

Test Group Summary Report

C02A Metals in Water-Full Range

October 2021 PT Round

Issued: December 23, 2021

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1.0 The Proficiency Testing Report

The Proficiency Testing Report consists of two parts.

- *PTC Proficiency Testing Report*: This report contains participant-specific data and other confidential information. This report is emailed to participants at the end of the PT round.
- *Test Group Summary Report*: A Test Group Summary Report is created for each quantified test group at the end of the PT round. These reports contain more detailed information on the round than is found in the participant-specific PTC Proficiency Testing Report. These reports do not contain any confidential information and are made available on the PTC web site.

2.0 Definitions

The participant-specific PTC Proficiency Testing Report contains some terms that new participants may not be familiar with.

<i>Code:</i>	The registration code that is unique to each analyte that a participant is registered for.
<i>App:</i>	If a participant is accredited by CALA, this three-digit number is the appendix number that the accredited method is assigned to.
<i>N:</i>	The number of participants results that were used to calculate the summary statistics. This excludes qualified data (e.g., <) and any results that were flagged as outliers.
<i>Assigned:</i>	The Assigned Value is the robust mean of the reported results, outliers excluded. This is often referred to as the “target” value.
<i>$\pm U$:</i>	The uncertainty of the assigned value.
<i>Reported:</i>	The result reported by the participant.
<i>s:</i>	The Standard Deviation of Proficiency Assessment (SDPA). This value is used to determine the acceptance limits for the PT evaluation.
<i>z-Score:</i>	A value assigned to each reported result that is a measure of the degree to which it deviates from the Assigned Value.
<i>Score:</i>	The composite score of the four results reported for each analyte. It is normalized to a score out of 100.
<i>Bias:</i>	A flag assigned if bias is detected using the re-scaled z-score procedure.

3.0 Scoring System

Participant performance is evaluated for each proficiency testing sample by a quantitative method that is consistent with ISO/IEC 17043:2010 *Conformity assessment – General requirements for proficiency testing*, the *International Harmonized Protocol for Proficiency Testing of (Chemical) Analytical Laboratories* (2006), and ISO 13528:2015 *Statistical methods for use in proficiency testing by interlaboratory comparisons*.

The following is a brief description of the evaluation procedure used by PTC. The detailed evaluation procedure is described in PROC09 – PT Evaluation *Procedure*, which is available on the PTC website www.PTCanada.org).

3.1 HOMOGENEITY AND STABILITY ASSESSMENT

Homogeneity and stability are assessed using participant data. Regression analysis is performed on reported result against order of sample production (Homogeneity) and reported result against date of analysis (Stability). If the slope is significantly different than zero for either then the Standard Deviation of Proficiency Assessment (s) is increased to minimize the impact.

3.2 THE Z SCORE

A "z-score" is calculated for each reported result as follows:

$$z - Score = \frac{(x - \bar{X})}{SDPA} \quad \text{where: } \begin{array}{l} x = \text{participant result;} \\ \bar{X} = \text{the Assigned Value;} \\ SDPA = \text{the Standard Deviation for Proficiency Assessment.} \end{array}$$

The assigned value \bar{X} is generally estimated from the inter-laboratory Robust mean after outliers due to obvious gross errors (e.g., reported in wrong units) have been removed.

The Standard Deviation for Proficiency Assessment, s, is determined as follows:

- The inter-laboratory Robust standard deviation ($Stdev_{rob}$) is calculated using reported results, obvious outliers removed;
- The regression equation standard deviation ($Stdev_{reg}$) is estimated from regression equations derived from previous studies (see PROC11- *PT Regression Equations* for details);
- The SDPA is the higher of $Stdev_{rob}$ and $Stdev_{reg}$;
- When a laboratory reports its detection limit, s will be estimated using a pooled variance procedure that uses both the inter-laboratory data and the reported detection limit.

3.2 COMPOSITE (PT) SCORE

Since each PT round involves four or two separate samples of distinct concentration for each test, it is necessary to calculate a composite PT score for each test to determine overall performance. The composite score is calculated by first averaging the absolute z-scores for the four results and then calculating a final score as $100 + (-15 \times \text{avg } |z|)$.

Acceptable PT Scores equal or exceed 70.

3.3 IDENTIFYING BIAS

The proficiency testing report provides flags for bias. These are determined using the re-scaled z-score procedure.

$$RSZ = \frac{\sum z}{\sqrt{N}} \quad \text{where } \begin{array}{l} z = \text{the z- score} \\ N = \text{the number of samples} \end{array}$$

Flags are assigned for each test group/parameter combination as follows:

$RSZ \geq -2$ and ≤ 2	no flag assigned
$RSZ > 2$	H (High)
$RSZ > 3$	VH (Very High)
$RSZ < -2$	L (LOW)
$RSZ < -3$	VL (Very Low)

3.4 DEVIATIONS FROM EVALUATION PROCEDURE

Other than changes to the Standard Deviation of Proficiency Assessment due to homogeneity or stability flags, any deviation from the published evaluation procedure is described on the cover page(s) of the final *PTC Proficiency Testing Report*.

4.0 PT Round Specific Data Summary

The following pages provide more detailed information about the PT round indicated in the cover page of this report than is found in the participant-specific PTC Proficiency Testing Report. The graphical representations and the statistical summaries are based upon the data after outliers have been removed.

4.1 SUMMARY STATISTICS

In addition to some of the statistics found in the customer reports, this table includes additional summary statistics such as Median, different measures of dispersion, the number of outliers removed, the number of results in the Questionable range ($|z|$ between 2 and 3) and the Unacceptable range ($z > 3$), and whether a data set was flagged for Homogeneity or Stability. This section also includes sorted scatter plots of the data for each sample.

4.2 z- SCORE PLOTS

The z -scores for each sample are ranked in increasing order and plotted. When the data is normally distributed, the plot should show a slight sigmoidal curve, with an equal number of points above zero as below. Each bar in these plots is colour-coded to indicate the analytical method used by the participant.

4.3 KERNEL DENSITY PLOTS

Kernel density plots are generated for each data set. These plots are a graphical way to represent the overall data distribution and are used to visualize possible deviations from normality and unimodality.

4.4 STABILITY AND HOMOGENEITY PLOTS

Plots of reported result against analysis date, and reported result against order of bottling are displayed, along with the regression line. These regression analyses are used to determine if the SDPA should be adjusted due to homogeneity or stability.

4.5 BOX-AND-WHISKER PLOTS

Box-and-Whisker plots are another way to display the distribution of the data. The box denotes the first and third quartile and the whiskers are the 5th and 95th percentile.

4.6 HISTORIC COMPARISON PLOT

The Historic Comparison Plot is a plot of robust mean against robust standard deviation for the previous ten PT rounds as well as the current PT round. This plot can be used to identify possible changes in the sample formulation.

ALUMINUM

Summary Statistics

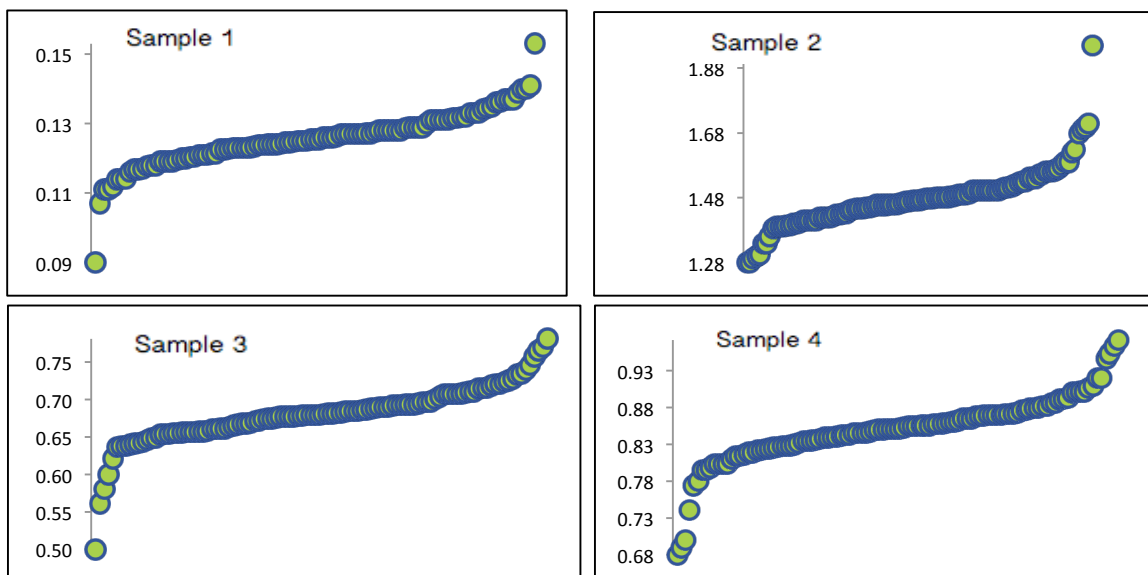
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	103	105	106	106
Median	0.128	1.47	0.680	0.852
Robust Mean	0.129	1.47	0.682	0.851
U	0.00085	0.00851	0.00374	0.00429
Robust Standard Deviation	0.00690	0.0698	0.0308	0.0353
Regression Standard Deviation	0.00964	0.110	0.0511	0.0639
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0096	0.110	0.0511	0.0639
Outliers	1	1	0	0
$ z > 3.0$	1	1	1	0
$2 < z < 3$	1	2	1	3

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	79	79	79	79
ICP/OES (Red)	23	25	26	26
AAG (Green)	1	1	1	1

