The Australian Wine Research Institute

AWRI COMMERCIAL SERVICES
SO MUCH MORE THAN A GREAT LAB

2017 Metals Survey – Data Summary

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Preface

AWRI Commercial Services conducts periodic surveys of data from wines submitted for metals analysis. This document presents aggregated data from more than 1,200 Australian wines analysed from October 2016 to September 2017. The samples include only finished commercially produced wines, 55% red and 45% white, with sparkling and fortified wines excluded. Metals were analysed using inductively coupled plasma mass spectrometry at the AWRI's NATA ISO 17025 accredited laboratory.

In the following pages the data from this survey is summarised as both a table (Table 1) and individual distribution graphs for each element, as well as the one-way ANOVA analysis for the difference for each element between red and white means.

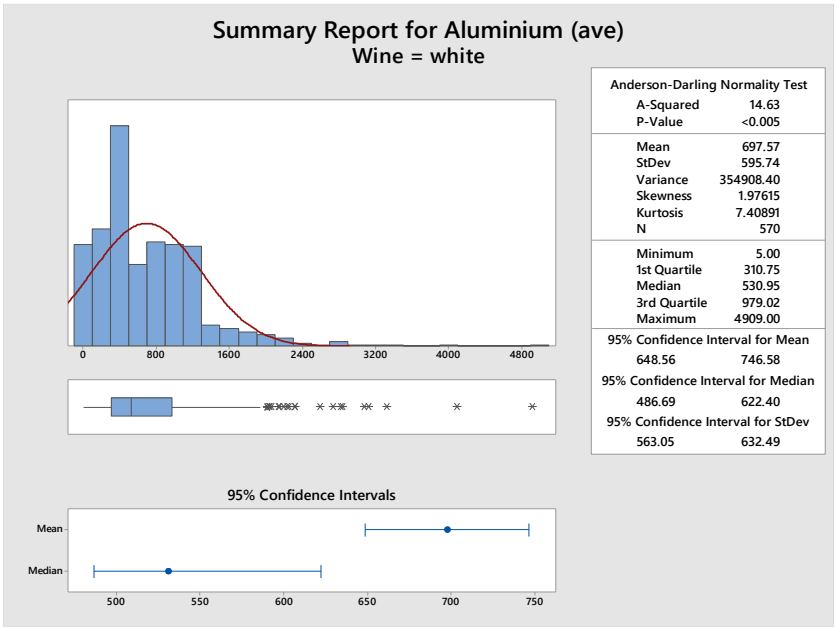
No interpretations of the results are provided; however, an article discussing the results was published in the April 2018 edition of *AWRI Technical Review* (https://www.awri.com.au/information_services/technical_review/).

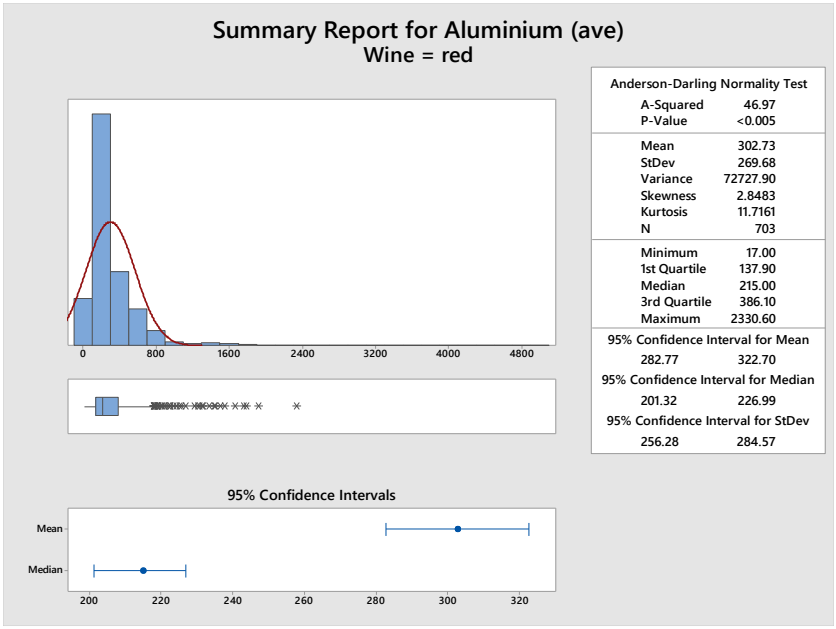
The following points should be noted when viewing the data:

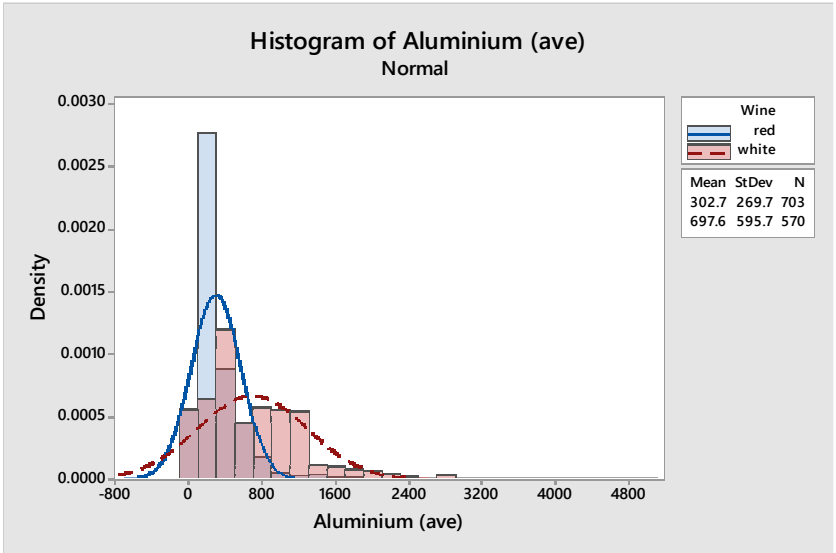
1) In the table of results the units of measurement differ for different elements depending on the quantities to be generally found in wine. The units for each metal, ppm (mg/L) or ppb (µg/L) can be found directly under the metal in question in the first column of the table. The units used in the following pages are all consistent with the use in the table.
2) All statistical analysis and graphing was carried out using Minitab software V18.0.
3) In the combined histogram for each metal the y axis shows units of density. This represents the number of samples as a proportion of the total set. Data is presented in this manner to allow differing size data sets (reds and whites) to be presented together in a meaningful way.

Table 1.

	Wine	N	Mean	SE Mean	StDev	Min	Q1	Median	Q3	Max	Range
Aluminium	red	703	302.7	10.2	269.7	17	137.9	215	386.1	2330.6	2313.6
ppb	white	570	697.6	25	595.7	5	310.8	531	979	4909	4904
Arsenic	red	703	2.4427	0.0891	2.3617	1	1	2	3	20.2	19.2
ppb	white	571	3.799	0.15	3.576	1	1	3.1	5	33.8	32.8
Cadmium	red	703	1.0357	0.0106	0.2816	1	1	1	1	3.7	2.7
ppb	white	571	1.0322	0.0144	0.3431	1	1	1	1	6.5	5.5
Calcium	red	705	67.187	0.633	16.811	5	57	67	77	187	182
ppm	white	577	76.58	1.15	27.72	5	64	76	92	188	183
Chromium	red	703	13.361	0.247	6.555	1	9.8	13	16.2	73	72
ppb	white	570	9.691	0.31	7.411	1	6	8.1	11.5	67	66
Cobalt	red	703	4.461	0.113	2.997	1	2.7	3.9	5.6	32.9	31.9
ppb	white	570	3.464	0.0979	2.3378	1	1	3.3	4.5	21.9	20.9
Copper	red	705	0.2662	0.0118	0.3125	0.05	0.05	0.2	0.3	4.1	4.05
ppm	white	577	0.3386	0.0372	0.8936	0.05	0.05	0.1	0.3	9.5	9.45
Iron	red	705	1.6571	0.0321	0.8525	0.15	1.1	1.5	2	7.52	7.37
ppm	white	576	0.9503	0.044	1.0555	0.15	0.4	0.7	1.1	12.4	12.25
Lead	red	702	3.713	0.0.223	5.909	1	1	2.6	3.9	99.5	98.5
ppb	white	563	10.151	0.465	24.12	1	5.1	8.6	12.0	124.1	123.1.8
Lithium	red	703	10.533	0.283	7.506	2.5	5	8.8	14.9	59.6	57.1
ppb	white	570	8.896	0.255	6.095	2.5	2.5	8.3	12.225	32.5	30
Magnesium	red	703	138.57	1.06	28.14	10	123.2	140.4	154.5	238.3	228.3
ppm	white	571	90.31	1.41	33.65	10	77	88	103.5	291	281
Manganese	red	705	1.4466	0.0242	0.6415	0.15	1	1.3	1.8	5.7	5.55
ppm	white	577	0.9608	0.0266	0.64	0.15	0.565	0.9	1.3	8.1	7.95
Nickel	red	703	14.346	0.489	12.976	1	10.1	12.8	16.6	311.3	310.3
ppb	white	569	13.843	0.5	11.921	1	7.75	11.4	15.9	95.7	94.7
Palladium	red	703	1.4211	0.0531	1.4092	1	1	1	1	17.9	16.9
ppb	white	571	1.5794	0.0697	1.666	1	1	1	1	15.1	14.1
Platinum	red	703	1.0043	0.00246	0.0652	1	1	1	1	2	1
ppb	white	571	1.0018	0.00175	0.0418	1	1	1	1	2	1
Potassium	red	705	1102.2	10.2	270.3	104	966	1088	1224	3540	3436
ppm	white	577	627.4	11.8	284.4	20	455	577	757	1873	1853
Selenium	red	703	1.7913	0.0906	2.402	1	1	1	1	27	26
ppb	white	570	1.541	0.0114	0.3011	1	1	1	1	21.1	20.1
Silver	red	697	1.0363	0.0018	0.0419	1	1	1	1	5.0	4.0
ppb	white	569	1.0018	0.0977	2.3357	1	1	1	1	2.0	1.0
Sodium	red	705	79.63	7.41	196.84	5	29	48	74.5	2029	2024
ppm	white	577	158.6	19.9	477.6	5	27	38	56	2829	2824
Strontium	red	703	1565.4	25.7	680.9	118	1053	1468	2011	4717	4599
ppb	white	571	830.1	25.2	602	1	466	680	1142	3754	3753
Tin	red	703	2.847	0.114	3.036	1	1	2	3.7	30.5	29.5
ppb	white	570	4.587	0.497	11.868	1	1	2.55	5	200	199
Vanadium	red	703	4.77	0.412	10.936	1	1	1	2.3	84.9	83.9
ppb	white	570	4.833	0.459	10.969	1	1	1	3.35	135.4	134.4
Zinc	red	703	993.7	16.4	435.9	35	676.4	979	1202	4089.9	4054.9
ppb	white	571	782.7	25	598.5	2.5	532	731.4	957	9333	9330.5







One-way ANOVA: Aluminium (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	9

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	49071727	49071727	246.52	0.000
Error	1271	252997865	199054		
Total	1272	302069592			

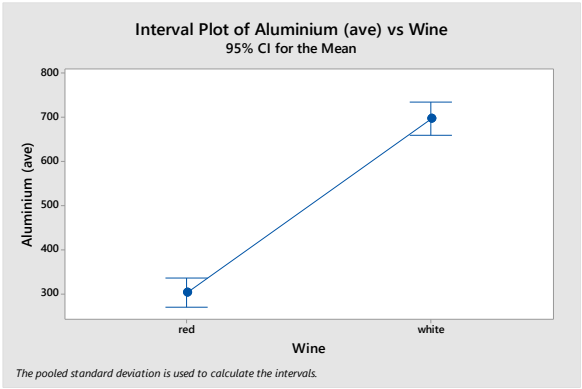
Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
446.155	16.25%	16.18%	15.96%

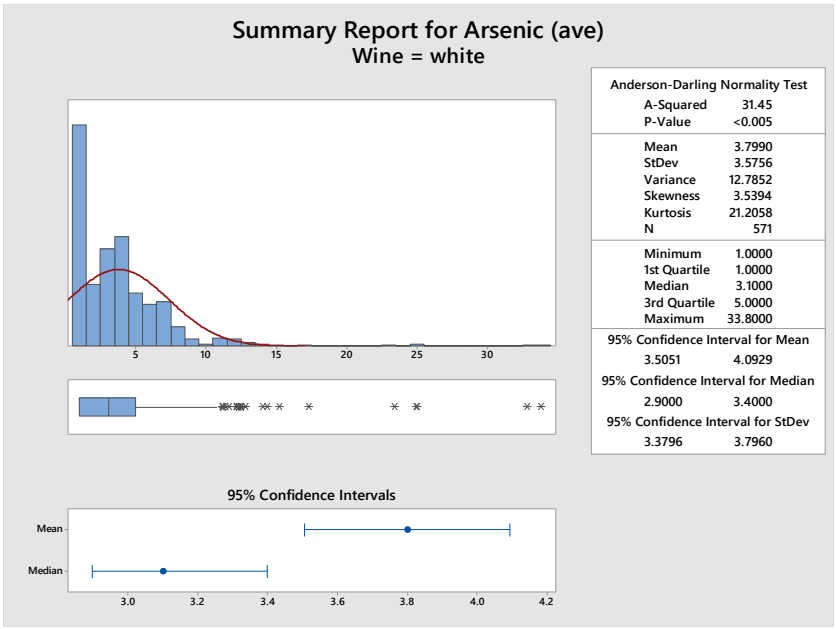
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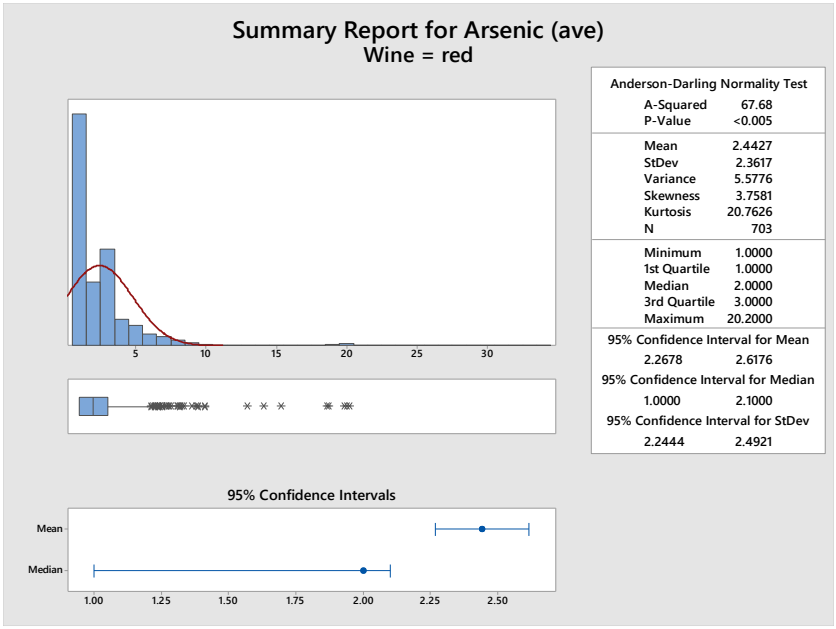
Wine	N	Mean	StDev	95% CI
red	703	302.7	269.7	(269.7, 335.7)
white	570	697.6	595.7	(660.9, 734.2)

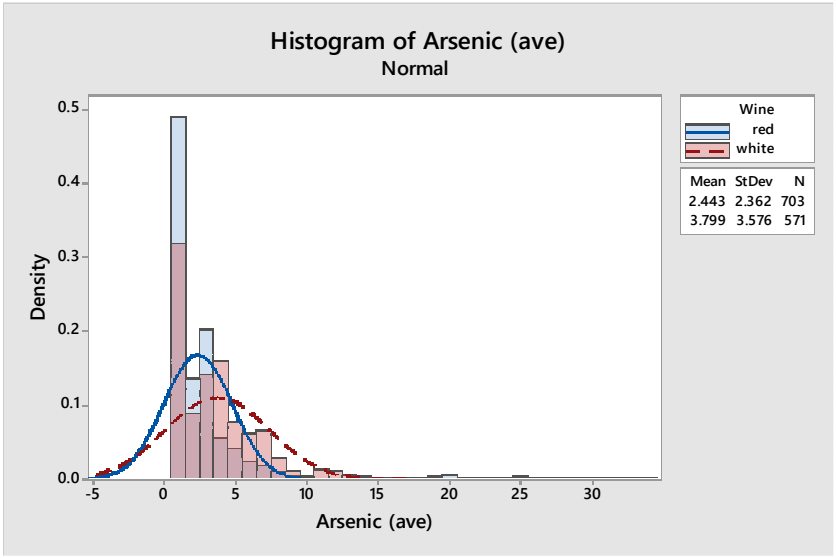
Pooled StDev = 446.155



The pooled standard deviation is used to calculate the intervals.







