Location | | Variability | |
| Mean | 46.46779 | Std Deviation | 32.89532 |
| Median | 38.00000 | Variance | 1082 |
| Mode | 28.00000 | Range | 283.00000 |
| | | Interquartile Range | 40.00000 |

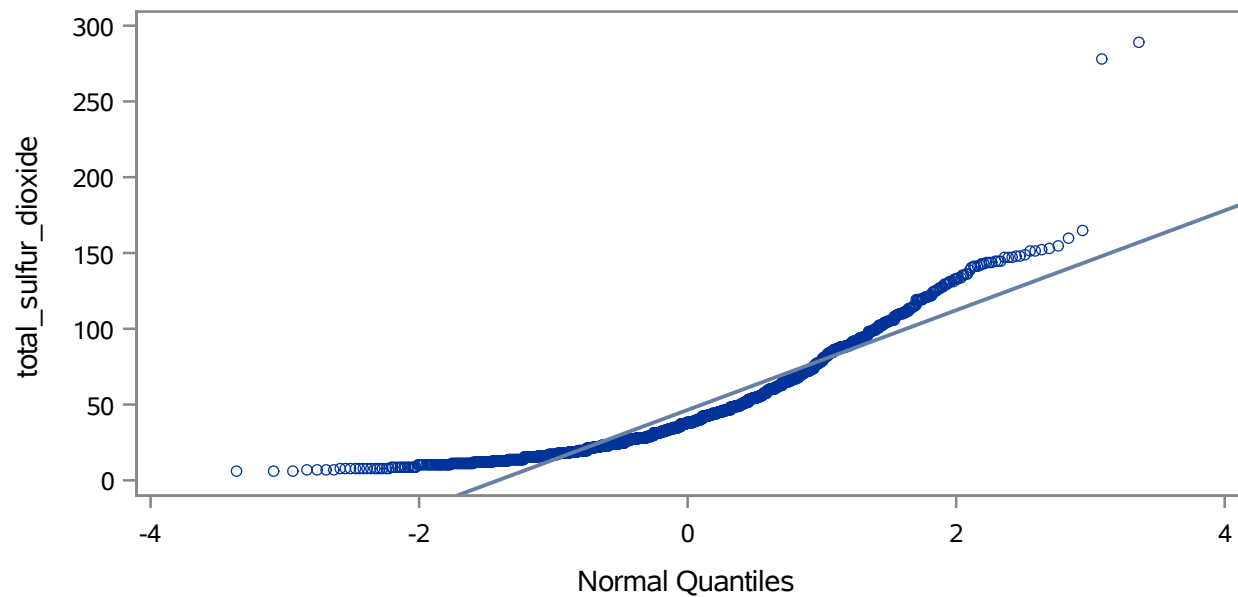
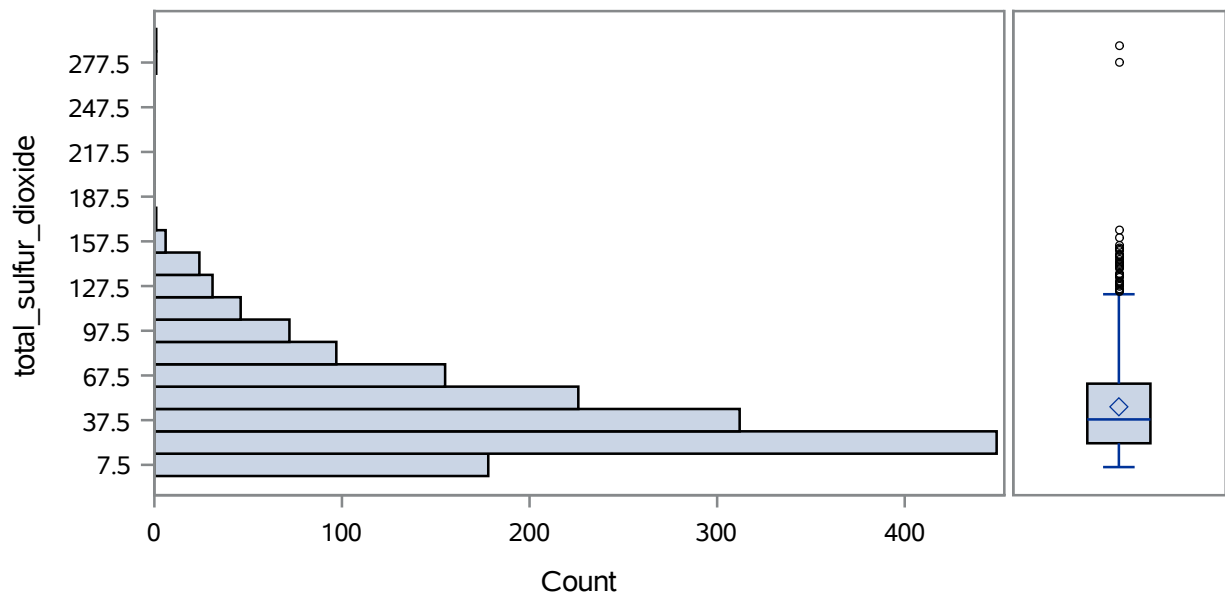
| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 56.48617 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 289 |
| 99% | 145 |
| 95% | 113 |
| 90% | 94 |
| 75% Q3 | 62 |
| 50% Median | 38 |
| 25% Q1 | 22 |
| 10% | 14 |
| 5% | 11 |
| 1% | 8 |
| 0% Min | 6 |

The UNIVARIATE Procedure
Variable: total_sulfur_dioxide

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 6 | 985 | 155 | 652 |
| 6 | 980 | 160 | 1245 |
| 6 | 916 | 165 | 355 |
| 7 | 1288 | 278 | 1080 |
| 7 | 1015 | 289 | 1082 |

Distribution and Probability Plot for total_sulfur_dioxide



The UNIVARIATE Procedure
Variable: density

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 0.99674668 | Sum Observations | 1593.79794 |
| Std Deviation | 0.00188733 | Variance | 3.56203E-6 |
| Skewness | 0.07128766 | Kurtosis | 0.93407907 |
| Uncorrected SS | 1588.6185 | Corrected SS | 0.00569212 |
| Coeff Variation | 0.18934941 | Std Error Mean | 0.0000472 |

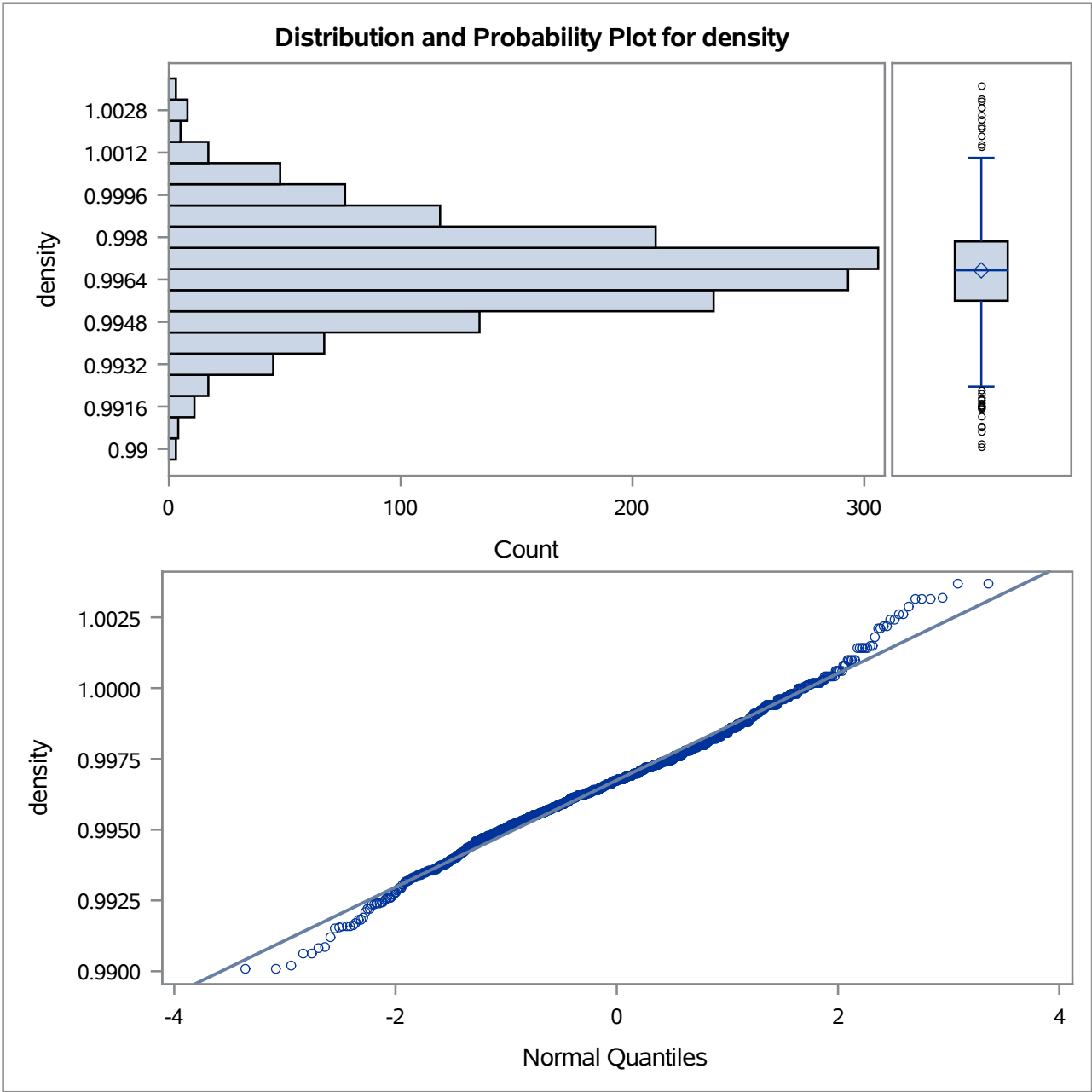
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|------------|
| Location | | Variability | |
| Mean | 0.996747 | Std Deviation | 0.00189 |
| Median | 0.996750 | Variance | 3.56203E-6 |
| Mode | 0.997200 | Range | 0.01362 |
| | | Interquartile Range | 0.00224 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 21118.36 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 1.00369 |
| 99% | 1.00180 |
| 95% | 1.00000 |
| 90% | 0.99914 |
| 75% Q3 | 0.99784 |
| 50% Median | 0.99675 |
| 25% Q1 | 0.99560 |
| 10% | 0.99454 |
| 5% | 0.99358 |
| 1% | 0.99182 |
| 0% Min | 0.99007 |

The UNIVARIATE Procedure
Variable: density

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.99007 | 1019 | 1.00315 | 556 |
| 0.99007 | 1018 | 1.00315 | 558 |
| 0.99020 | 1115 | 1.00320 | 443 |
| 0.99064 | 838 | 1.00369 | 1435 |
| 0.99064 | 837 | 1.00369 | 1436 |



The UNIVARIATE Procedure
Variable: pH

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 3.3111132 | Sum Observations | 5294.47 |
| Std Deviation | 0.15438646 | Variance | 0.02383518 |
| Skewness | 0.1936835 | Kurtosis | 0.80694251 |
| Uncorrected SS | 17568.6781 | Corrected SS | 38.0886185 |
| Coeff Variation | 4.66267553 | Std Error Mean | 0.00386087 |

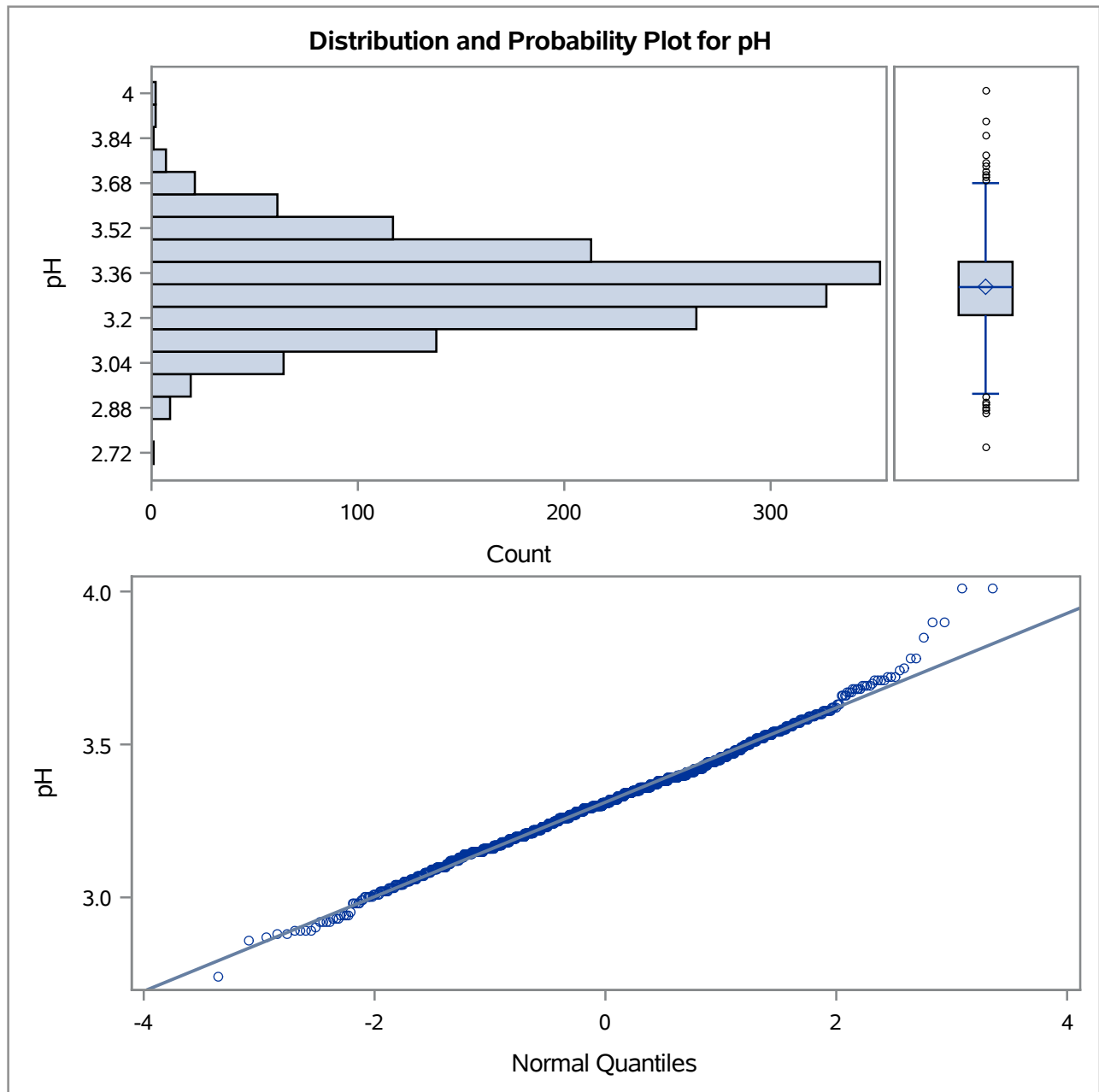
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 3.311113 | Std Deviation | 0.15439 |
| Median | 3.310000 | Variance | 0.02384 |
| Mode | 3.300000 | Range | 1.27000 |
| | | Interquartile Range | 0.19000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 857.6084 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 4.01 |
| 99% | 3.71 |
| 95% | 3.57 |
| 90% | 3.51 |
| 75% Q3 | 3.40 |
| 50% Median | 3.31 |
| 25% Q1 | 3.21 |
| 10% | 3.12 |
| 5% | 3.06 |
| 1% | 2.93 |
| 0% Min | 2.74 |

The UNIVARIATE Procedure
Variable: pH

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 2.74 | 152 | 3.85 | 96 |
| 2.86 | 545 | 3.90 | 46 |
| 2.87 | 615 | 3.90 | 696 |
| 2.88 | 1471 | 4.01 | 1317 |
| 2.88 | 441 | 4.01 | 1322 |



The UNIVARIATE Procedure
Variable: Sulphates

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 0.65814884 | Sum Observations | 1052.38 |
| Std Deviation | 0.16950698 | Variance | 0.02873262 |
| Skewness | 2.42867235 | Kurtosis | 11.7202507 |
| Uncorrected SS | 738.5374 | Corrected SS | 45.9147206 |
| Coeff Variation | 25.7551132 | Std Error Mean | 0.004239 |

| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 0.658149 | Std Deviation | 0.16951 |
| Median | 0.620000 | Variance | 0.02873 |
| Mode | 0.600000 | Range | 1.67000 |
| | | Interquartile Range | 0.18000 |

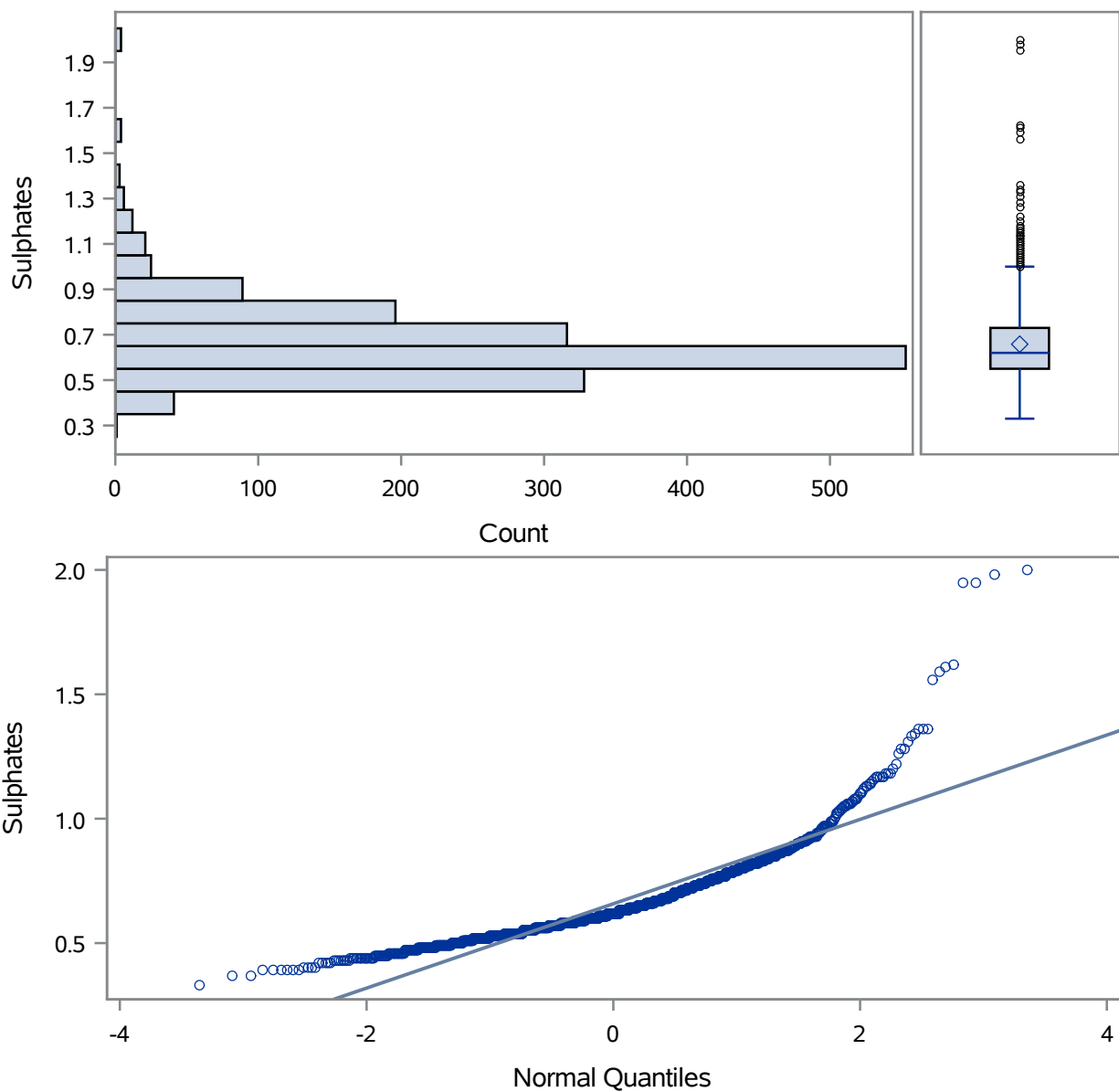
| Tests for Location: $\mu_0=0$ | | | | |
|-------------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 155.2604 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 2.00 |
| 99% | 1.28 |
| 95% | 0.93 |
| 90% | 0.85 |
| 75% Q3 | 0.73 |
| 50% Median | 0.62 |
| 25% Q1 | 0.55 |
| 10% | 0.50 |
| 5% | 0.47 |
| 1% | 0.42 |
| 0% Min | 0.33 |

The UNIVARIATE Procedure
Variable: Sulphates

| Extreme Observations | | | |
|----------------------|------|---------|-----|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.33 | 171 | 1.62 | 724 |
| 0.37 | 1370 | 1.95 | 87 |
| 0.37 | 1288 | 1.95 | 92 |
| 0.39 | 1349 | 1.98 | 93 |
| 0.39 | 1348 | 2.00 | 152 |

Distribution and Probability Plot for Sulphates



The UNIVARIATE Procedure
Variable: alcohol

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 10.4229831 | Sum Observations | 16666.35 |
| Std Deviation | 1.06566758 | Variance | 1.1356474 |
| Skewness | 0.86082881 | Kurtosis | 0.20002931 |
| Uncorrected SS | 175527.849 | Corrected SS | 1814.76454 |
| Coeff Variation | 10.224209 | Std Error Mean | 0.02665002 |

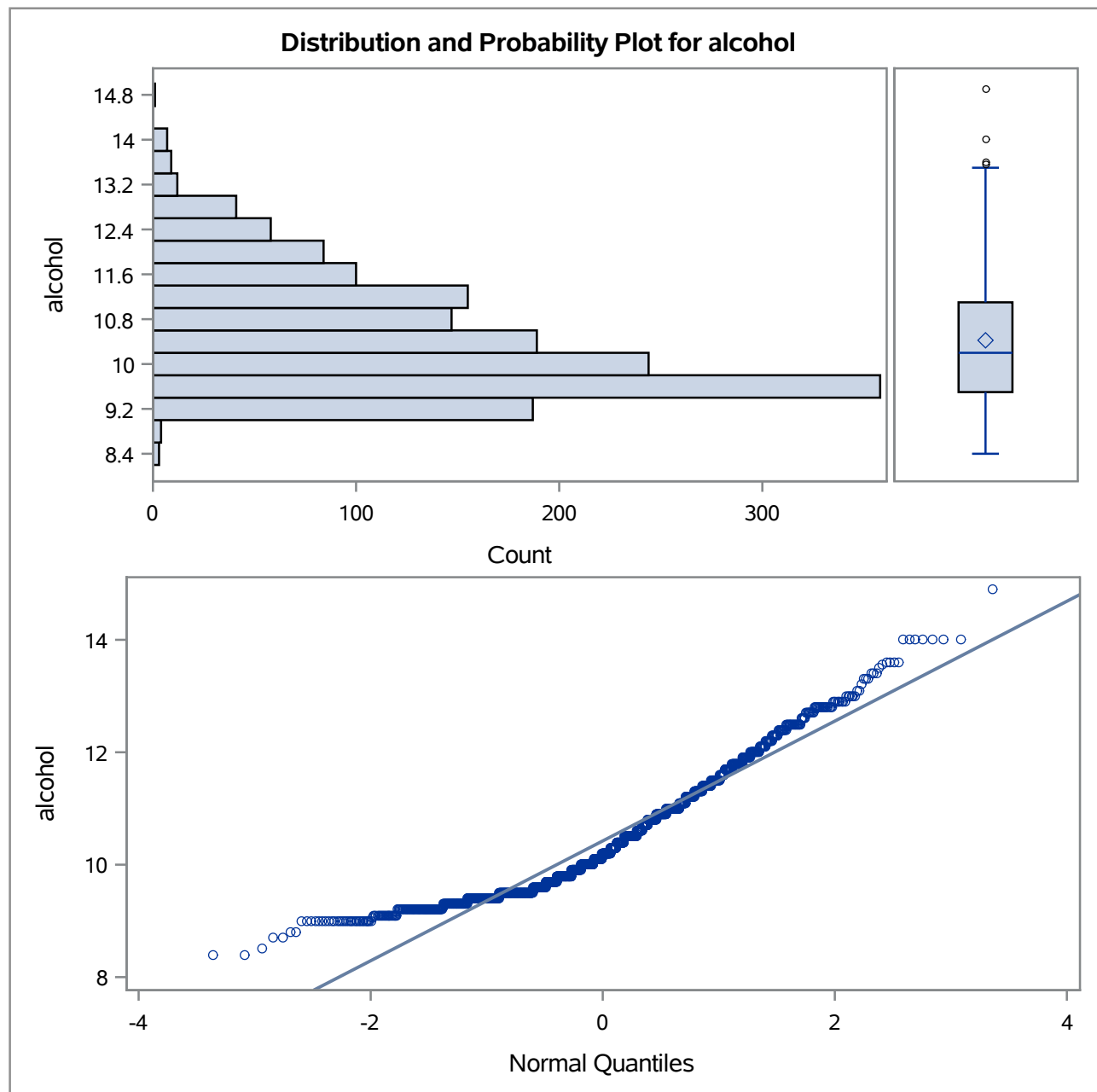
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 10.42298 | Std Deviation | 1.06567 |
| Median | 10.20000 | Variance | 1.13565 |
| Mode | 9.50000 | Range | 6.50000 |
| | | Interquartile Range | 1.60000 |

| Tests for Location: $\mu_0=0$ | | | | |
|-------------------------------|-----------|---------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 391.106 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 14.9 |
| 99% | 13.4 |
| 95% | 12.5 |
| 90% | 12.0 |
| 75% Q3 | 11.1 |
| 50% Median | 10.2 |
| 25% Q1 | 9.5 |
| 10% | 9.3 |
| 5% | 9.2 |
| 1% | 9.0 |
| 0% Min | 8.4 |