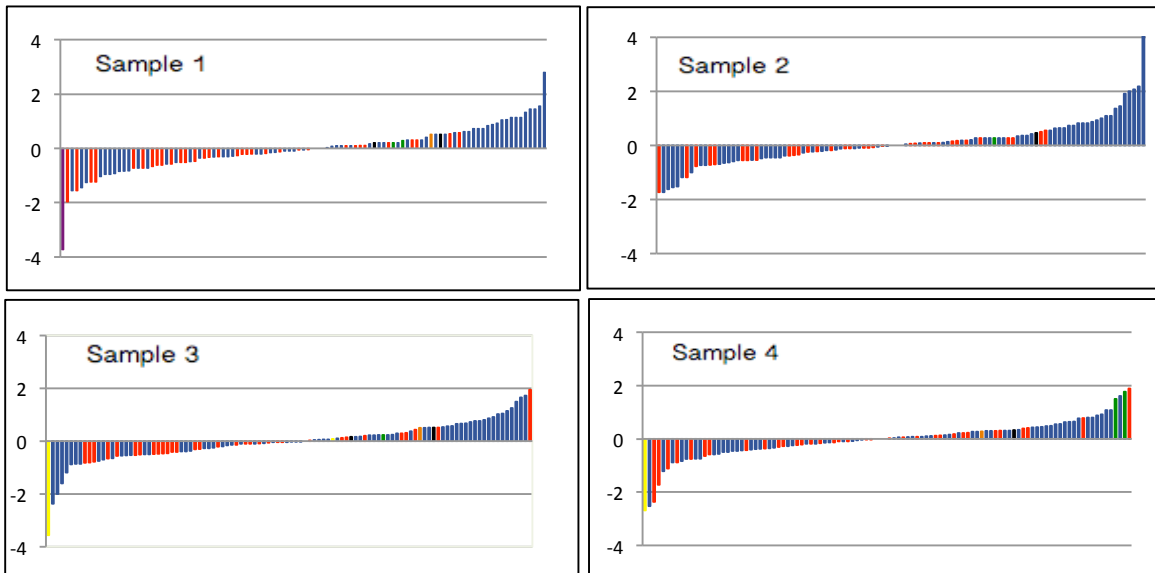
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

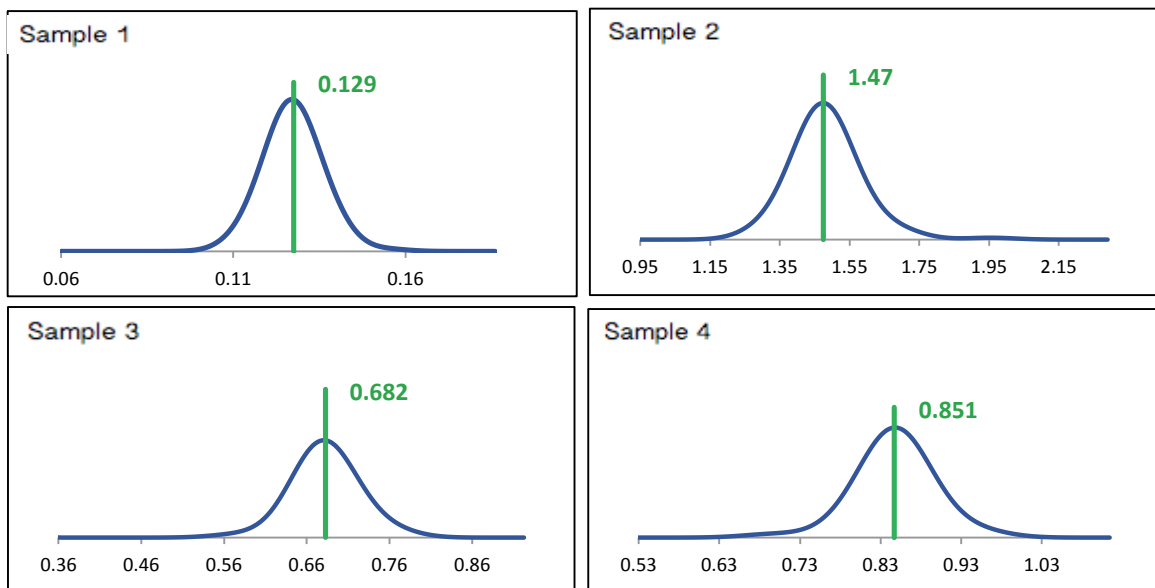


ALUMINUM

z-Score Plots

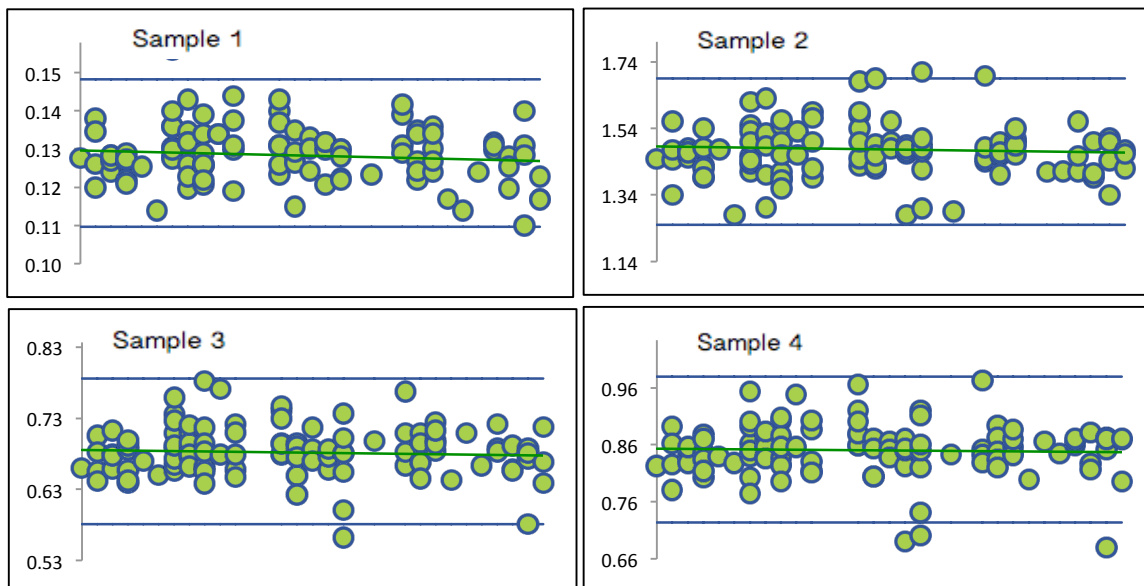


Kernel Density Plots



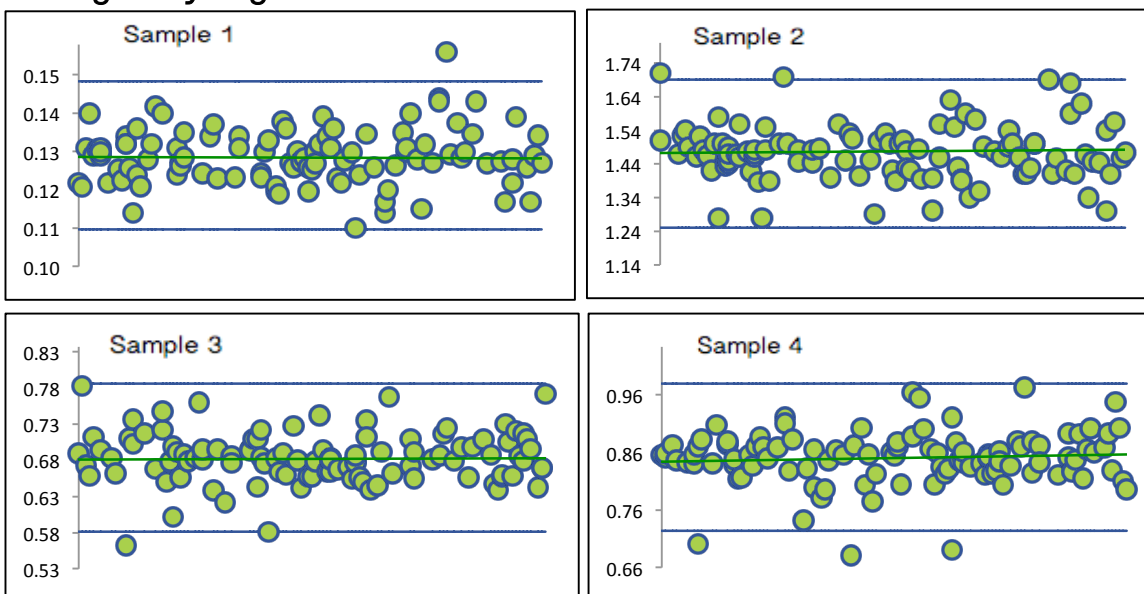
ALUMINUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