One-way ANOVA: Arsenic (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	8

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	579.7	579.660	65.82	0.000
Error	1272	11203.0	8.807		
Total	1273	11782.7			

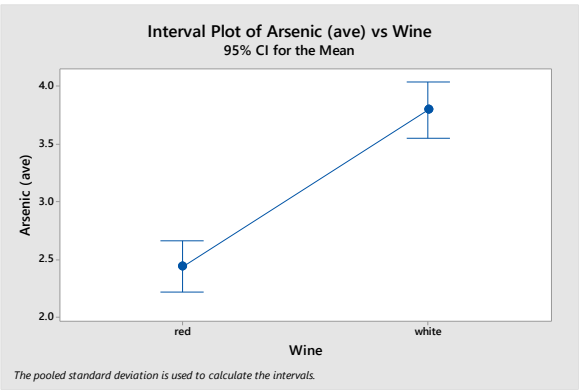
Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
2.96773	4.92%	4.84%	4.61%

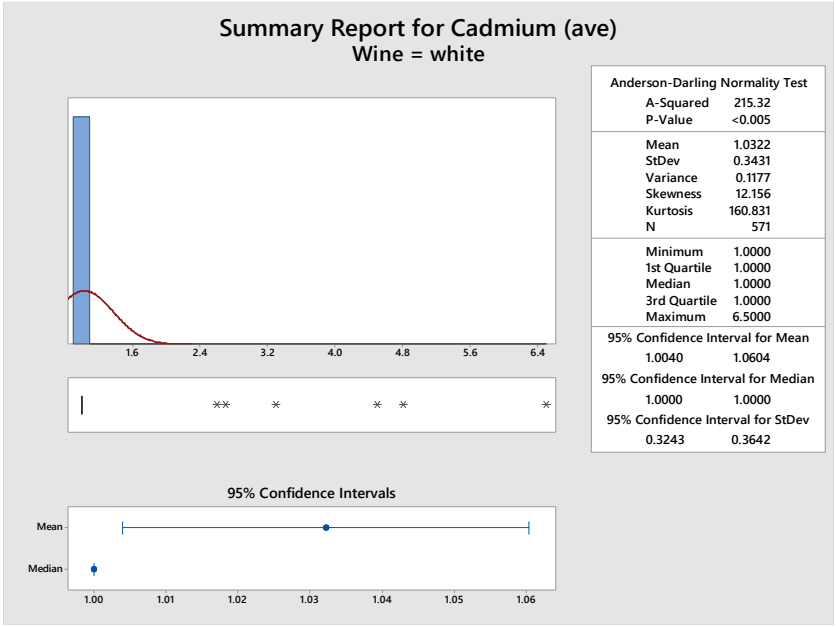
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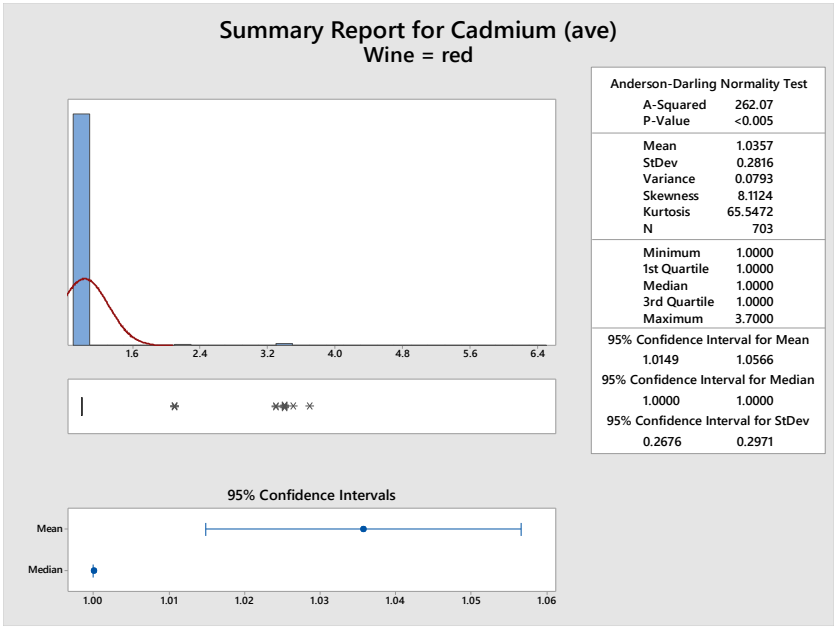
Wine	N	Mean	StDev	95% CI
red	703	2.4427	2.3617	(2.2231, 2.6623)
white	571	3.799	3.576	(3.555, 4.043)

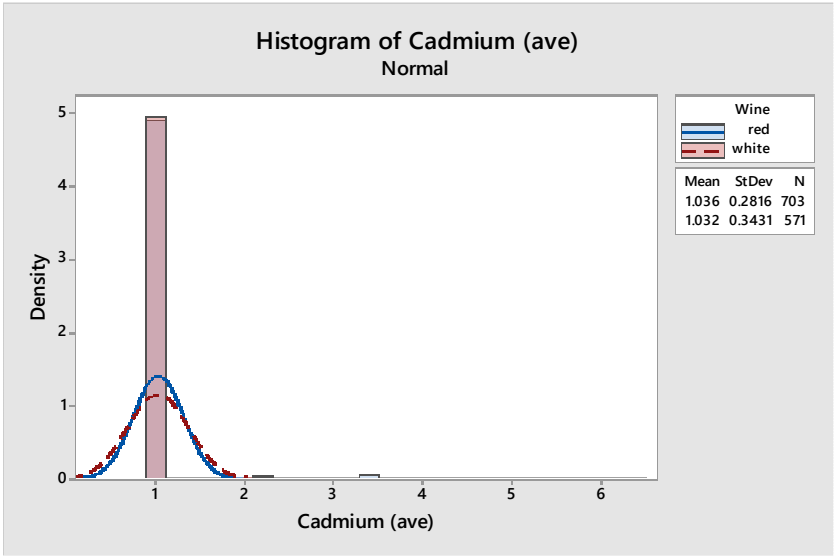
Pooled StDev = 2.96773



The pooled standard deviation is used to calculate the intervals.







One-way ANOVA: Cadmium (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	8

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	0.004	0.003816	0.04	0.842
Error	1272	122.741	0.096494		
Total	1273	122.745			

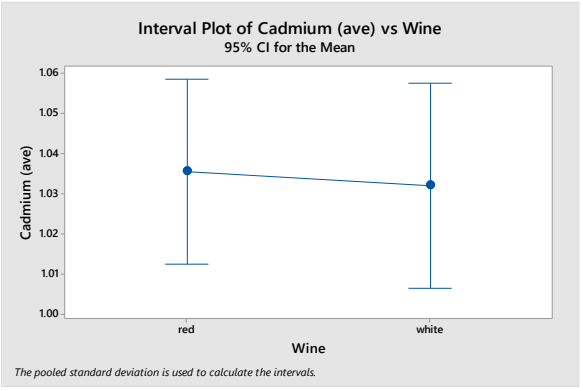
Model Summary

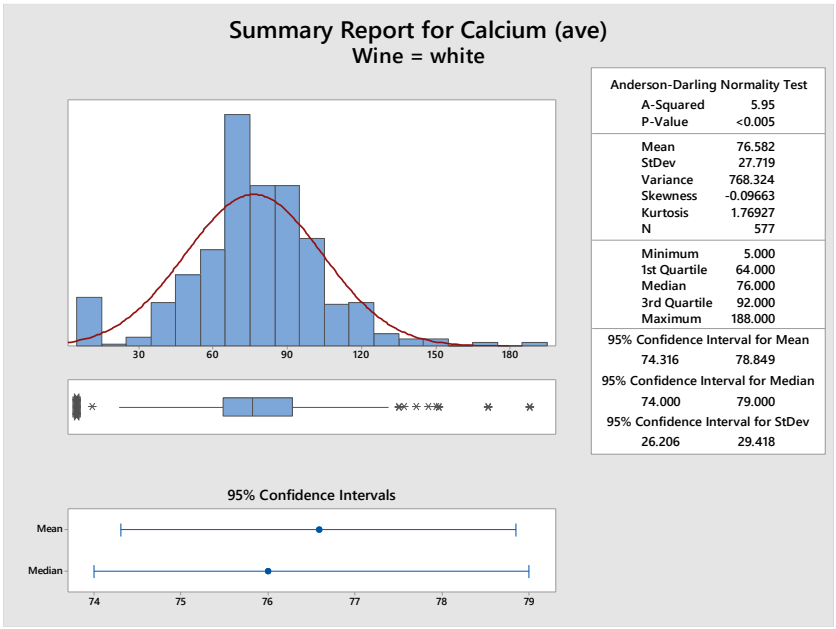
S	R-sq	R-sq(adj)	R-sq(pred)
0.310636	0.00%	0.00%	0.00%

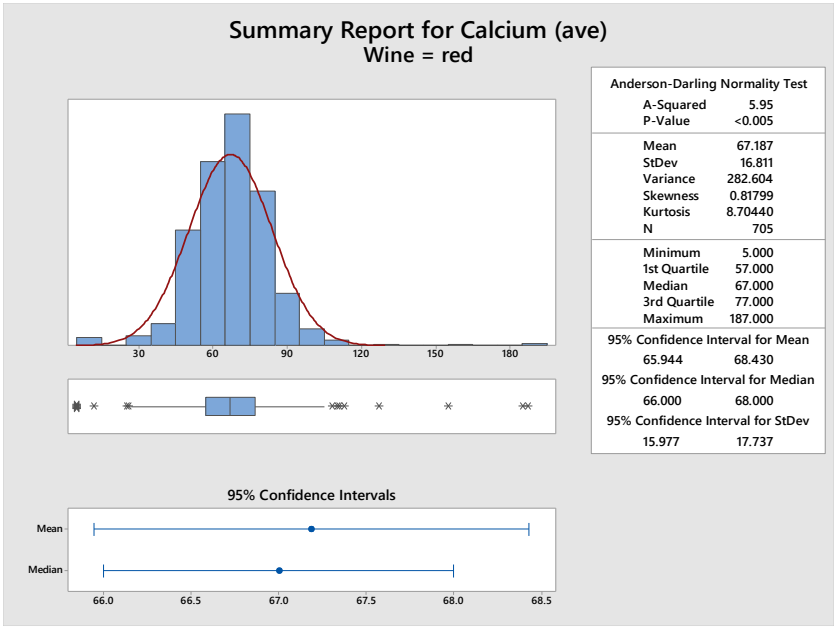
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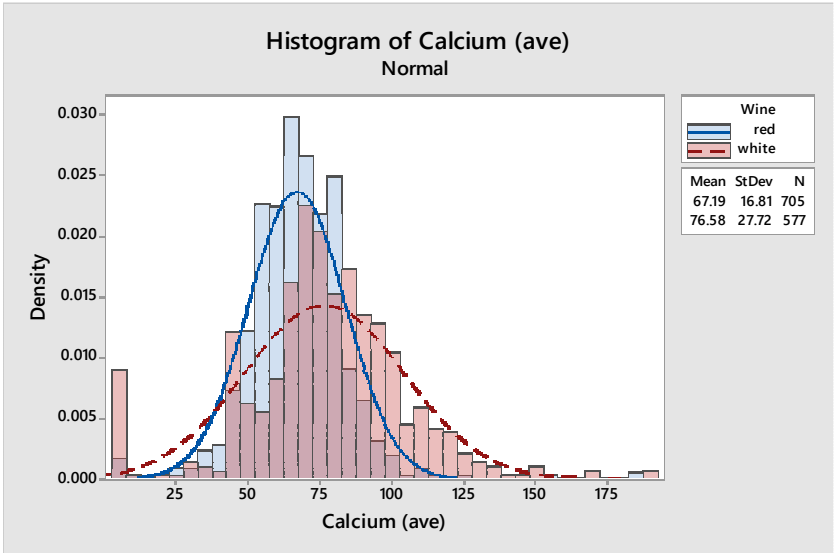
Wine	N	Mean	StDev	95% CI
red	703	1.0357	0.2816	(1.0127, 1.0587)
white	571	1.0322	0.3431	(1.0067, 1.0577)

Pooled StDev = 0.310636









One-way ANOVA: Calcium (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	28008	28007.8	55.88	0.000
Error	1280	641508	501.2		
Total	1281	669515			

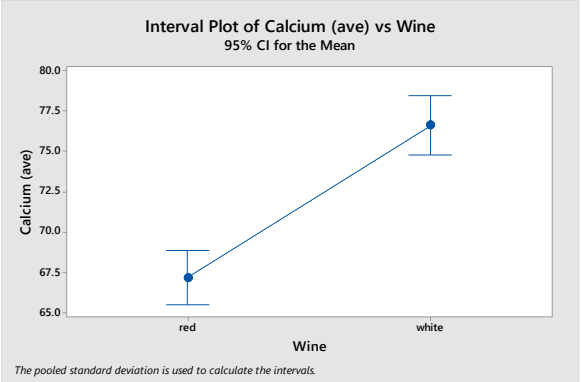
Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
22.3870	4.18%	4.11%	3.87%

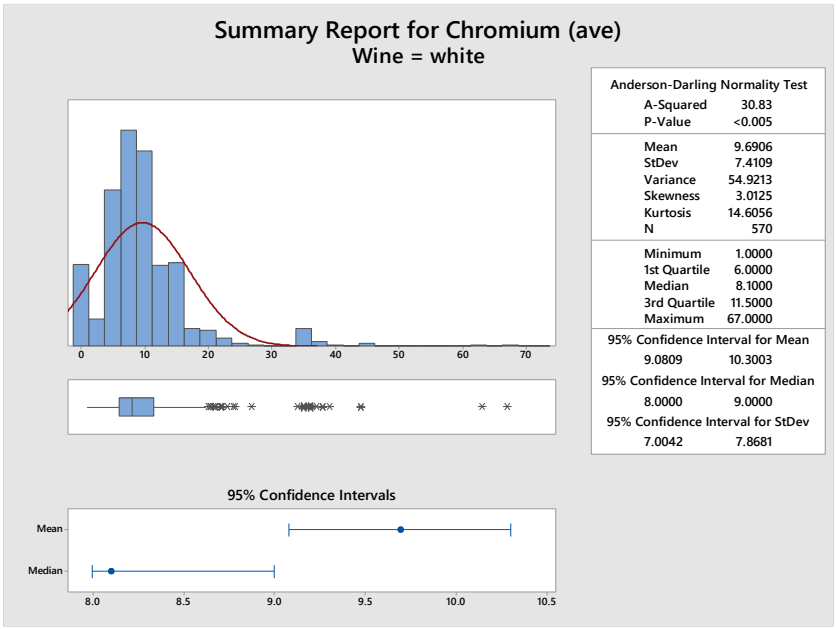
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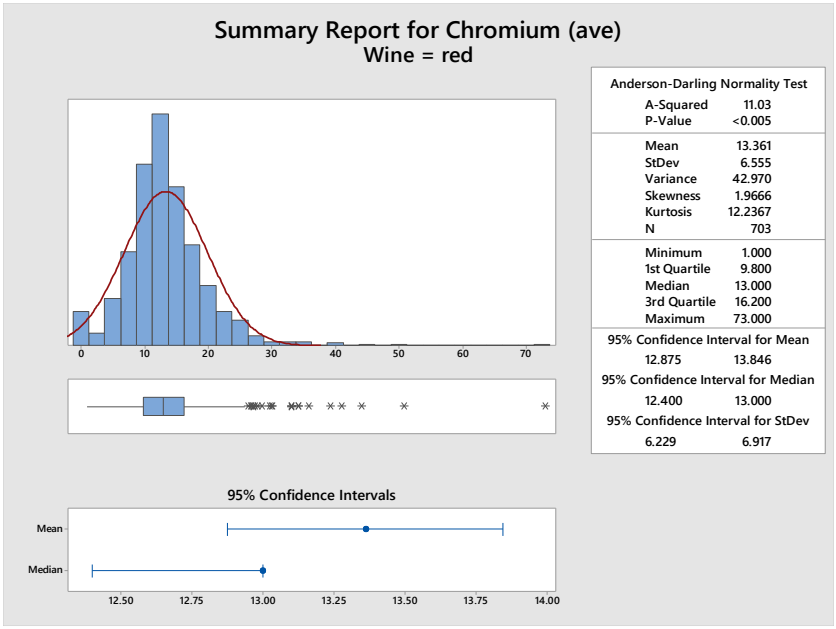
Wine	N	Mean	StDev	95% CI
red	705	67.187	16.811	(65.533, 68.841)
white	577	76.58	27.72	(74.75, 78.41)

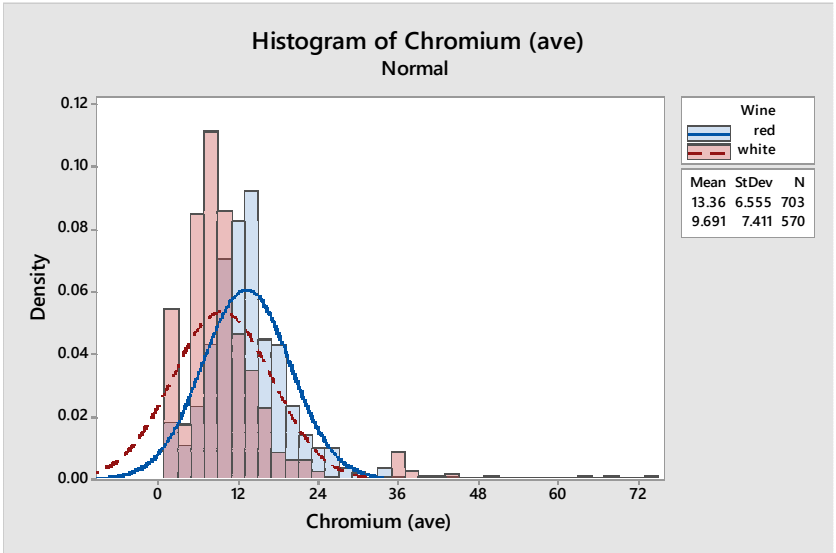
Pooled StDev = 22.3870



The pooled standard deviation is used to calculate the intervals.