The UNIVARIATE Procedure
Variable: alcohol

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 8.4 | 545 | 14.0 | 589 |
| 8.4 | 518 | 14.0 | 822 |
| 8.5 | 1437 | 14.0 | 1270 |
| 8.7 | 529 | 14.0 | 1271 |
| 8.7 | 372 | 14.9 | 653 |



The UNIVARIATE Procedure
Variable: quality

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 5.63602251 | Sum Observations | 9012 |
| Std Deviation | 0.80756944 | Variance | 0.6521684 |
| Skewness | 0.21780158 | Kurtosis | 0.29670812 |
| Uncorrected SS | 51834 | Corrected SS | 1042.1651 |
| Coeff Variation | 14.3287121 | Std Error Mean | 0.02019555 |

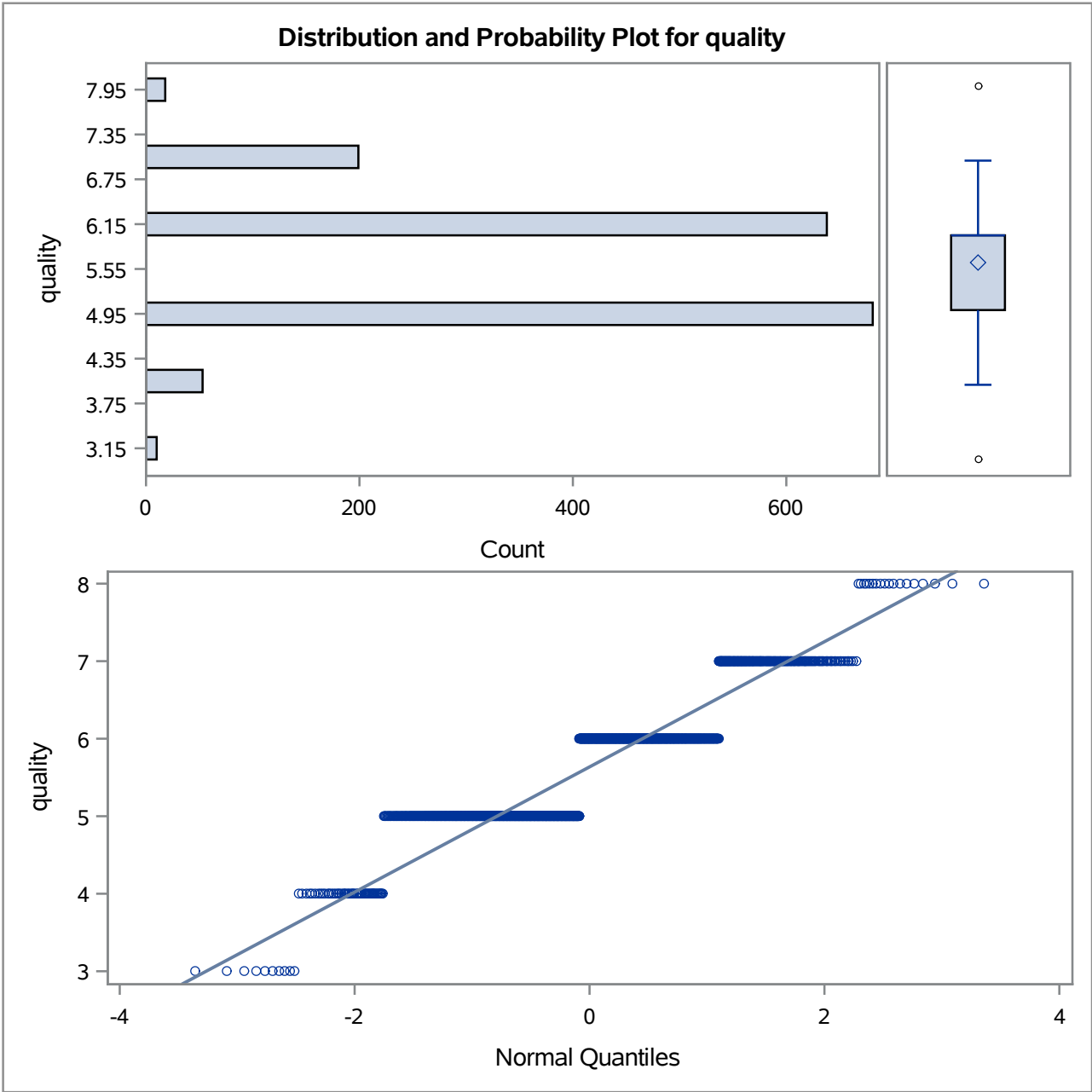
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 5.636023 | Std Deviation | 0.80757 |
| Median | 6.000000 | Variance | 0.65217 |
| Mode | 5.000000 | Range | 5.00000 |
| | | Interquartile Range | 1.00000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 279.0725 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 8 |
| 99% | 8 |
| 95% | 7 |
| 90% | 7 |
| 75% Q3 | 6 |
| 50% Median | 6 |
| 25% Q1 | 5 |
| 10% | 5 |
| 5% | 5 |
| 1% | 4 |
| 0% Min | 3 |

The UNIVARIATE Procedure
Variable: quality

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 3 | 1506 | 8 | 1203 |
| 3 | 1479 | 8 | 1270 |
| 3 | 1470 | 8 | 1404 |
| 3 | 1375 | 8 | 1450 |
| 3 | 1300 | 8 | 1550 |



The GLM Procedure

| Class Level Information | | |
|-------------------------|--------|--|
| Class | Levels | Values |
| fixed_acidity | 96 | 4.6 4.7 4.9 5 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6 6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8 6.9 7 7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8 7.9 8 8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9 9 9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8 9.9 10 10.1 10.2 10.3 10.4 10.5 10.6 10.7 10.8 10.9 11 11.1 11.2 11.3 11.4 11.5 11.6 11.7 11.8 11.9 12 12.1 12.2 12.3 12.4 12.5 12.6 12.7 12.8 12.9 13 13.2 13.3 13.4 13.5 13.7 13.8 14 14.3 15 15.5 15.6 15.9 |
| volatile_acidity | 143 | 0.12 0.16 0.18 0.19 0.2 0.21 0.22 0.23 0.24 0.25 0.26 0.27 0.28 0.29 0.295 0.3 0.305 0.31 0.315 0.32 0.33 0.34 0.35 0.36 0.365 0.37 0.38 0.39 0.395 0.4 0.41 0.415 0.42 0.43 0.44 0.45 0.46 0.47 0.475 0.48 0.49 0.5 0.51 0.52 0.53 0.54 0.545 0.55 0.56 0.565 0.57 0.575 0.58 0.585 0.59 0.595 0.6 0.605 0.61 0.615 0.62 0.625 0.63 0.635 0.64 0.645 0.65 0.655 0.66 0.665 0.67 0.675 0.68 0.685 0.69 0.695 0.7 0.705 0.71 0.715 0.72 0.725 0.73 0.735 0.74 0.745 0.75 0.755 0.76 0.765 0.77 0.775 0.78 0.785 0.79 0.795 0.8 0.805 0.81 0.815 0.82 0.825 0.83 0.835 0.84 0.845 0.85 0.855 0.86 0.865 0.87 0.875 0.88 0.885 0.89 0.895 0.9 0.91 0.915 0.92 0.935 0.95 0.955 0.96 0.965 0.975 0.98 1 1.005 1.01 1.02 1.025 1.035 1.04 1.07 1.09 1.115 1.13 1.18 1.185 1.24 1.33 1.58 |
| citric_acid | 80 | 0 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.1 0.11 0.12 0.13 0.14 0.15 0.16 0.17 0.18 0.19 0.2 0.21 0.22 0.23 0.24 0.25 0.26 0.27 0.28 0.29 0.3 0.31 0.32 0.33 0.34 0.35 0.36 0.37 0.38 0.39 0.4 0.41 0.42 0.43 0.44 0.45 0.46 0.47 0.48 0.49 0.5 0.51 0.52 0.53 0.54 0.55 0.56 0.57 0.58 0.59 0.6 0.61 0.62 0.63 0.64 0.65 0.66 0.67 0.68 0.69 0.7 0.71 0.72 0.73 0.74 0.75 0.76 0.78 0.79 1 |
| residual_sugar | 91 | 0.9 1.2 1.3 1.4 1.5 1.6 1.65 1.7 1.75 1.8 1.9 2 2.05 2.1 2.15 2.2 2.25 2.3 2.35 2.4 2.5 2.55 2.6 2.65 2.7 2.8 2.85 2.9 2.95 3 3.1 3.2 3.3 3.4 3.45 3.5 3.6 3.65 3.7 3.75 3.8 3.9 4 4.1 4.2 4.25 4.3 4.4 4.5 4.6 4.65 4.7 4.8 5 5.1 5.15 5.2 5.4 5.5 5.6 5.7 5.8 5.9 6 6.1 6.2 6.3 6.4 6.55 6.6 6.7 7 7.2 7.3 7.5 7.8 7.9 8.1 8.3 8.6 8.8 8.9 9 10.7 11 12.9 13.4 13.8 13.9 15.4 15.5 |
| chlorides | 153 | 0.012 0.034 0.038 0.039 0.041 0.042 0.043 0.044 0.045 0.046 0.047 0.048 0.049 0.05 0.051 0.052 0.053 0.054 0.055 0.056 0.057 0.058 0.059 0.06 0.061 0.062 0.063 0.064 0.065 0.066 0.067 0.068 0.069 0.07 0.071 0.072 0.073 0.074 0.075 0.076 0.077 0.078 0.079 0.08 0.081 0.082 0.083 0.084 0.085 0.086 0.087 0.088 0.089 0.09 0.091 0.092 0.093 0.094 0.095 0.096 0.097 0.098 0.099 0.1 0.101 0.102 0.103 0.104 0.105 0.106 0.107 0.108 0.109 0.11 0.111 0.112 0.113 0.114 0.115 0.116 0.117 0.118 0.119 0.12 0.121 0.122 0.123 0.124 0.125 0.126 0.127 0.128 0.132 0.136 0.137 0.143 0.145 0.146 0.147 0.148 0.152 0.153 0.157 0.159 0.161 0.165 0.166 0.168 0.169 0.17 0.171 0.172 0.174 0.176 0.178 0.186 0.19 0.194 0.2 0.205 0.213 0.214 0.216 0.222 0.226 0.23 0.235 0.236 0.241 0.243 0.25 0.263 0.267 0.27 0.332 0.337 0.341 0.343 0.358 0.36 0.368 0.369 0.387 0.401 0.403 0.413 0.414 0.415 0.422 0.464 0.467 0.61 0.611 |
| free_sulfur_dioxide | 60 | 1 2 3 4 5 5.5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 37.5 38 39 40 40.5 41 42 43 45 46 47 48 50 51 52 53 54 55 57 66 68 72 |
| total_sulfur_dioxide | 144 | 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 77.5 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 98 99 100 101 102 103 104 105 106 108 109 110 111 112 113 114 115 116 119 120 121 122 124 125 126 127 128 129 130 131 133 134 135 136 139 140 141 142 143 144 145 147 148 149 151 152 153 155 160 165 278 289 |

The GLM Procedure

| Class Level Information | | |
|-------------------------|--------|--|
| Class | Levels | Values |
| density | 436 | 0.99007 0.9902 0.99064 0.9908 0.99084 0.9912 0.9915 0.99154 0.99157 0.9916 0.99162 0.9917 0.99182 0.99191 0.9921 0.9922 0.99235 0.99236 0.9924 0.99242 0.99252 0.99256 0.99258 0.99264 0.9927 0.9928 0.99286 0.9929 0.99292 0.99294 0.99306 0.99314 0.99316 0.99318 0.9932 0.99322 0.99323 0.99328 0.9933 0.99331 0.99332 0.99334 0.99336 0.9934 0.99341 0.99344 0.99346 0.99348 0.9935 0.99352 0.99354 0.99356 0.99357 0.99358 0.9936 0.99362 0.99364 0.9937 0.99371 0.99374 0.99376 0.99378 0.99379 0.9938 0.99384 0.99385 0.99386 0.99387 0.99388 0.99392 0.99394 0.99395 0.99396 0.99397 0.994 0.99402 0.99408 0.9941 0.99414 0.99416 0.99417 0.99418 0.99419 0.9942 0.99425 0.99426 0.99428 0.9943 0.99434 0.99437 0.99438 0.99439 0.9944 0.99444 0.99448 0.99451 0.99454 0.99456 0.99458 0.99459 0.9946 0.99462 0.99464 0.99467 0.99468 0.9947 0.99471 0.99472 0.99473 0.99474 0.99476 0.99478 0.99479 0.9948 0.99483 0.99484 0.99486 0.99488 0.99489 0.9949 0.99491 0.99492 0.99494 0.99495 0.99496 0.99498 0.99499 0.995 0.99501 0.99502 0.99504 0.99506 0.99508 0.99509 0.9951 0.99512 0.99514 0.99516 0.99517 0.99518 0.99519 0.9952 0.99521 0.99522 0.99523 0.99524 0.99525 0.99526 0.99528 0.99529 0.9953 0.99531 0.99532 0.99533 0.99534 0.99536 0.99538 0.9954 0.99541 0.99542 0.99543 0.99544 0.99545 0.99546 0.99547 0.99549 0.9955 0.99551 0.99552 0.99553 0.99554 0.99555 0.99556 0.99557 0.99558 0.9956 0.99562 0.99564 0.99565 0.99566 0.99568 0.99569 0.9957 0.99572 0.99573 0.99574 0.99575 0.99576 0.99577 0.99578 0.9958 0.99581 0.99582 0.99584 0.99585 0.99586 0.99587 0.99588 0.99589 0.9959 0.99592 0.99593 0.99594 0.99596 0.99598 0.99599 0.996 0.99603 0.99604 0.99605 0.99606 0.99608 0.99609 0.9961 0.99612 0.99613 0.99614 0.99615 0.99616 0.99617 0.99619 0.9962 0.99621 0.99622 0.99623 0.99624 0.99625 0.99627 0.99628 0.99629 0.9963 0.99631 0.99632 0.99633 0.99634 0.99635 0.99636 0.99638 0.99639 0.9964 0.99641 0.99642 0.99643 0.99645 0.99646 0.99647 0.99648 0.99649 0.9965 0.99651 0.99652 0.99654 0.99655 0.99656 0.99658 0.99659 0.9966 0.99661 0.99664 0.99665 0.99666 0.99667 0.99668 0.99669 0.9967 0.99672 0.99674 0.99675 0.99676 0.99677 0.99678 0.9968 0.99682 0.99683 0.99684 0.99685 0.99686 0.99688 0.99689 0.9969 0.99692 0.99693 0.99694 0.99695 0.99697 0.99698 0.99699 0.997 0.99701 0.99702 0.99704 0.99705 0.99706 0.99708 0.99709 0.9971 0.99712 0.99713 0.99714 0.99716 0.99717 0.99718 0.99719 0.9972 0.99721 0.99722 0.99724 0.99725 0.99726 0.99727 0.99728 0.99729 0.9973 0.99732 0.99733 0.99734 0.99735 0.99736 0.99738 0.99739 0.9974 0.99743 0.99744 0.99745 0.99746 0.99747 0.99748 0.9975 0.99752 0.99754 0.99756 0.99758 0.9976 0.99761 0.99764 0.99765 0.99768 0.99769 0.9977 0.99772 0.99774 0.99779 0.9978 0.99782 0.99783 0.99784 0.99785 0.99786 0.99787 0.99788 0.9979 0.99791 0.99796 0.99798 0.998 0.99801 0.99803 0.99808 0.9981 0.99814 0.99815 0.99817 0.99818 0.9982 0.99822 0.99823 0.99824 0.99828 0.9983 0.99832 0.99834 0.99836 0.9984 0.99842 0.99845 0.9985 0.99852 0.99854 0.99855 0.99859 0.9986 0.99864 0.99865 0.9987 0.99878 0.9988 0.99888 0.9989 0.99892 0.999 0.99901 0.9991 0.99914 0.99915 0.99918 0.9992 0.99922 0.99925 0.9993 0.99935 0.99938 0.99939 0.9994 0.9995 0.9996 0.99965 0.9997 0.99974 0.99975 0.99976 0.9998 0.9999 1 1.00005 1.0001 1.00012 1.00015 1.0002 1.00024 1.00025 1.0003 1.0004 1.0006 1.0008 1.001 1.0014 1.0015 1.0018 1.0021 1.0022 1.00242 1.0026 1.00289 1.00315 1.0032 1.00369 |
| pH | 89 | 2.74 2.86 2.87 2.88 2.89 2.9 2.92 2.93 2.94 2.95 2.98 2.99 3 3.01 3.02 3.03 3.04 3.05 3.06 3.07 3.08 3.09 3.1 3.11 3.12 3.13 3.14 3.15 3.16 3.17 3.18 3.19 3.2 3.21 3.22 3.23 3.24 3.25 3.26 3.27 3.28 3.29 3.3 3.31 3.32 3.33 3.34 3.35 3.36 3.37 3.38 3.39 3.4 3.41 3.42 3.43 3.44 3.45 3.46 3.47 3.48 3.49 3.5 3.51 3.52 3.53 3.54 3.55 3.56 3.57 3.58 3.59 3.6 3.61 3.62 3.63 3.66 3.67 3.68 3.69 3.7 3.71 3.72 3.74 3.75 3.78 3.85 3.9 4.01 |

The GLM Procedure

| Class Level Information | | |
|-------------------------|--------|--|
| Class | Levels | Values |
| Sulphates | 96 | 0.33 0.37 0.39 0.4 0.42 0.43 0.44 0.45 0.46 0.47 0.48 0.49 0.5 0.51 0.52 0.53 0.54 0.55 0.56 0.57 0.58 0.59 0.6 0.61 0.62 0.63 0.64 0.65 0.66 0.67 0.68 0.69 0.7 0.71 0.72 0.73 0.74 0.75 0.76 0.77 0.78 0.79 0.8 0.81 0.82 0.83 0.84 0.85 0.86 0.87 0.88 0.89 0.9 0.91 0.92 0.93 0.94 0.95 0.96 0.97 0.98 0.99 1 1.01 1.02 1.03 1.04 1.05 1.06 1.07 1.08 1.09 1.1 1.11 1.12 1.13 1.14 1.15 1.16 1.17 1.18 1.2 1.22 1.26 1.28 1.31 1.33 1.34 1.36 1.56 1.59 1.61 1.62 1.95 1.98 2 |
| alcohol | 65 | 8.4 8.5 8.7 8.8 9 9.05 9.1 9.2 9.2333333333 9.25 9.3 9.4 9.5 9.55 9.5666666667 9.6 9.7 9.8 9.9 9.95 10 10.0333333333 10.1 10.2 10.3 10.4 10.5 10.55 10.6 10.7 10.75 10.8 10.9 11 11.0666666667 11.1 11.2 11.3 11.4 11.5 11.6 11.7 11.8 11.9 11.95 12 12.1 12.2 12.3 12.4 12.5 12.6 12.7 12.8 12.9 13 13.1 13.2 13.3 13.4 13.5 13.5666666667 13.6 14 14.9 |

| | |
|-----------------------------|------|
| Number of Observations Read | 1599 |
| Number of Observations Used | 1599 |

The GLM Procedure

Dependent Variable: quality

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|------|----------------|-------------|---------|--------|
| Model | 1346 | 1037.918334 | 0.771113 | 45.76 | <.0001 |
| Error | 252 | 4.246770 | 0.016852 | | |
| Corrected Total | 1598 | 1042.165103 | | | |

| R-Square | Coeff Var | Root MSE | quality Mean |
|----------|-----------|----------|--------------|
| 0.995925 | 2.303331 | 0.129816 | 5.636023 |

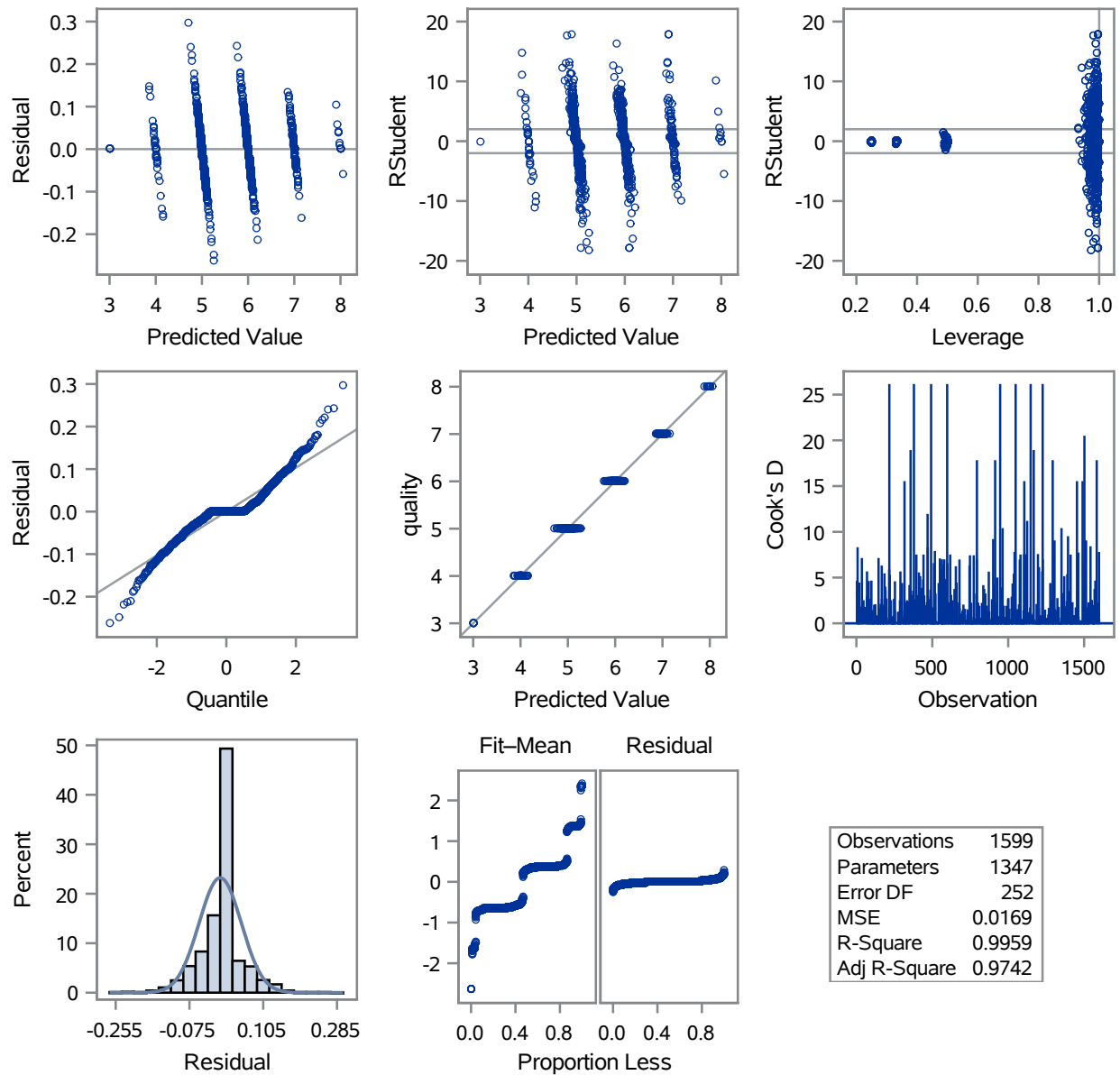
| Source | DF | Type I SS | Mean Square | F Value | Pr > F |
|----------------------|-----|-------------|-------------|---------|--------|
| fixed_acidity | 95 | 117.7097632 | 1.2390501 | 73.52 | <.0001 |
| volatile_acidity | 142 | 225.1392509 | 1.5854877 | 94.08 | <.0001 |
| citric_acid | 77 | 71.4109145 | 0.9274145 | 55.03 | <.0001 |
| residual_sugar | 86 | 78.5238962 | 0.9130686 | 54.18 | <.0001 |
| chlorides | 147 | 103.2821462 | 0.7025996 | 41.69 | <.0001 |
| free_sulfur_dioxide | 53 | 23.0872343 | 0.4356082 | 25.85 | <.0001 |
| total_sulfur_dioxide | 139 | 99.9853350 | 0.7193190 | 42.68 | <.0001 |
| density | 398 | 218.9244769 | 0.5500615 | 32.64 | <.0001 |
| pH | 76 | 36.1796761 | 0.4760484 | 28.25 | <.0001 |
| Sulphates | 80 | 34.1571337 | 0.4269642 | 25.34 | <.0001 |
| alcohol | 53 | 29.5185067 | 0.5569530 | 33.05 | <.0001 |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|----------------------|-----|-------------|-------------|---------|--------|
| fixed_acidity | 80 | 25.8697819 | 0.3233723 | 19.19 | <.0001 |
| volatile_acidity | 129 | 54.4132291 | 0.4218080 | 25.03 | <.0001 |
| citric_acid | 72 | 30.8091718 | 0.4279052 | 25.39 | <.0001 |
| residual_sugar | 67 | 29.4788359 | 0.4399826 | 26.11 | <.0001 |
| chlorides | 120 | 47.7381738 | 0.3978181 | 23.61 | <.0001 |
| free_sulfur_dioxide | 49 | 21.0407311 | 0.4294027 | 25.48 | <.0001 |
| total_sulfur_dioxide | 135 | 54.4924785 | 0.4036480 | 23.95 | <.0001 |
| density | 384 | 154.9038420 | 0.4033954 | 23.94 | <.0001 |
| pH | 74 | 28.7081761 | 0.3879483 | 23.02 | <.0001 |
| Sulphates | 80 | 32.2284857 | 0.4028561 | 23.91 | <.0001 |
| alcohol | 53 | 29.5185067 | 0.5569530 | 33.05 | <.0001 |