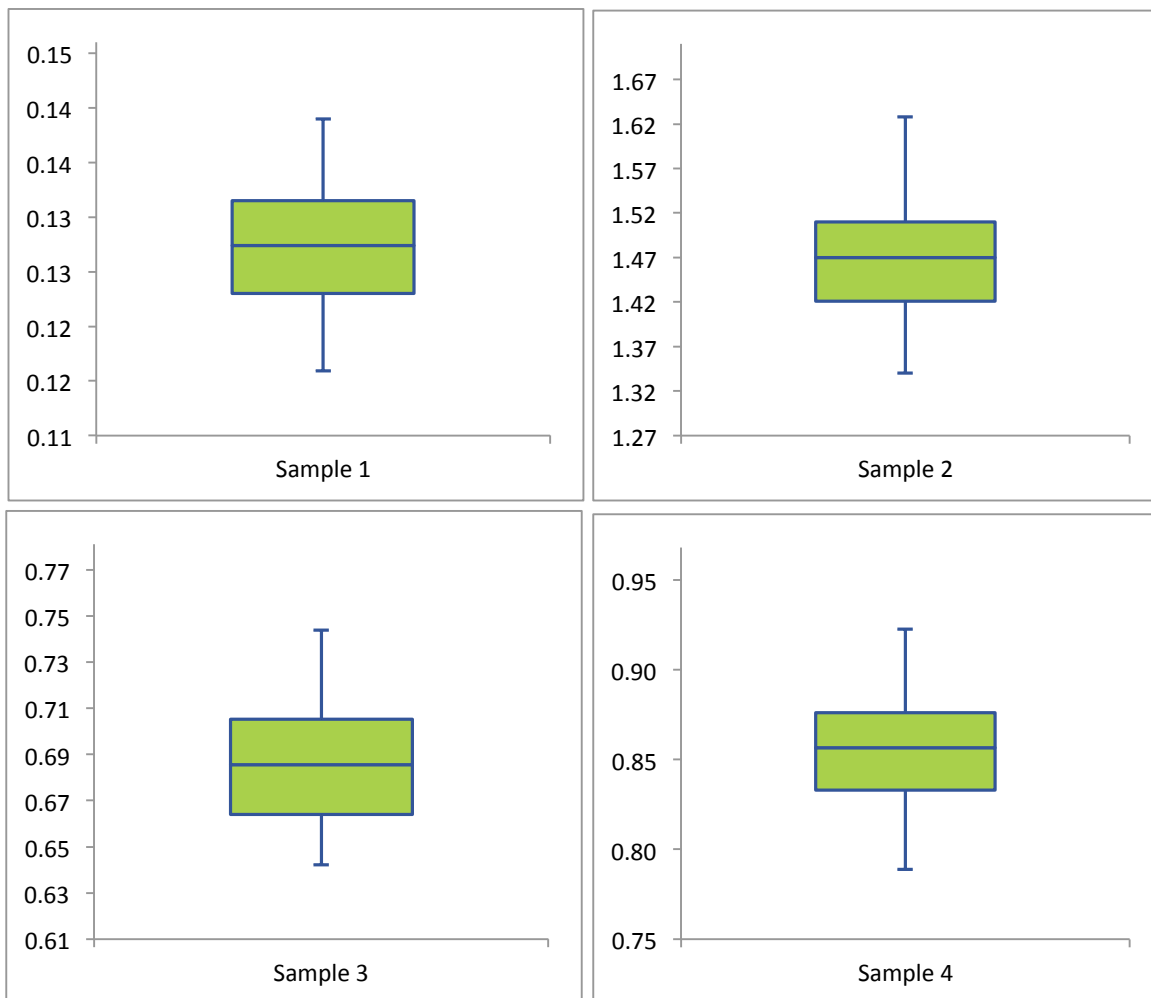
Homogeneity Regression



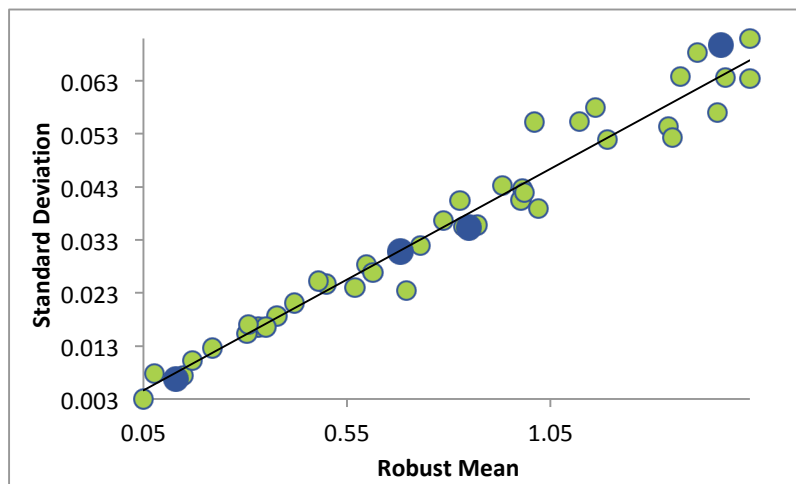
Reported results (Y-axis) plotted against bottling order (X-axis).

ALUMINUM

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



ANTIMONY

Summary Statistics

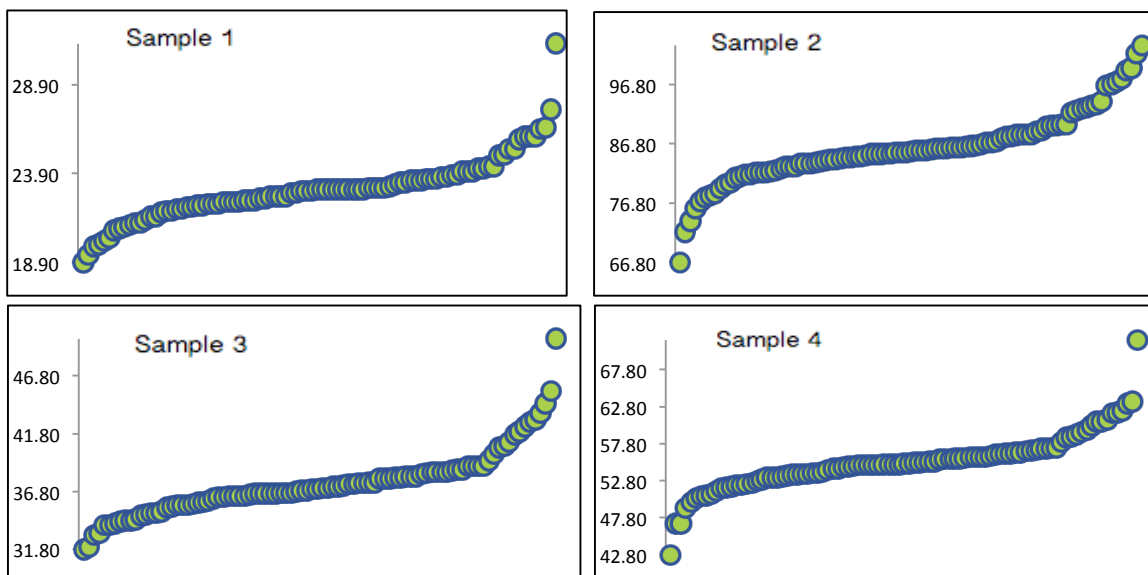
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	92	93	92	93
Median	23.0	85.5	37.1	55.1
Robust Mean	22.9	85.9	37.2	55.2
U	0.182	0.625	0.288	0.381
Robust Standard Deviation	1.40	4.82	2.21	2.94
Regression Standard Deviation	2.29	8.59	3.72	5.52
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	2.29	8.59	3.72	5.52
Outliers	1	1	1	1
$ z > 3.0$	1	0	1	1
$2 < z < 3$	1	2	1	1

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	11	12	11	12
ICP/MS (Red)	77	77	77	77
AAHY (Green)	1	1	1	1
ICPHY (Orange)	2	2	2	2
AAG (Black)	1	1	1	1

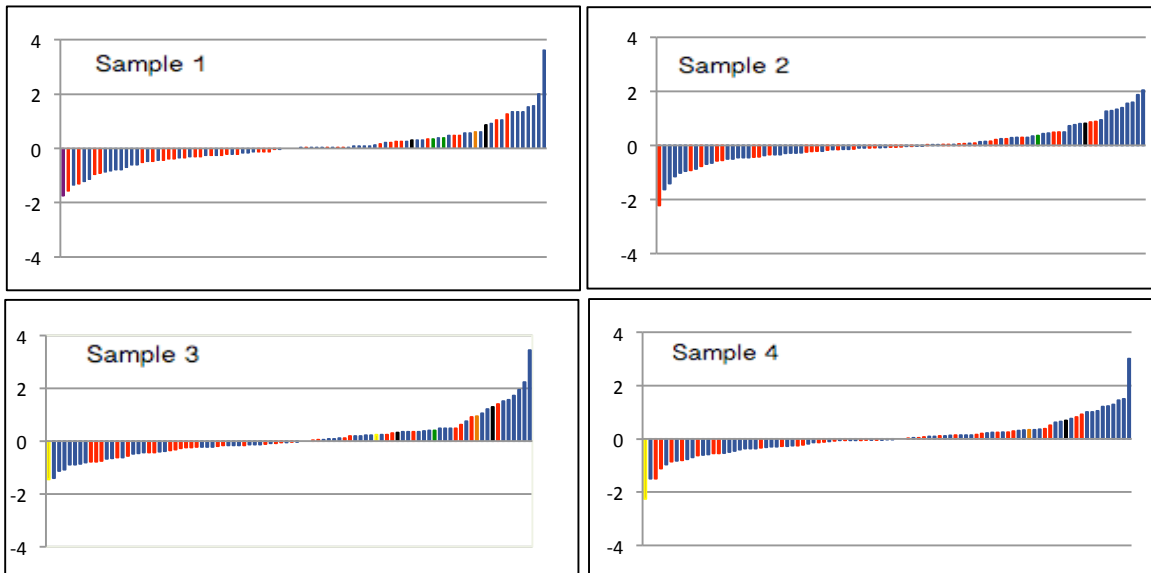
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