One-way ANOVA: Chromium (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	9

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	4240	4239.65	87.74	0.000
Error	1271	61415	48.32		
Total	1272	65655			

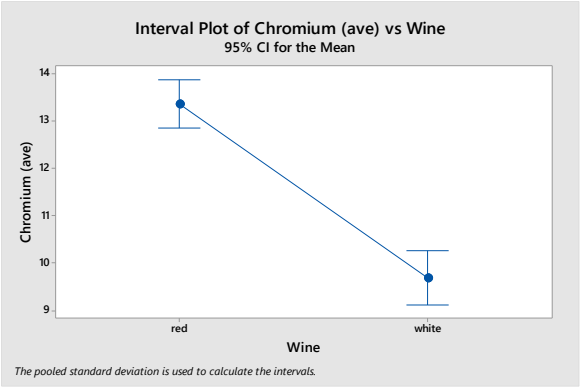
Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
6.95129	6.46%	6.38%	6.16%

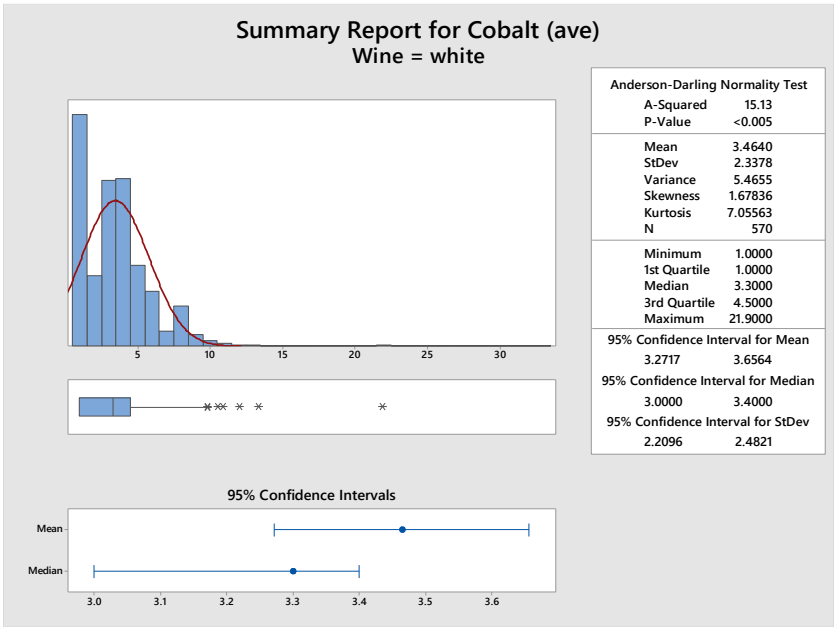
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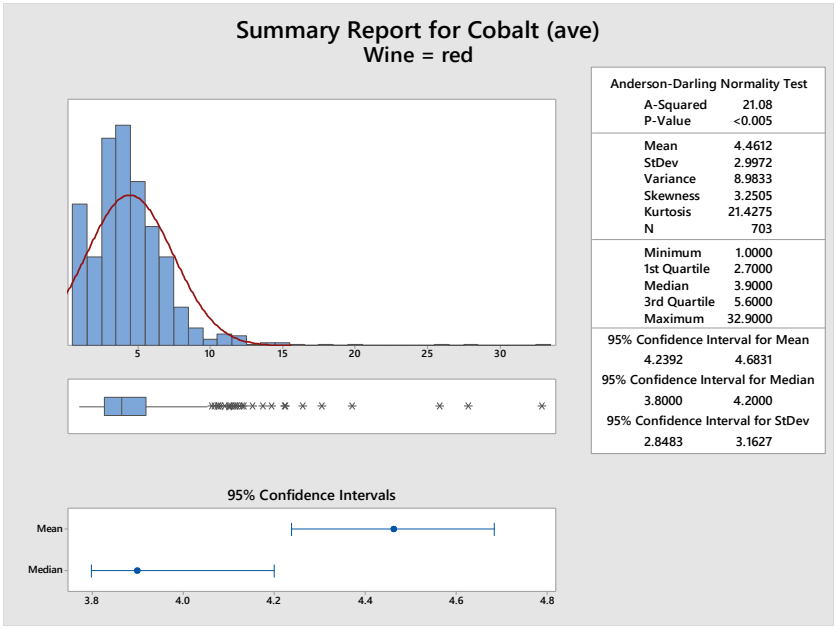
Wine	N	Mean	StDev	95% CI
red	703	13.361	6.555	(12.846, 13.875)
white	570	9.691	7.411	(9.119, 10.262)

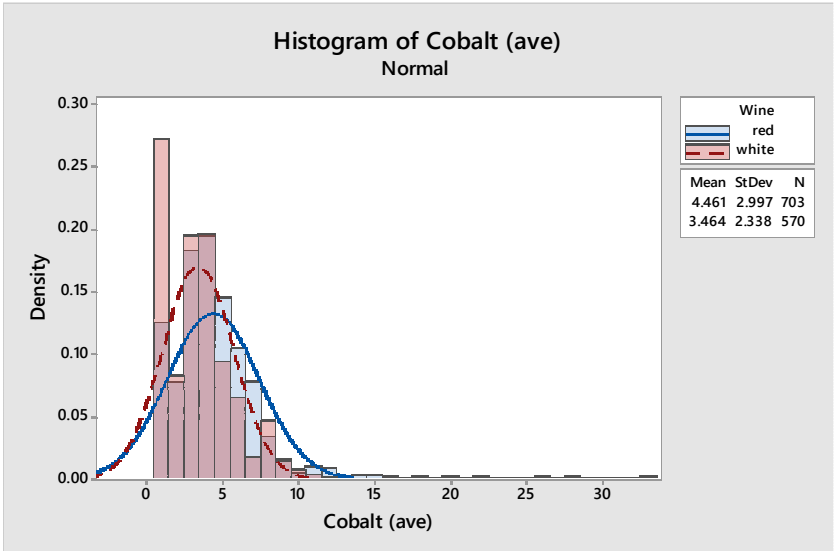
Pooled StDev = 6.95129



The pooled standard deviation is used to calculate the intervals.







One-way ANOVA: Cobalt (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	9

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	313.0	312.973	42.25	0.000
Error	1271	9416.2	7.408		
Total	1272	9729.1			

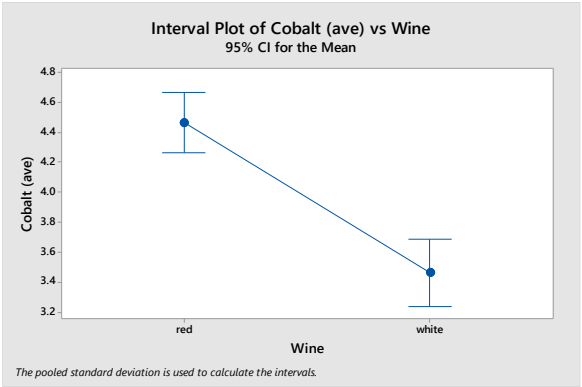
Model Summary

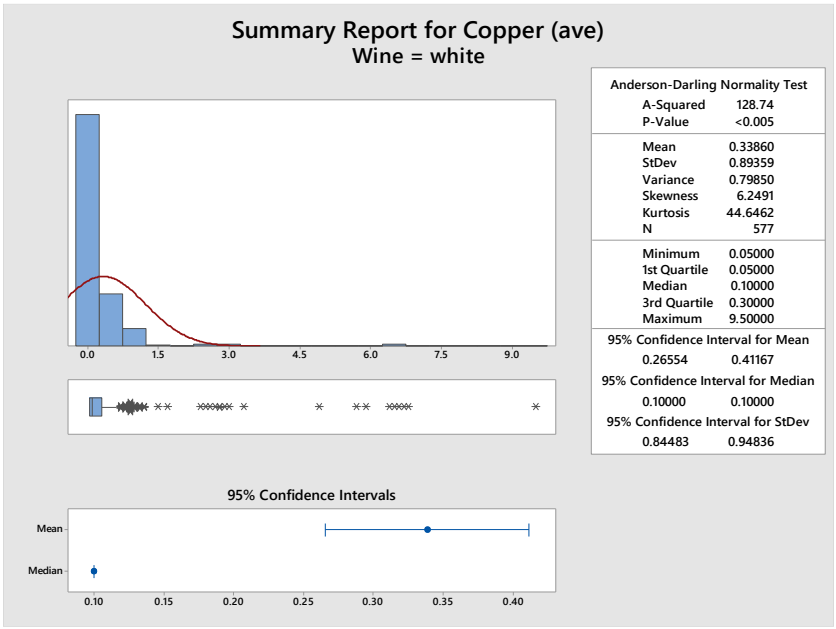
S	R-sq	R-sq(adj)	R-sq(pred)
2.72185	3.22%	3.14%	2.92%

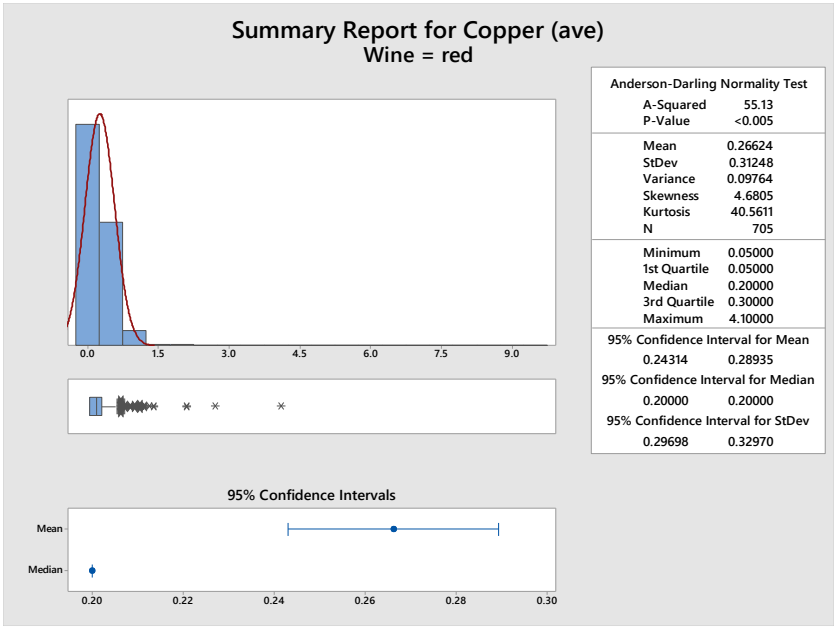
Means

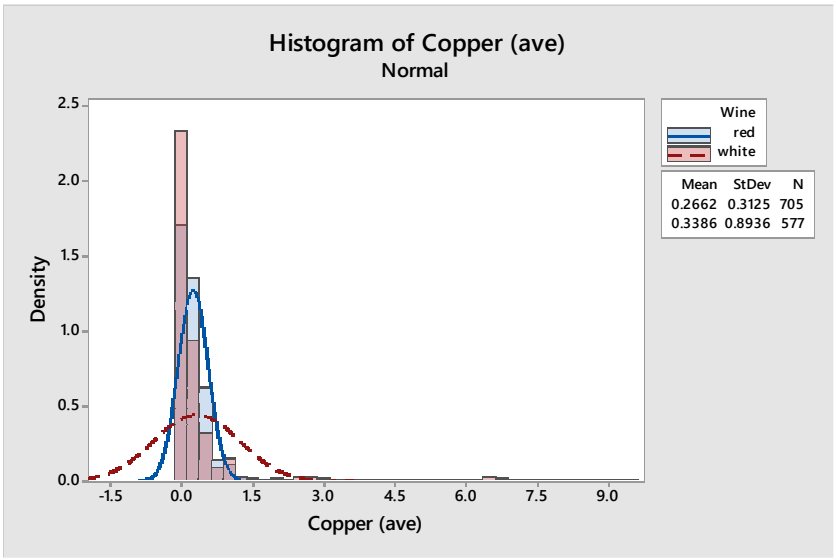
Wine	N	Mean	StDev	95% CI
red	703	4.461	2.997	(4.260, 4.663)
white	570	3.4640	2.3378	(3.2404, 3.6877)

Pooled StDev = 2.72185









One-way ANOVA: Copper (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	1.662	1.6616	4.02	0.045
Error	1280	528.675	0.4130		
Total	1281	530.336			

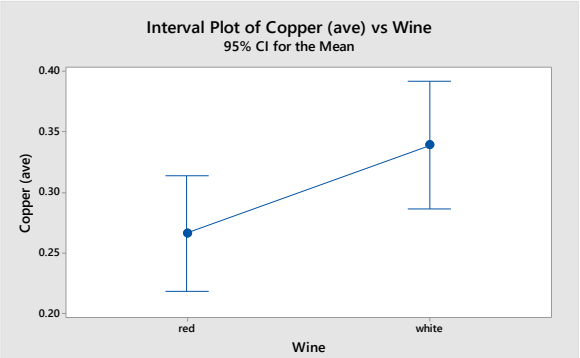
Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0.642672	0.31%	0.24%	0.00%

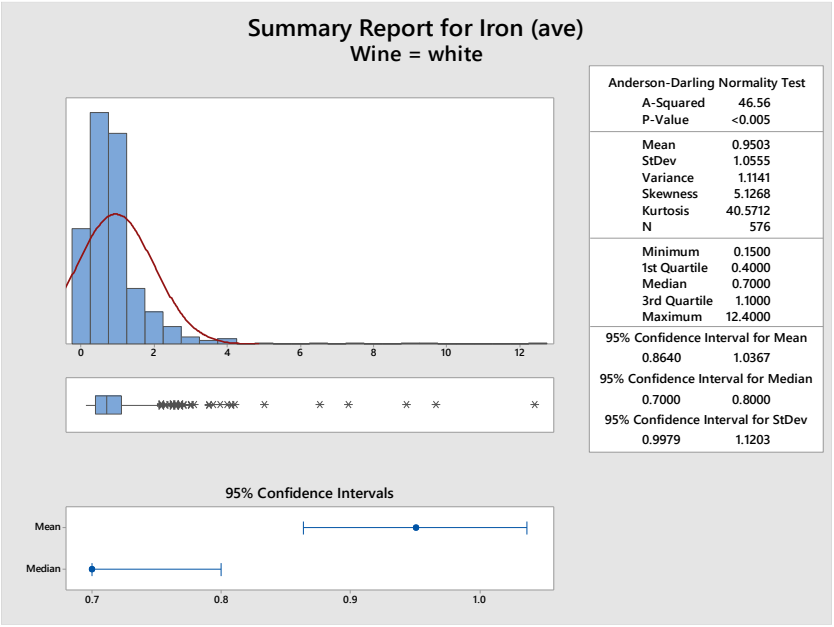
Means

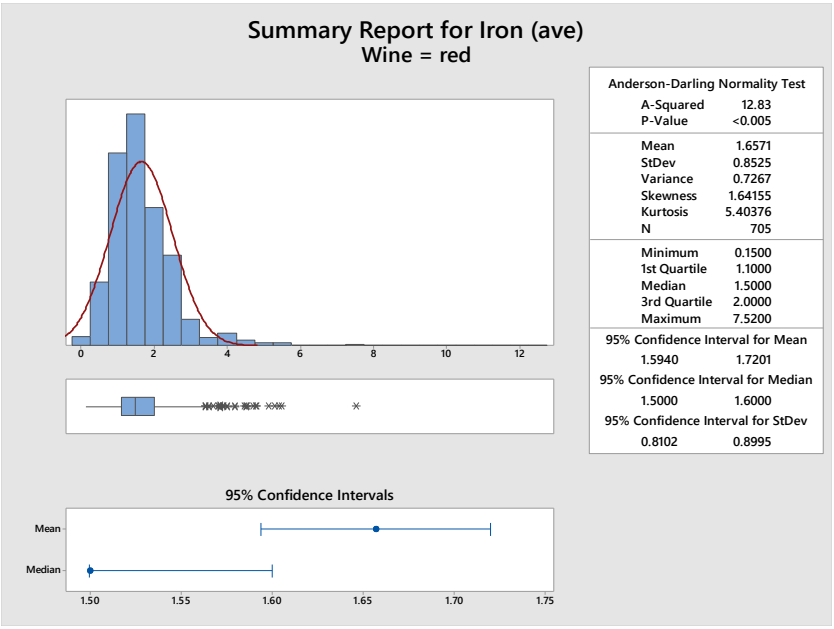
Wine	N	Mean	StDev	95% CI
red	705	0.2662	0.3125	(0.2188, 0.3137)
white	577	0.3386	0.8936	(0.2861, 0.3911)

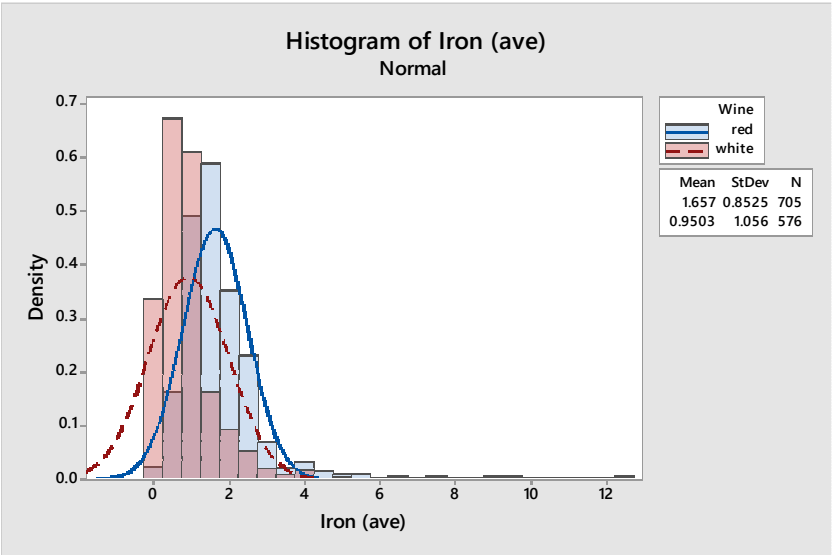
Pooled StDev = 0.642672



The pooled standard deviation is used to calculate the intervals.