The GLM Procedure

Dependent Variable: quality

Fit Diagnostics for quality



| | |
|--------------|--------|
| Observations | 1599 |
| Parameters | 1347 |
| Error DF | 252 |
| MSE | 0.0169 |
| R-Square | 0.9959 |
| Adj R-Square | 0.9742 |

The UNIVARIATE Procedure
Variable: log_fixed_acidity

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 0.91124796 | Sum Observations | 1457.08549 |
| Std Deviation | 0.08660357 | Variance | 0.00750018 |
| Skewness | 0.39391499 | Kurtosis | 0.10102179 |
| Uncorrected SS | 1339.75146 | Corrected SS | 11.9852851 |
| Coeff Variation | 9.50384243 | Std Error Mean | 0.00216577 |

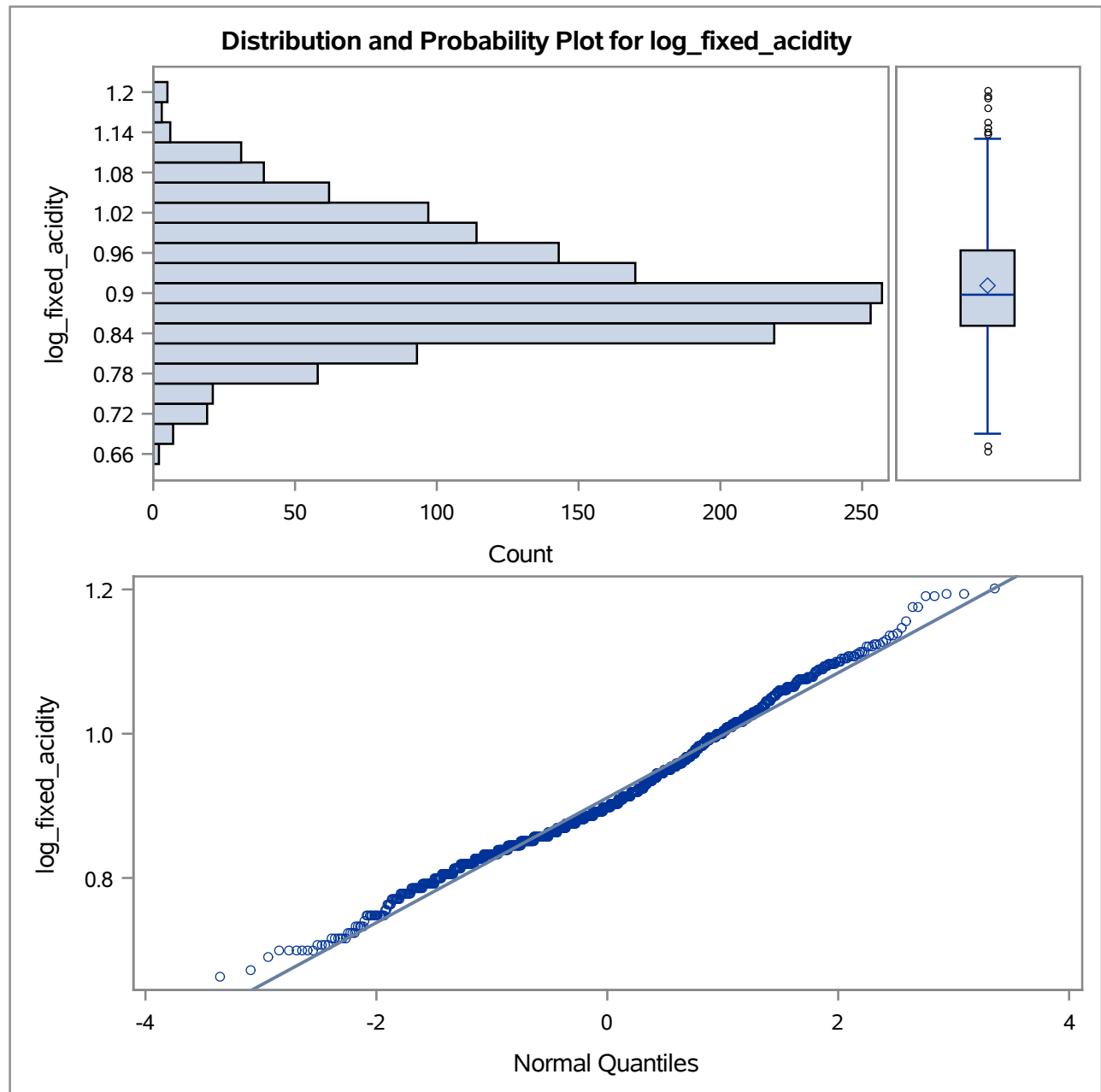
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 0.911248 | Std Deviation | 0.08660 |
| Median | 0.897627 | Variance | 0.00750 |
| Mode | 0.857332 | Range | 0.53864 |
| | | Interquartile Range | 0.11253 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 420.7509 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 1.201397 |
| 99% | 1.123852 |
| 95% | 1.071882 |
| 90% | 1.029384 |
| 75% Q3 | 0.963788 |
| 50% Median | 0.897627 |
| 25% Q1 | 0.851258 |
| 10% | 0.812913 |
| 5% | 0.785330 |
| 1% | 0.716003 |
| 0% Min | 0.662758 |

The UNIVARIATE Procedure
Variable: log_fixed_acidity

| Extreme Observations | | | |
|----------------------|------|---------|-----|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.662758 | 46 | 1.19033 | 555 |
| 0.672098 | 96 | 1.19033 | 556 |
| 0.690196 | 822 | 1.19312 | 443 |
| 0.698970 | 1322 | 1.19312 | 558 |
| 0.698970 | 1271 | 1.20140 | 653 |



The UNIVARIATE Procedure
Variable: volatile_acidity

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 0.52782051 | Sum Observations | 843.985 |
| Std Deviation | 0.1790597 | Variance | 0.03206238 |
| Skewness | 0.67159257 | Kurtosis | 1.22554225 |
| Uncorrected SS | 496.708275 | Corrected SS | 51.2356795 |
| Coeff Variation | 33.9243549 | Std Error Mean | 0.00447789 |

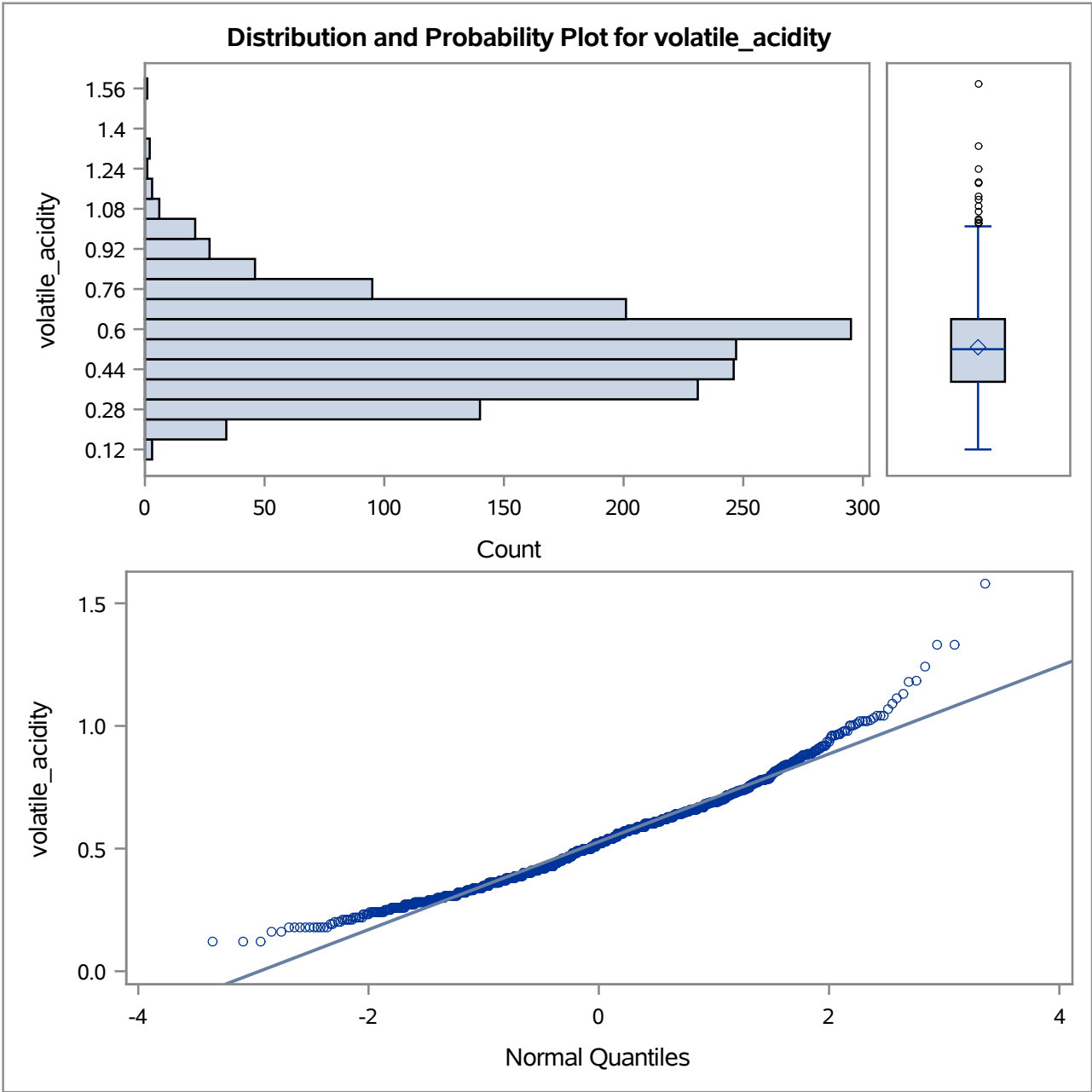
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 0.527821 | Std Deviation | 0.17906 |
| Median | 0.520000 | Variance | 0.03206 |
| Mode | 0.600000 | Range | 1.46000 |
| | | Interquartile Range | 0.25000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 117.8725 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 1.580 |
| 99% | 1.020 |
| 95% | 0.840 |
| 90% | 0.745 |
| 75% Q3 | 0.640 |
| 50% Median | 0.520 |
| 25% Q1 | 0.390 |
| 10% | 0.310 |
| 5% | 0.270 |
| 1% | 0.190 |
| 0% Min | 0.120 |

The UNIVARIATE Procedure
Variable: volatile_acidity

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.12 | 951 | 1.185 | 691 |
| 0.12 | 950 | 1.240 | 673 |
| 0.12 | 949 | 1.330 | 127 |
| 0.16 | 1567 | 1.330 | 128 |
| 0.16 | 1287 | 1.580 | 1300 |



The UNIVARIATE Procedure
Variable: citric_acid

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 0.27097561 | Sum Observations | 433.29 |
| Std Deviation | 0.19480114 | Variance | 0.03794748 |
| Skewness | 0.3183373 | Kurtosis | -0.7889975 |
| Uncorrected SS | 178.0511 | Corrected SS | 60.640078 |
| Coeff Variation | 71.8888086 | Std Error Mean | 0.00487155 |

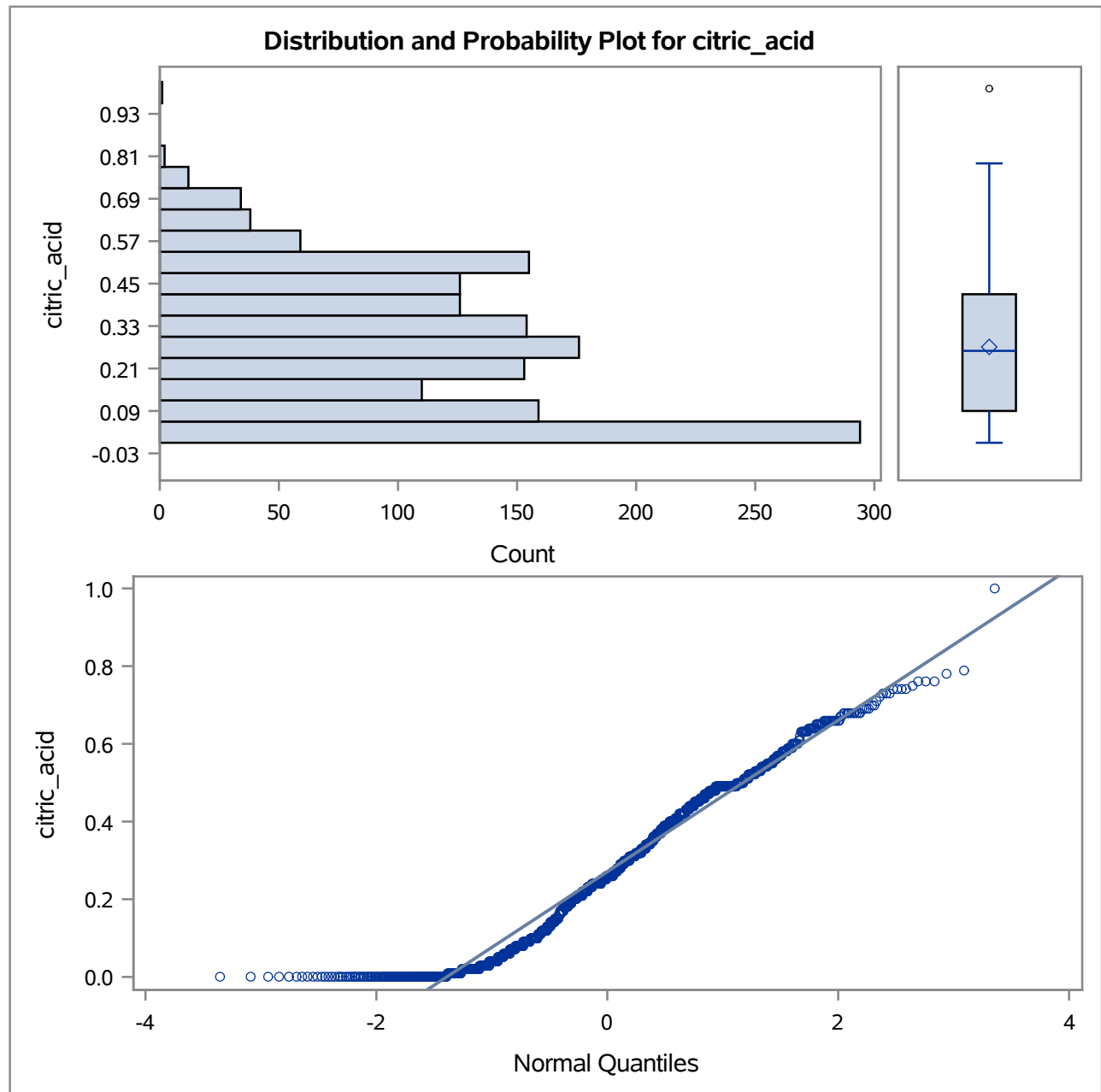
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 0.270976 | Std Deviation | 0.19480 |
| Median | 0.260000 | Variance | 0.03795 |
| Mode | 0.000000 | Range | 1.00000 |
| | | Interquartile Range | 0.33000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 55.62409 | Pr > t | <.0001 |
| Sign | M | 733.5 | Pr >= M | <.0001 |
| Signed Rank | S | 538389 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 1.00 |
| 99% | 0.71 |
| 95% | 0.60 |
| 90% | 0.53 |
| 75% Q3 | 0.42 |
| 50% Median | 0.26 |
| 25% Q1 | 0.09 |
| 10% | 0.01 |
| 5% | 0.00 |
| 1% | 0.00 |
| 0% Min | 0.00 |

The UNIVARIATE Procedure
Variable: citric_acid

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0 | 1554 | 0.76 | 396 |
| 0 | 1552 | 0.76 | 443 |
| 0 | 1551 | 0.78 | 1575 |
| 0 | 1462 | 0.79 | 354 |
| 0 | 1456 | 1.00 | 152 |



The UNIVARIATE Procedure
Variable: residual_sugar

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 2.5388055 | Sum Observations | 4059.55 |
| Std Deviation | 1.40992806 | Variance | 1.98789713 |
| Skewness | 4.54065543 | Kurtosis | 28.6175954 |
| Uncorrected SS | 13483.0675 | Corrected SS | 3176.65962 |
| Coeff Variation | 55.5350954 | Std Error Mean | 0.03525922 |

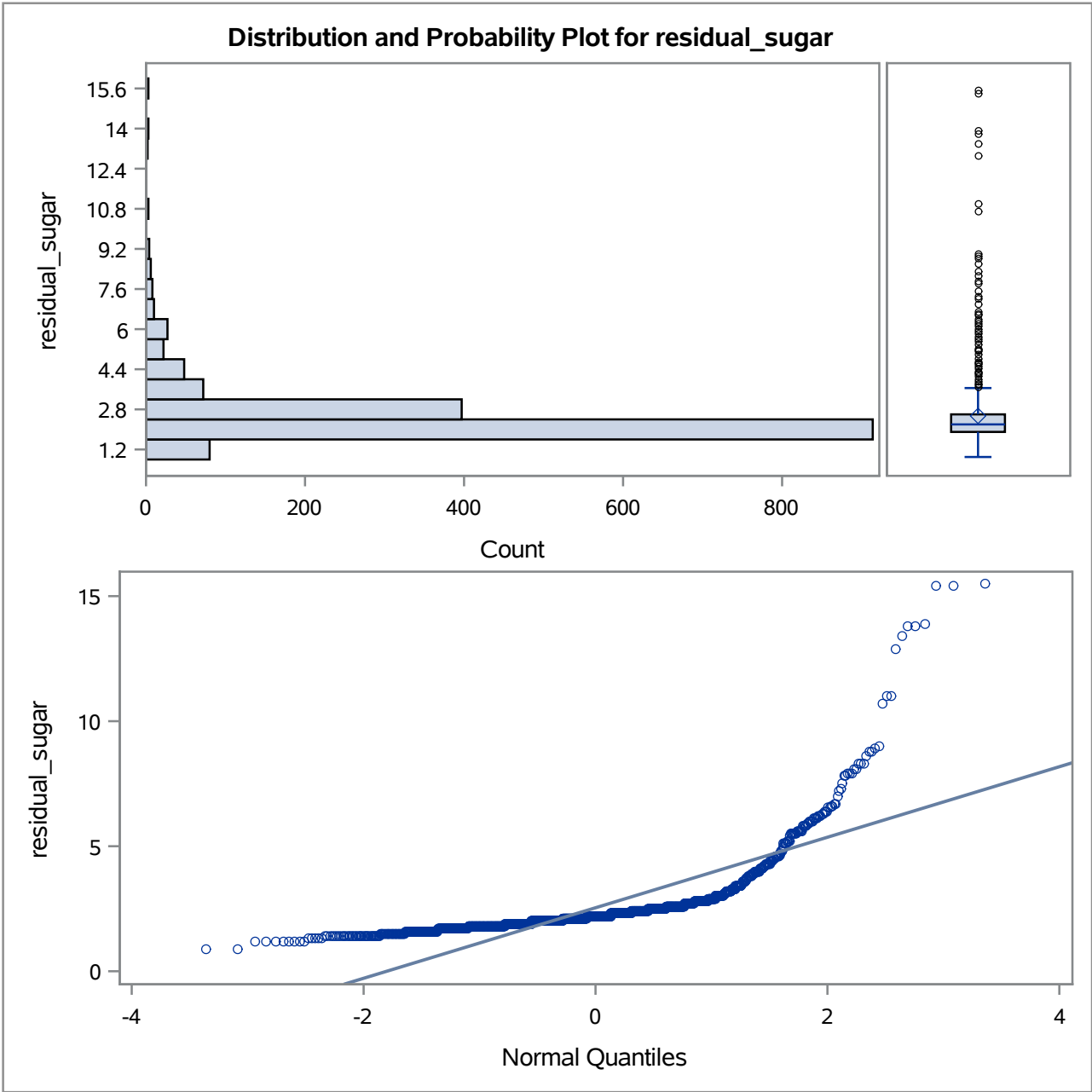
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|----------|
| Location | | Variability | |
| Mean | 2.538806 | Std Deviation | 1.40993 |
| Median | 2.200000 | Variance | 1.98790 |
| Mode | 2.000000 | Range | 14.60000 |
| | | Interquartile Range | 0.70000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 72.00401 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 15.5 |
| 99% | 8.6 |
| 95% | 5.1 |
| 90% | 3.6 |
| 75% Q3 | 2.6 |
| 50% Median | 2.2 |
| 25% Q1 | 1.9 |
| 10% | 1.7 |
| 5% | 1.5 |
| 1% | 1.4 |
| 0% Min | 0.9 |

The UNIVARIATE Procedure
Variable: residual_sugar

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.9 | 1019 | 13.8 | 1477 |
| 0.9 | 1018 | 13.9 | 1575 |
| 1.2 | 1375 | 15.4 | 1435 |
| 1.2 | 1322 | 15.4 | 1436 |
| 1.2 | 1317 | 15.5 | 481 |



The UNIVARIATE Procedure
Variable: chlorides

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 0.08746654 | Sum Observations | 139.859 |
| Std Deviation | 0.0470653 | Variance | 0.00221514 |
| Skewness | 5.68034657 | Kurtosis | 41.7157872 |
| Uncorrected SS | 15.772781 | Corrected SS | 3.53979796 |
| Coeff Variation | 53.8094924 | Std Error Mean | 0.001177 |

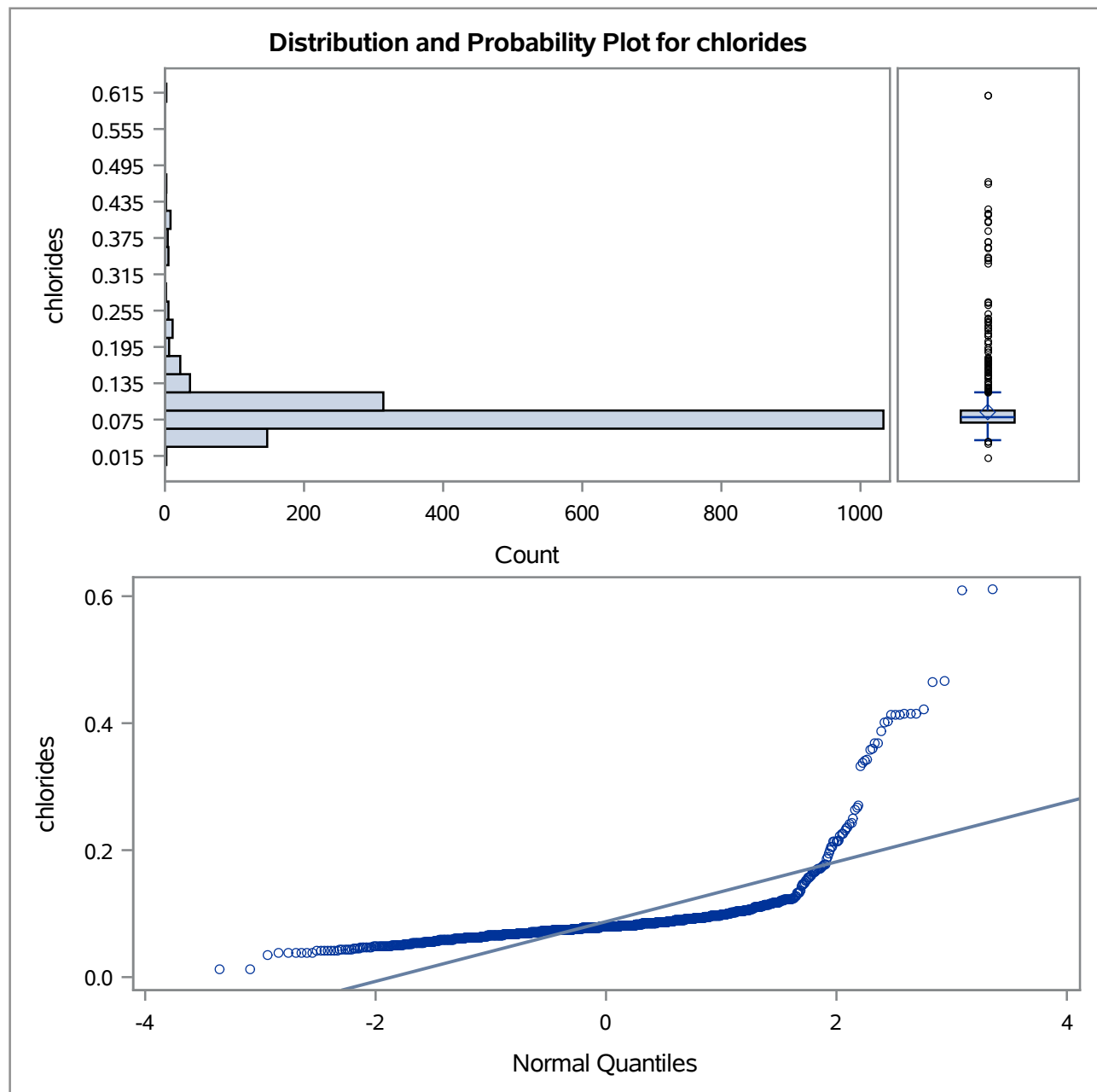
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 0.087467 | Std Deviation | 0.04707 |
| Median | 0.079000 | Variance | 0.00222 |
| Mode | 0.080000 | Range | 0.59900 |
| | | Interquartile Range | 0.02000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 74.31309 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 0.611 |
| 99% | 0.368 |
| 95% | 0.127 |
| 90% | 0.109 |
| 75% Q3 | 0.090 |
| 50% Median | 0.079 |
| 25% Q1 | 0.070 |
| 10% | 0.060 |
| 5% | 0.054 |
| 1% | 0.042 |
| 0% Min | 0.012 |