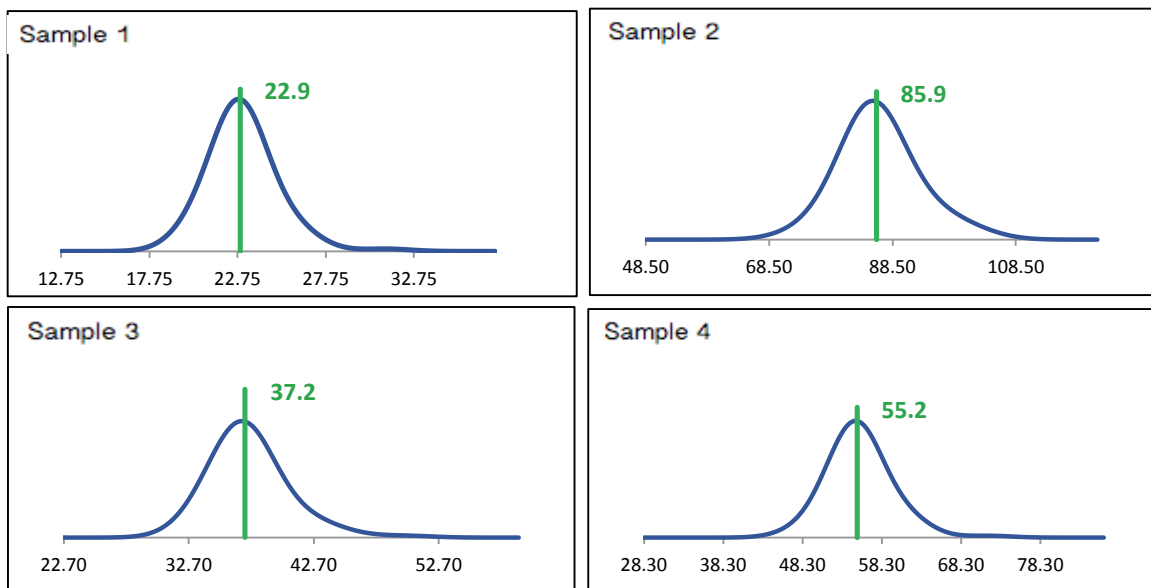


ANTIMONY

z-Score Plots

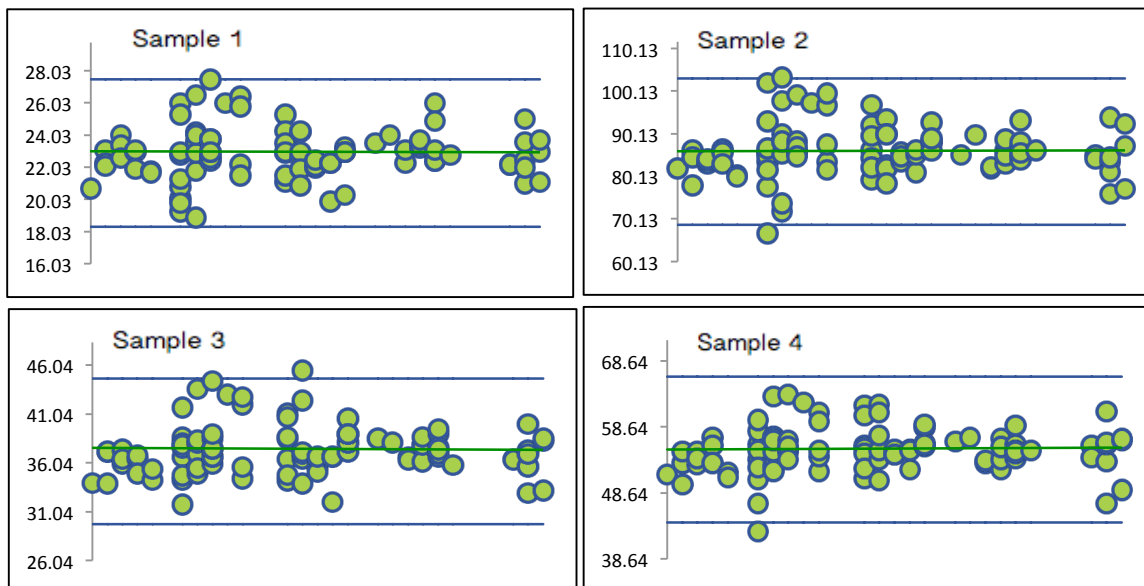


Kernel Density Plots



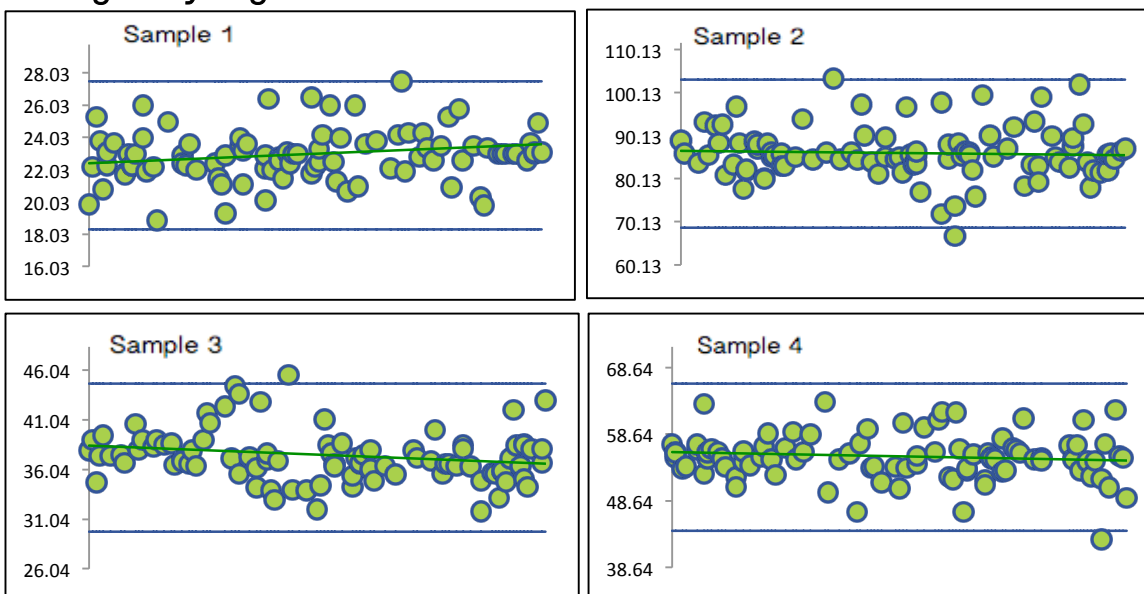
ANTIMONY

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

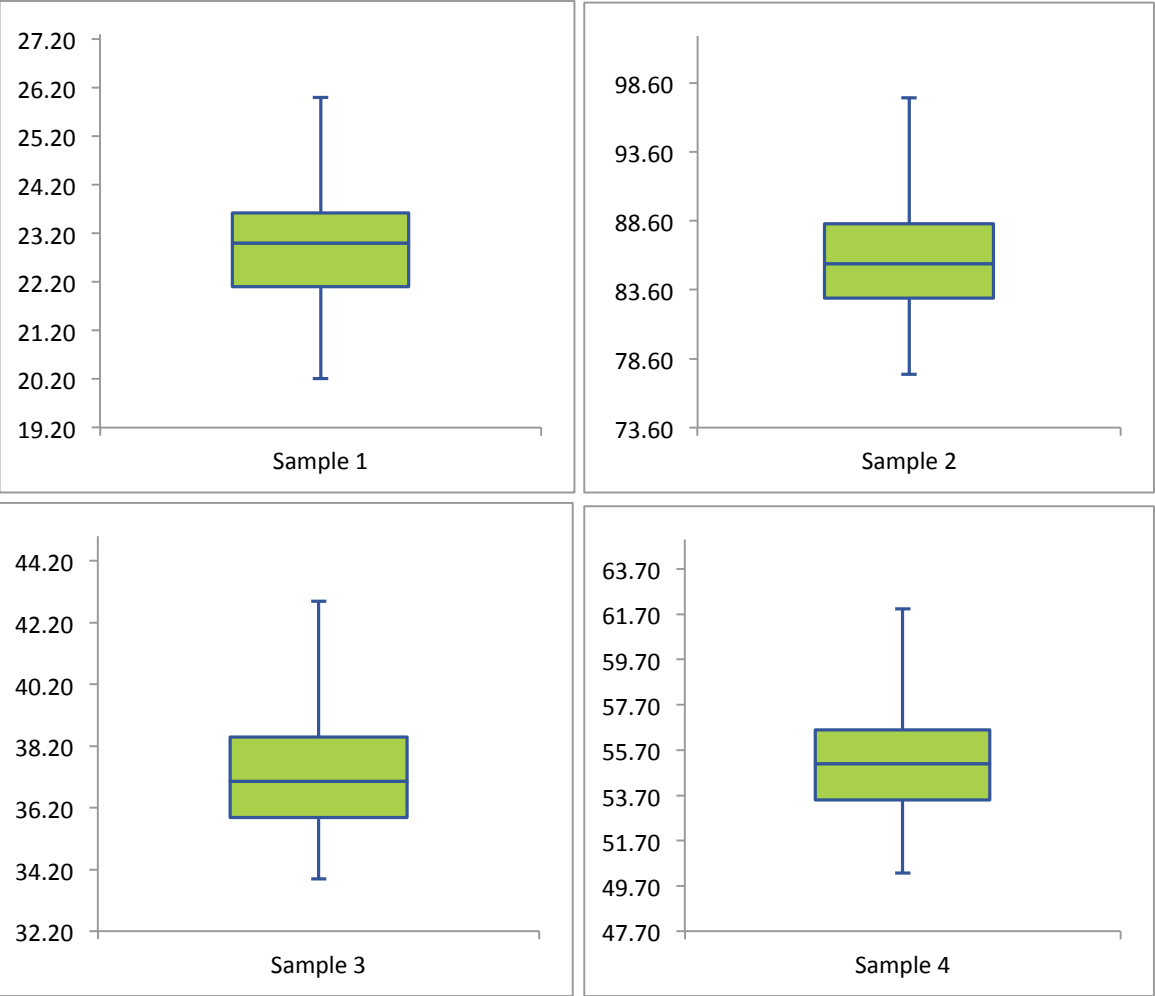
Homogeneity Regression



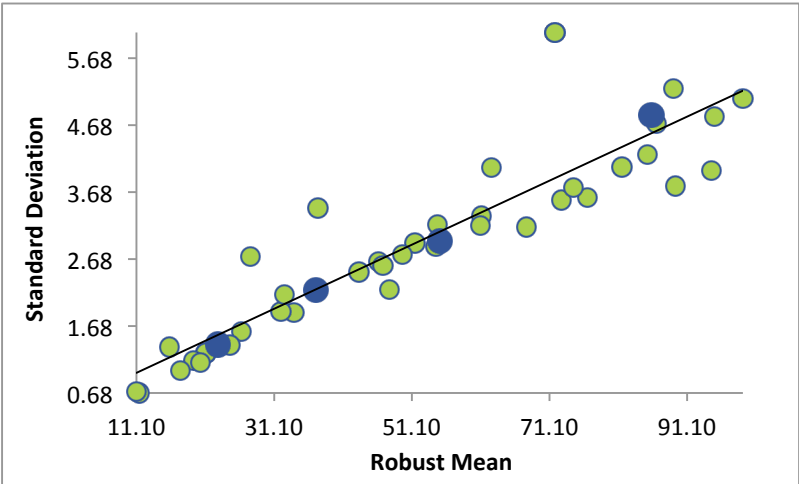
Reported results (Y-axis) plotted against bottling order (X-axis).