One-way ANOVA: Iron (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	1

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	158.3	158.326	175.75	0.000
Error	1279	1152.2	0.901		
Total	1280	1310.6			

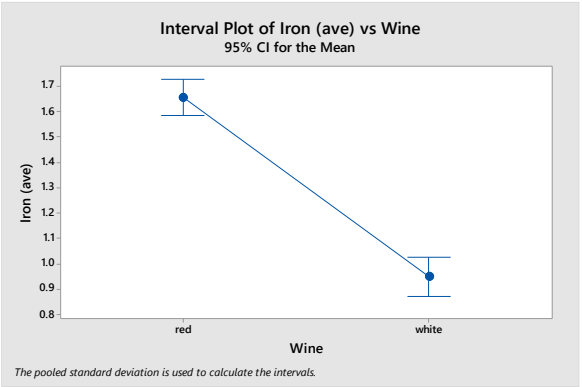
Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0.949149	12.08%	12.01%	11.80%

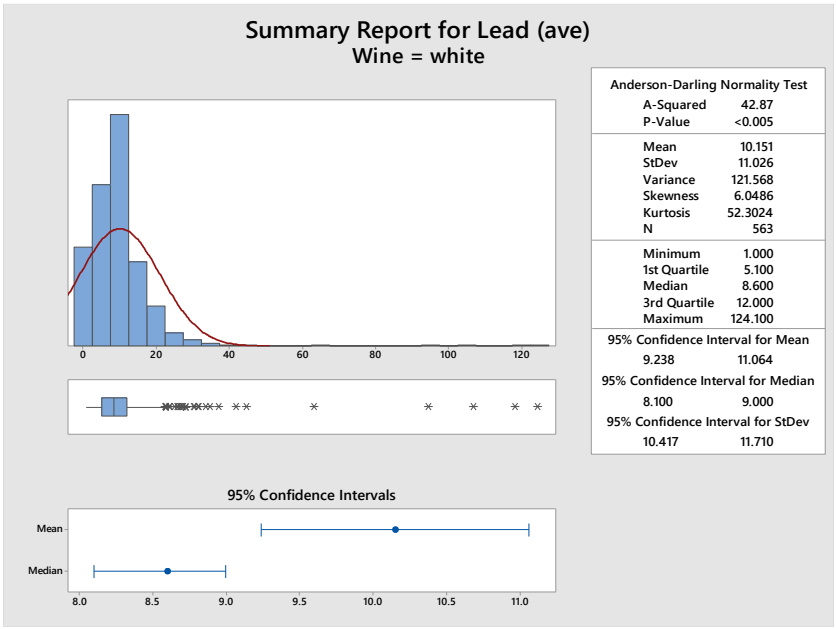
Means

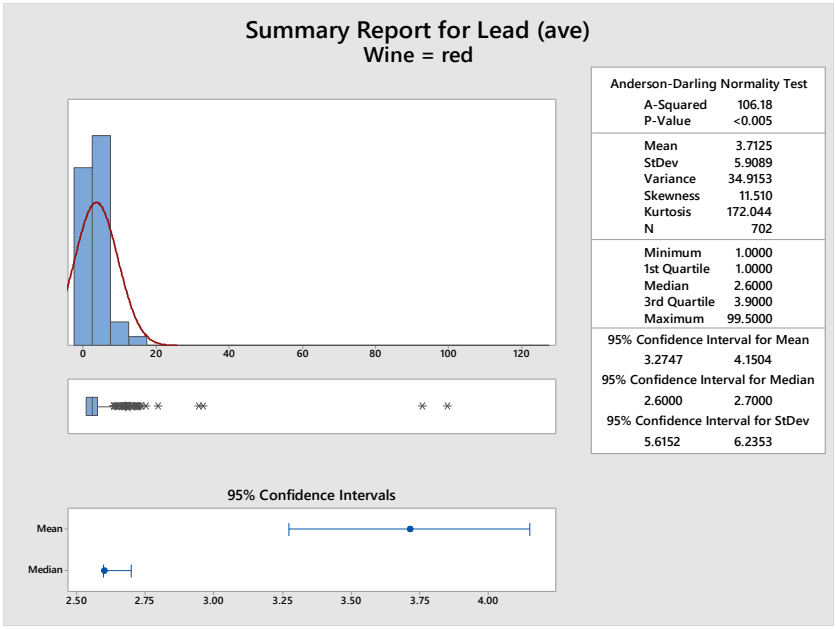
Wine	N	Mean	StDev	95% CI
red	705	1.6571	0.8525	(1.5869, 1.7272)
white	576	0.9503	1.0555	(0.8728, 1.0279)

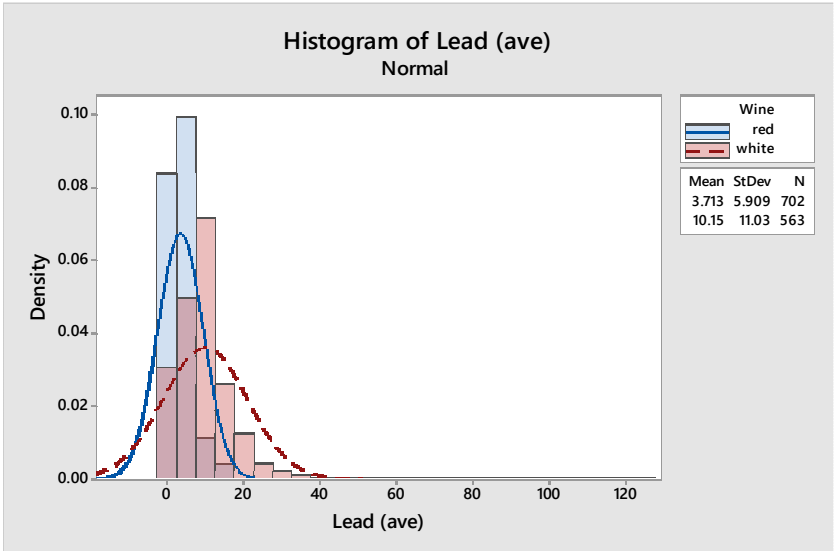
Pooled StDev = 0.949149



The pooled standard deviation is used to calculate the intervals.







One-way ANOVA: Lead (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	17

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	12952	12952.1	176.28	0.000
Error	1263	92797	73.5		
Total	1264	105749			

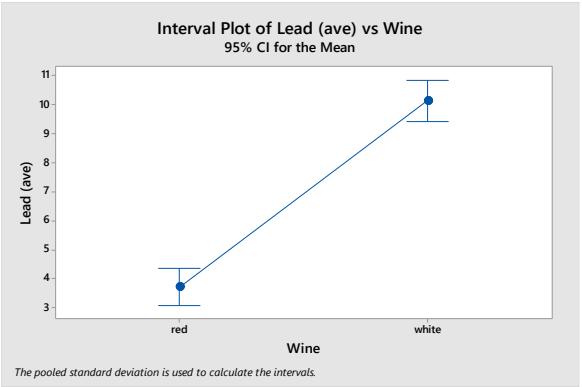
Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
8.57166	12.25%	12.18%	11.95%

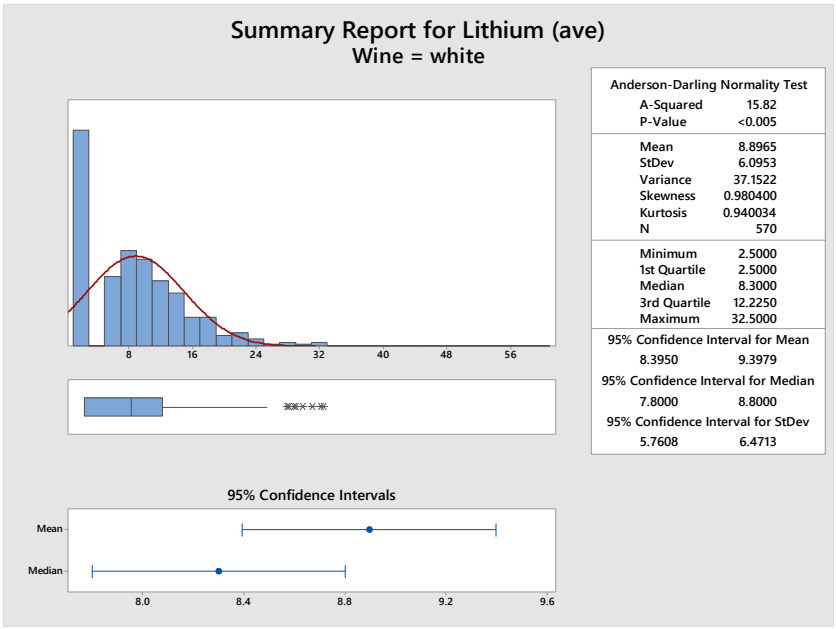
Means

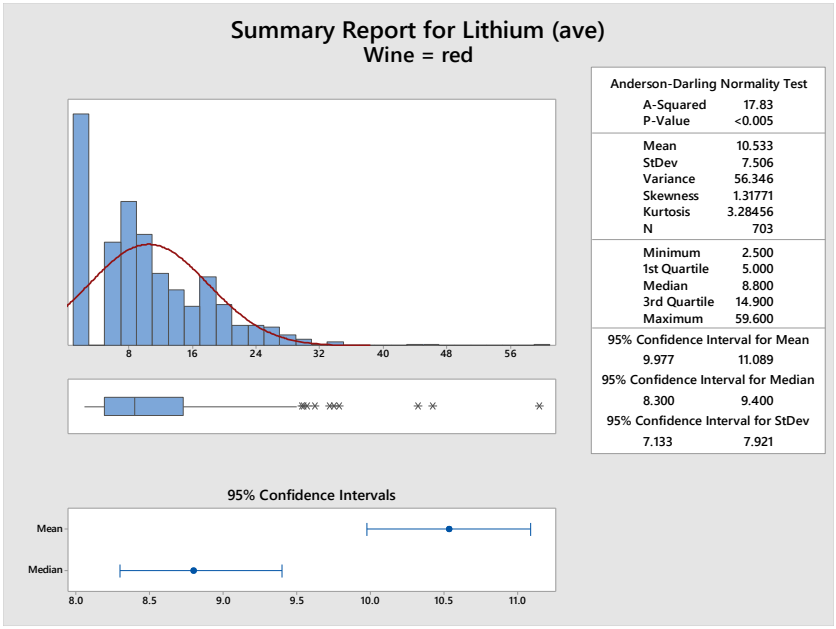
Wine	N	Mean	StDev	95% CI
red	702	3.713	5.909	(3.078, 4.347)
white	563	10.151	11.026	(9.442, 10.860)

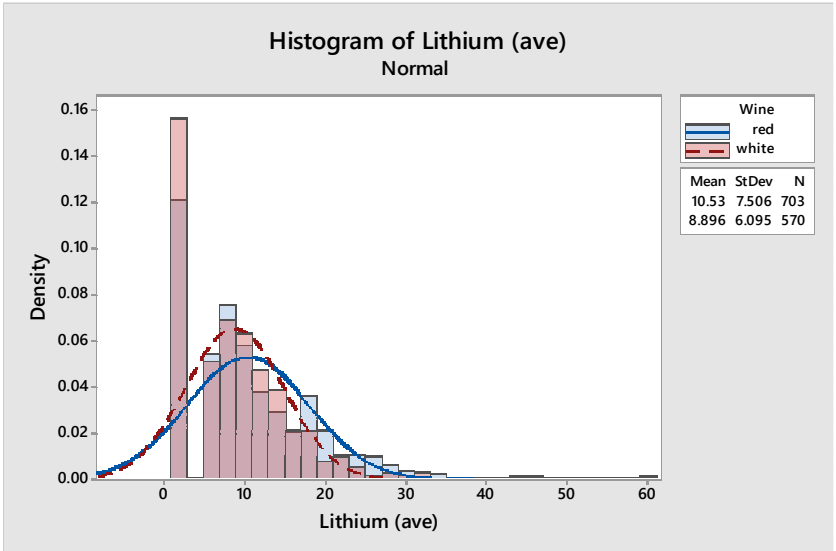
Pooled StDev = 8.57166



The pooled standard deviation is used to calculate the intervals.







One-way ANOVA: Lithium (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	9

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	843.2	843.17	17.66	0.000
Error	1271	60694.2	47.75		
Total	1272	61537.4			

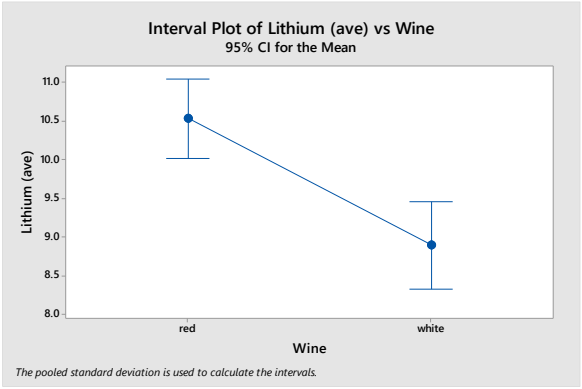
Model Summary

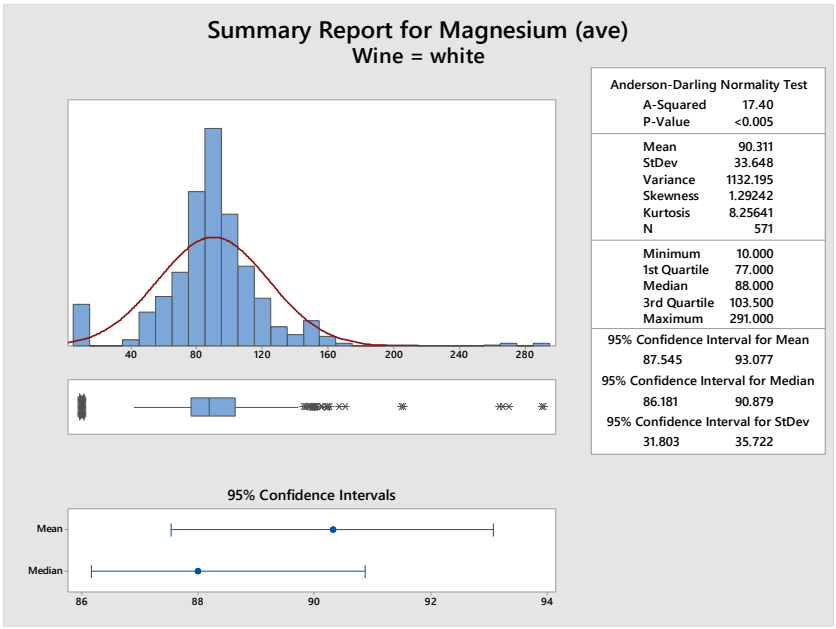
S	R-sq	R-sq(adj)	R-sq(pred)
6.91036	1.37%	1.29%	1.07%

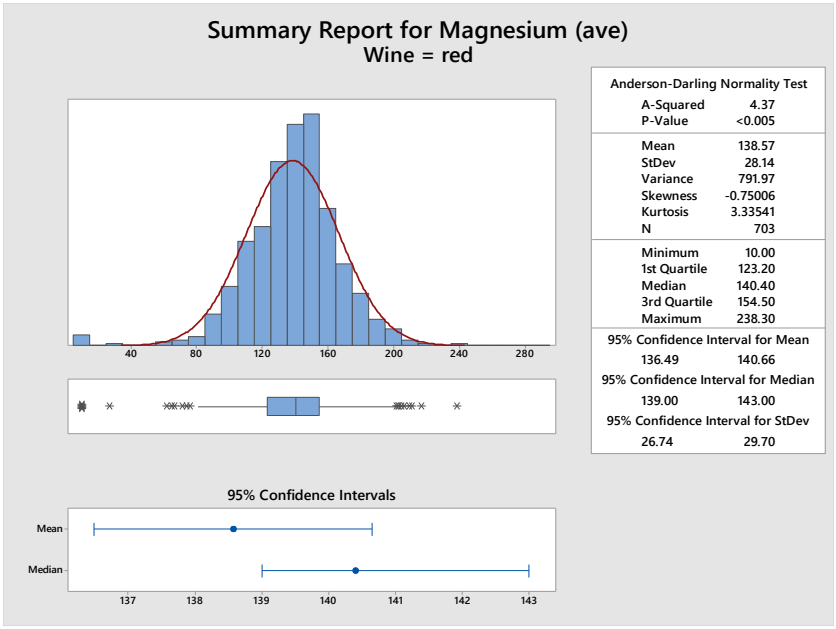
Means

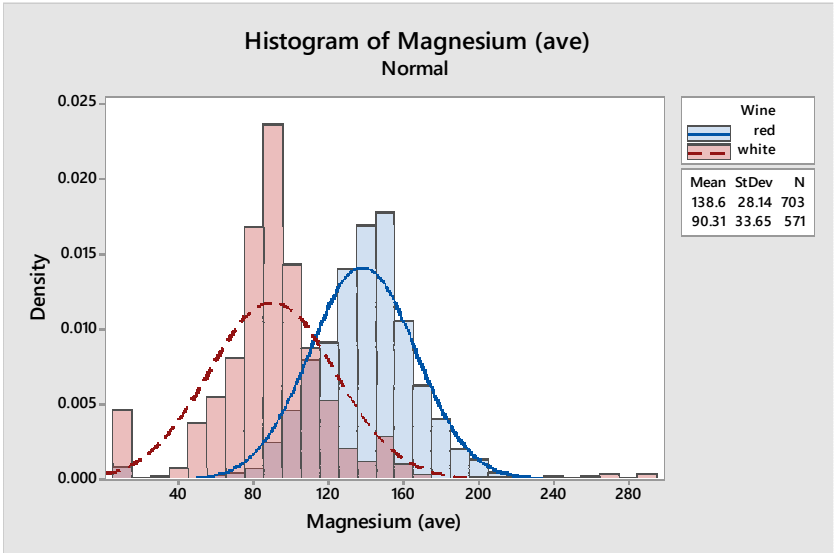
Wine	N	Mean	StDev	95% CI
red	703	10.533	7.506	(10.022, 11.044)
white	570	8.896	6.095	(8.329, 9.464)

Pooled StDev = 6.91036









One-way ANOVA: Magnesium (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	8

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	733876	733876	777.06	0.000
Error	1272	1201315	944		
Total	1273	1935191			