The UNIVARIATE Procedure
Variable: chlorides

| Extreme Observations | | | |
|----------------------|------|---------|-----|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.012 | 838 | 0.422 | 693 |
| 0.012 | 837 | 0.464 | 82 |
| 0.034 | 696 | 0.467 | 107 |
| 0.038 | 1572 | 0.610 | 152 |
| 0.038 | 798 | 0.611 | 259 |



The UNIVARIATE Procedure
Variable: log_free_sulfur_dioxide

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 1.10577109 | Sum Observations | 1768.12797 |
| Std Deviation | 0.29761833 | Variance | 0.08857667 |
| Skewness | -0.2340312 | Kurtosis | -0.462059 |
| Uncorrected SS | 2096.69031 | Corrected SS | 141.545523 |
| Coeff Variation | 26.9150041 | Std Error Mean | 0.00744278 |

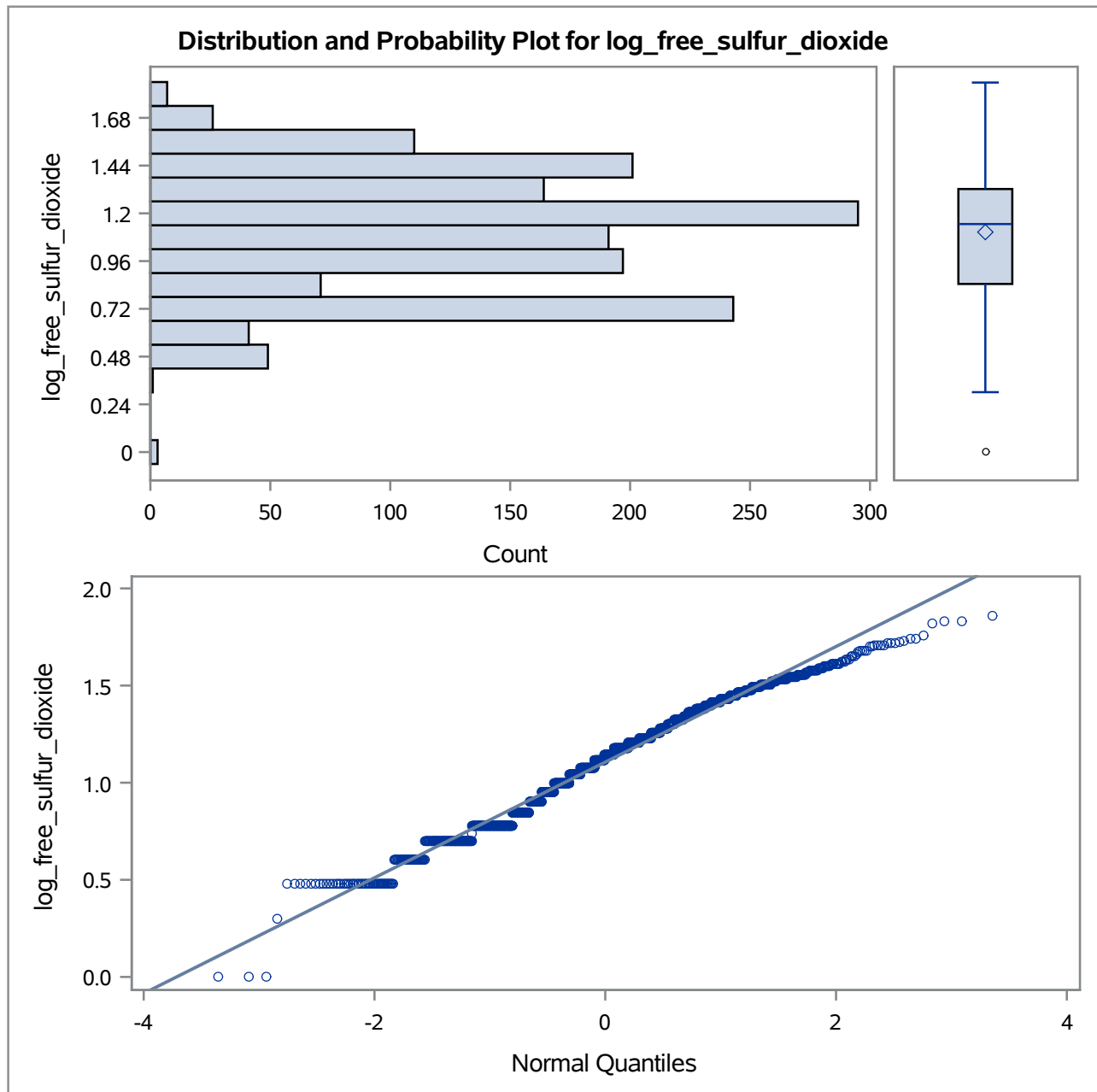
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 1.105771 | Std Deviation | 0.29762 |
| Median | 1.146128 | Variance | 0.08858 |
| Mode | 0.778151 | Range | 1.85733 |
| | | Interquartile Range | 0.47712 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 148.5695 | Pr > t | <.0001 |
| Sign | M | 798 | Pr >= M | <.0001 |
| Signed Rank | S | 637203 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 1.857332 |
| 99% | 1.707570 |
| 95% | 1.544068 |
| 90% | 1.491362 |
| 75% Q3 | 1.322219 |
| 50% Median | 1.146128 |
| 25% Q1 | 0.845098 |
| 10% | 0.698970 |
| 5% | 0.602060 |
| 1% | 0.477121 |
| 0% Min | 0.000000 |

The UNIVARIATE Procedure
Variable: log_free_sulfur_dioxide

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.000000 | 774 | 1.75587 | 1132 |
| 0.000000 | 536 | 1.81954 | 1559 |
| 0.000000 | 531 | 1.83251 | 397 |
| 0.301030 | 775 | 1.83251 | 401 |
| 0.477121 | 1483 | 1.85733 | 1245 |



The UNIVARIATE Procedure
Variable: log_total_sulfur_dioxide

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 1.56377346 | Sum Observations | 2500.47376 |
| Std Deviation | 0.30634833 | Variance | 0.0938493 |
| Skewness | -0.0793228 | Kurtosis | -0.6651528 |
| Uncorrected SS | 4060.14568 | Corrected SS | 149.971179 |
| Coeff Variation | 19.5903267 | Std Error Mean | 0.0076611 |

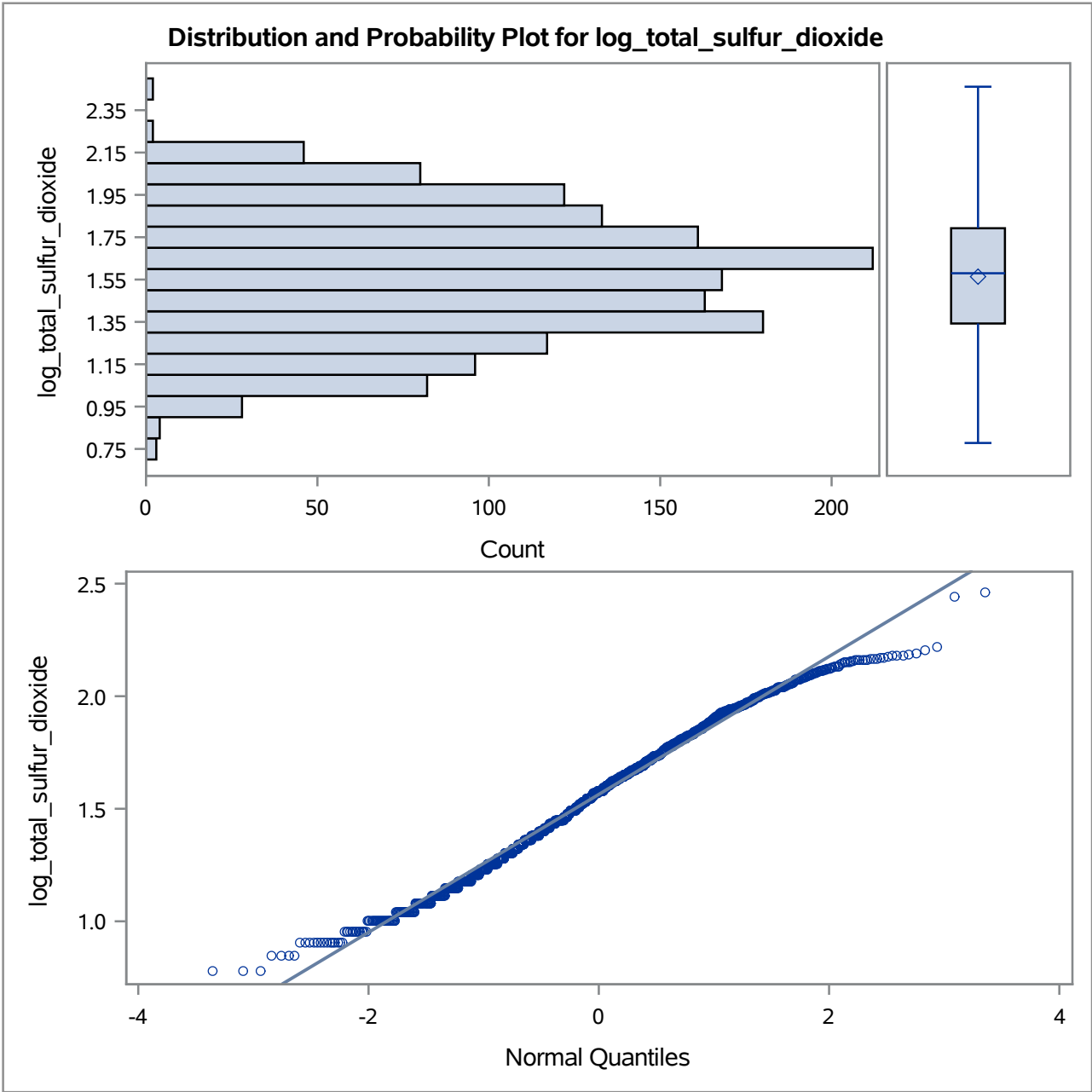
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 1.563773 | Std Deviation | 0.30635 |
| Median | 1.579784 | Variance | 0.09385 |
| Mode | 1.447158 | Range | 1.68275 |
| | | Interquartile Range | 0.44997 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 204.1186 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 2.460898 |
| 99% | 2.161368 |
| 95% | 2.053078 |
| 90% | 1.973128 |
| 75% Q3 | 1.792392 |
| 50% Median | 1.579784 |
| 25% Q1 | 1.342423 |
| 10% | 1.146128 |
| 5% | 1.041393 |
| 1% | 0.903090 |
| 0% Min | 0.778151 |

The UNIVARIATE Procedure
Variable: log_total_sulfur_dioxide

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.778151 | 985 | 2.19033 | 652 |
| 0.778151 | 980 | 2.20412 | 1245 |
| 0.778151 | 916 | 2.21748 | 355 |
| 0.845098 | 1288 | 2.44404 | 1080 |
| 0.845098 | 1015 | 2.46090 | 1082 |



The UNIVARIATE Procedure
Variable: density

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 0.99674668 | Sum Observations | 1593.79794 |
| Std Deviation | 0.00188733 | Variance | 3.56203E-6 |
| Skewness | 0.07128766 | Kurtosis | 0.93407907 |
| Uncorrected SS | 1588.6185 | Corrected SS | 0.00569212 |
| Coeff Variation | 0.18934941 | Std Error Mean | 0.0000472 |

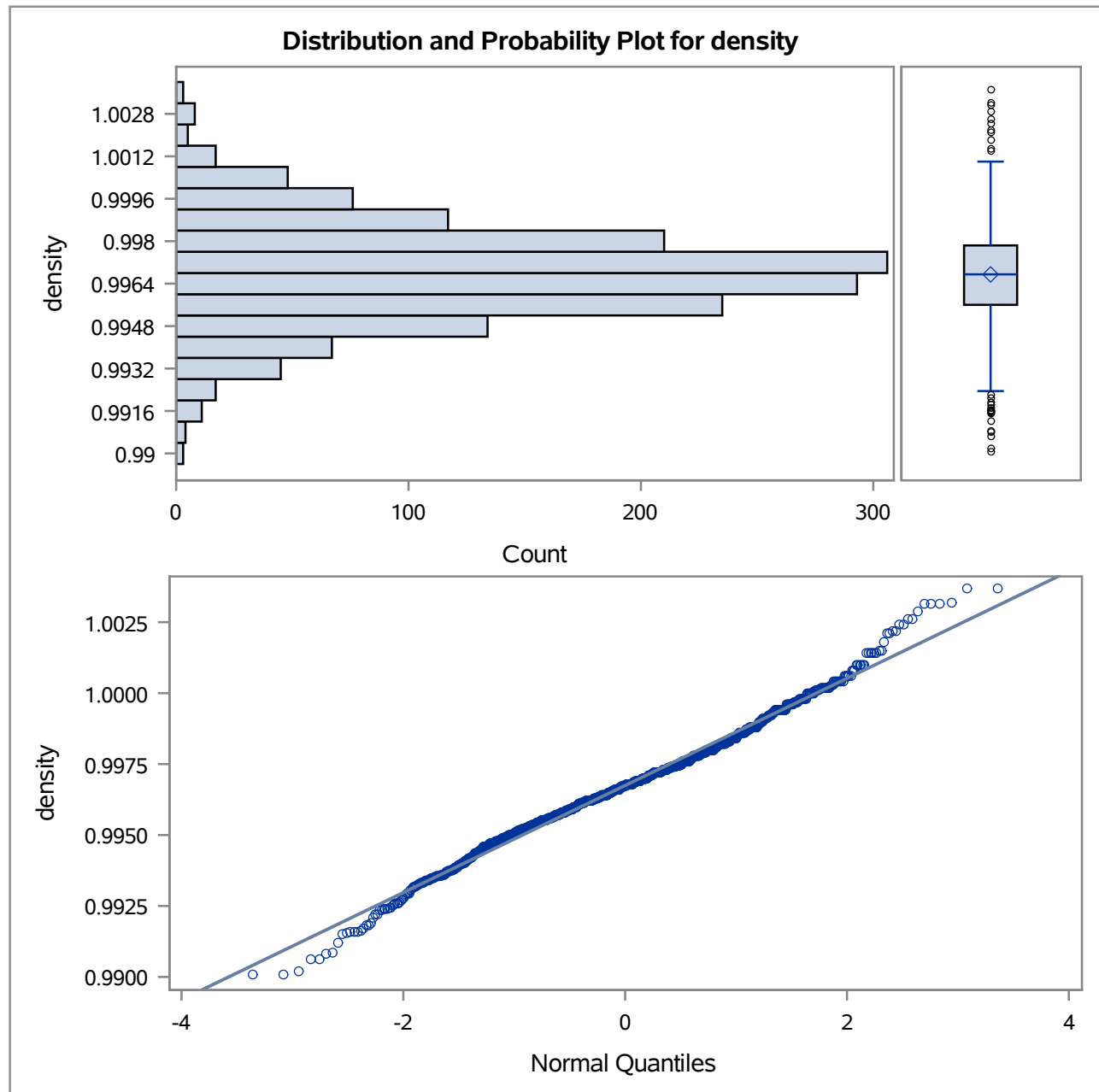
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|------------|
| Location | | Variability | |
| Mean | 0.996747 | Std Deviation | 0.00189 |
| Median | 0.996750 | Variance | 3.56203E-6 |
| Mode | 0.997200 | Range | 0.01362 |
| | | Interquartile Range | 0.00224 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 21118.36 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 1.00369 |
| 99% | 1.00180 |
| 95% | 1.00000 |
| 90% | 0.99914 |
| 75% Q3 | 0.99784 |
| 50% Median | 0.99675 |
| 25% Q1 | 0.99560 |
| 10% | 0.99454 |
| 5% | 0.99358 |
| 1% | 0.99182 |
| 0% Min | 0.99007 |

The UNIVARIATE Procedure
Variable: density

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.99007 | 1019 | 1.00315 | 556 |
| 0.99007 | 1018 | 1.00315 | 558 |
| 0.99020 | 1115 | 1.00320 | 443 |
| 0.99064 | 838 | 1.00369 | 1435 |
| 0.99064 | 837 | 1.00369 | 1436 |



The UNIVARIATE Procedure
Variable: pH

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 3.3111132 | Sum Observations | 5294.47 |
| Std Deviation | 0.15438646 | Variance | 0.02383518 |
| Skewness | 0.1936835 | Kurtosis | 0.80694251 |
| Uncorrected SS | 17568.6781 | Corrected SS | 38.0886185 |
| Coeff Variation | 4.66267553 | Std Error Mean | 0.00386087 |

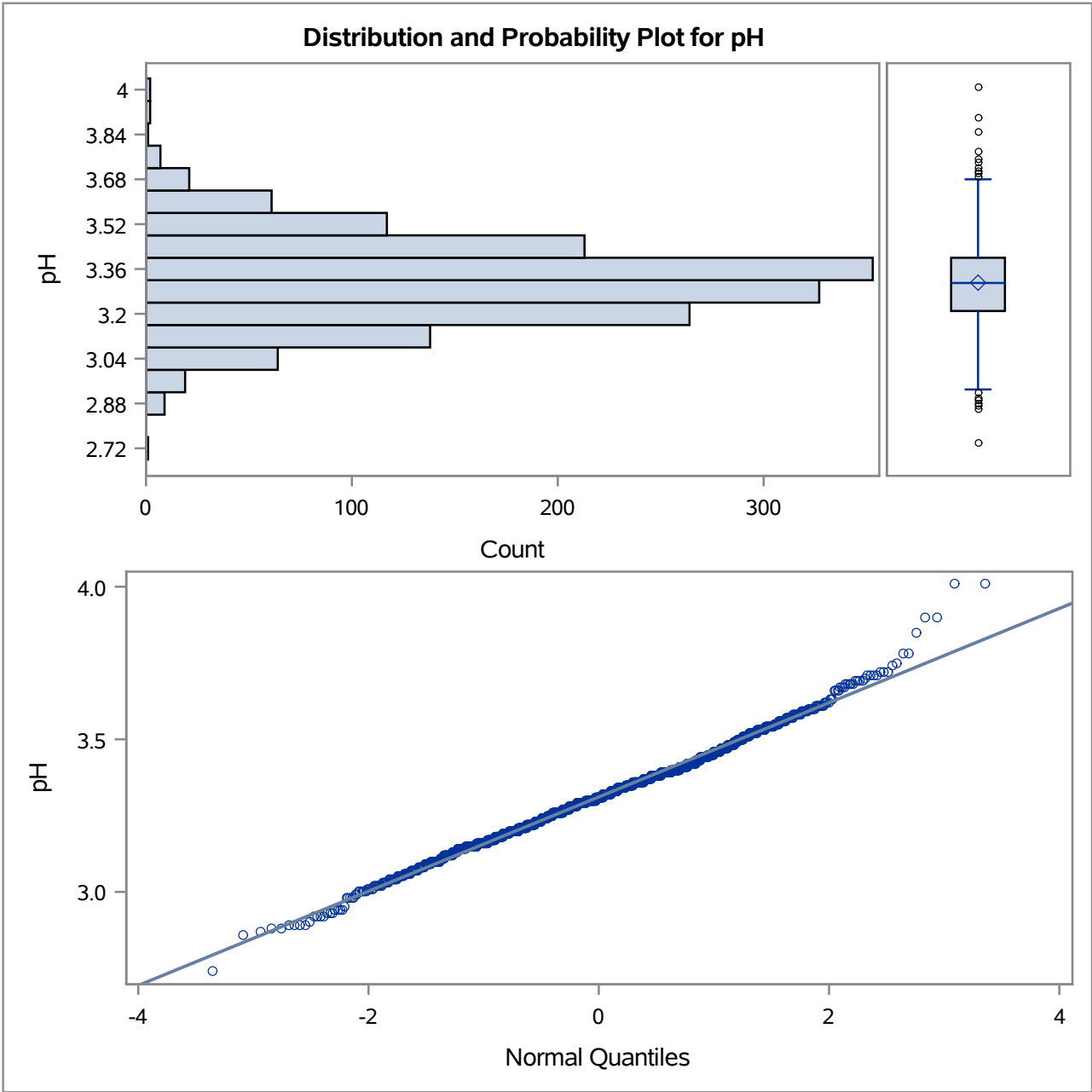
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 3.311113 | Std Deviation | 0.15439 |
| Median | 3.310000 | Variance | 0.02384 |
| Mode | 3.300000 | Range | 1.27000 |
| | | Interquartile Range | 0.19000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 857.6084 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 4.01 |
| 99% | 3.71 |
| 95% | 3.57 |
| 90% | 3.51 |
| 75% Q3 | 3.40 |
| 50% Median | 3.31 |
| 25% Q1 | 3.21 |
| 10% | 3.12 |
| 5% | 3.06 |
| 1% | 2.93 |
| 0% Min | 2.74 |

The UNIVARIATE Procedure
Variable: pH

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 2.74 | 152 | 3.85 | 96 |
| 2.86 | 545 | 3.90 | 46 |
| 2.87 | 615 | 3.90 | 696 |
| 2.88 | 1471 | 4.01 | 1317 |
| 2.88 | 441 | 4.01 | 1322 |



The UNIVARIATE Procedure
Variable: Sulphates

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 0.65814884 | Sum Observations | 1052.38 |
| Std Deviation | 0.16950698 | Variance | 0.02873262 |
| Skewness | 2.42867235 | Kurtosis | 11.7202507 |
| Uncorrected SS | 738.5374 | Corrected SS | 45.9147206 |
| Coeff Variation | 25.7551132 | Std Error Mean | 0.004239 |