ANTIMONY

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



ARSENIC

Summary Statistics

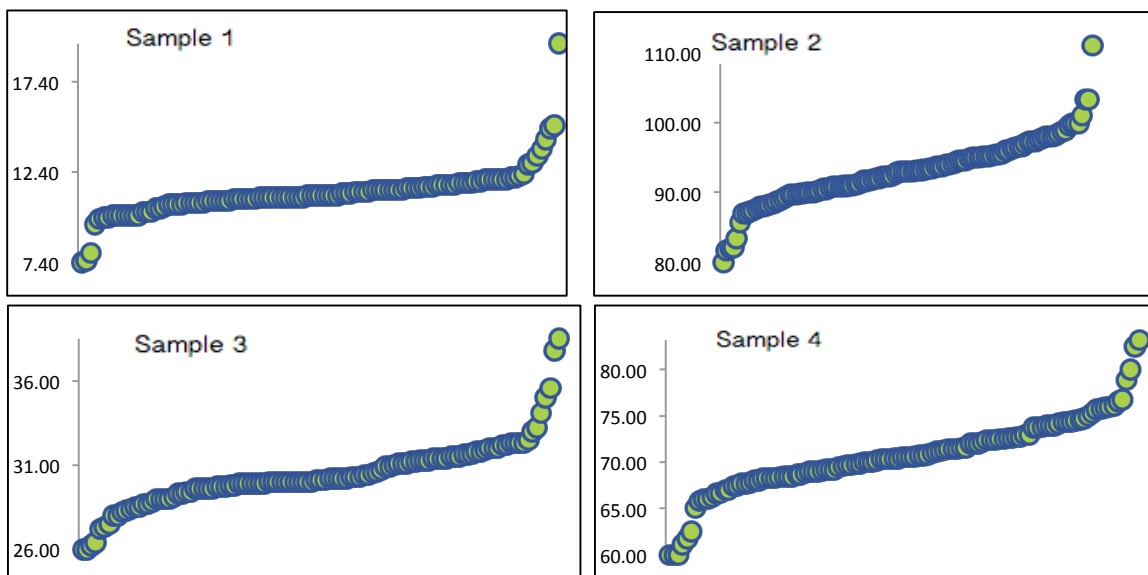
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	111	112	111	112
Median	11.1	93.0	30.1	70.5
Robust Mean	11.1	93.0	30.3	70.7
U	0.0928	0.49	0.177	0.405
Robust Standard Deviation	0.782	4.15	1.49	3.43
Regression Standard Deviation	1.11	9.30	3.03	7.07
Stability Flag				
Homogeneity Flag	Homogeneity			
Standard Deviation Used (SDPA)	1.14	9.30	3.03	7.07
Outliers	0	0	0	0
$ z > 3.0$	5	0	0	0
$2 < z < 3$	3	0	2	0

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	16	17	16	17
AAHY (Red)	2	2	2	2
ICP/MS (Green)	90	90	90	90
AAG (Orange)	1	1	1	1
ICPHY (Black)	2	2	2	2

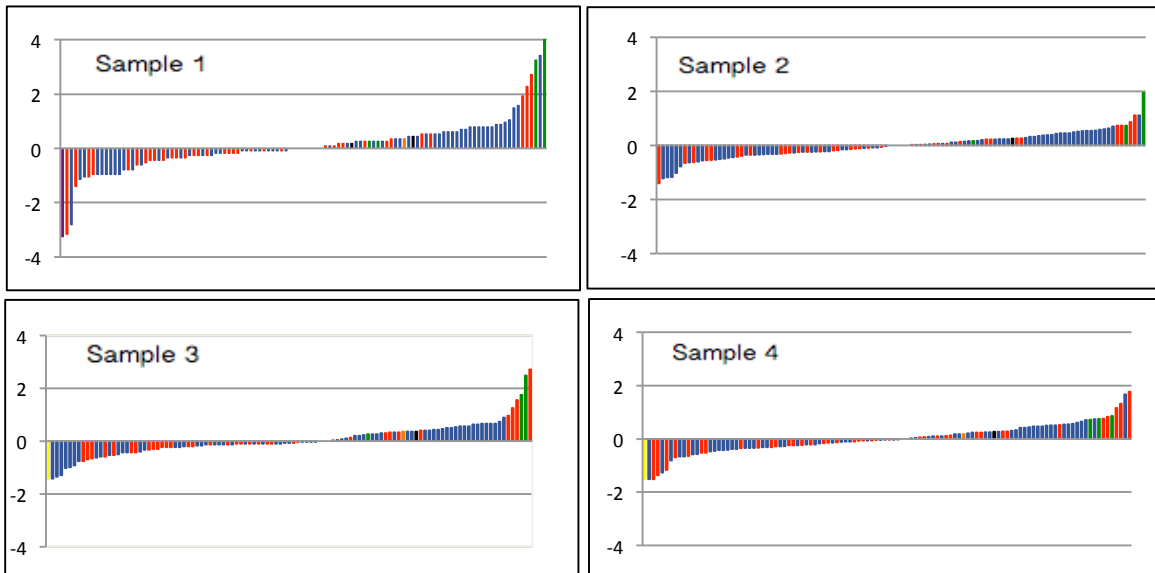
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Sorted Scatter Plots

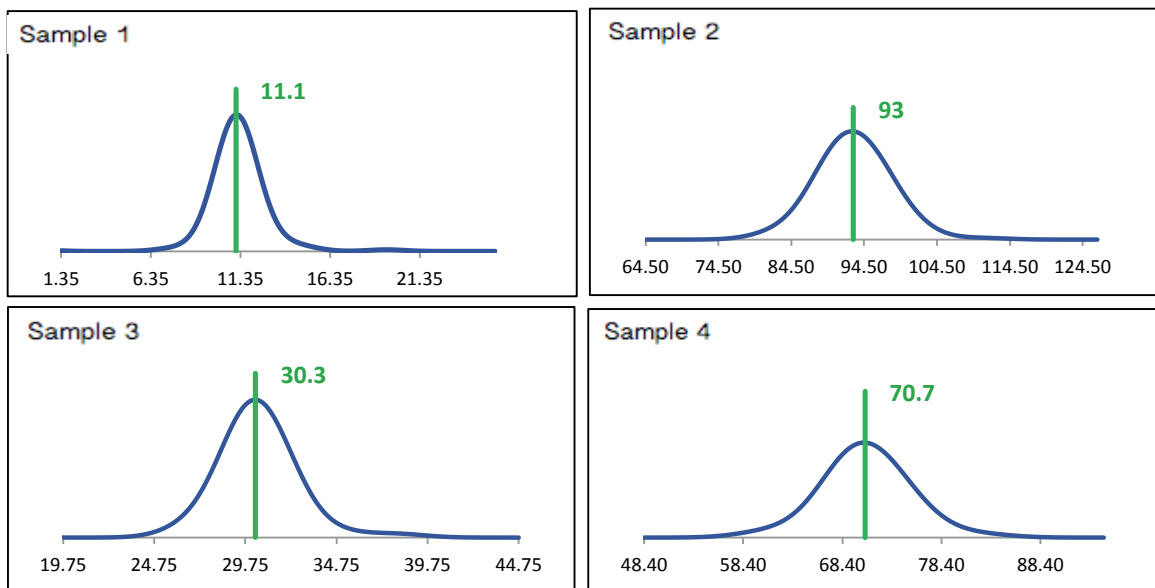


ARSENIC

z-Score Plots

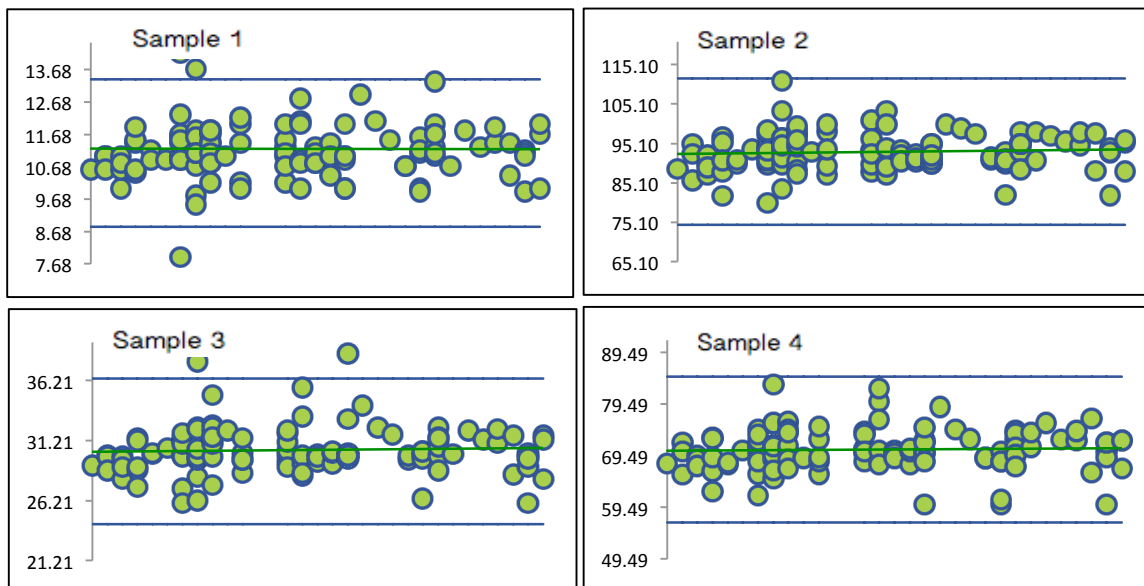


Kernel Density Plots



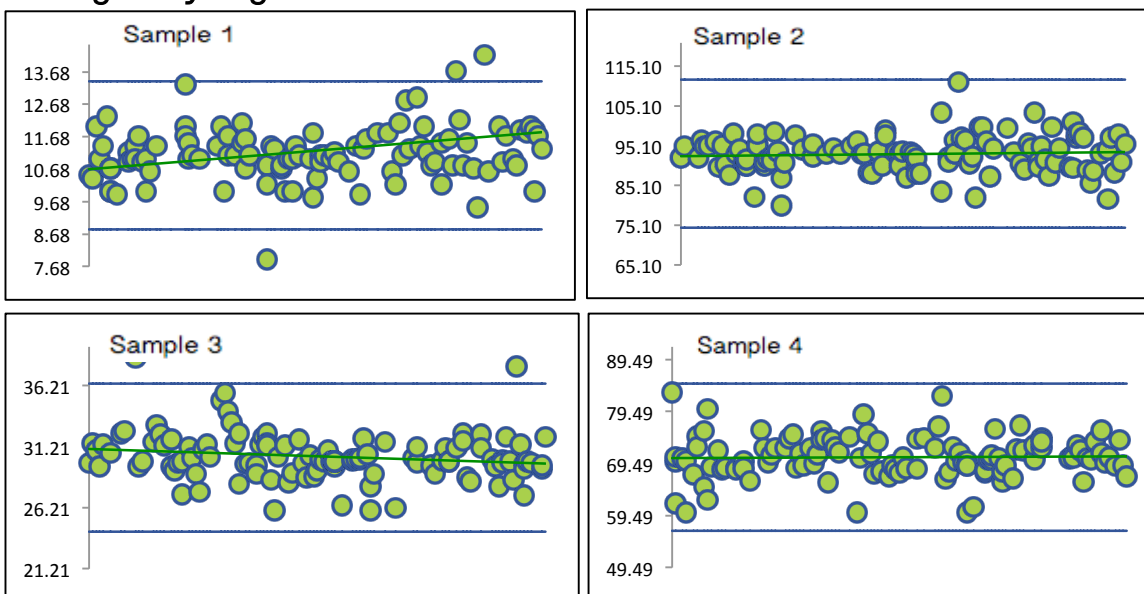
ARSENIC

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

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The figure displays four box plots, each representing the distribution of sample means for a different sample. The y-axis for each plot shows the range of values, and the x-axis is labeled with the sample number.