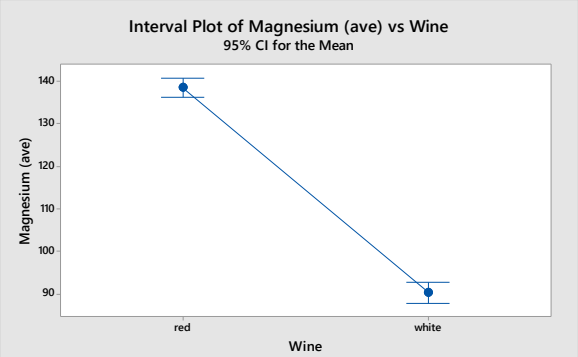
Model Summary

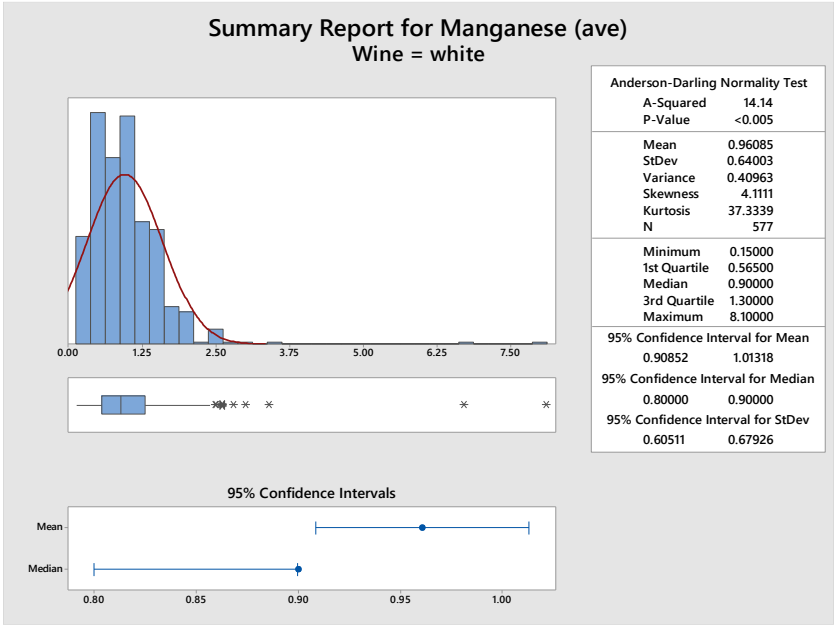
S	R-sq	R-sq(adj)	R-sq(pred)
30.7316	37.92%	37.87%	37.72%

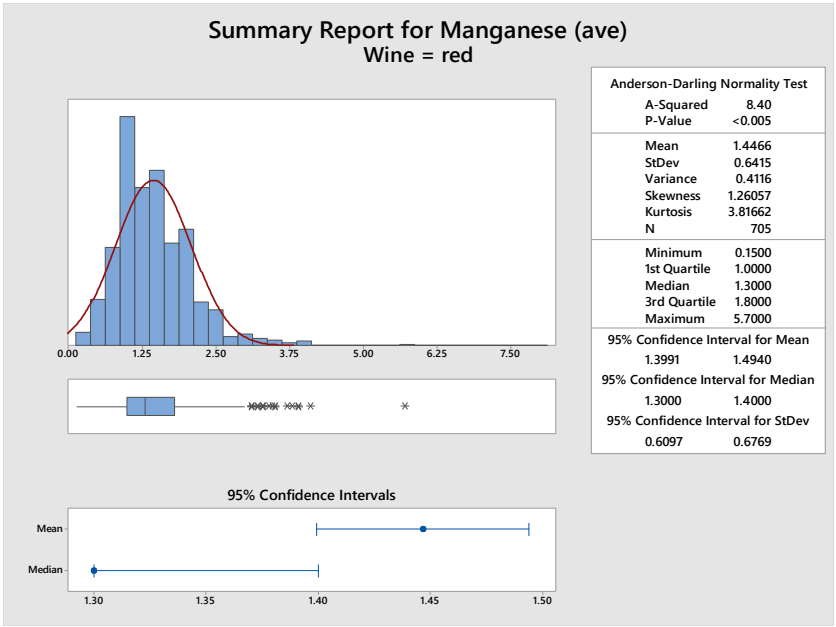
Means

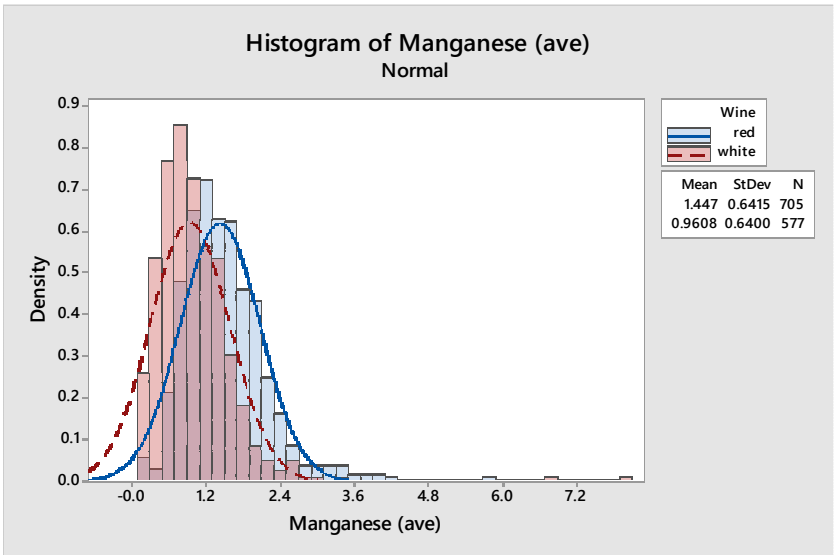
Wine	N	Mean	StDev	95% CI
red	703	138.57	28.14	(136.30, 140.85)
white	571	90.31	33.65	(87.79, 92.83)

Pooled StDev = 30.7316









One-way ANOVA: Manganese (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	74.86	74.8636	182.29	0.000
Error	1280	525.69	0.4107		
Total	1281	600.55			

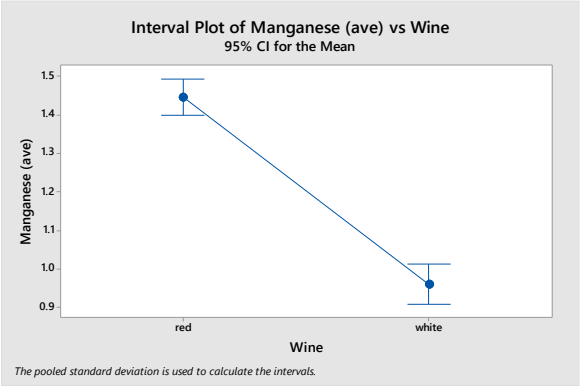
Model Summary

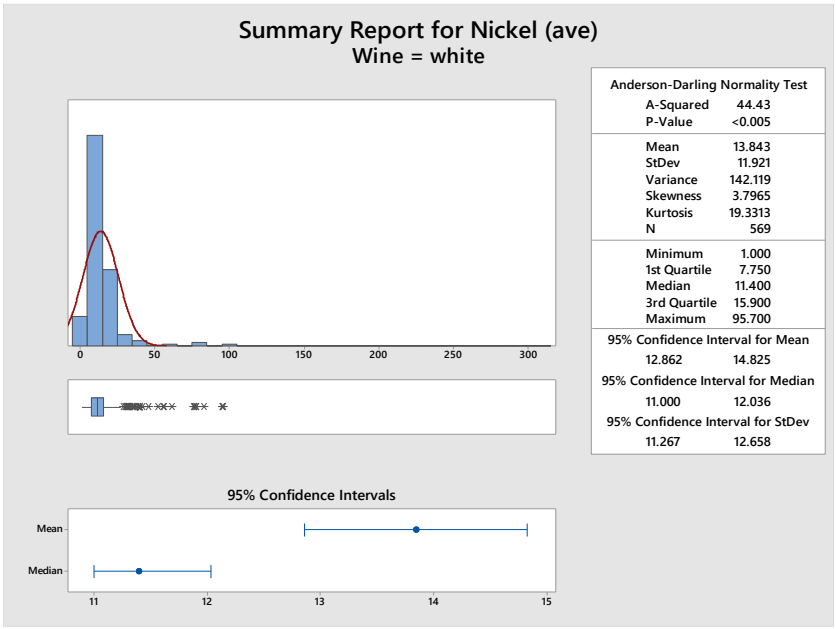
S	R-sq	R-sq(adj)	R-sq(pred)
0.640855	12.47%	12.40%	12.19%

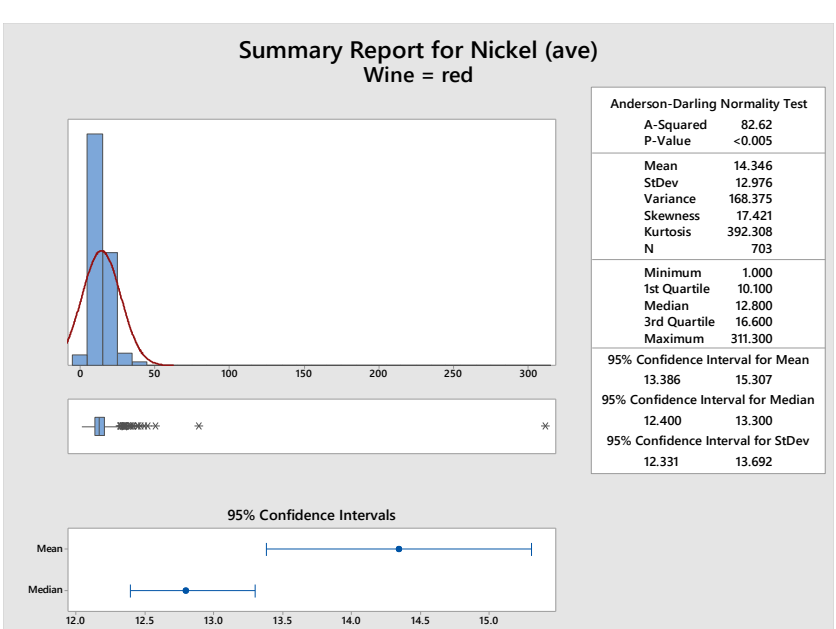
Means

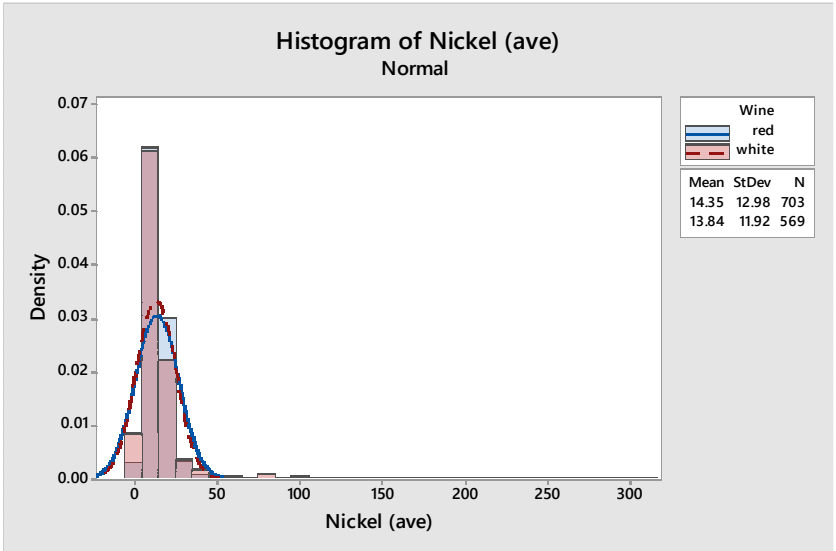
Wine	N	Mean	StDev	95% CI
red	705	1.4466	0.6415	(1.3992, 1.4939)
white	577	0.9608	0.6400	(0.9085, 1.0132)

Pooled StDev = 0.640855









One-way ANOVA: Nickel (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	10

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	80	79.52	0.51	0.476
Error	1270	198923	156.63		
Total	1271	199003			

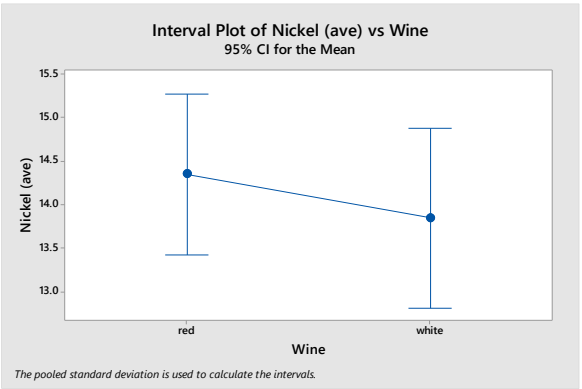
Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
12.5153	0.04%	0.00%	0.00%

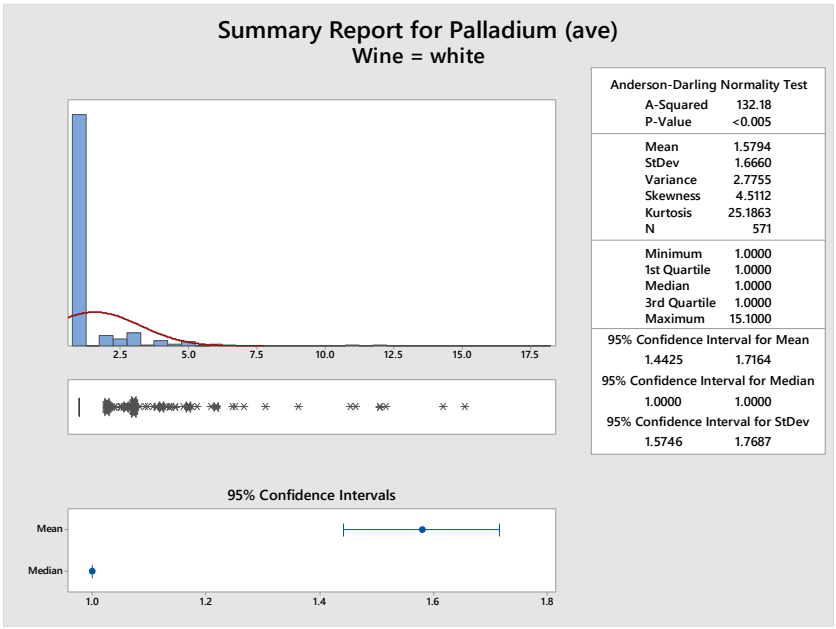
Means

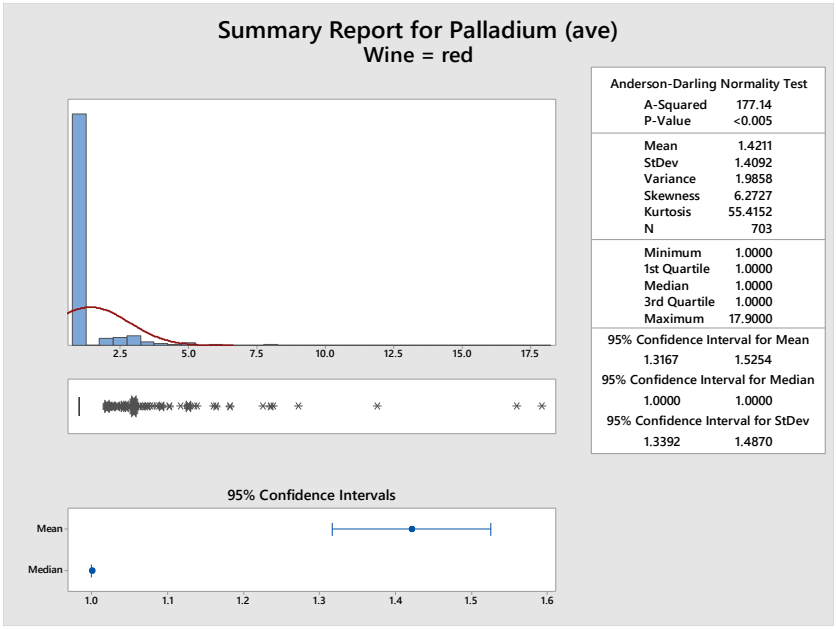
Wine	N	Mean	StDev	95% CI
red	703	14.346	12.976	(13.420, 15.272)
white	569	13.843	11.921	(12.814, 14.873)

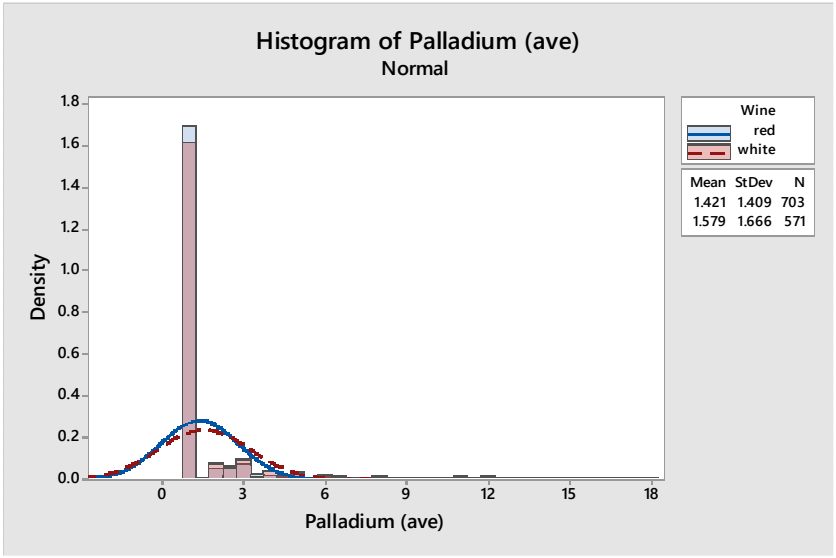
Pooled StDev = 12.5153



The pooled standard deviation is used to calculate the intervals.