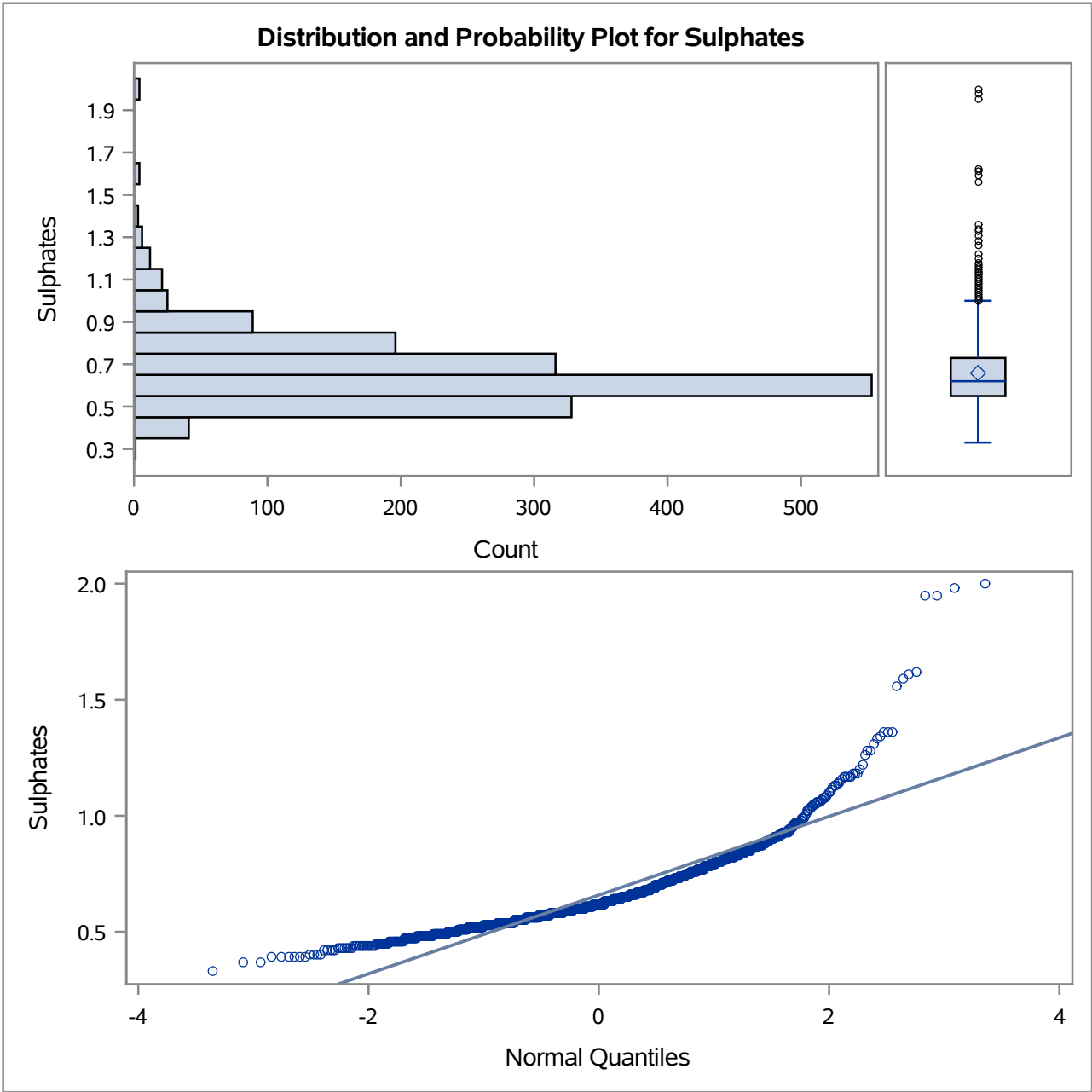
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 0.658149 | Std Deviation | 0.16951 |
| Median | 0.620000 | Variance | 0.02873 |
| Mode | 0.600000 | Range | 1.67000 |
| | | Interquartile Range | 0.18000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 155.2604 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 2.00 |
| 99% | 1.28 |
| 95% | 0.93 |
| 90% | 0.85 |
| 75% Q3 | 0.73 |
| 50% Median | 0.62 |
| 25% Q1 | 0.55 |
| 10% | 0.50 |
| 5% | 0.47 |
| 1% | 0.42 |
| 0% Min | 0.33 |

The UNIVARIATE Procedure
Variable: Sulphates

| Extreme Observations | | | |
|----------------------|------|---------|-----|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 0.33 | 171 | 1.62 | 724 |
| 0.37 | 1370 | 1.95 | 87 |
| 0.37 | 1288 | 1.95 | 92 |
| 0.39 | 1349 | 1.98 | 93 |
| 0.39 | 1348 | 2.00 | 152 |



The UNIVARIATE Procedure
Variable: alcohol

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 10.4229831 | Sum Observations | 16666.35 |
| Std Deviation | 1.06566758 | Variance | 1.1356474 |
| Skewness | 0.86082881 | Kurtosis | 0.20002931 |
| Uncorrected SS | 175527.849 | Corrected SS | 1814.76454 |
| Coeff Variation | 10.224209 | Std Error Mean | 0.02665002 |

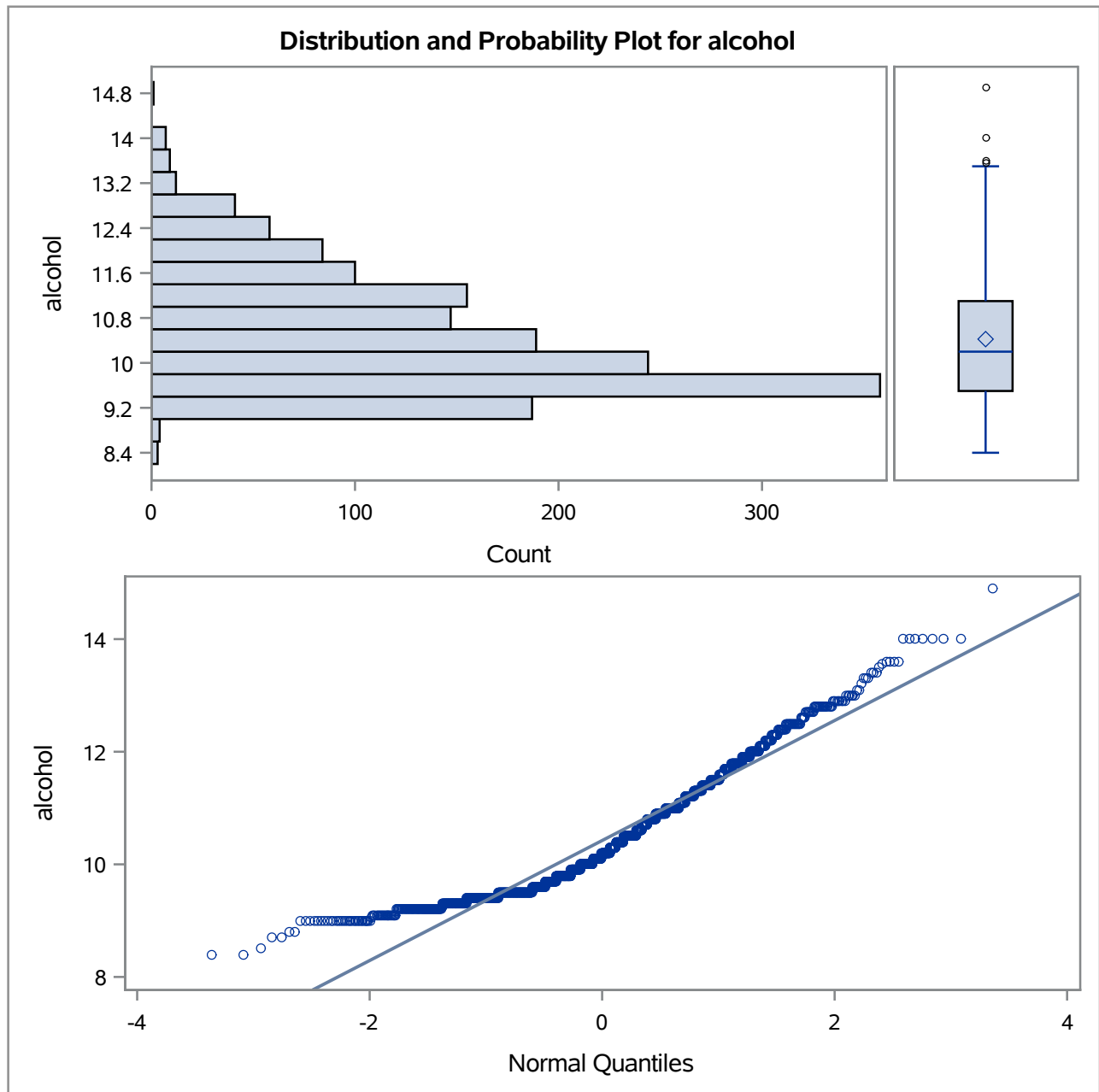
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 10.42298 | Std Deviation | 1.06567 |
| Median | 10.20000 | Variance | 1.13565 |
| Mode | 9.50000 | Range | 6.50000 |
| | | Interquartile Range | 1.60000 |

| Tests for Location: $\mu_0=0$ | | | | |
|-------------------------------|-----------|---------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 391.106 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 14.9 |
| 99% | 13.4 |
| 95% | 12.5 |
| 90% | 12.0 |
| 75% Q3 | 11.1 |
| 50% Median | 10.2 |
| 25% Q1 | 9.5 |
| 10% | 9.3 |
| 5% | 9.2 |
| 1% | 9.0 |
| 0% Min | 8.4 |

The UNIVARIATE Procedure
Variable: alcohol

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 8.4 | 545 | 14.0 | 589 |
| 8.4 | 518 | 14.0 | 822 |
| 8.5 | 1437 | 14.0 | 1270 |
| 8.7 | 529 | 14.0 | 1271 |
| 8.7 | 372 | 14.9 | 653 |



The UNIVARIATE Procedure
Variable: quality

| Moments | | | |
|------------------------|------------|-------------------------|------------|
| N | 1599 | Sum Weights | 1599 |
| Mean | 5.63602251 | Sum Observations | 9012 |
| Std Deviation | 0.80756944 | Variance | 0.6521684 |
| Skewness | 0.21780158 | Kurtosis | 0.29670812 |
| Uncorrected SS | 51834 | Corrected SS | 1042.1651 |
| Coeff Variation | 14.3287121 | Std Error Mean | 0.02019555 |

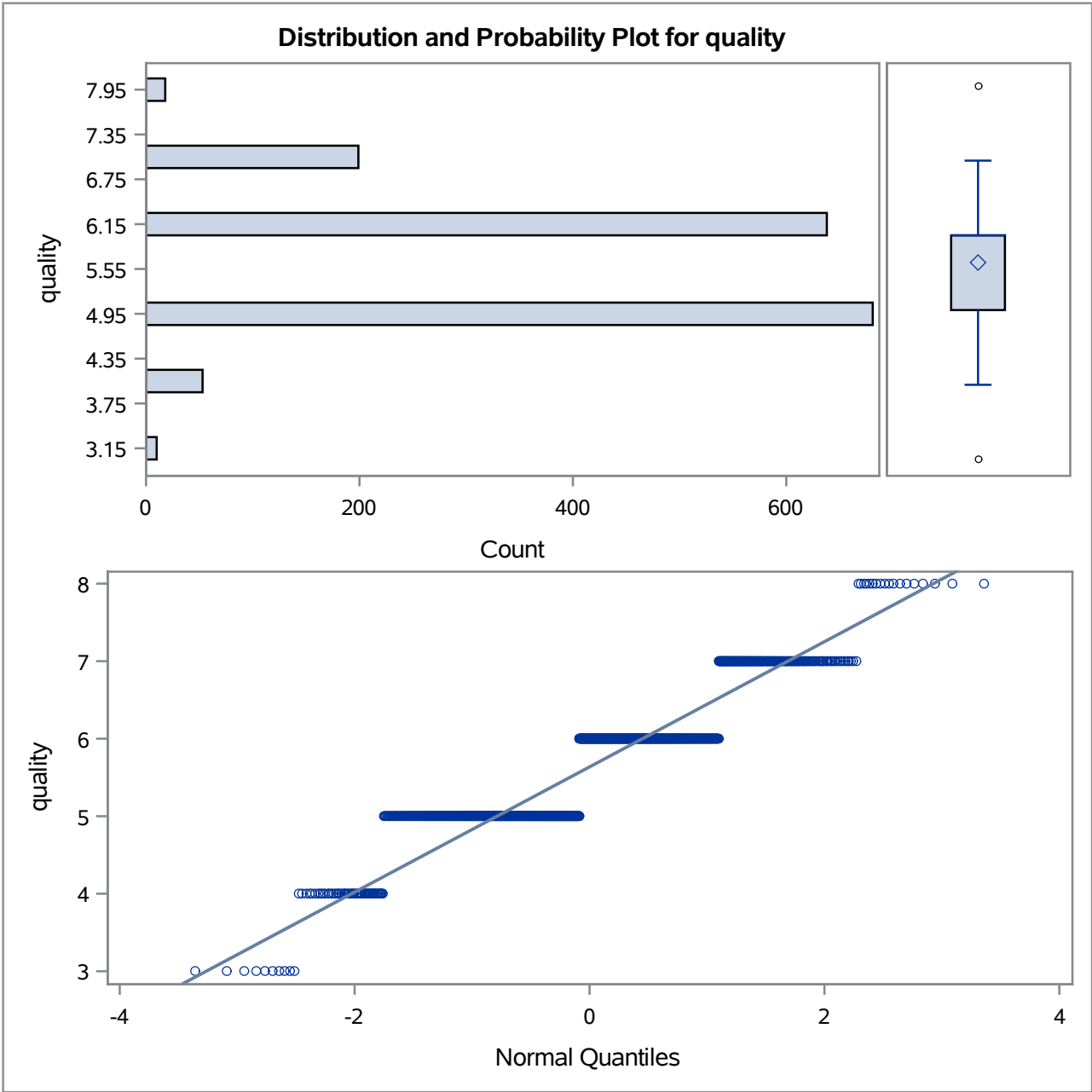
| Basic Statistical Measures | | | |
|----------------------------|----------|----------------------------|---------|
| Location | | Variability | |
| Mean | 5.636023 | Std Deviation | 0.80757 |
| Median | 6.000000 | Variance | 0.65217 |
| Mode | 5.000000 | Range | 5.00000 |
| | | Interquartile Range | 1.00000 |

| Tests for Location: Mu0=0 | | | | |
|---------------------------|-----------|----------|---------------------|--------|
| Test | Statistic | | p Value | |
| Student's t | t | 279.0725 | Pr > t | <.0001 |
| Sign | M | 799.5 | Pr >= M | <.0001 |
| Signed Rank | S | 639600 | Pr >= S | <.0001 |

| Quantiles (Definition 5) | |
|--------------------------|----------|
| Level | Quantile |
| 100% Max | 8 |
| 99% | 8 |
| 95% | 7 |
| 90% | 7 |
| 75% Q3 | 6 |
| 50% Median | 6 |
| 25% Q1 | 5 |
| 10% | 5 |
| 5% | 5 |
| 1% | 4 |
| 0% Min | 3 |

The UNIVARIATE Procedure
Variable: quality

| Extreme Observations | | | |
|----------------------|------|---------|------|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 3 | 1506 | 8 | 1203 |
| 3 | 1479 | 8 | 1270 |
| 3 | 1470 | 8 | 1404 |
| 3 | 1375 | 8 | 1450 |
| 3 | 1300 | 8 | 1550 |



The CORR Procedure

| | | | | | | |
|-------------------|-------------------------|--------------------------|-------------|----------------|-----------|---------------------|
| 15 | fixed_acidity | volatile_acidity | citric_acid | residual_sugar | chlorides | free_sulfur_dioxide |
| Variables: | total_sulfur_dioxide | density | pH | Sulphates | alcohol | quality |
| | log_free_sulfur_dioxide | log_total_sulfur_dioxide | | | | log_fixed_acidity |

| Simple Statistics | | | | | | |
|--------------------------|------|----------|----------|-----------|---------|-----------|
| Variable | N | Mean | Std Dev | Sum | Minimum | Maximum |
| fixed_acidity | 1599 | 8.31964 | 1.74110 | 13303 | 4.60000 | 15.90000 |
| volatile_acidity | 1599 | 0.52782 | 0.17906 | 843.98500 | 0.12000 | 1.58000 |
| citric_acid | 1599 | 0.27098 | 0.19480 | 433.29000 | 0 | 1.00000 |
| residual_sugar | 1599 | 2.53881 | 1.40993 | 4060 | 0.90000 | 15.50000 |
| chlorides | 1599 | 0.08747 | 0.04707 | 139.85900 | 0.01200 | 0.61100 |
| free_sulfur_dioxide | 1599 | 15.87492 | 10.46016 | 25384 | 1.00000 | 72.00000 |
| total_sulfur_dioxide | 1599 | 46.46779 | 32.89532 | 74302 | 6.00000 | 289.00000 |
| density | 1599 | 0.99675 | 0.00189 | 1594 | 0.99007 | 1.00369 |
| pH | 1599 | 3.31111 | 0.15439 | 5294 | 2.74000 | 4.01000 |
| Sulphates | 1599 | 0.65815 | 0.16951 | 1052 | 0.33000 | 2.00000 |
| alcohol | 1599 | 10.42298 | 1.06567 | 16666 | 8.40000 | 14.90000 |
| quality | 1599 | 5.63602 | 0.80757 | 9012 | 3.00000 | 8.00000 |
| log_fixed_acidity | 1599 | 0.91125 | 0.08660 | 1457 | 0.66276 | 1.20140 |
| log_free_sulfur_dioxide | 1599 | 1.10577 | 0.29762 | 1768 | 0 | 1.85733 |
| log_total_sulfur_dioxide | 1599 | 1.56377 | 0.30635 | 2500 | 0.77815 | 2.46090 |

The CORR Procedure

| Pearson Correlation Coefficients, N = 1599 Prob > r under H0: Rho=0 | | | | | | |
|--|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|
| | fixed_acidity | volatile_acidity | citric_acid | residual_sugar | chlorides | free_sulfur_dioxide |
| fixed_acidity | 1.00000 <.0001 | -0.25613 <.0001 | 0.67170 <.0001 | 0.11478 <.0001 | 0.09371 0.0002 | -0.15379 <.0001 |
| volatile_acidity | -0.25613 <.0001 | 1.00000 | -0.55250 <.0001 | 0.00192 0.9389 | 0.06130 0.0142 | -0.01050 0.6747 |
| citric_acid | 0.67170 <.0001 | -0.55250 <.0001 | 1.00000 | 0.14358 <.0001 | 0.20382 <.0001 | -0.06098 0.0147 |
| residual_sugar | 0.11478 <.0001 | 0.00192 0.9389 | 0.14358 <.0001 | 1.00000 | 0.05561 0.0262 | 0.18705 <.0001 |
| chlorides | 0.09371 0.0002 | 0.06130 0.0142 | 0.20382 <.0001 | 0.05561 0.0262 | 1.00000 | 0.00556 0.8241 |
| free_sulfur_dioxide | -0.15379 <.0001 | -0.01050 0.6747 | -0.06098 0.0147 | 0.18705 <.0001 | 0.00556 0.8241 | 1.00000 |
| total_sulfur_dioxide | -0.11318 <.0001 | 0.07647 0.0022 | 0.03553 0.1555 | 0.20303 <.0001 | 0.04740 0.0581 | 0.66767 <.0001 |
| density | 0.66805 <.0001 | 0.02203 0.3788 | 0.36495 <.0001 | 0.35528 <.0001 | 0.20063 <.0001 | -0.02195 0.3805 |
| pH | -0.68298 <.0001 | 0.23494 <.0001 | -0.54190 <.0001 | -0.08565 0.0006 | -0.26503 <.0001 | 0.07038 0.0049 |
| Sulphates | 0.18301 <.0001 | -0.26099 <.0001 | 0.31277 <.0001 | 0.00553 0.8252 | 0.37126 <.0001 | 0.05166 0.0389 |
| alcohol | -0.06167 0.0136 | -0.20229 <.0001 | 0.10990 <.0001 | 0.04208 0.0926 | -0.22114 <.0001 | -0.06941 0.0055 |
| quality | 0.12405 <.0001 | -0.39056 <.0001 | 0.22637 <.0001 | 0.01373 0.5832 | -0.12891 <.0001 | -0.05066 0.0428 |
| log_fixed_acidity | 0.99044 <.0001 | -0.25289 <.0001 | 0.66716 <.0001 | 0.10928 <.0001 | 0.11100 <.0001 | -0.15092 <.0001 |
| log_free_sulfur_dioxide | -0.17921 <.0001 | 0.01667 0.5054 | -0.08915 0.0004 | 0.10701 <.0001 | -0.00390 0.8762 | 0.92759 <.0001 |
| log_total_sulfur_dioxide | -0.11790 <.0001 | 0.07341 0.0033 | -0.00364 0.8844 | 0.14747 <.0001 | 0.06022 0.0160 | 0.71354 <.0001 |

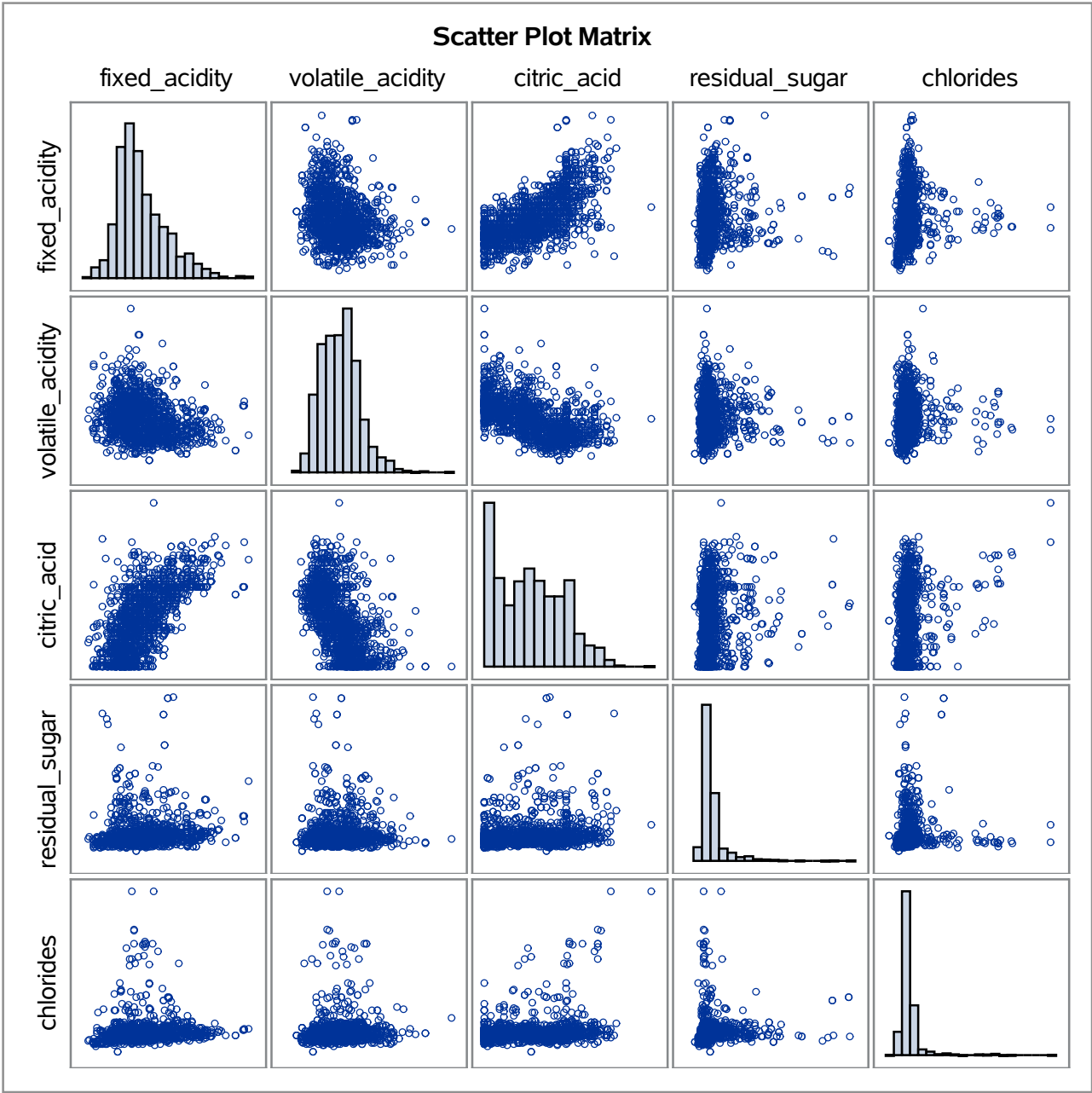
The CORR Procedure

| Pearson Correlation Coefficients, N = 1599 Prob > r under H0: Rho=0 | | | | | | | |
|--|----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| | total_sulfur_dioxide | density | pH | Sulphates | alcohol | quality | log_fixed_acidity |
| fixed_acidity | -0.11318 <.0001 | 0.66805 <.0001 | -0.68298 <.0001 | 0.18301 <.0001 | -0.06167 0.0136 | 0.12405 <.0001 | 0.99044 <.0001 |
| volatile_acidity | 0.07647 0.0022 | 0.02203 0.3788 | 0.23494 <.0001 | -0.26099 <.0001 | -0.20229 <.0001 | -0.39056 <.0001 | -0.25289 <.0001 |
| citric_acid | 0.03553 0.1555 | 0.36495 <.0001 | -0.54190 <.0001 | 0.31277 <.0001 | 0.10990 <.0001 | 0.22637 <.0001 | 0.66716 <.0001 |
| residual_sugar | 0.20303 <.0001 | 0.35528 <.0001 | -0.08565 0.0006 | 0.00553 0.8252 | 0.04208 0.0926 | 0.01373 0.5832 | 0.10928 <.0001 |
| chlorides | 0.04740 0.0581 | 0.20063 <.0001 | -0.26503 <.0001 | 0.37126 <.0001 | -0.22114 <.0001 | -0.12891 <.0001 | 0.11100 <.0001 |
| free_sulfur_dioxide | 0.66767 <.0001 | -0.02195 0.3805 | 0.07038 0.0049 | 0.05166 0.0389 | -0.06941 0.0055 | -0.05066 0.0428 | -0.15092 <.0001 |
| total_sulfur_dioxide | 1.00000 | 0.07127 0.0044 | -0.06649 0.0078 | 0.04295 0.0860 | -0.20565 <.0001 | -0.18510 <.0001 | -0.10461 <.0001 |
| density | 0.07127 0.0044 | 1.00000 | -0.34170 <.0001 | 0.14851 <.0001 | -0.49618 <.0001 | -0.17492 <.0001 | 0.67477 <.0001 |
| pH | -0.06649 0.0078 | -0.34170 <.0001 | 1.00000 | -0.19665 <.0001 | 0.20563 <.0001 | -0.05773 0.0210 | -0.70636 <.0001 |
| Sulphates | 0.04295 0.0860 | 0.14851 <.0001 | -0.19665 <.0001 | 1.00000 | 0.09359 0.0002 | 0.25140 <.0001 | 0.17985 <.0001 |
| alcohol | -0.20565 <.0001 | -0.49618 <.0001 | 0.20563 <.0001 | 0.09359 0.0002 | 1.00000 | 0.47617 <.0001 | -0.09885 <.0001 |
| quality | -0.18510 <.0001 | -0.17492 <.0001 | -0.05773 0.0210 | 0.25140 <.0001 | 0.47617 <.0001 | 1.00000 | 0.11424 <.0001 |
| log_fixed_acidity | -0.10461 <.0001 | 0.67477 <.0001 | -0.70636 <.0001 | 0.17985 <.0001 | -0.09885 <.0001 | 0.11424 <.0001 | 1.00000 |
| log_free_sulfur_dioxide | 0.67245 <.0001 | -0.03964 0.1131 | 0.09576 0.0001 | 0.05520 0.0273 | -0.08267 0.0009 | -0.05009 0.0452 | -0.17775 <.0001 |
| log_total_sulfur_dioxide | 0.92314 <.0001 | 0.10554 <.0001 | -0.01484 0.5533 | 0.06975 0.0053 | -0.23086 <.0001 | -0.17014 <.0001 | -0.11328 <.0001 |