- Sample 1:** The y-axis ranges from 9.41 to 13.41. The box plot shows a median around 10.91, with the interquartile range (IQR) spanning from approximately 10.41 to 11.41. The whiskers extend from about 9.41 to 12.91.
- Sample 2:** The y-axis ranges from 82.10 to 102.10. The box plot shows a median around 92.10, with the IQR spanning from approximately 89.10 to 97.10. The whiskers extend from about 87.10 to 100.10.
- Sample 3:** The y-axis ranges from 26.00 to 34.00. The box plot shows a median around 30.00, with the IQR spanning from approximately 29.50 to 31.50. The whiskers extend from about 27.50 to 33.00.
- Sample 4:** The y-axis ranges from 60.70 to 78.70. The box plot shows a median around 70.70, with the IQR spanning from approximately 68.70 to 72.70. The whiskers extend from about 63.70 to 76.70.

A scatter plot showing the relationship between Robust Mean (X-axis) and Standard Deviation (Y-axis). The X-axis ranges from 2.14 to 102.14 with major ticks every 20 units. The Y-axis ranges from 0.23 to 4.73 with major ticks every 0.5 units. Data points are represented by blue circles with black outlines. A solid black line represents the linear regression fit, showing a positive correlation between the Robust Mean and Standard Deviation.

BARIUM

Summary Statistics

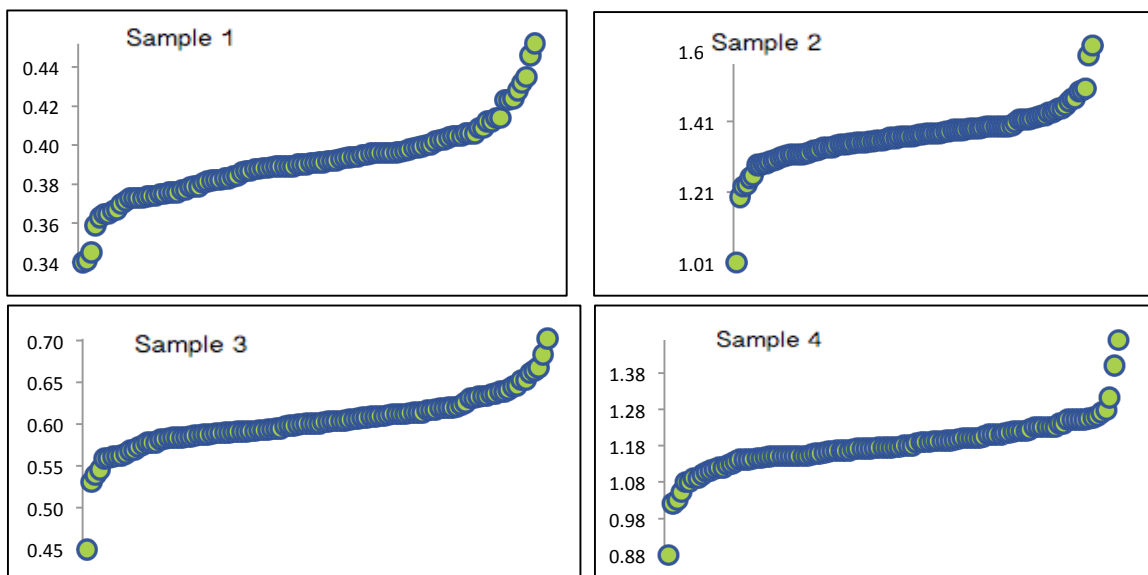
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	106	108	108	108
Median	0.386	1.37	0.600	1.18
Robust Mean	0.385	1.37	0.601	1.18
U	0.00192	0.00657	0.0031	0.00613
Robust Standard Deviation	0.0158	0.0546	0.0258	0.0510
Regression Standard Deviation	0.0289	0.103	0.0451	0.0885
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0289	0.103	0.0451	0.0885
Outliers	1	0	0	0
$ z > 3.0$	0	1	1	2
$2 < z < 3$	1	2	1	1

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	79	80	80	80
ICP/OES (Red)	26	27	27	27
AAG (Green)	1	1	1	1

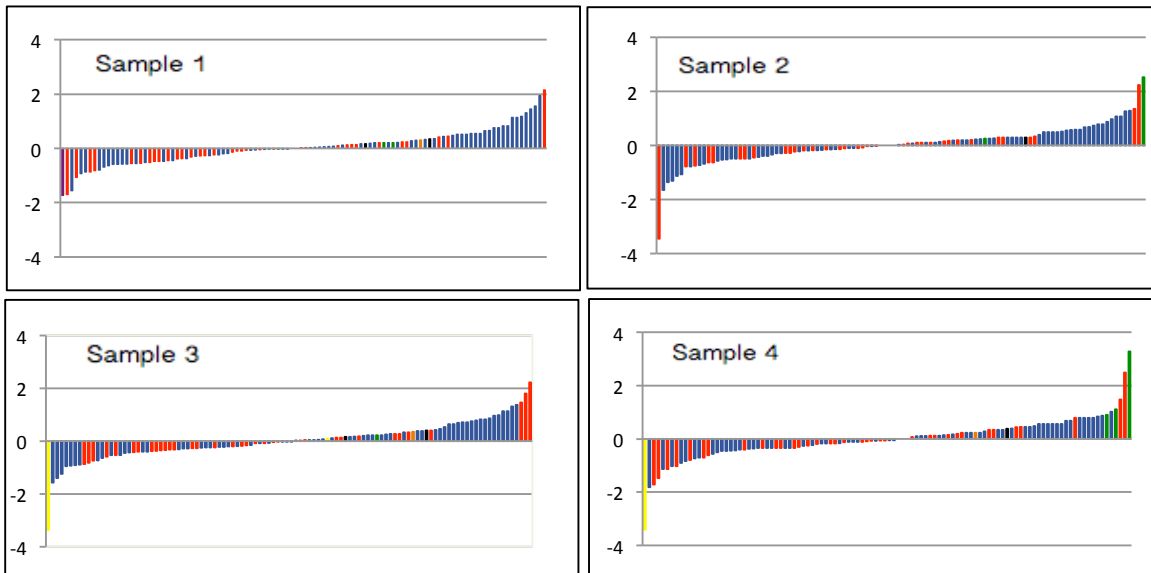
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Sorted Scatter Plots