One-way ANOVA: Palladium (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	8

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	7.90	7.903	3.38	0.066
Error	1272	2976.08	2.340		
Total	1273	2983.98			

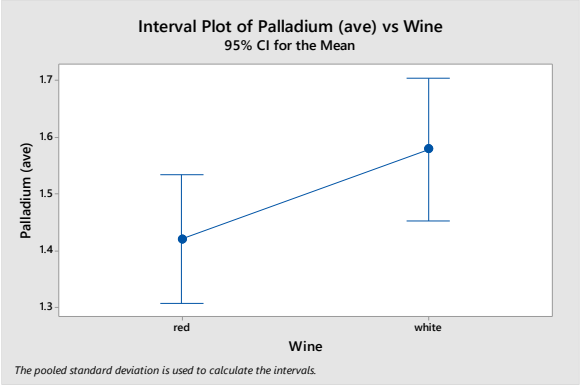
Model Summary

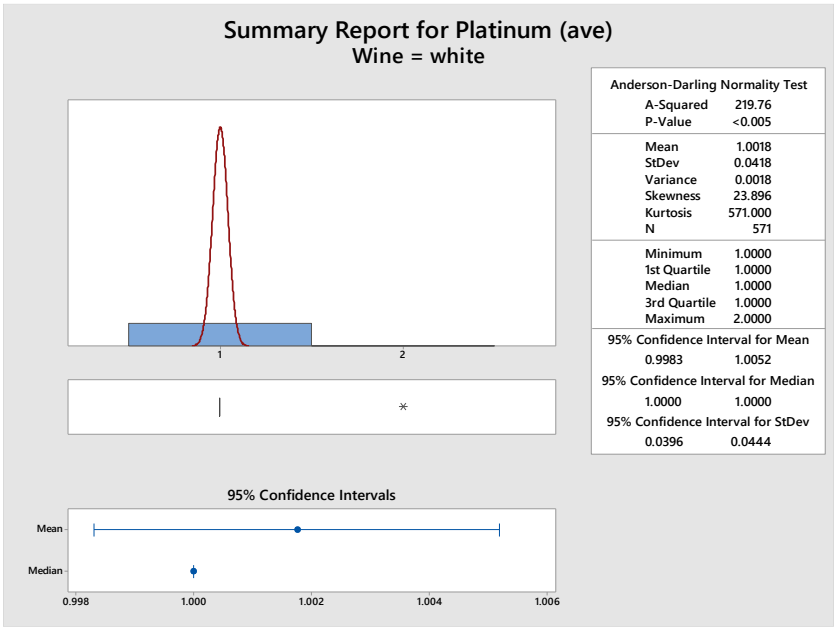
S	R-sq	R-sq(adj)	R-sq(pred)
1.52960	0.26%	0.19%	0.00%

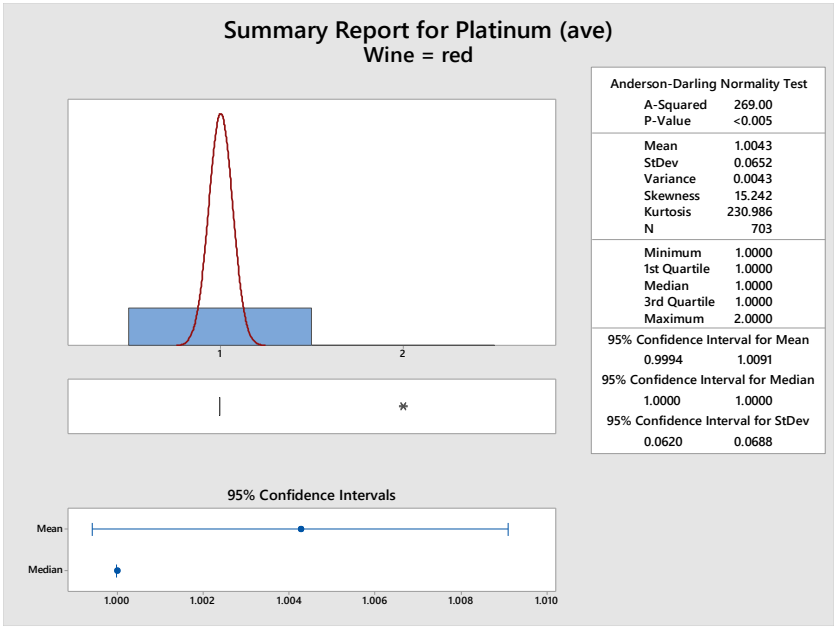
Means

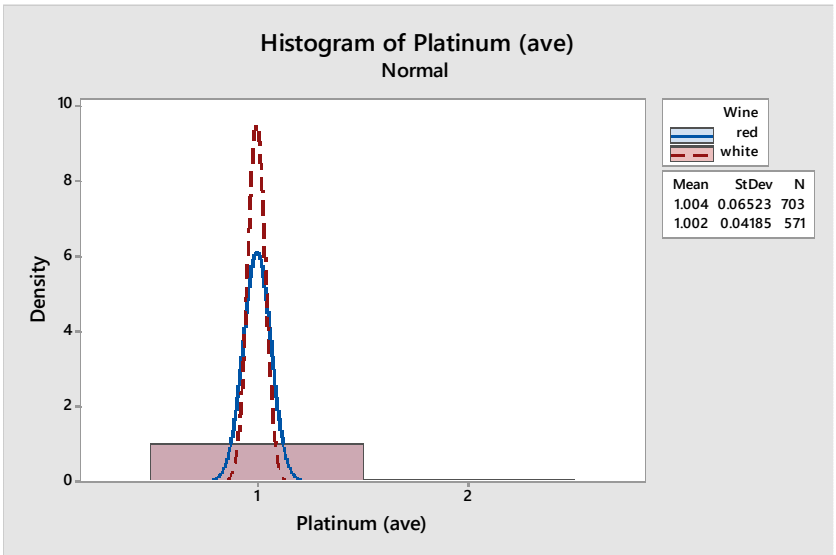
Wine	N	Mean	StDev	95% CI
red	703	1.4211	1.4092	(1.3079, 1.5342)
white	571	1.5794	1.6660	(1.4538, 1.7050)

Pooled StDev = 1.52960









One-way ANOVA: Platinum (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	8

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	0.00199	0.001995	0.64	0.425
Error	1272	3.98545	0.003133		
Total	1273	3.98744			

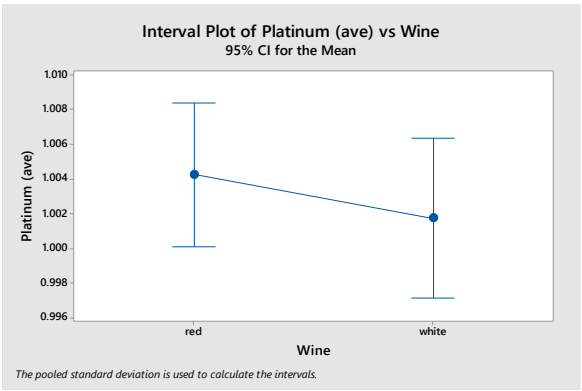
Model Summary

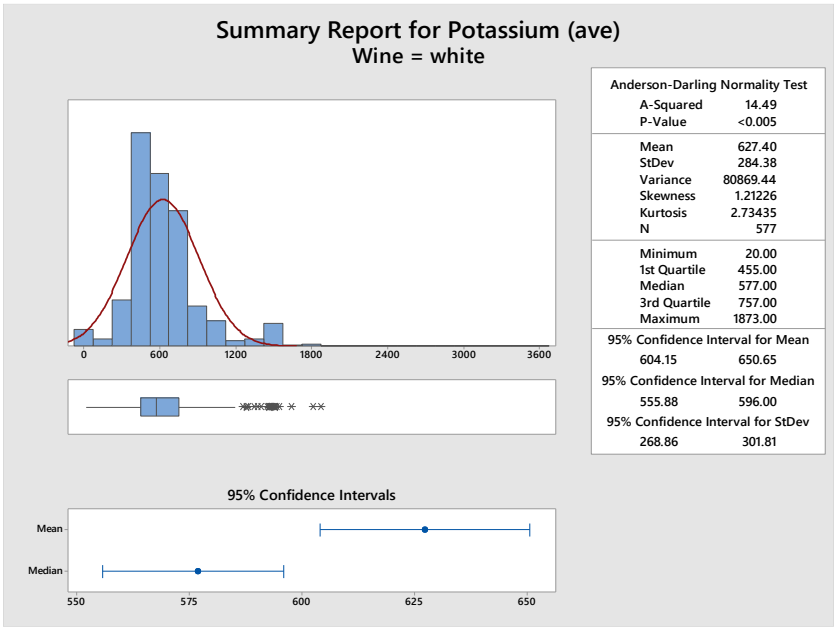
S	R-sq	R-sq(adj)	R-sq(pred)
0.0559751	0.05%	0.00%	0.00%

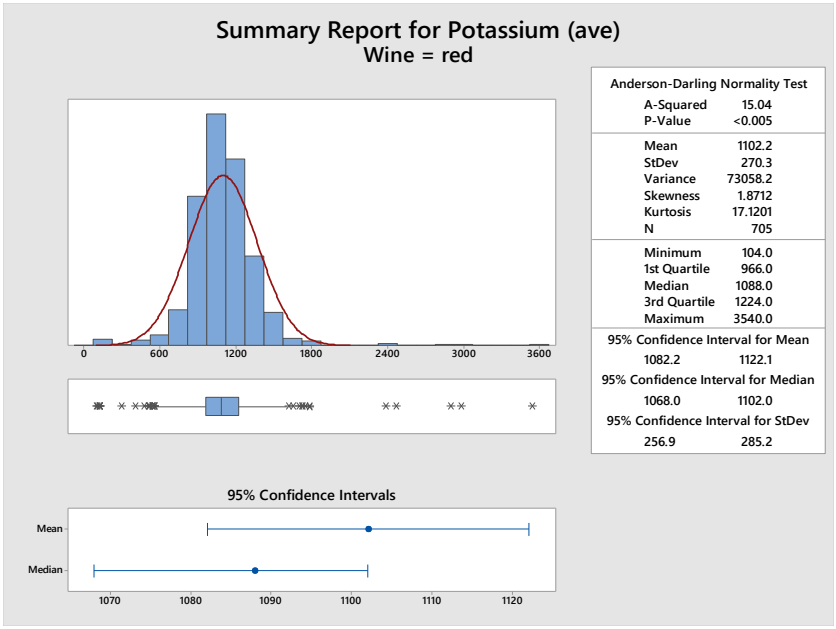
Means

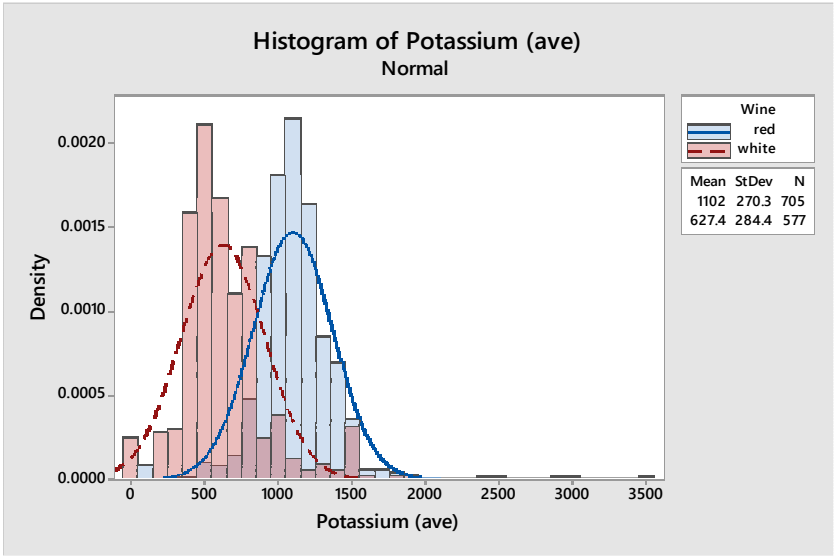
Wine	N	Mean	StDev	95% CI
red	703	1.00427	0.06523	(1.00013, 1.00841)
white	571	1.00175	0.04185	(0.99716, 1.00635)

Pooled StDev = 0.0559751









One-way ANOVA: Potassium (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	71519949	71519949	934.01	0.000
Error	1280	98013742	76573		
Total	1281	169533691			

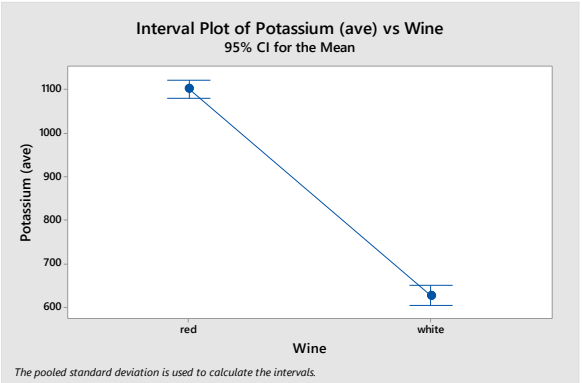
Model Summary

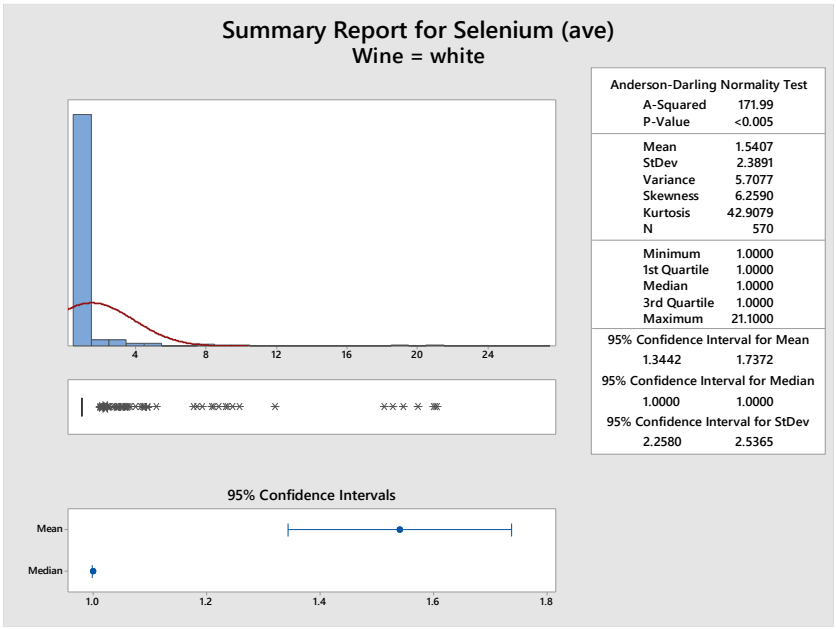
S	R-sq	R-sq(adj)	R-sq(pred)
276.719	42.19%	42.14%	42.00%

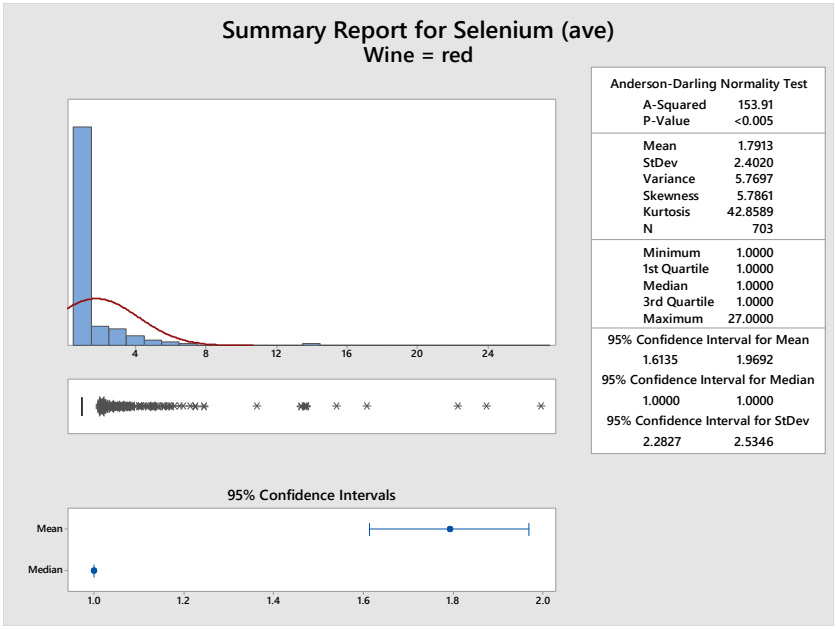
Means

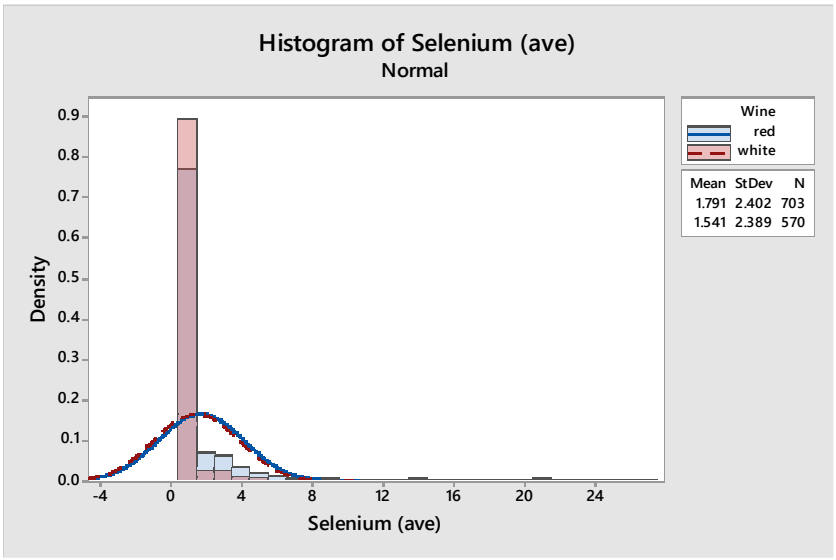
Wine	N	Mean	StDev	95% CI
red	705	1102.2	270.3	(1081.7, 1122.6)
white	577	627.4	284.4	(604.8, 650.0)

Pooled StDev = 276.719









One-way ANOVA: Selenium (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	9

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	19.77	19.771	3.44	0.064
Error	1271	7298.05	5.742		
Total	1272	7317.82			