The CORR Procedure

| Pearson Correlation Coefficients, N = 1599 Prob > r under H0: Rho=0 | | |
|--|-------------------------|--------------------------|
| | log_free_sulfur_dioxide | log_total_sulfur_dioxide |
| fixed_acidity | -0.17921 <.0001 | -0.11790 <.0001 |
| volatile_acidity | 0.01667 0.5054 | 0.07341 0.0033 |
| citric_acid | -0.08915 0.0004 | -0.00364 0.8844 |
| residual_sugar | 0.10701 <.0001 | 0.14747 <.0001 |
| chlorides | -0.00390 0.8762 | 0.06022 0.0160 |
| free_sulfur_dioxide | 0.92759 <.0001 | 0.71354 <.0001 |
| total_sulfur_dioxide | 0.67245 <.0001 | 0.92314 <.0001 |
| density | -0.03964 0.1131 | 0.10554 <.0001 |
| pH | 0.09576 0.0001 | -0.01484 0.5533 |
| Sulphates | 0.05520 0.0273 | 0.06975 0.0053 |
| alcohol | -0.08267 0.0009 | -0.23086 <.0001 |
| quality | -0.05009 0.0452 | -0.17014 <.0001 |
| log_fixed_acidity | -0.17775 <.0001 | -0.11328 <.0001 |
| log_free_sulfur_dioxide | 1.00000 | 0.78462 <.0001 |
| log_total_sulfur_dioxide | 0.78462 <.0001 | 1.00000 |

The CORR Procedure



The GLM Procedure

| Class Level Information | | |
|-------------------------|--------|---|
| Class | Levels | Values |
| fixed_acidity | 96 | 4.6 4.7 4.9 5 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6 6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8 6.9 7 7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8 7.9 8 8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9 9 9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8 9.9 10 10.1 10.2 10.3 10.4 10.5 10.6 10.7 10.8 10.9 11 11.1 11.2 11.3 11.4 11.5 11.6 11.7 11.8 11.9 12 12.1 12.2 12.3 12.4 12.5 12.6 12.7 12.8 12.9 13 13.2 13.3 13.4 13.5 13.7 13.8 14 14.3 15 15.5 15.6 15.9 |
| volatile_acidity | 143 | 0.12 0.16 0.18 0.19 0.2 0.21 0.22 0.23 0.24 0.25 0.26 0.27 0.28 0.29 0.295 0.3 0.305 0.31 0.315 0.32 0.33 0.34 0.35 0.36 0.365 0.37 0.38 0.39 0.395 0.4 0.41 0.415 0.42 0.43 0.44 0.45 0.46 0.47 0.475 0.48 0.49 0.5 0.51 0.52 0.53 0.54 0.545 0.55 0.56 0.565 0.57 0.575 0.58 0.585 0.59 0.595 0.6 0.605 0.61 0.615 0.62 0.625 0.63 0.635 0.64 0.645 0.65 0.655 0.66 0.665 0.67 0.675 0.68 0.685 0.69 0.695 0.7 0.705 0.71 0.715 0.72 0.725 0.73 0.735 0.74 0.745 0.75 0.755 0.76 0.765 0.77 0.775 0.78 0.785 0.79 0.795 0.8 0.805 0.81 0.815 0.82 0.825 0.83 0.835 0.84 0.845 0.85 0.855 0.86 0.865 0.87 0.875 0.88 0.885 0.89 0.895 0.9 0.91 0.915 0.92 0.935 0.95 0.955 0.96 0.965 0.975 0.98 1 1.005 1.01 1.02 1.025 1.035 1.04 1.07 1.09 1.115 1.13 1.18 1.185 1.24 1.33 1.58 |
| citric_acid | 80 | 0 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.1 0.11 0.12 0.13 0.14 0.15 0.16 0.17 0.18 0.19 0.2 0.21 0.22 0.23 0.24 0.25 0.26 0.27 0.28 0.29 0.3 0.31 0.32 0.33 0.34 0.35 0.36 0.37 0.38 0.39 0.4 0.41 0.42 0.43 0.44 0.45 0.46 0.47 0.48 0.49 0.5 0.51 0.52 0.53 0.54 0.55 0.56 0.57 0.58 0.59 0.6 0.61 0.62 0.63 0.64 0.65 0.66 0.67 0.68 0.69 0.7 0.71 0.72 0.73 0.74 0.75 0.76 0.78 0.79 1 |
| residual_sugar | 91 | 0.9 1.2 1.3 1.4 1.5 1.6 1.65 1.7 1.75 1.8 1.9 2 2.05 2.1 2.15 2.2 2.25 2.3 2.35 2.4 2.5 2.55 2.6 2.65 2.7 2.8 2.85 2.9 2.95 3 3.1 3.2 3.3 3.4 3.45 3.5 3.6 3.65 3.7 3.75 3.8 3.9 4 4.1 4.2 4.25 4.3 4.4 4.5 4.6 4.65 4.7 4.8 5 5.1 5.15 5.2 5.4 5.5 5.6 5.7 5.8 5.9 6 6.1 6.2 6.3 6.4 6.55 6.6 6.7 7 7.2 7.3 7.5 7.8 7.9 8.1 8.3 8.6 8.8 8.9 9 10.7 11 12.9 13.4 13.8 13.9 15.4 15.5 |
| chlorides | 153 | 0.012 0.034 0.038 0.039 0.041 0.042 0.043 0.044 0.045 0.046 0.047 0.048 0.049 0.05 0.051 0.052 0.053 0.054 0.055 0.056 0.057 0.058 0.059 0.06 0.061 0.062 0.063 0.064 0.065 0.066 0.067 0.068 0.069 0.07 0.071 0.072 0.073 0.074 0.075 0.076 0.077 0.078 0.079 0.08 0.081 0.082 0.083 0.084 0.085 0.086 0.087 0.088 0.089 0.09 0.091 0.092 0.093 0.094 0.095 0.096 0.097 0.098 0.099 0.1 0.101 0.102 0.103 0.104 0.105 0.106 0.107 0.108 0.109 0.11 0.111 0.112 0.113 0.114 0.115 0.116 0.117 0.118 0.119 0.12 0.121 0.122 0.123 0.124 0.125 0.126 0.127 0.128 0.132 0.136 0.137 0.143 0.145 0.146 0.147 0.148 0.152 0.153 0.157 0.159 0.161 0.165 0.166 0.168 0.169 0.17 0.171 0.172 0.174 0.176 0.178 0.186 0.19 0.194 0.2 0.205 0.213 0.214 0.216 0.222 0.226 0.23 0.235 0.236 0.241 0.243 0.25 0.263 0.267 0.27 0.332 0.337 0.341 0.343 0.358 0.36 0.368 0.369 0.387 0.401 0.403 0.413 0.414 0.415 0.422 0.464 0.467 0.61 0.611 |
| free_sulfur_dioxide | 60 | 1 2 3 4 5 5.5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 37.5 38 39 40 40.5 41 42 43 45 46 47 48 50 51 52 53 54 55 57 66 68 72 |
| total_sulfur_dioxide | 144 | 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 77.5 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 98 99 100 101 102 103 104 105 106 108 109 110 111 112 113 114 115 116 119 120 121 122 124 125 126 127 128 129 130 131 133 134 135 136 139 140 141 142 143 144 145 147 148 149 151 152 153 155 160 165 278 289 |

The GLM Procedure

| Class Level Information | | |
|-------------------------|--------|--|
| Class | Levels | Values |
| density | 436 | 0.99007 0.9902 0.99064 0.9908 0.99084 0.9912 0.9915 0.99154 0.99157 0.9916 0.99162 0.9917 0.99182 0.99191 0.9921 0.9922 0.99235 0.99236 0.9924 0.99242 0.99252 0.99256 0.99258 0.99264 0.9927 0.9928 0.99286 0.9929 0.99292 0.99294 0.99306 0.99314 0.99316 0.99318 0.9932 0.99322 0.99323 0.99328 0.9933 0.99331 0.99332 0.99334 0.99336 0.9934 0.99341 0.99344 0.99346 0.99348 0.9935 0.99352 0.99354 0.99356 0.99357 0.99358 0.9936 0.99362 0.99364 0.9937 0.99371 0.99374 0.99376 0.99378 0.99379 0.9938 0.99384 0.99385 0.99386 0.99387 0.99388 0.99392 0.99394 0.99395 0.99396 0.99397 0.994 0.99402 0.99408 0.9941 0.99414 0.99416 0.99417 0.99418 0.99419 0.9942 0.99425 0.99426 0.99428 0.9943 0.99434 0.99437 0.99438 0.99439 0.9944 0.99444 0.99448 0.99451 0.99454 0.99456 0.99458 0.99459 0.9946 0.99462 0.99464 0.99467 0.99468 0.9947 0.99471 0.99472 0.99473 0.99474 0.99476 0.99478 0.99479 0.9948 0.99483 0.99484 0.99486 0.99488 0.99489 0.9949 0.99491 0.99492 0.99494 0.99495 0.99496 0.99498 0.99499 0.995 0.99501 0.99502 0.99504 0.99506 0.99508 0.99509 0.9951 0.99512 0.99514 0.99516 0.99517 0.99518 0.99519 0.9952 0.99521 0.99522 0.99523 0.99524 0.99525 0.99526 0.99528 0.99529 0.9953 0.99531 0.99532 0.99533 0.99534 0.99536 0.99538 0.9954 0.99541 0.99542 0.99543 0.99544 0.99545 0.99546 0.99547 0.99549 0.9955 0.99551 0.99552 0.99553 0.99554 0.99555 0.99556 0.99557 0.99558 0.9956 0.99562 0.99564 0.99565 0.99566 0.99568 0.99569 0.9957 0.99572 0.99573 0.99574 0.99575 0.99576 0.99577 0.99578 0.9958 0.99581 0.99582 0.99584 0.99585 0.99586 0.99587 0.99588 0.99589 0.9959 0.99592 0.99593 0.99594 0.99596 0.99598 0.99599 0.996 0.99603 0.99604 0.99605 0.99606 0.99608 0.99609 0.9961 0.99612 0.99613 0.99614 0.99615 0.99616 0.99617 0.99619 0.9962 0.99621 0.99622 0.99623 0.99624 0.99625 0.99627 0.99628 0.99629 0.9963 0.99631 0.99632 0.99633 0.99634 0.99635 0.99636 0.99638 0.99639 0.9964 0.99641 0.99642 0.99643 0.99645 0.99646 0.99647 0.99648 0.99649 0.9965 0.99651 0.99652 0.99654 0.99655 0.99656 0.99658 0.99659 0.9966 0.99661 0.99664 0.99665 0.99666 0.99667 0.99668 0.99669 0.9967 0.99672 0.99674 0.99675 0.99676 0.99677 0.99678 0.9968 0.99682 0.99683 0.99684 0.99685 0.99686 0.99688 0.99689 0.9969 0.99692 0.99693 0.99694 0.99695 0.99697 0.99698 0.99699 0.997 0.99701 0.99702 0.99704 0.99705 0.99706 0.99708 0.99709 0.9971 0.99712 0.99713 0.99714 0.99716 0.99717 0.99718 0.99719 0.9972 0.99721 0.99722 0.99724 0.99725 0.99726 0.99727 0.99728 0.99729 0.9973 0.99732 0.99733 0.99734 0.99735 0.99736 0.99738 0.99739 0.9974 0.99743 0.99744 0.99745 0.99746 0.99747 0.99748 0.9975 0.99752 0.99754 0.99756 0.99758 0.9976 0.99761 0.99764 0.99765 0.99768 0.99769 0.9977 0.99772 0.99774 0.99779 0.9978 0.99782 0.99783 0.99784 0.99785 0.99786 0.99787 0.99788 0.9979 0.99791 0.99796 0.99798 0.998 0.99801 0.99803 0.99808 0.9981 0.99814 0.99815 0.99817 0.99818 0.9982 0.99822 0.99823 0.99824 0.99828 0.9983 0.99832 0.99834 0.99836 0.9984 0.99842 0.99845 0.9985 0.99852 0.99854 0.99855 0.99859 0.9986 0.99864 0.99865 0.9987 0.99878 0.9988 0.99888 0.9989 0.99892 0.999 0.99901 0.9991 0.99914 0.99915 0.99918 0.9992 0.99922 0.99925 0.9993 0.99935 0.99938 0.99939 0.9994 0.9995 0.9996 0.99965 0.9997 0.99974 0.99975 0.99976 0.9998 0.9999 1 1.00005 1.0001 1.00012 1.00015 1.0002 1.00024 1.00025 1.0003 1.0004 1.0006 1.0008 1.001 1.0014 1.0015 1.0018 1.0021 1.0022 1.00242 1.0026 1.00289 1.00315 1.0032 1.00369 |
| pH | 89 | 2.74 2.86 2.87 2.88 2.89 2.9 2.92 2.93 2.94 2.95 2.98 2.99 3 3.01 3.02 3.03 3.04 3.05 3.06 3.07 3.08 3.09 3.1 3.11 3.12 3.13 3.14 3.15 3.16 3.17 3.18 3.19 3.2 3.21 3.22 3.23 3.24 3.25 3.26 3.27 3.28 3.29 3.3 3.31 3.32 3.33 3.34 3.35 3.36 3.37 3.38 3.39 3.4 3.41 3.42 3.43 3.44 3.45 3.46 3.47 3.48 3.49 3.5 3.51 3.52 3.53 3.54 3.55 3.56 3.57 3.58 3.59 3.6 3.61 3.62 3.63 3.66 3.67 3.68 3.69 3.7 3.71 3.72 3.74 3.75 3.78 3.85 3.9 4.01 |

The GLM Procedure

| Class Level Information | | |
|-------------------------|--------|--|
| Class | Levels | Values |
| Sulphates | 96 | 0.33 0.37 0.39 0.4 0.42 0.43 0.44 0.45 0.46 0.47 0.48 0.49 0.5 0.51 0.52 0.53 0.54 0.55 0.56 0.57 0.58 0.59 0.6 0.61 0.62 0.63 0.64 0.65 0.66 0.67 0.68 0.69 0.7 0.71 0.72 0.73 0.74 0.75 0.76 0.77 0.78 0.79 0.8 0.81 0.82 0.83 0.84 0.85 0.86 0.87 0.88 0.89 0.9 0.91 0.92 0.93 0.94 0.95 0.96 0.97 0.98 0.99 1 1.01 1.02 1.03 1.04 1.05 1.06 1.07 1.08 1.09 1.1 1.11 1.12 1.13 1.14 1.15 1.16 1.17 1.18 1.2 1.22 1.26 1.28 1.31 1.33 1.34 1.36 1.56 1.59 1.61 1.62 1.95 1.98 2 |
| alcohol | 65 | 8.4 8.5 8.7 8.8 9 9.05 9.1 9.2 9.2333333333 9.25 9.3 9.4 9.5 9.55 9.5666666667 9.6 9.7 9.8 9.9 9.95 10 10.0333333333 10.1 10.2 10.3 10.4 10.5 10.55 10.6 10.7 10.75 10.8 10.9 11 11.0666666667 11.1 11.2 11.3 11.4 11.5 11.6 11.7 11.8 11.9 11.95 12 12.1 12.2 12.3 12.4 12.5 12.6 12.7 12.8 12.9 13 13.1 13.2 13.3 13.4 13.5 13.5666666667 13.6 14 14.9 |

| | |
|-----------------------------|------|
| Number of Observations Read | 1599 |
| Number of Observations Used | 1599 |

The GLM Procedure

Dependent Variable: quality

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|------|----------------|-------------|---------|--------|
| Model | 1346 | 1037.918334 | 0.771113 | 45.76 | <.0001 |
| Error | 252 | 4.246770 | 0.016852 | | |
| Corrected Total | 1598 | 1042.165103 | | | |

| R-Square | Coeff Var | Root MSE | quality Mean |
|----------|-----------|----------|--------------|
| 0.995925 | 2.303331 | 0.129816 | 5.636023 |

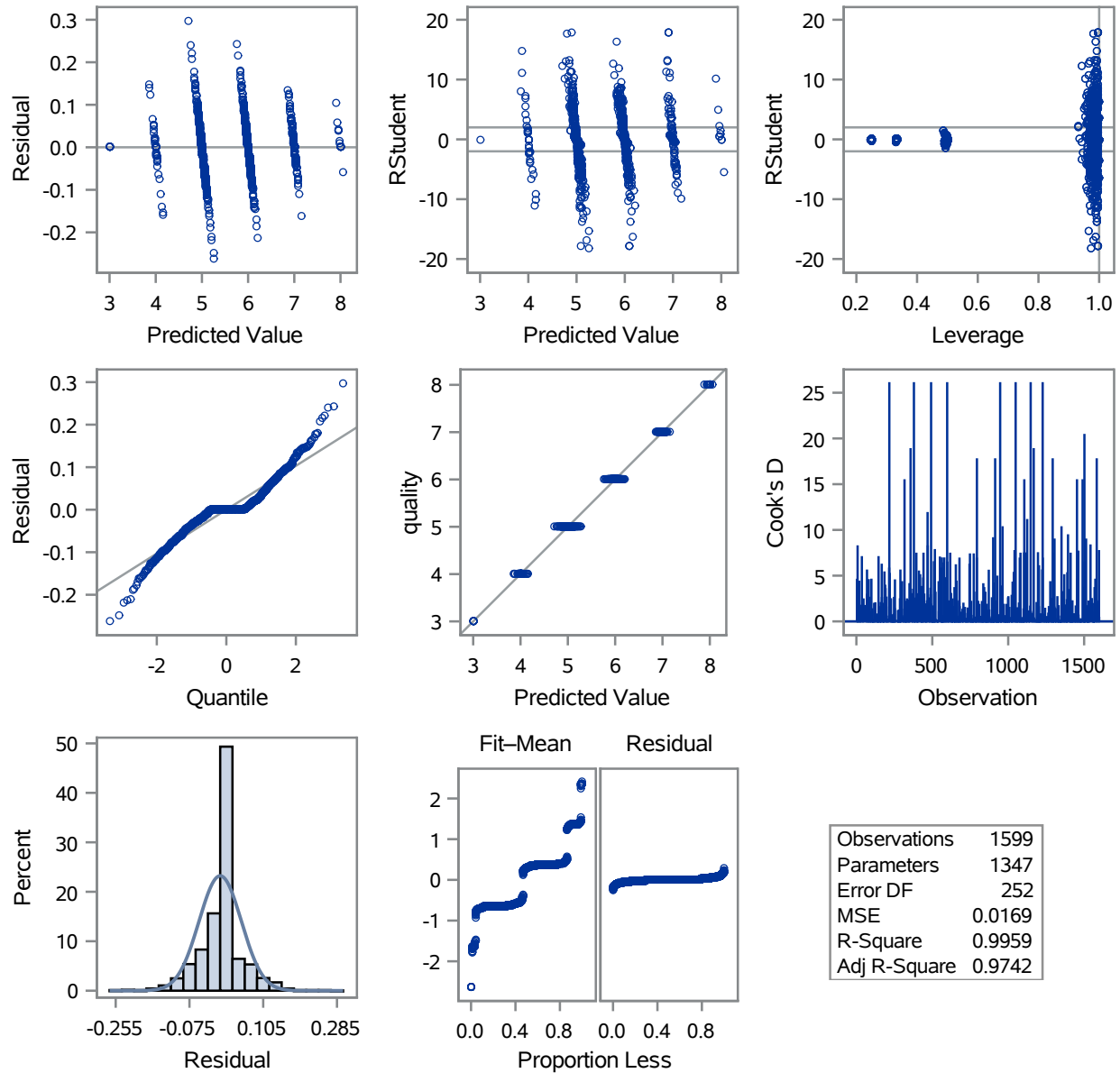
| Source | DF | Type I SS | Mean Square | F Value | Pr > F |
|----------------------|-----|-------------|-------------|---------|--------|
| fixed_acidity | 95 | 117.7097632 | 1.2390501 | 73.52 | <.0001 |
| volatile_acidity | 142 | 225.1392509 | 1.5854877 | 94.08 | <.0001 |
| citric_acid | 77 | 71.4109145 | 0.9274145 | 55.03 | <.0001 |
| residual_sugar | 86 | 78.5238962 | 0.9130686 | 54.18 | <.0001 |
| chlorides | 147 | 103.2821462 | 0.7025996 | 41.69 | <.0001 |
| free_sulfur_dioxide | 53 | 23.0872343 | 0.4356082 | 25.85 | <.0001 |
| total_sulfur_dioxide | 139 | 99.9853350 | 0.7193190 | 42.68 | <.0001 |
| density | 398 | 218.9244769 | 0.5500615 | 32.64 | <.0001 |
| pH | 76 | 36.1796761 | 0.4760484 | 28.25 | <.0001 |
| Sulphates | 80 | 34.1571337 | 0.4269642 | 25.34 | <.0001 |
| alcohol | 53 | 29.5185067 | 0.5569530 | 33.05 | <.0001 |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|----------------------|-----|-------------|-------------|---------|--------|
| fixed_acidity | 80 | 25.8697819 | 0.3233723 | 19.19 | <.0001 |
| volatile_acidity | 129 | 54.4132291 | 0.4218080 | 25.03 | <.0001 |
| citric_acid | 72 | 30.8091718 | 0.4279052 | 25.39 | <.0001 |
| residual_sugar | 67 | 29.4788359 | 0.4399826 | 26.11 | <.0001 |
| chlorides | 120 | 47.7381738 | 0.3978181 | 23.61 | <.0001 |
| free_sulfur_dioxide | 49 | 21.0407311 | 0.4294027 | 25.48 | <.0001 |
| total_sulfur_dioxide | 135 | 54.4924785 | 0.4036480 | 23.95 | <.0001 |
| density | 384 | 154.9038420 | 0.4033954 | 23.94 | <.0001 |
| pH | 74 | 28.7081761 | 0.3879483 | 23.02 | <.0001 |
| Sulphates | 80 | 32.2284857 | 0.4028561 | 23.91 | <.0001 |
| alcohol | 53 | 29.5185067 | 0.5569530 | 33.05 | <.0001 |

The GLM Procedure

Dependent Variable: quality

Fit Diagnostics for quality



| | |
|--------------|--------|
| Observations | 1599 |
| Parameters | 1347 |
| Error DF | 252 |
| MSE | 0.0169 |
| R-Square | 0.9959 |
| Adj R-Square | 0.9742 |

The GLMSELECT Procedure

| | |
|--------------------------------|--------------------|
| Data Set | WORK.TRAIN |
| Test Data Set | WORK.TEST |
| Dependent Variable | quality |
| Selection Method | Stepwise |
| Select Criterion | Significance Level |
| Stop Criterion | Significance Level |
| Entry Significance Level (SLE) | 0.15 |
| Stay Significance Level (SLS) | 0.15 |
| Effect Hierarchy Enforced | None |

| Observation Profile for Analysis Data | |
|--|------|
| Number of Observations Read | 1209 |
| Number of Observations Used | 1209 |
| Number of Observations Used for Training | 1209 |

| Observation Profile for Test Data | |
|-----------------------------------|-----|
| Number of Observations Read | 390 |
| Number of Observations Used | 390 |

| Dimensions | |
|----------------------|----|
| Number of Effects | 12 |
| Number of Parameters | 12 |