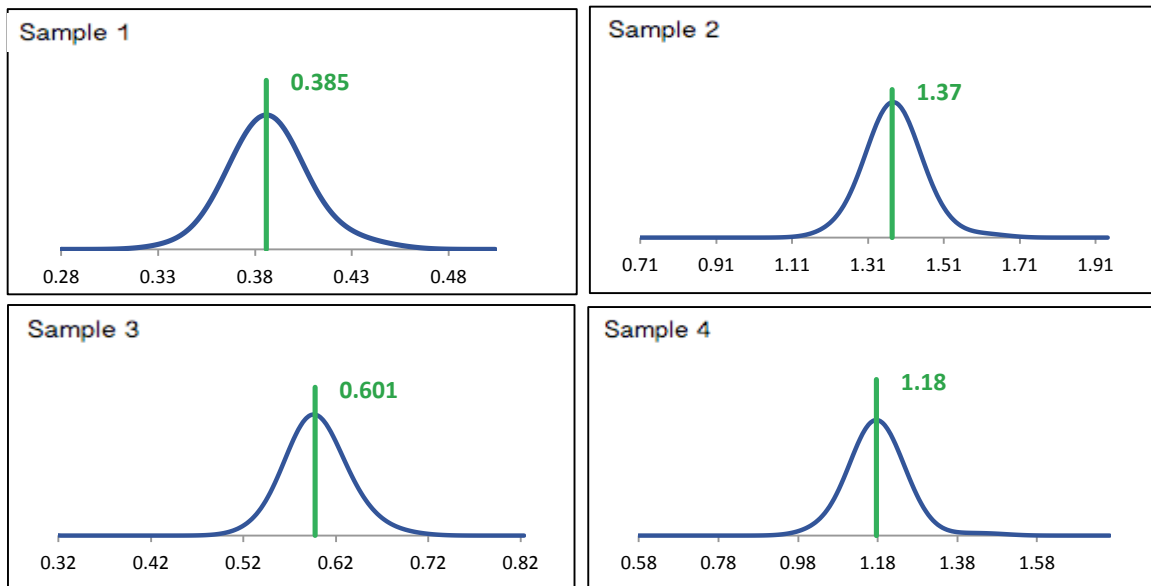


BARIUM

z-Score Plots

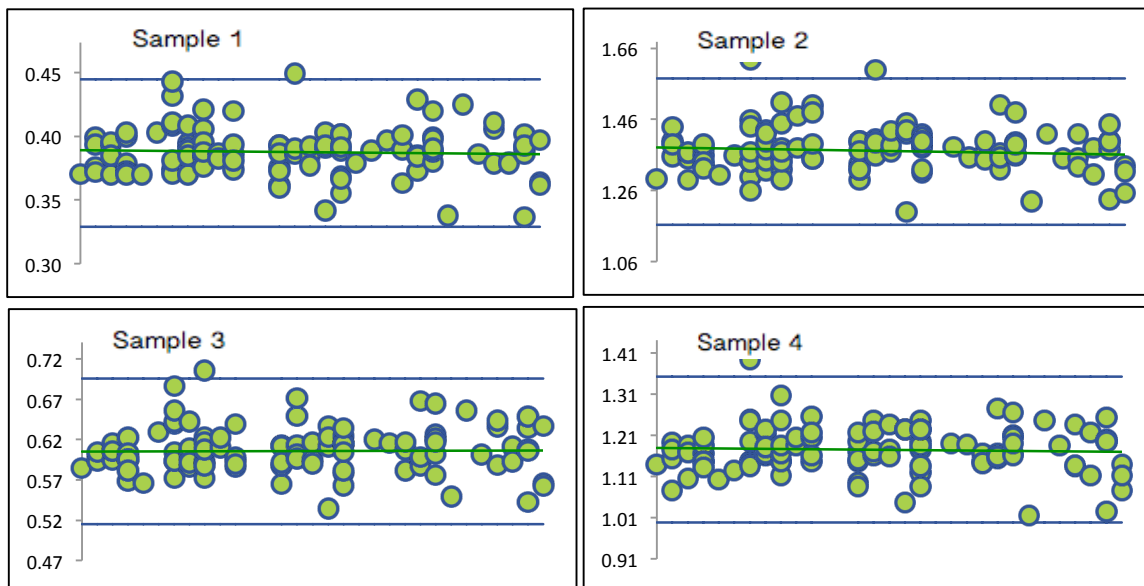


Kernel Density Plots



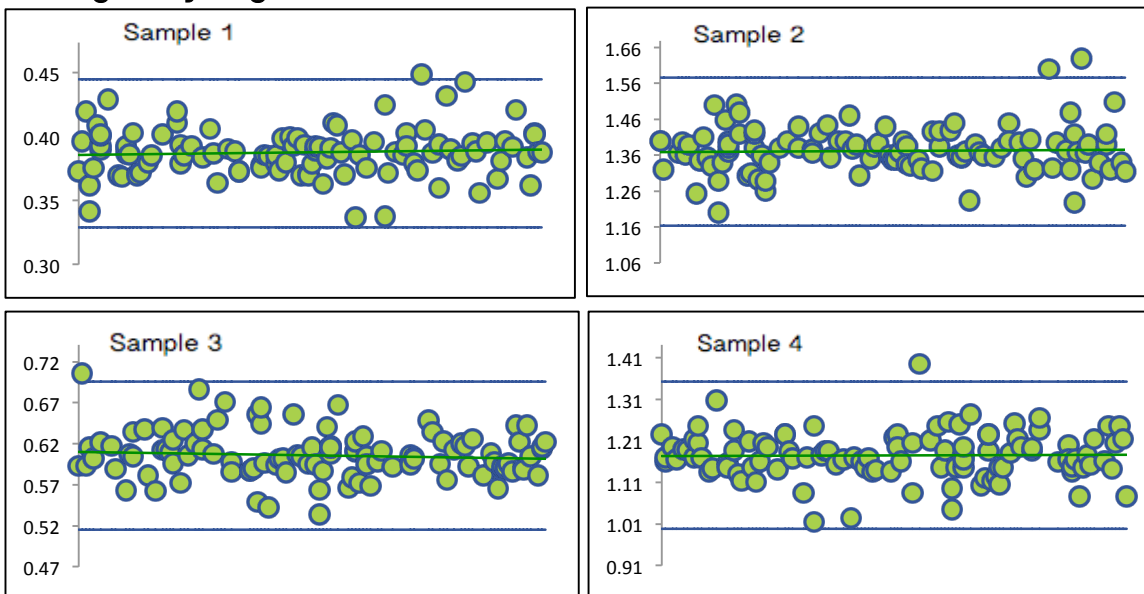
BARIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

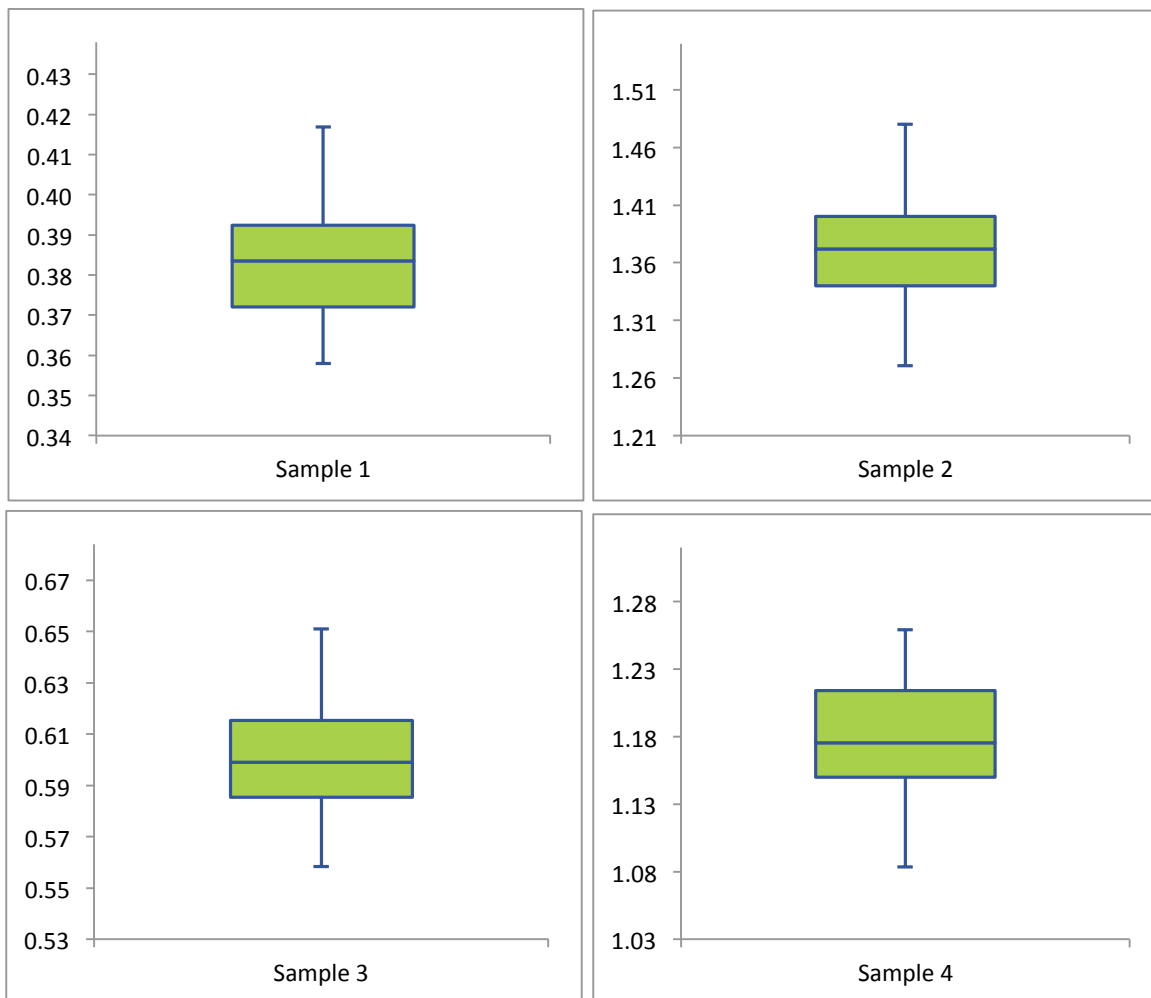
Homogeneity Regression



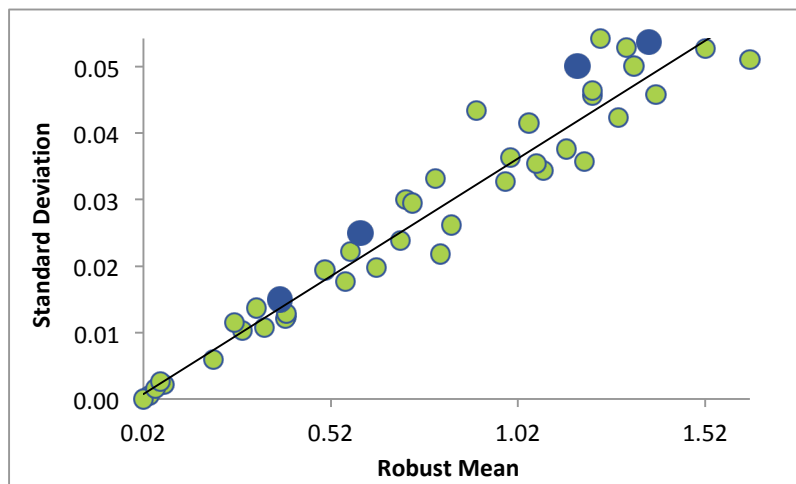
Reported results (Y-axis) plotted against bottling order (X-axis).