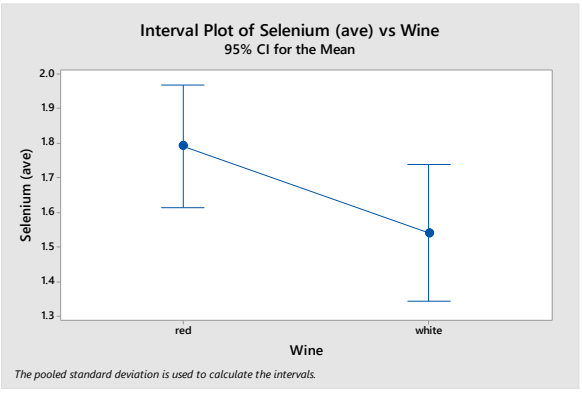
Model Summary

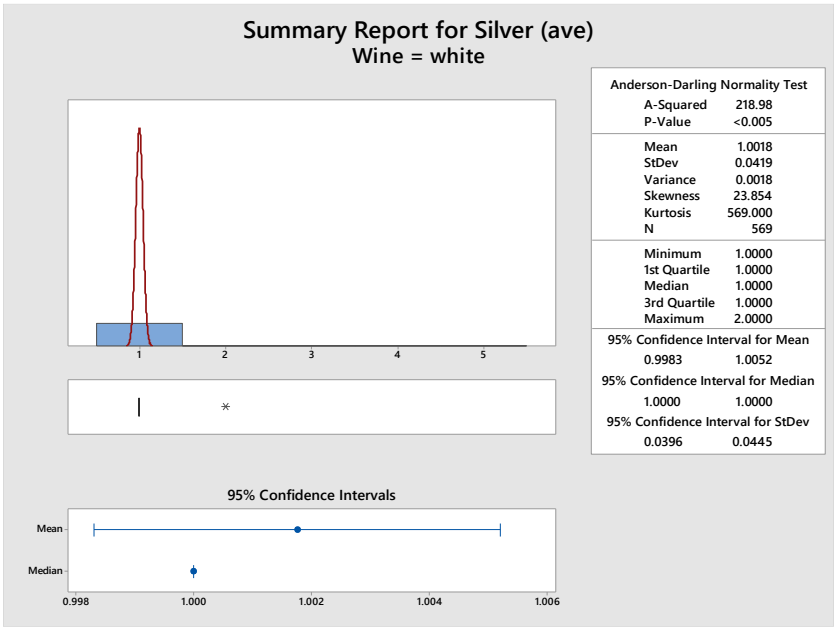
S	R-sq	R-sq(adj)	R-sq(pred)
2.39624	0.27%	0.19%	0.00%

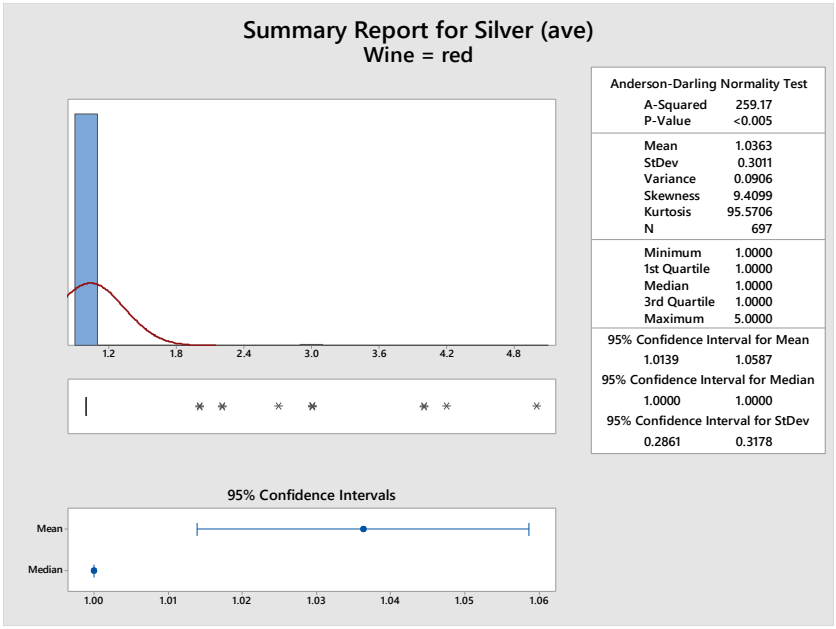
Means

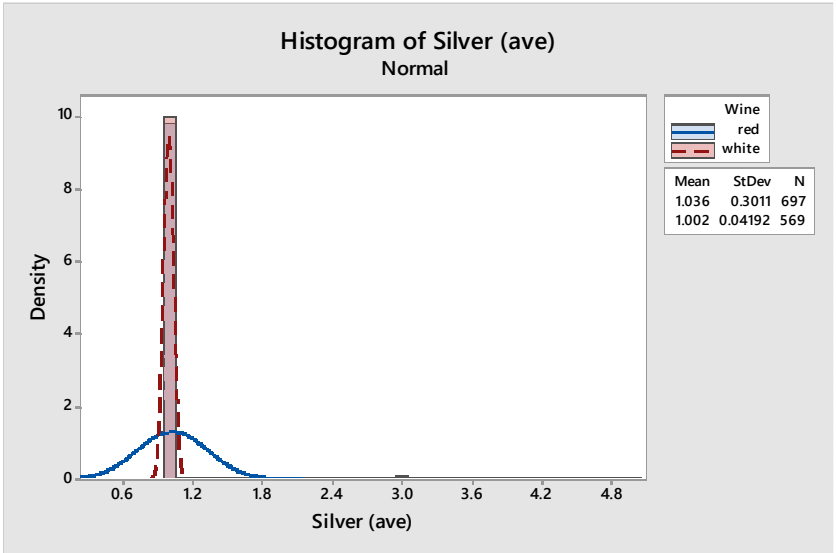
Wine	N	Mean	StDev	95% CI
red	703	1.7913	2.4020	(1.6140, 1.9686)
white	570	1.541	2.389	(1.344, 1.738)

Pooled StDev = 2.39624









One-way ANOVA: Silver (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	16

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	0.3737	0.37375	7.37	0.007
Error	1264	64.0899	0.05070		
Total	1265	64.4636			

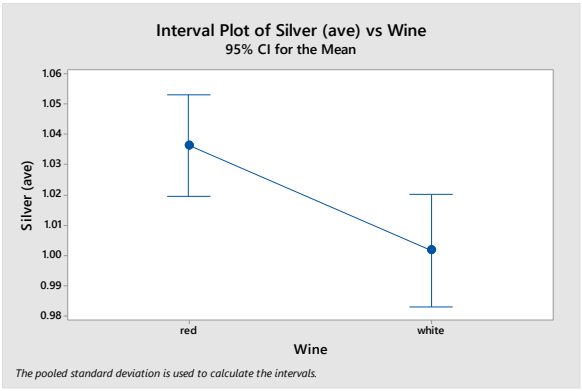
Model Summary

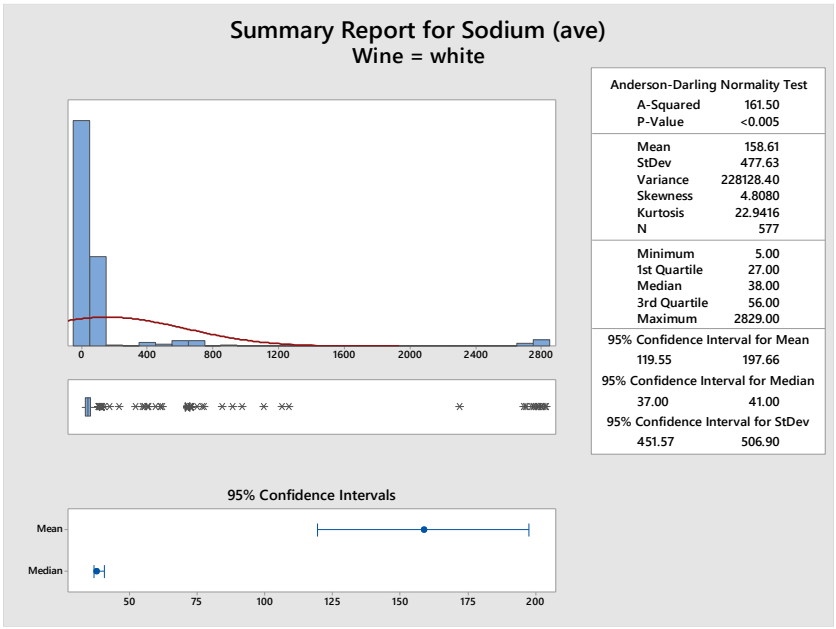
S	R-sq	R-sq(adj)	R-sq(pred)
0.225176	0.58%	0.50%	0.29%

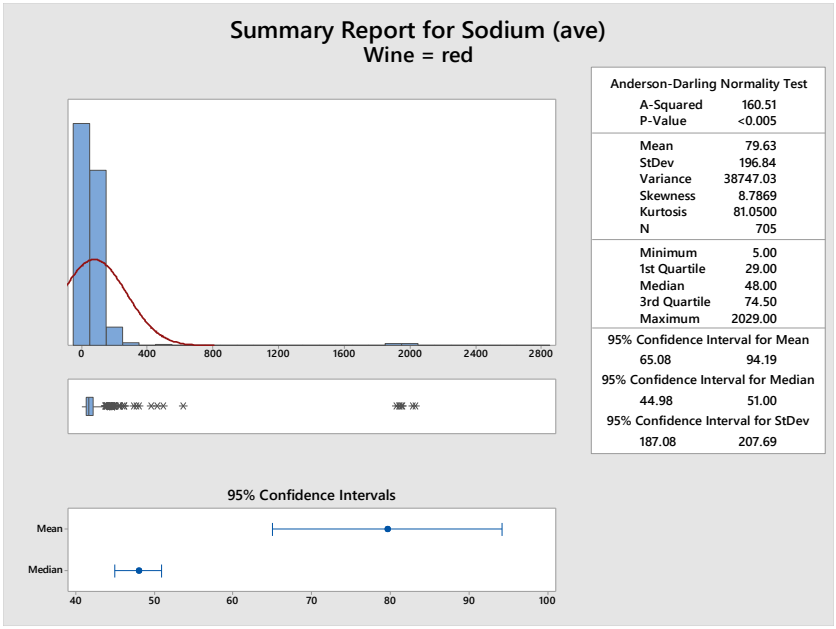
Means

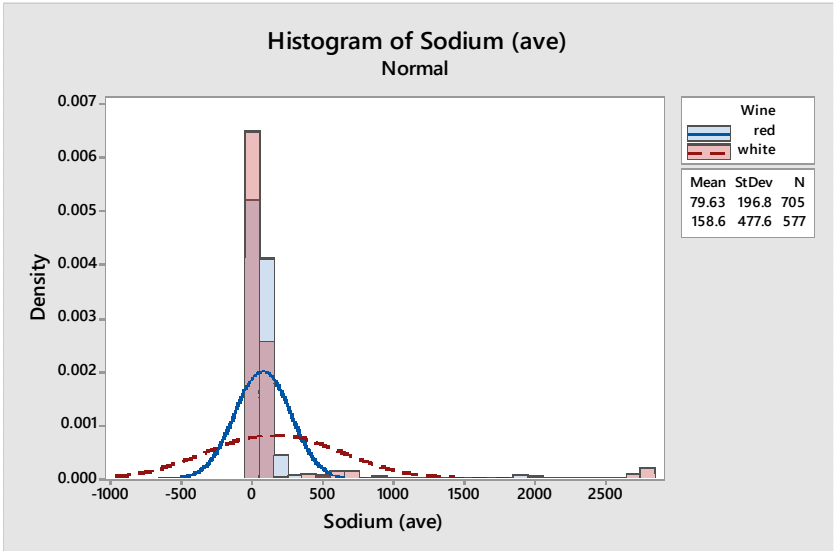
Wine	N	Mean	StDev	95% CI
red	697	1.0363	0.3011	(1.0196, 1.0530)
white	569	1.00176	0.04192	(0.98324, 1.02028)

Pooled StDev = 0.225176









One-way ANOVA: Sodium (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	1978952	1978952	15.96	0.000
Error	1280	158679870	123969		
Total	1281	160658822			

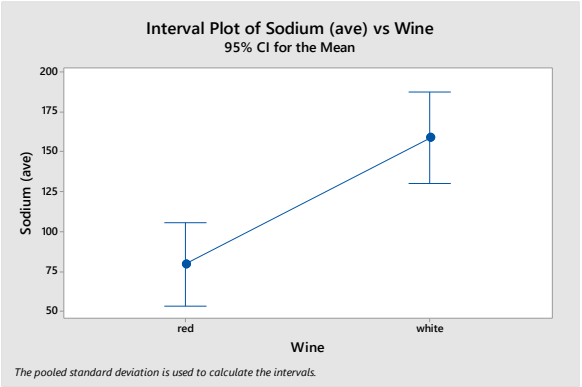
Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
352.092	1.23%	1.15%	0.90%

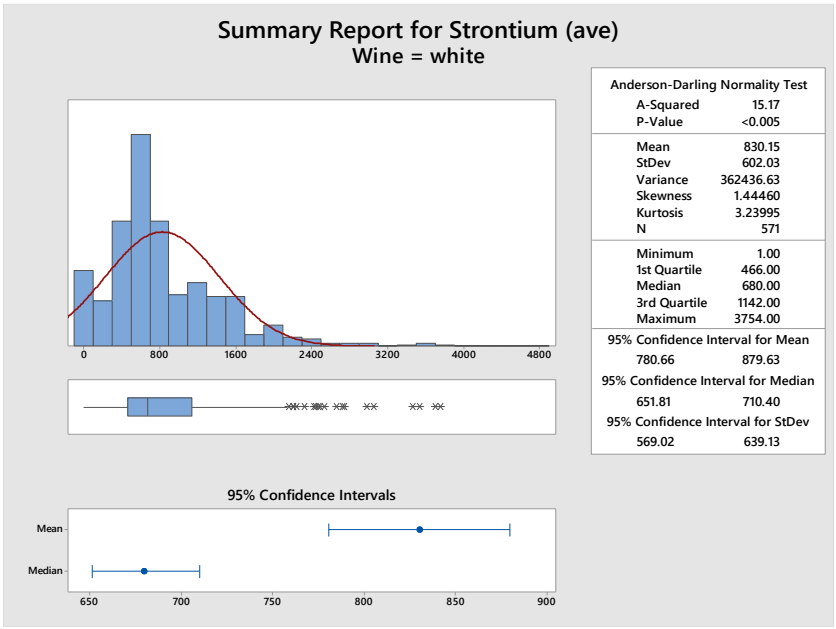
Means

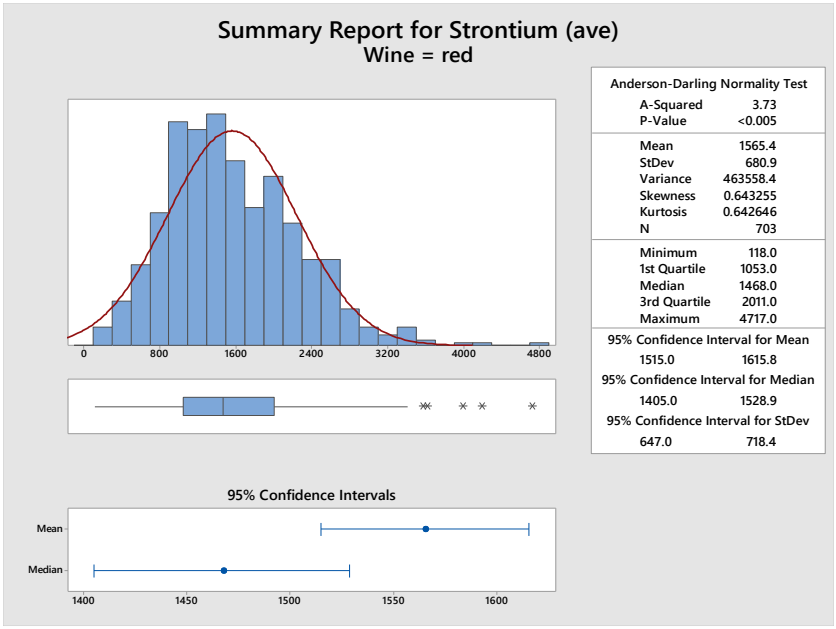
Wine	N	Mean	StDev	95% CI
red	705	79.63	196.84	(53.62, 105.65)
white	577	158.6	477.6	(129.8, 187.4)

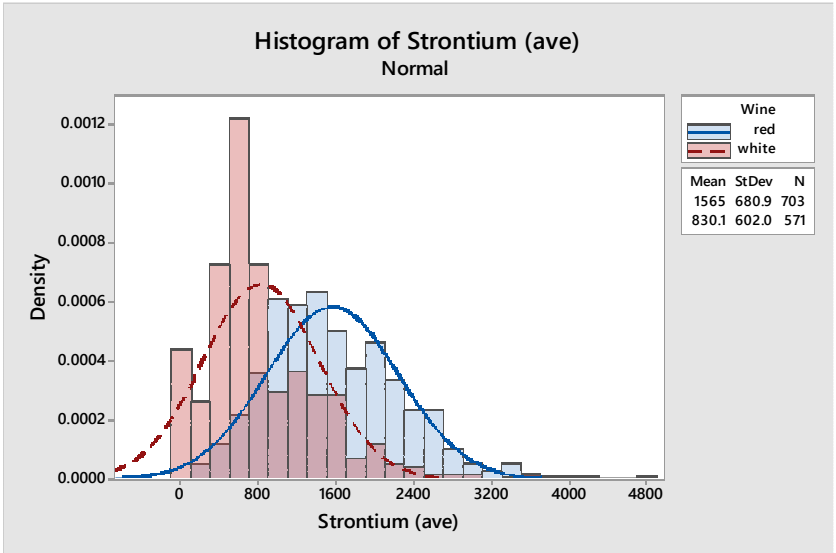
Pooled StDev = 352.092



The pooled standard deviation is used to calculate the intervals.