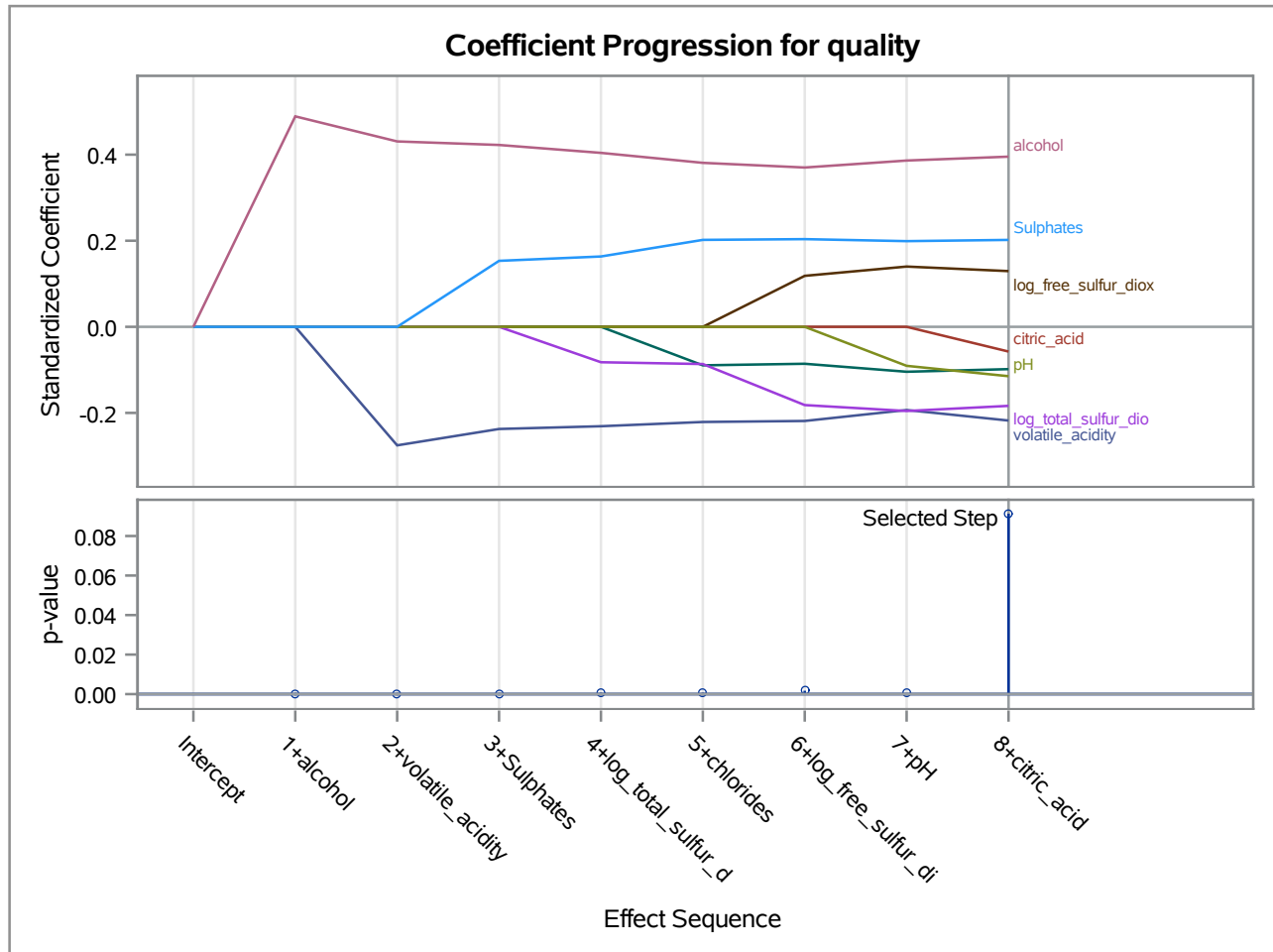
The GLMSELECT Procedure

| Stepwise Selection Summary | | | | | | | |
|----------------------------|----------------------|----------------|-------------------|--------|----------|---------|--------|
| Step | Effect Entered | Effect Removed | Number Effects In | ASE | Test ASE | F Value | Pr > F |
| 0 | Intercept | | 1 | 0.6432 | 0.6784 | 0.00 | 1.0000 |
| 1 | alcohol | | 2 | 0.4894 | 0.5493 | 379.22 | <.0001 |
| 2 | volatile_acidity | | 3 | 0.4428 | 0.4561 | 126.90 | <.0001 |
| 3 | Sulphates | | 4 | 0.4288 | 0.4491 | 39.48 | <.0001 |
| 4 | log_total_sulfur_dio | | 5 | 0.4247 | 0.4499 | 11.50 | 0.0007 |
| 5 | chlorides | | 6 | 0.4207 | 0.4421 | 11.45 | 0.0007 |
| 6 | log_free_sulfur_diox | | 7 | 0.4173 | 0.4465 | 9.88 | 0.0017 |
| 7 | pH | | 8 | 0.4130 | 0.4434 | 12.47 | 0.0004 |
| 8 | citric_acid | | 9 | 0.4120 | 0.4459 | 2.86 | 0.0913 |

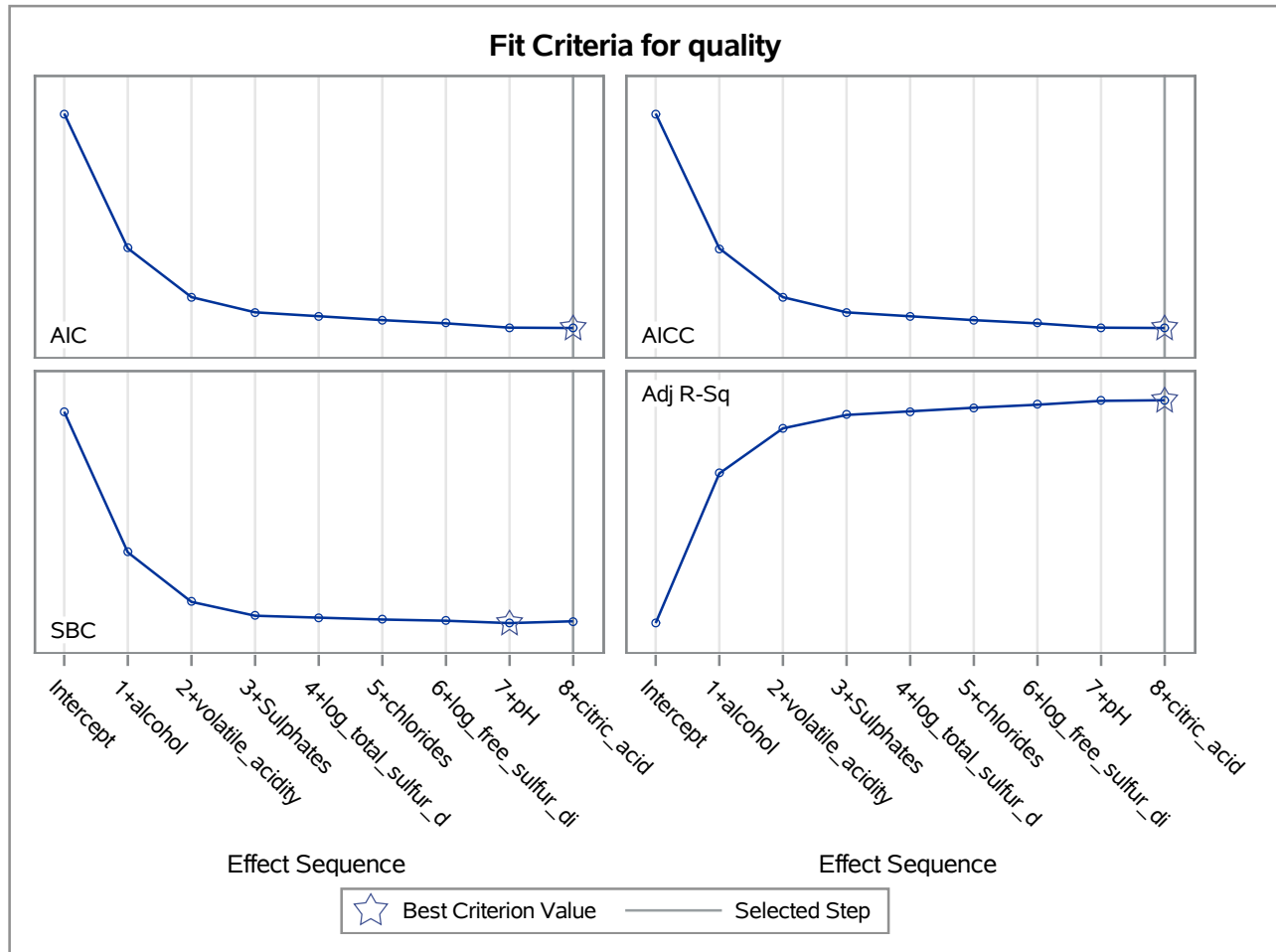
Selection stopped because the candidate for entry has SLE > 0.15 and the candidate for removal has SLS < 0.15.

| Stop Details | | | | | |
|---------------|-------------------|------------------------|---|----------------------|-------|
| Candidate For | Effect | Candidate Significance | | Compare Significance | |
| Entry | log_fixed_acidity | 0.1950 | > | 0.1500 | (SLE) |
| Removal | citric_acid | 0.0913 | < | 0.1500 | (SLS) |

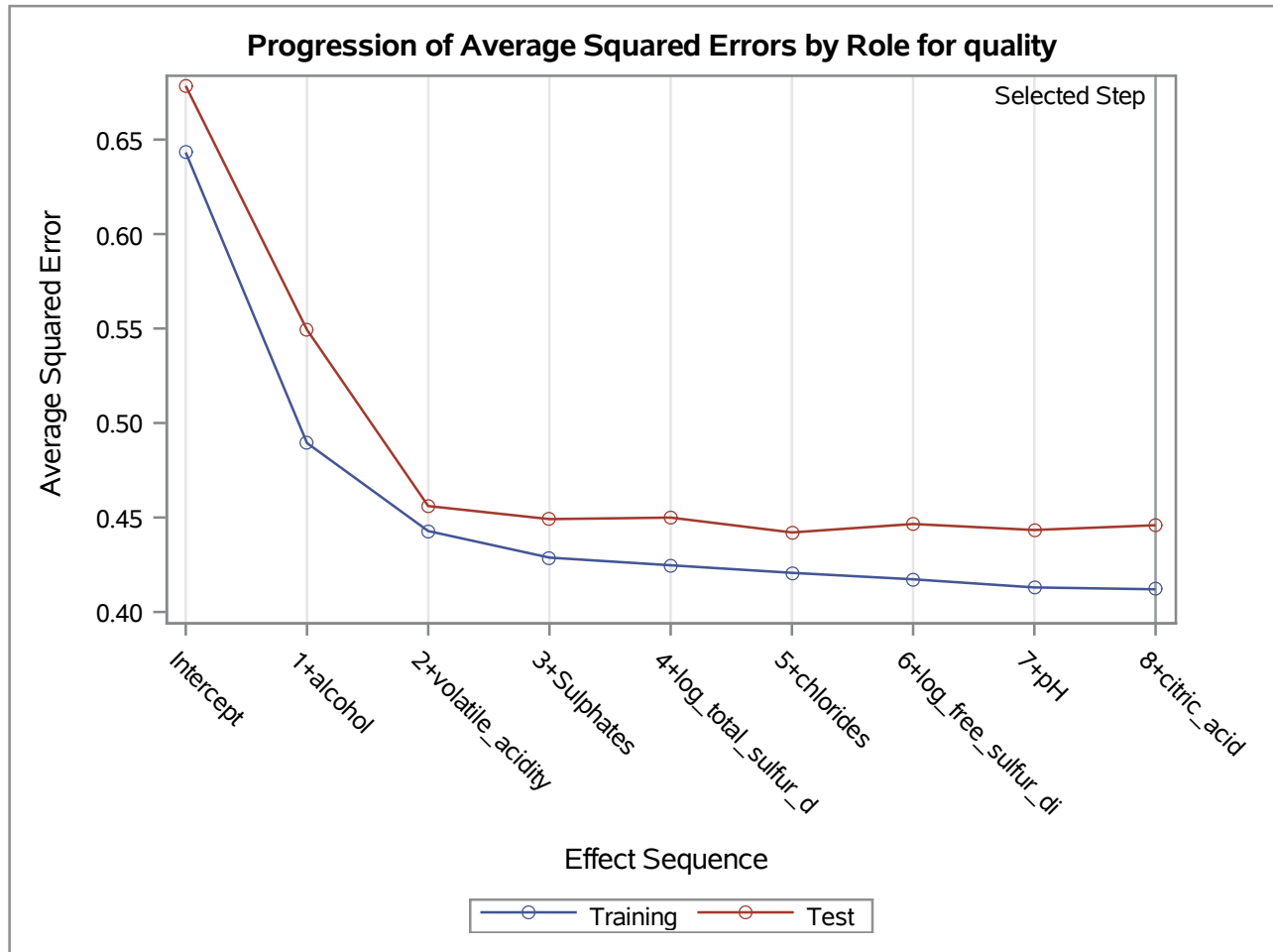
The GLMSELECT Procedure



The GLMSELECT Procedure



The GLMSELECT Procedure



The GLMSELECT Procedure Selected Model

The selected model is the model at the last step (Step 8).

| | |
|-----------------|---|
| Effects: | Intercept volatile_acidity citric_acid chlorides log_free_sulfur_diox log_total_sulfur_dio pH Sulphates alcohol |
|-----------------|---|

| Analysis of Variance | | | | |
|----------------------|------|----------------|-------------|---------|
| Source | DF | Sum of Squares | Mean Square | F Value |
| Model | 8 | 279.47771 | 34.93471 | 84.16 |
| Error | 1200 | 498.11699 | 0.41510 | |
| Corrected Total | 1208 | 777.59471 | | |

| | |
|----------------|-------------|
| Root MSE | 0.64428 |
| Dependent Mean | 5.63689 |
| R-Square | 0.3594 |
| Adj R-Sq | 0.3551 |
| AIC | 156.96292 |
| AICC | 157.14656 |
| SBC | -1008.15914 |
| ASE (Train) | 0.41201 |
| ASE (Test) | 0.44590 |

| Parameter Estimates | | | | |
|----------------------|----|-----------|----------------|---------|
| Parameter | DF | Estimate | Standard Error | t Value |
| Intercept | 1 | 5.000889 | 0.547737 | 9.13 |
| volatile_acidity | 1 | -0.959981 | 0.129896 | -7.39 |
| citric_acid | 1 | -0.240121 | 0.142088 | -1.69 |
| chlorides | 1 | -1.630177 | 0.447280 | -3.64 |
| log_free_sulfur_diox | 1 | 0.345937 | 0.102798 | 3.37 |
| log_total_sulfur_dio | 1 | -0.479216 | 0.102711 | -4.67 |
| pH | 1 | -0.606515 | 0.155134 | -3.91 |
| Sulphates | 1 | 0.973333 | 0.128954 | 7.55 |
| alcohol | 1 | 0.296254 | 0.019779 | 14.98 |

The GLMSELECT Procedure

| | |
|-----------------------------------|------------------|
| Data Set | WORK.TRAIN |
| Test Data Set | WORK.TEST |
| Dependent Variable | quality |
| Selection Method | LASSO |
| Stop at Specified Number of Steps | 120 |
| Choose Criterion | Cross Validation |
| Cross Validation Method | Split |
| Cross Validation Fold | 10 |
| Effect Hierarchy Enforced | None |

| Observation Profile for Analysis Data | |
|--|------|
| Number of Observations Read | 1209 |
| Number of Observations Used | 1209 |
| Number of Observations Used for Training | 1209 |

| Observation Profile for Test Data | |
|-----------------------------------|-----|
| Number of Observations Read | 390 |
| Number of Observations Used | 390 |

| Dimensions | |
|----------------------|----|
| Number of Effects | 12 |
| Number of Parameters | 12 |

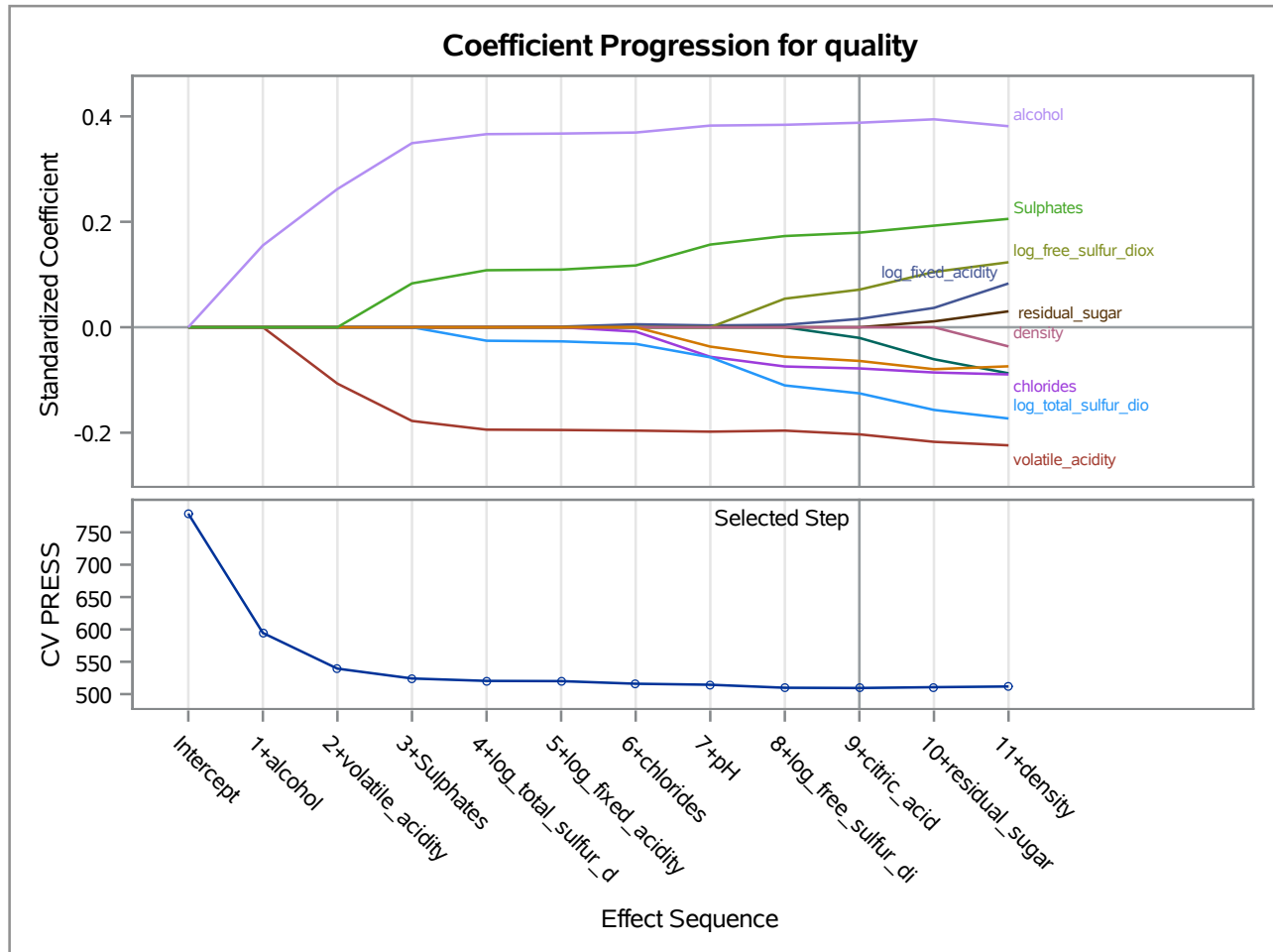
The GLMSELECT Procedure

| LASSO Selection Summary | | | | | | | | | | | |
|------------------------------|----------------------|----------------|-------------------|----------------|-------------------|-----------|-----------|-------------|----------|------------|--------|
| Step | Effect Entered | Effect Removed | Number Effects In | Model R-Square | Adjusted R-Square | AIC | AICC | BIC | CP | SBC | ASE |
| 0 | Intercept | | 1 | 0.0000 | 0.0000 | 679.4158 | 679.4258 | -530.5443 | 665.7854 | -526.4866 | 0.6432 |
| 1 | alcohol | | 2 | 0.1277 | 0.1270 | 516.1846 | 516.2045 | -693.9901 | 428.5558 | -684.6203 | 0.5610 |
| 2 | volatile_acidity | | 3 | 0.2427 | 0.2415 | 347.2878 | 347.3211 | -862.6408 | 215.2239 | -848.4195 | 0.4871 |
| 3 | Sulphates | | 4 | 0.3144 | 0.3127 | 229.0574 | 229.1072 | -980.4166 | 82.9729 | -961.5524 | 0.4410 |
| 4 | log_total_sulfur_dio | | 5 | 0.3277 | 0.3254 | 207.4286 | 207.4985 | -1001.9726 | 60.1225 | -978.0836 | 0.4324 |
| 5 | log_fixed_acidity | | 6 | 0.3283 | 0.3255 | 208.2512 | 208.3445 | -1001.2183 | 60.8969 | -972.1635 | 0.4320 |
| 6 | chlorides | | 7 | 0.3317 | 0.3284 | 204.0898 | 204.2098 | -1005.3880 | 56.5026 | -971.2274 | 0.4298 |
| 7 | pH | | 8 | 0.3458 | 0.3419 | 180.4580 | 180.6081 | -1028.7545 | 32.2490 | -989.7616 | 0.4208 |
| 8 | log_free_sulfur_diox | | 9 | 0.3533 | 0.3490 | 168.3907 | 168.5744 | -1040.6401 | 20.0753 | -996.7313* | 0.4159 |
| 9 | citric_acid | | 10 | 0.3562 | 0.3514 | 164.9401 | 165.1607 | -1044.0039 | 16.6276 | -995.0844 | 0.4140 |
| 10 | residual_sugar | | 11 | 0.3599 | 0.3546 | 159.9681* | 160.2289* | -1048.8429* | 11.6950* | -994.9589 | 0.4117 |
| 11 | density | | 12 | 0.3608 | 0.3550* | 160.2573 | 160.5619 | -1048.5023 | 12.0000 | -989.5721 | 0.4111 |
| * Optimal Value of Criterion | | | | | | | | | | | |

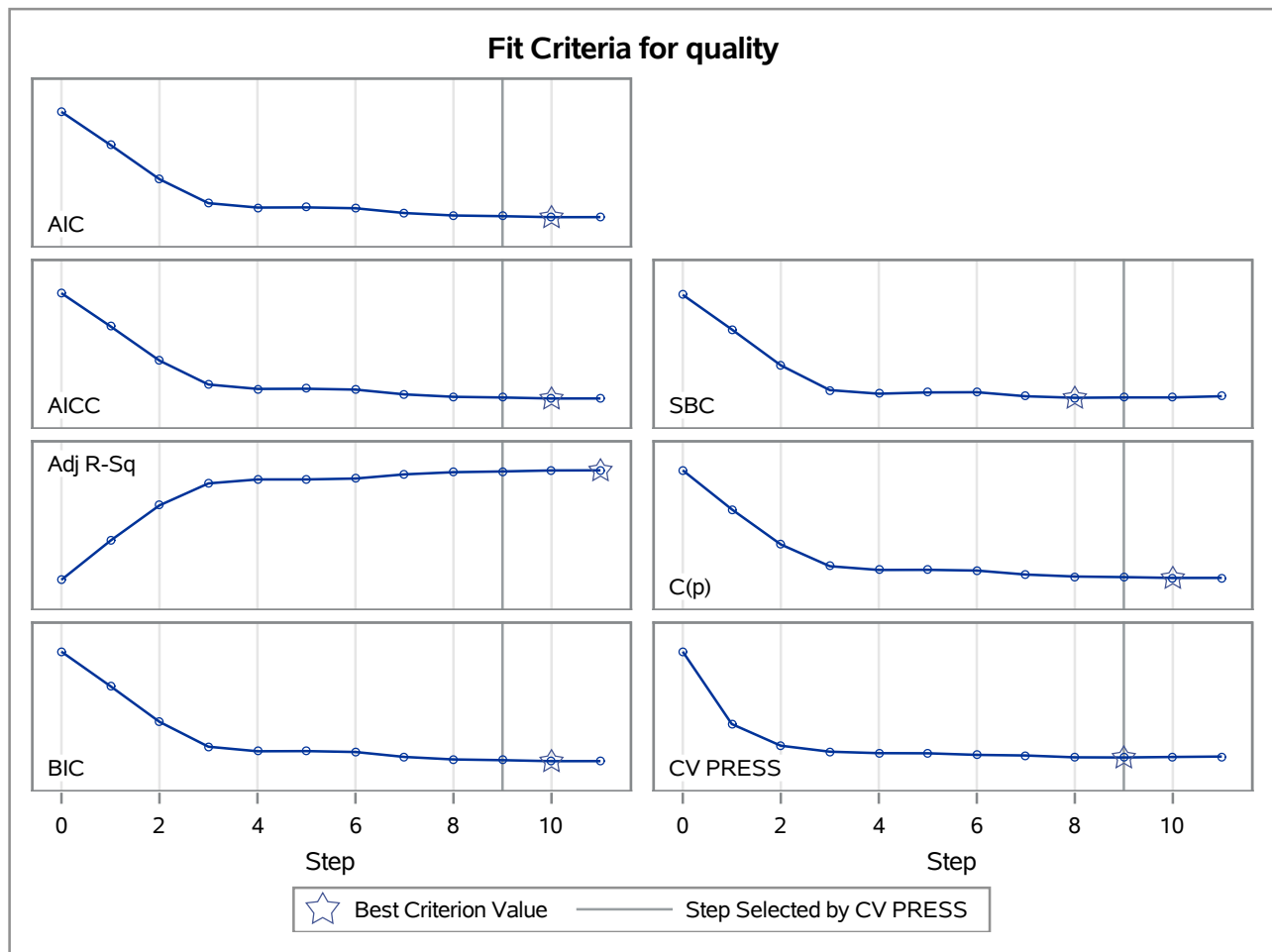
| LASSO Selection Summary | | | | | | |
|------------------------------|----------------------|----------------|----------|-----------|---------|--------|
| Step | Effect Entered | Effect Removed | Test ASE | CV PRESS | F Value | Pr > F |
| 0 | Intercept | | 0.6784 | 778.8299 | 0.00 | 1.0000 |
| 1 | alcohol | | 0.6053 | 594.5172 | 176.76 | <.0001 |
| 2 | volatile_acidity | | 0.5225 | 539.3601 | 183.11 | <.0001 |
| 3 | Sulphates | | 0.4688 | 524.1639 | 125.99 | <.0001 |
| 4 | log_total_sulfur_dio | | 0.4595 | 520.3949 | 23.76 | <.0001 |
| 5 | log_fixed_acidity | | 0.4590 | 520.0733 | 1.17 | 0.2792 |
| 6 | chlorides | | 0.4561 | 516.0275 | 6.14 | 0.0133 |
| 7 | pH | | 0.4444 | 514.4822 | 25.73 | <.0001 |
| 8 | log_free_sulfur_diox | | 0.4421 | 509.8011 | 14.04 | 0.0002 |
| 9 | citric_acid | | 0.4419 | 509.4365* | 5.42 | 0.0201 |
| 10 | residual_sugar | | 0.4434 | 510.7176 | 6.93 | 0.0086 |
| 11 | density | | 0.4445 | 511.7623 | 1.70 | 0.1932 |
| * Optimal Value of Criterion | | | | | | |

Selection stopped because all effects are in the final model.

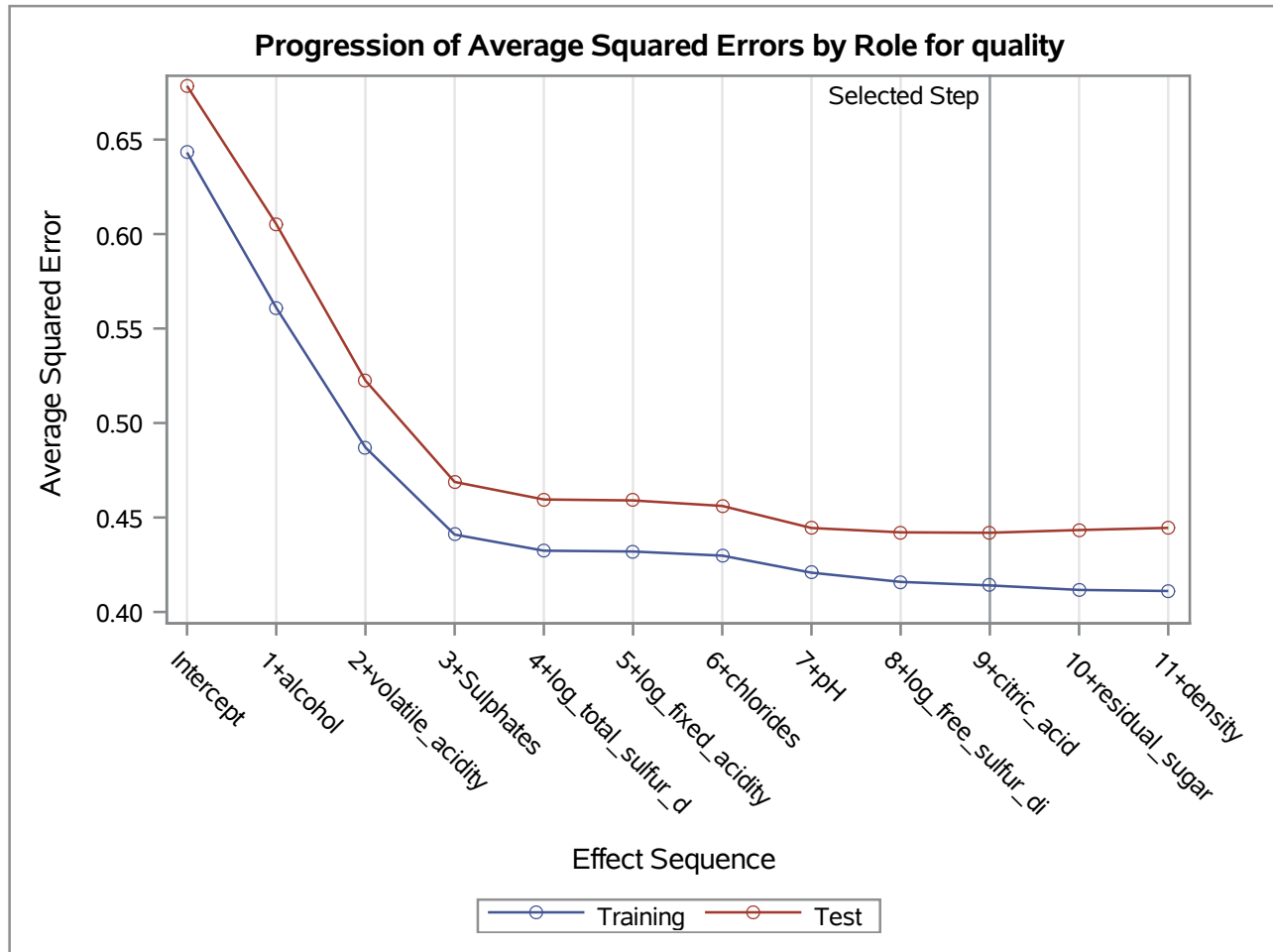
The GLMSELECT Procedure



The GLMSELECT Procedure



The GLMSELECT Procedure



The GLMSELECT Procedure Selected Model

The selected model, based on Cross Validation, is the model at Step 9.

| | |
|-----------------|---|
| Effects: | Intercept log_fixed_acidity volatile_acidity citric_acid chlorides log_free_sulfur_diox log_total_sulfur_dio pH Sulphates alcohol |
|-----------------|---|

| Analysis of Variance | | | | |
|------------------------|------|----------------|-------------|---------|
| Source | DF | Sum of Squares | Mean Square | F Value |
| Model | 9 | 277.00896 | 30.77877 | 73.72 |
| Error | 1199 | 500.58575 | 0.41750 | |
| Corrected Total | 1208 | 777.59471 | | |

| | |
|-----------------------|-------------|
| Root MSE | 0.64614 |
| Dependent Mean | 5.63689 |
| R-Square | 0.3562 |
| Adj R-Sq | 0.3514 |
| AIC | 164.94014 |
| AICC | 165.16069 |
| BIC | -1044.00393 |
| C(p) | 16.62763 |
| SBC | -995.08437 |
| ASE (Train) | 0.41405 |
| ASE (Test) | 0.44193 |
| CV PRESS | 509.43649 |

The GLMSELECT Procedure
Selected Model

| Parameter Estimates | | |
|----------------------|----|-----------|
| Parameter | DF | Estimate |
| Intercept | 1 | 3.933787 |
| log_fixed_acidity | 1 | 0.146681 |
| volatile_acidity | 1 | -0.895544 |
| citric_acid | 1 | -0.084370 |
| chlorides | 1 | -1.294834 |
| log_free_sulfur_diox | 1 | 0.190538 |
| log_total_sulfur_dio | 1 | -0.326972 |
| pH | 1 | -0.337718 |
| Sulphates | 1 | 0.864812 |
| alcohol | 1 | 0.290706 |

The GLMSELECT Procedure

| | |
|--|------------------|
| Data Set | WORK.TRAIN |
| Test Data Set | WORK.TEST |
| Dependent Variable | quality |
| Selection Method | ELASTICNET |
| Stop at Specified Number of Steps | 120 |
| Choose Criterion | Cross Validation |
| Cross Validation Method | Split |
| Cross Validation Fold | 10 |
| Effect Hierarchy Enforced | None |

| Observation Profile for Analysis Data | |
|---|------|
| Number of Observations Read | 1209 |
| Number of Observations Used | 1209 |
| Number of Observations Used for Training | 1209 |

| Observation Profile for Test Data | |
|------------------------------------|-----|
| Number of Observations Read | 390 |
| Number of Observations Used | 390 |

| Dimensions | |
|-----------------------------|----|
| Number of Effects | 12 |
| Number of Parameters | 12 |

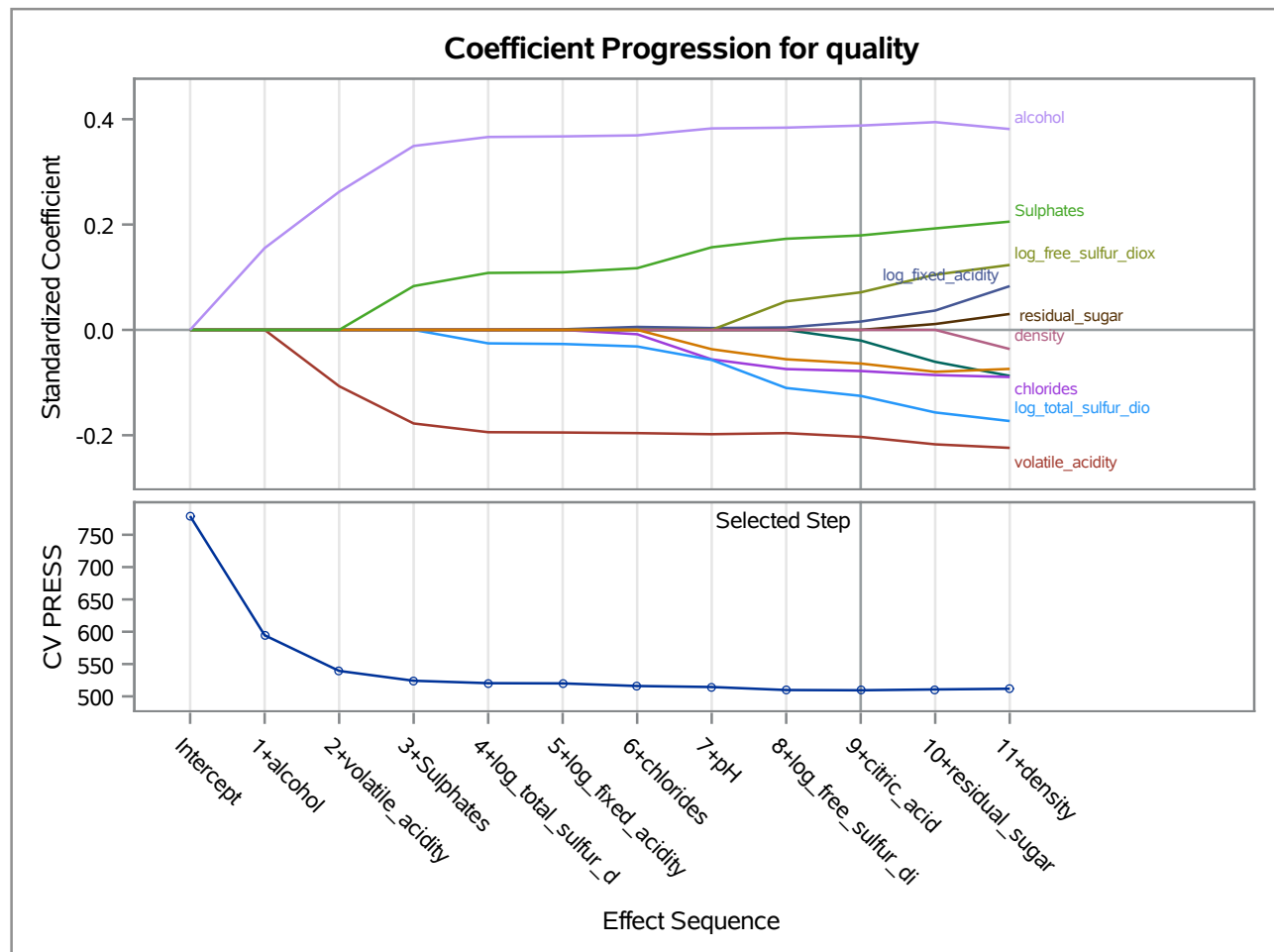
The GLMSELECT Procedure

| Elastic Net Selection Summary | | | | | | | | | | | |
|-------------------------------|----------------------|----------------|-------------------|----------------|-------------------|-----------|-----------|-------------|----------|------------|--------|
| Step | Effect Entered | Effect Removed | Number Effects In | Model R-Square | Adjusted R-Square | AIC | AICC | BIC | CP | SBC | ASE |
| 0 | Intercept | | 1 | 0.0000 | 0.0000 | 679.4158 | 679.4258 | -530.5443 | 665.7854 | -526.4866 | 0.6432 |
| 1 | alcohol | | 2 | 0.1277 | 0.1270 | 516.1846 | 516.2045 | -693.9901 | 428.5558 | -684.6203 | 0.5610 |
| 2 | volatile_acidity | | 3 | 0.2427 | 0.2415 | 347.2878 | 347.3211 | -862.6408 | 215.2239 | -848.4195 | 0.4871 |
| 3 | Sulphates | | 4 | 0.3144 | 0.3127 | 229.0574 | 229.1072 | -980.4166 | 82.9729 | -961.5524 | 0.4410 |
| 4 | log_total_sulfur_dio | | 5 | 0.3277 | 0.3254 | 207.4286 | 207.4985 | -1001.9726 | 60.1225 | -978.0836 | 0.4324 |
| 5 | log_fixed_acidity | | 6 | 0.3283 | 0.3255 | 208.2512 | 208.3445 | -1001.2183 | 60.8969 | -972.1635 | 0.4320 |
| 6 | chlorides | | 7 | 0.3317 | 0.3284 | 204.0898 | 204.2098 | -1005.3880 | 56.5026 | -971.2274 | 0.4298 |
| 7 | pH | | 8 | 0.3458 | 0.3419 | 180.4580 | 180.6081 | -1028.7545 | 32.2490 | -989.7616 | 0.4208 |
| 8 | log_free_sulfur_diox | | 9 | 0.3533 | 0.3490 | 168.3907 | 168.5744 | -1040.6401 | 20.0753 | -996.7313* | 0.4159 |
| 9 | citric_acid | | 10 | 0.3562 | 0.3514 | 164.9401 | 165.1607 | -1044.0039 | 16.6276 | -995.0844 | 0.4140 |
| 10 | residual_sugar | | 11 | 0.3599 | 0.3546 | 159.9681* | 160.2289* | -1048.8429* | 11.6950* | -994.9589 | 0.4117 |
| 11 | density | | 12 | 0.3608 | 0.3550* | 160.2573 | 160.5619 | -1048.5023 | 12.0000 | -989.5721 | 0.4111 |
| * Optimal Value of Criterion | | | | | | | | | | | |

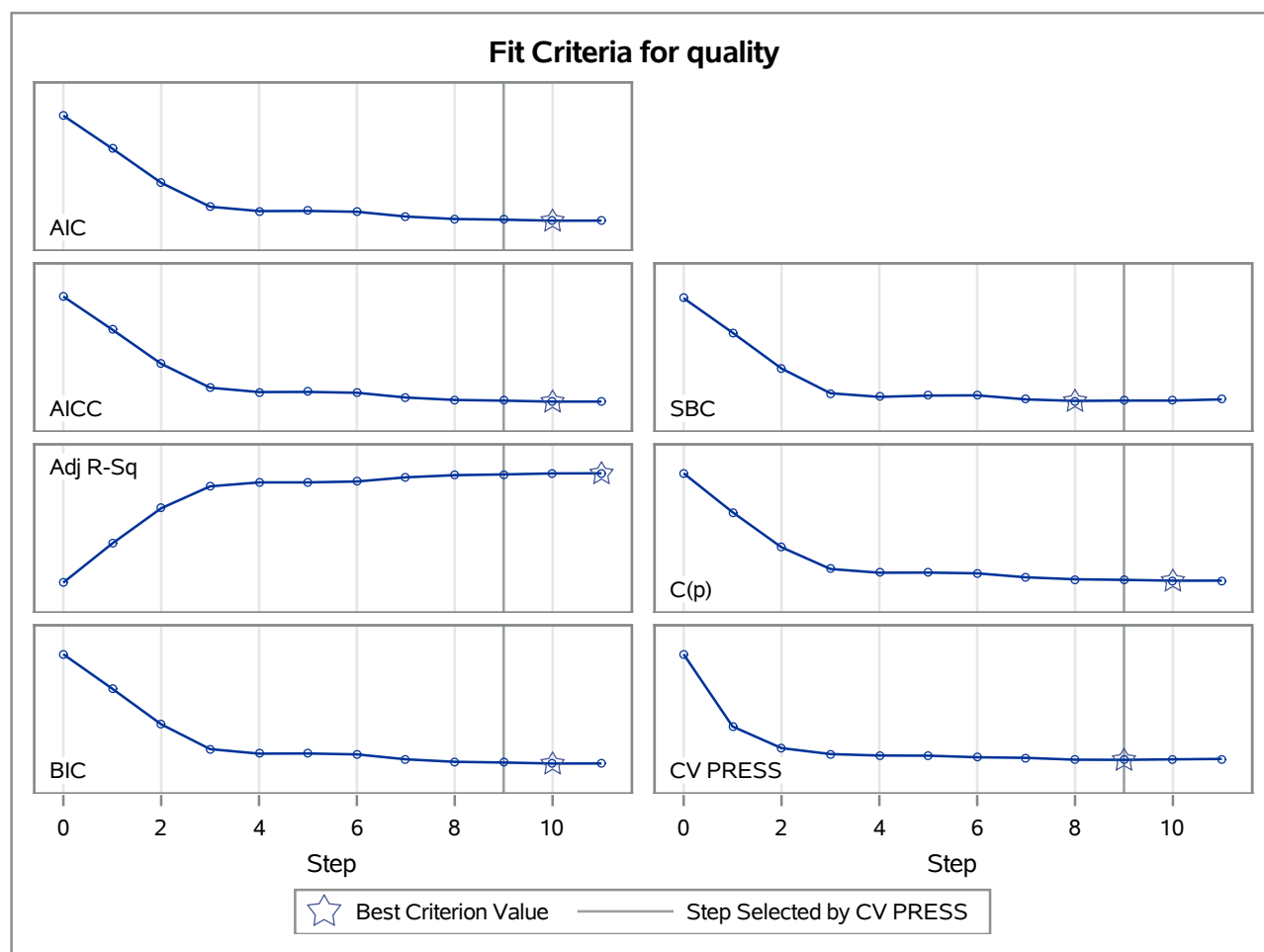
| Elastic Net Selection Summary | | | | | | |
|-------------------------------|----------------------|----------------|----------|-----------|---------|--------|
| Step | Effect Entered | Effect Removed | Test ASE | CV PRESS | F Value | Pr > F |
| 0 | Intercept | | 0.6784 | 778.8299 | 0.00 | 1.0000 |
| 1 | alcohol | | 0.6053 | 594.5172 | 176.76 | <.0001 |
| 2 | volatile_acidity | | 0.5225 | 539.3601 | 183.11 | <.0001 |
| 3 | Sulphates | | 0.4688 | 524.1639 | 125.99 | <.0001 |
| 4 | log_total_sulfur_dio | | 0.4595 | 520.3949 | 23.76 | <.0001 |
| 5 | log_fixed_acidity | | 0.4590 | 520.0733 | 1.17 | 0.2792 |
| 6 | chlorides | | 0.4561 | 516.0275 | 6.14 | 0.0133 |
| 7 | pH | | 0.4444 | 514.4822 | 25.73 | <.0001 |
| 8 | log_free_sulfur_diox | | 0.4421 | 509.8011 | 14.04 | 0.0002 |
| 9 | citric_acid | | 0.4419 | 509.4365* | 5.42 | 0.0201 |
| 10 | residual_sugar | | 0.4434 | 510.7176 | 6.93 | 0.0086 |
| 11 | density | | 0.4445 | 511.7623 | 1.70 | 0.1932 |
| * Optimal Value of Criterion | | | | | | |

Selection stopped because all effects are in the final model.

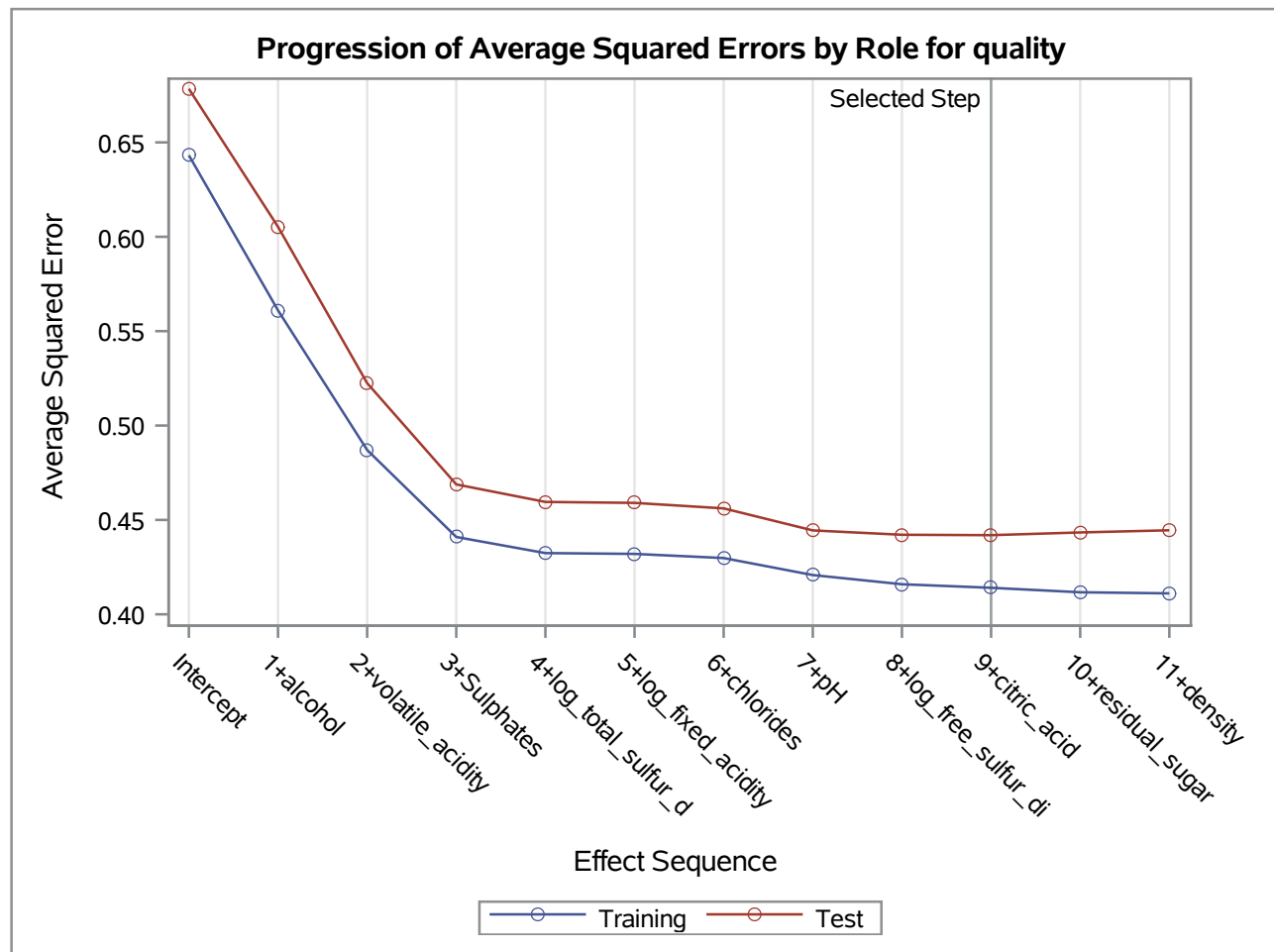
The GLMSELECT Procedure



The GLMSELECT Procedure



The GLMSELECT Procedure



The GLMSELECT Procedure Selected Model

The selected model, based on Cross Validation, is the model at Step 9.

| | |
|-----------------|---|
| Effects: | Intercept log_fixed_acidity volatile_acidity citric_acid chlorides log_free_sulfur_diox log_total_sulfur_dio pH Sulphates alcohol |
|-----------------|---|

| Analysis of Variance | | | | |
|------------------------|------|----------------|-------------|---------|
| Source | DF | Sum of Squares | Mean Square | F Value |
| Model | 9 | 277.00896 | 30.77877 | 73.72 |
| Error | 1199 | 500.58575 | 0.41750 | |
| Corrected Total | 1208 | 777.59471 | | |

| | |
|-----------------------|-------------|
| Root MSE | 0.64614 |
| Dependent Mean | 5.63689 |
| R-Square | 0.3562 |
| Adj R-Sq | 0.3514 |
| AIC | 164.94014 |
| AICC | 165.16069 |
| BIC | -1044.00393 |
| C(p) | 16.62763 |
| SBC | -995.08437 |
| ASE (Train) | 0.41405 |
| ASE (Test) | 0.44193 |
| CV PRESS | 509.43649 |

**The GLMSELECT Procedure
Selected Model**

| Parameter Estimates | | |
|----------------------|----|-----------|
| Parameter | DF | Estimate |
| Intercept | 1 | 3.933787 |
| log_fixed_acidity | 1 | 0.146681 |
| volatile_acidity | 1 | -0.895544 |
| citric_acid | 1 | -0.084370 |
| chlorides | 1 | -1.294834 |
| log_free_sulfur_diox | 1 | 0.190538 |
| log_total_sulfur_dio | 1 | -0.326972 |
| pH | 1 | -0.337718 |
| Sulphates | 1 | 0.864812 |
| alcohol | 1 | 0.290706 |