One-way ANOVA: Strontium (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	8

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	170320467	170320467	407.23	0.000
Error	1272	532006888	418244		
Total	1273	702327355			

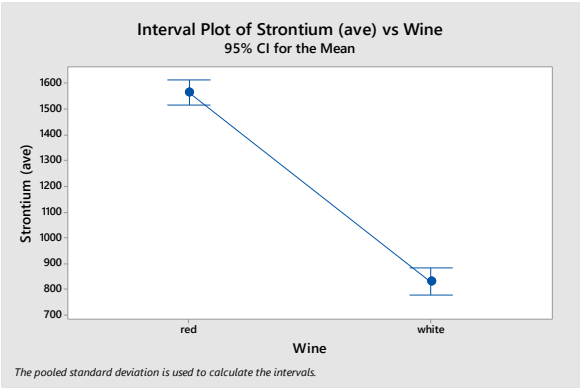
Model Summary

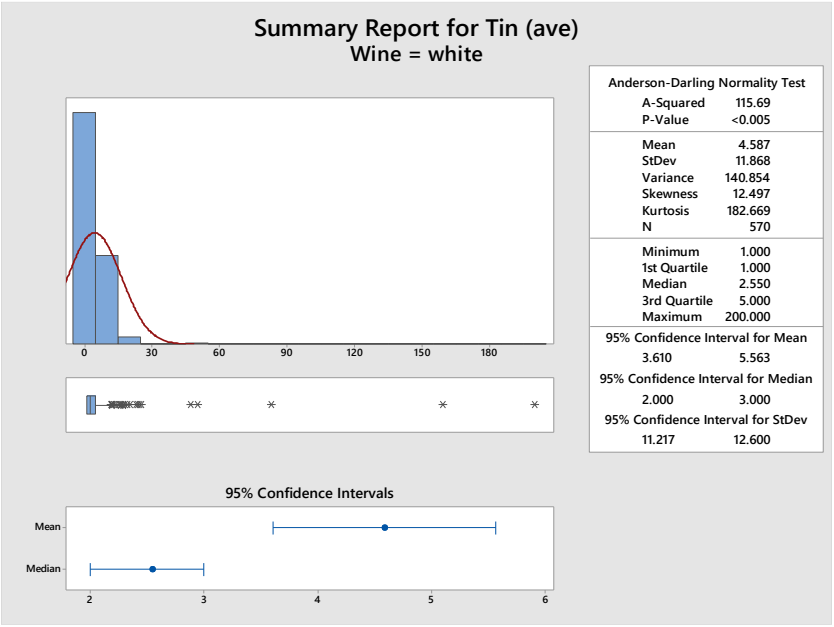
S	R-sq	R-sq(adj)	R-sq(pred)
646.718	24.25%	24.19%	24.02%

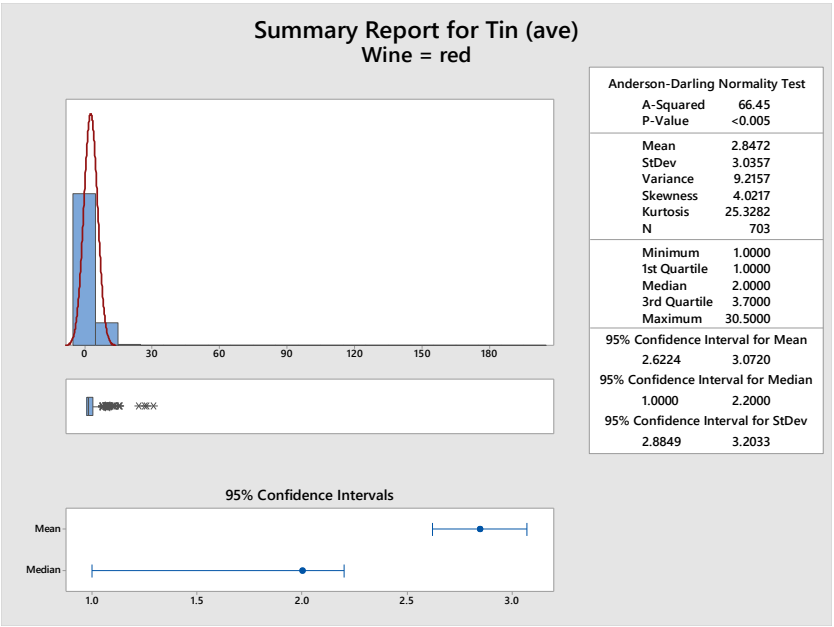
Means

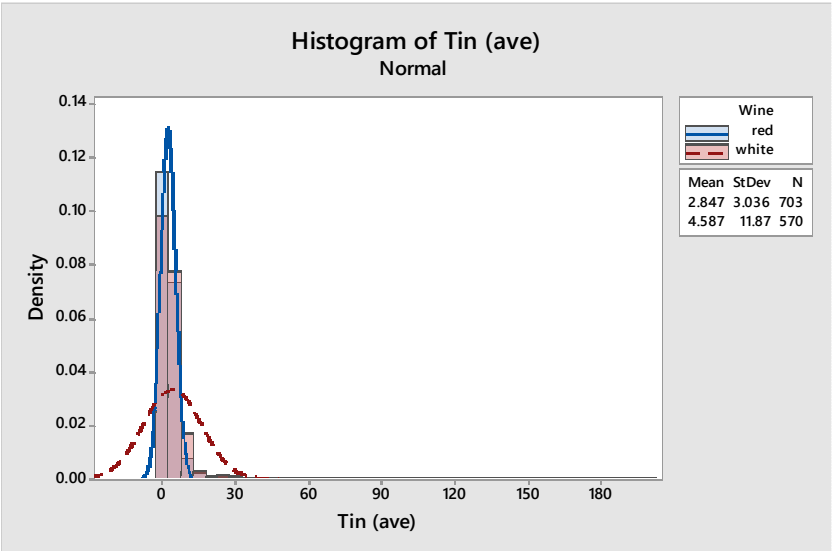
Wine	N	Mean	StDev	95% CI
red	703	1565.4	680.9	(1517.5, 1613.2)
white	571	830.1	602.0	(777.1, 883.2)

Pooled StDev = 646.718









One-way ANOVA: Tin (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	9

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	952.5	952.50	13.98	0.000
Error	1271	86615.4	68.15		
Total	1272	87567.9			

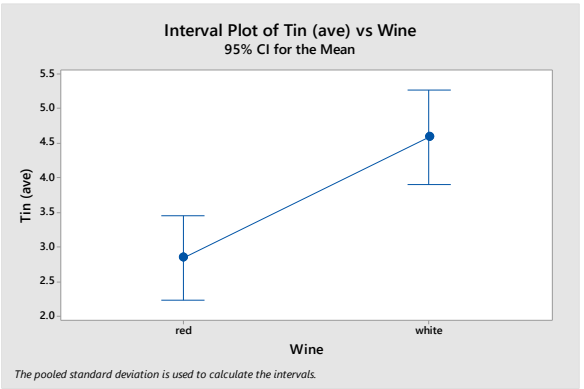
Model Summary

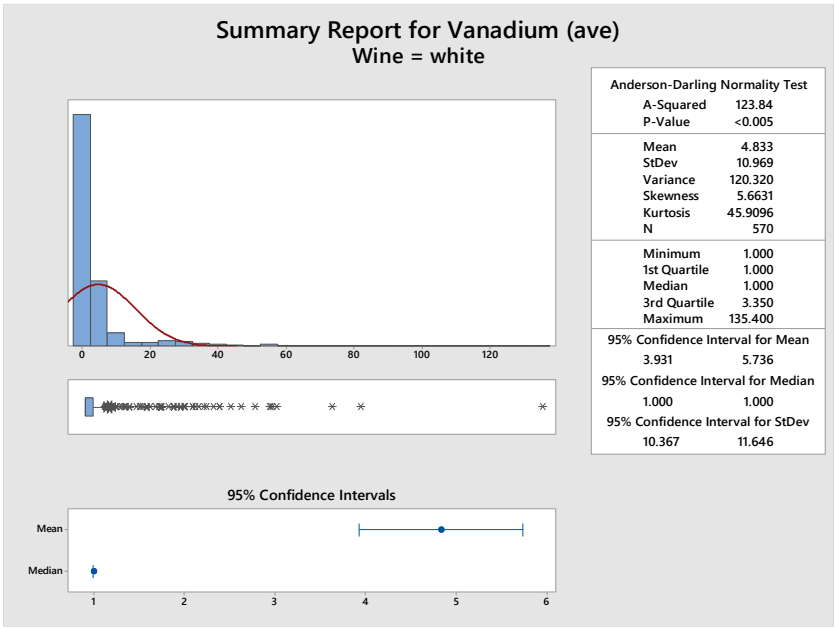
S	R-sq	R-sq(adj)	R-sq(pred)
8.25515	1.09%	1.01%	0.74%

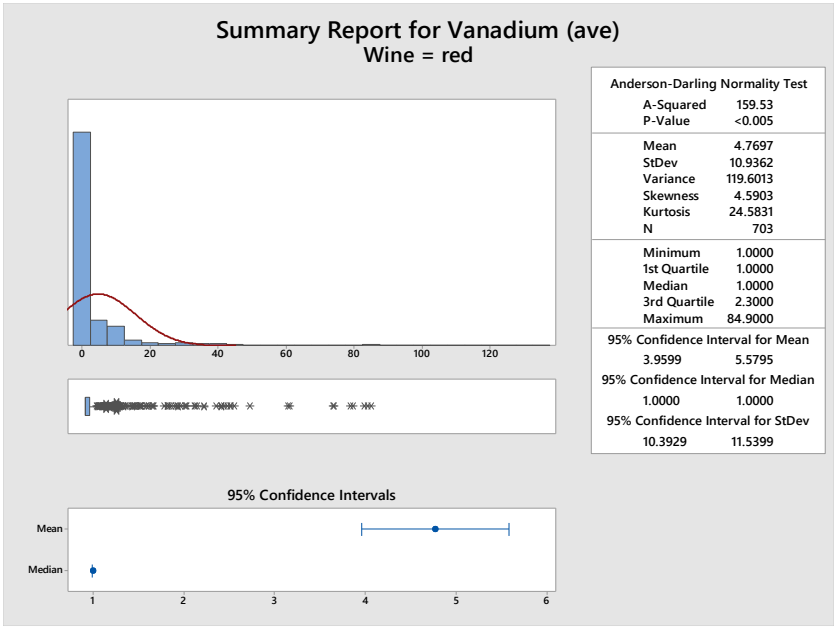
Means

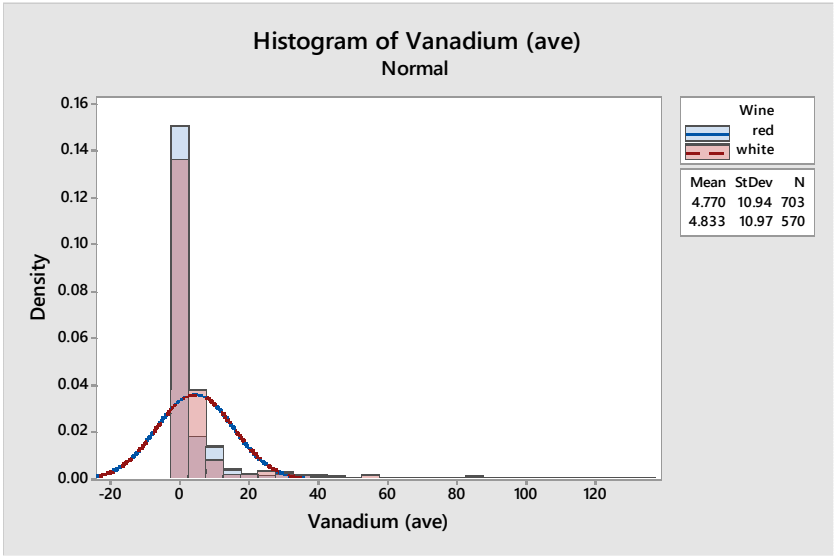
Wine	N	Mean	StDev	95% CI
red	703	2.847	3.036	(2.236, 3.458)
white	570	4.587	11.868	(3.908, 5.265)

Pooled StDev = 8.25515









One-way ANOVA: Vanadium (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	9

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	1	1.268	0.01	0.918
Error	1271	152422	119.923		
Total	1272	152423			

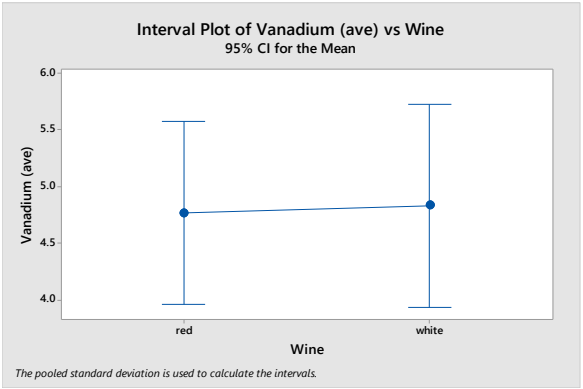
Model Summary

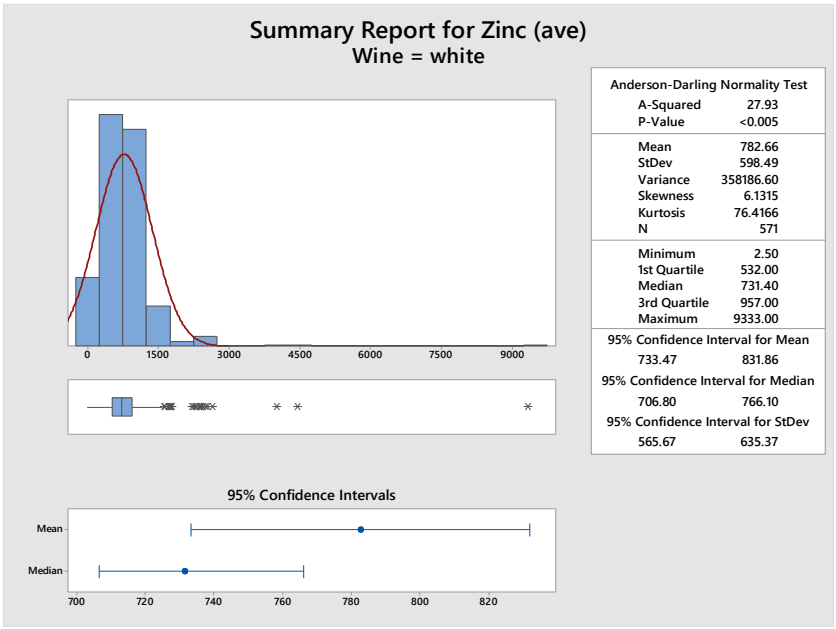
S	R-sq	R-sq(adj)	R-sq(pred)
10.9509	0.00%	0.00%	0.00%

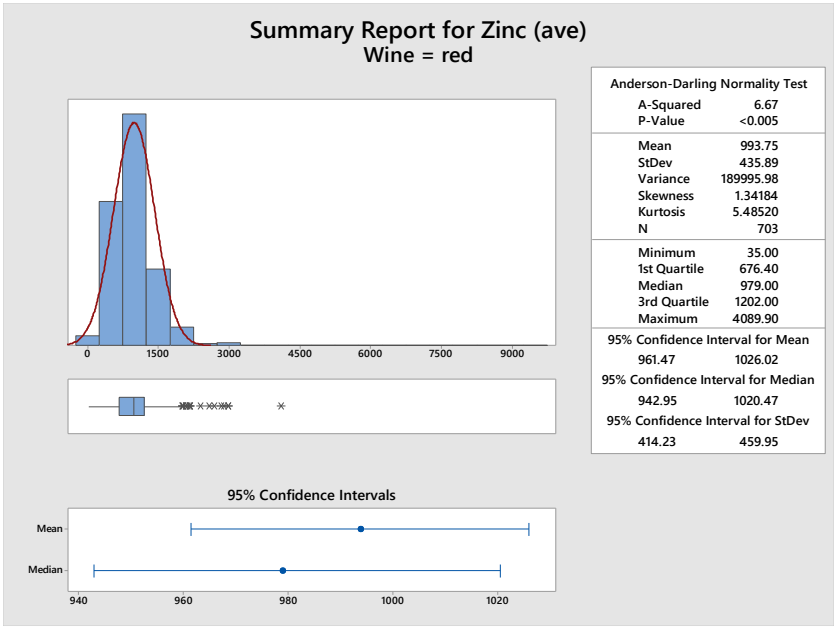
Means

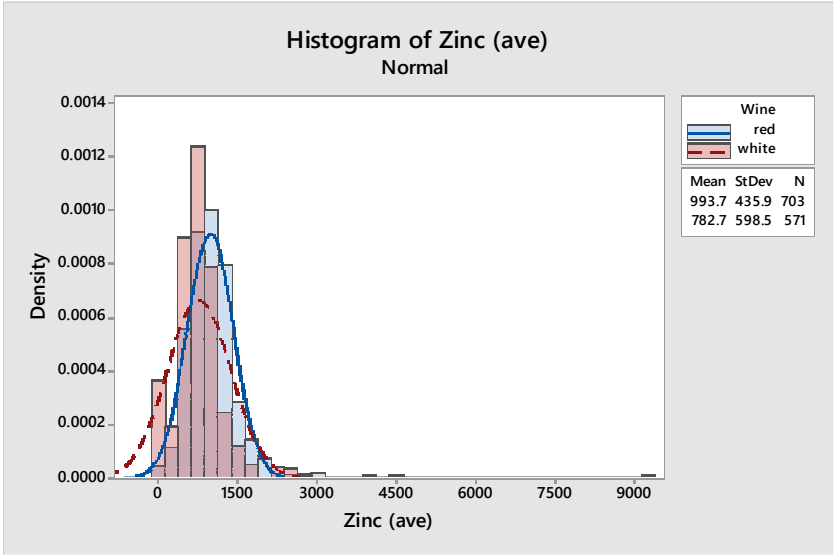
Wine	N	Mean	StDev	95% CI
red	703	4.770	10.936	(3.959, 5.580)
white	570	4.833	10.969	(3.933, 5.733)

Pooled StDev = 10.9509









One-way ANOVA: Zinc (ave) versus Wine

Method

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05
Rows unused	8

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Wine	2	red, white

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Wine	1	14038982	14038982	52.90	0.000
Error	1272	337543541	265364		
Total	1273	351582523			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
515.135	3.99%	3.92%	3.68%

Means

Wine	N	Mean	StDev	95% CI
red	703	993.7	435.9	(955.6, 1031.9)
white	571	782.7	598.5	(740.4, 825.0)

Pooled StDev = 515.135