BARIUM

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



BERYLLIUM

Summary Statistics

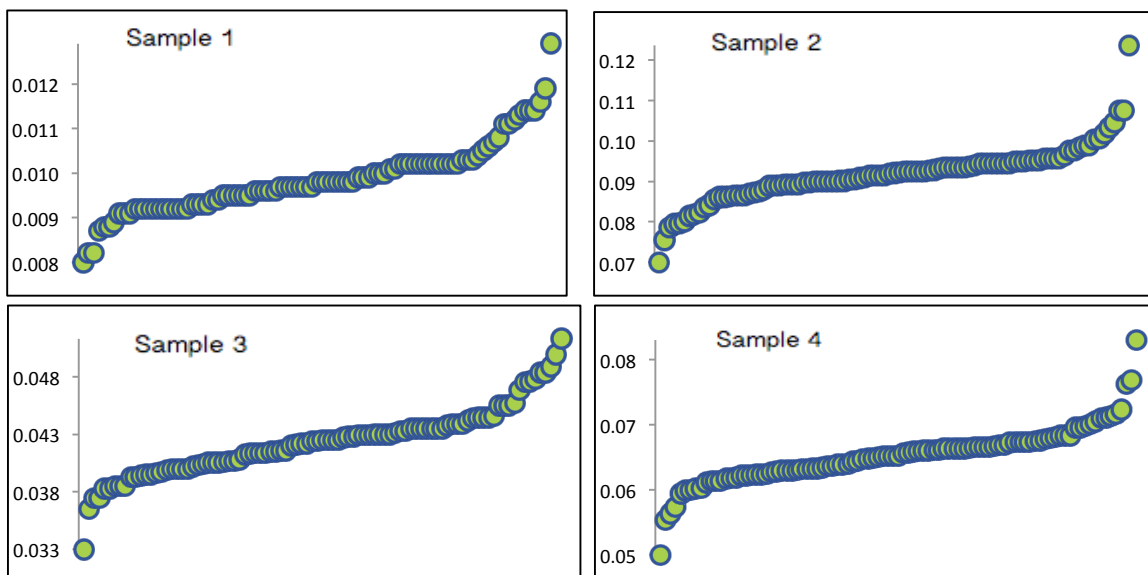
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	91	95	93	95
Median	0.0096	0.097	0.0420	0.0639
Robust Mean	0.0096	0.096	0.0417	0.0639
U	0.000086	0.000662	0.00034	0.000448
Robust Standard Deviation	0.000656	0.00516	0.00262	0.00349
Regression Standard Deviation	0.000720	0.00721	0.00313	0.00479
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.000720	0.00721	0.00313	0.00479
Outliers	0	0	0	0
$ z > 3.0$	1	2	0	2
$2 < z < 3$	9	3	4	3

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	73	73	73	73
ICP/OES (Red)	17	21	19	21
AAG (Green)	1	1	1	1

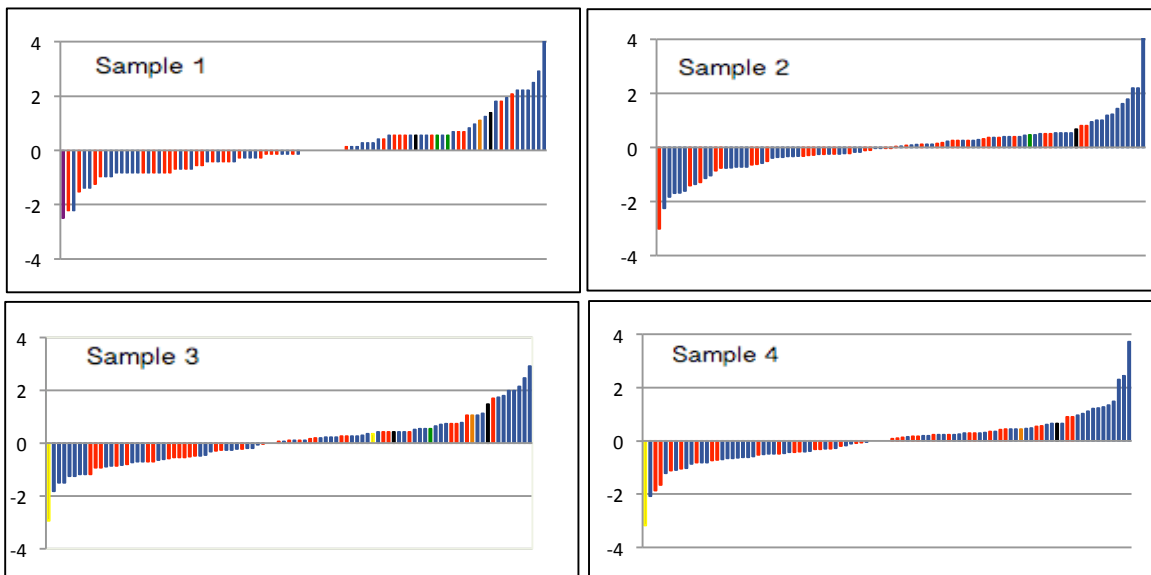
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Sorted Scatter Plots

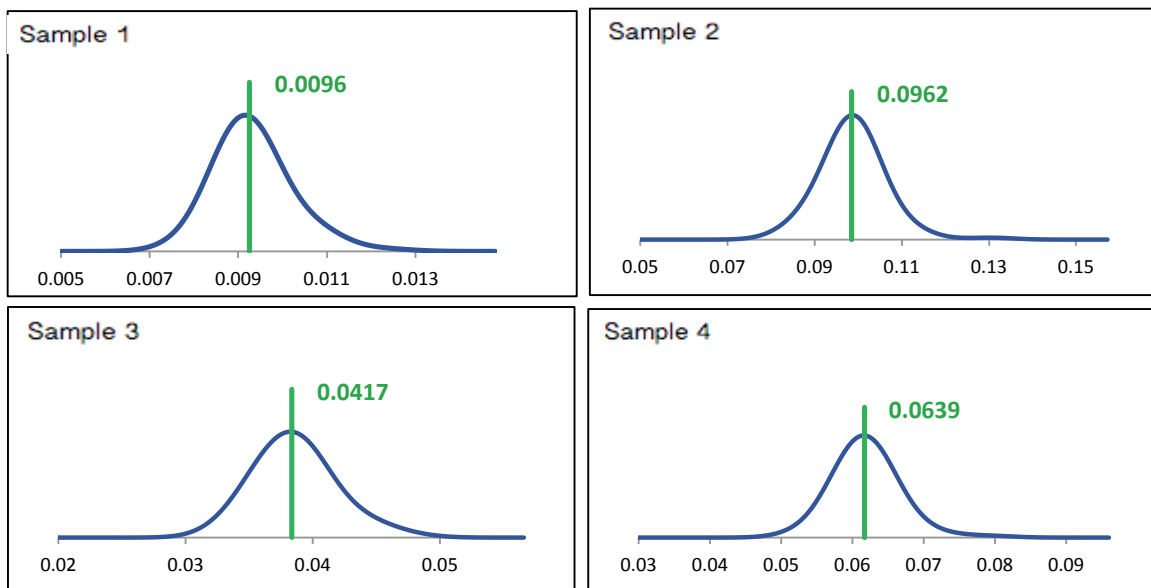


BERYLLIUM

z-Score Plots

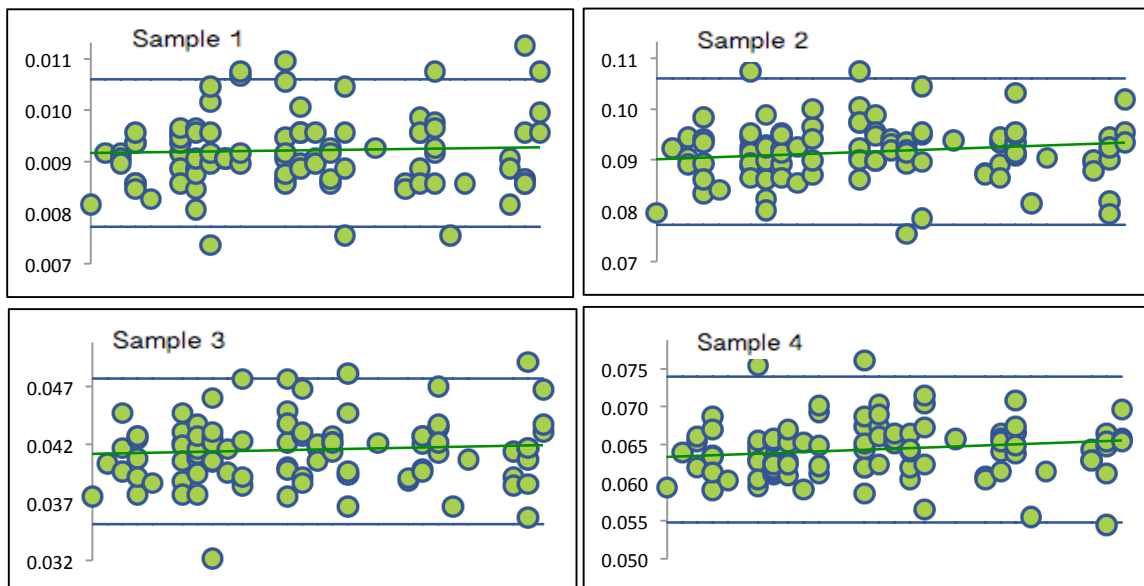


Kernel Density Plots



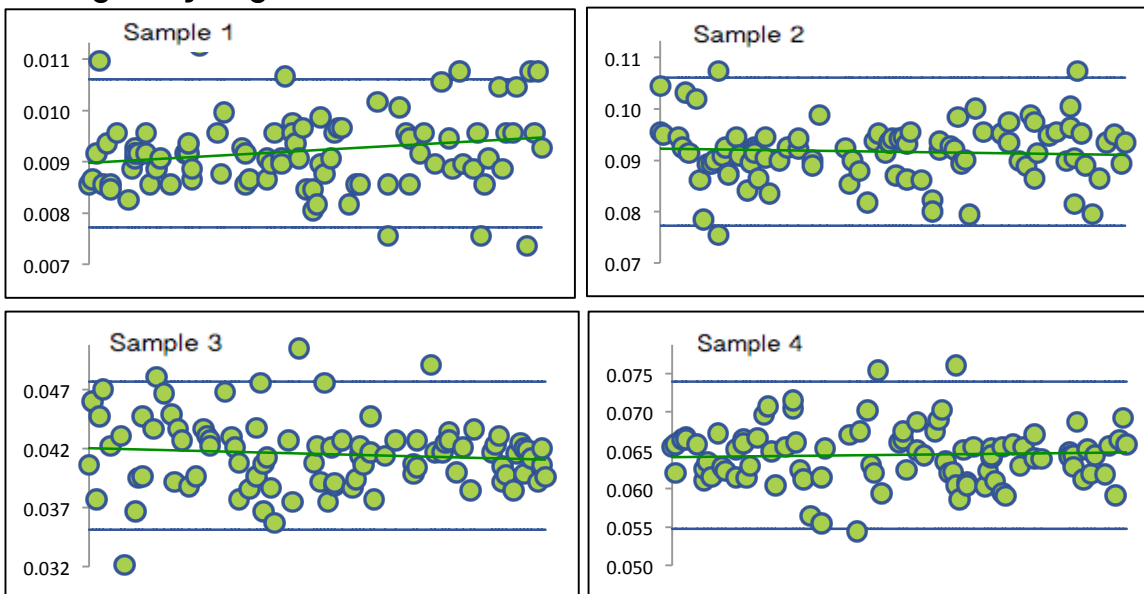
BERYLLIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

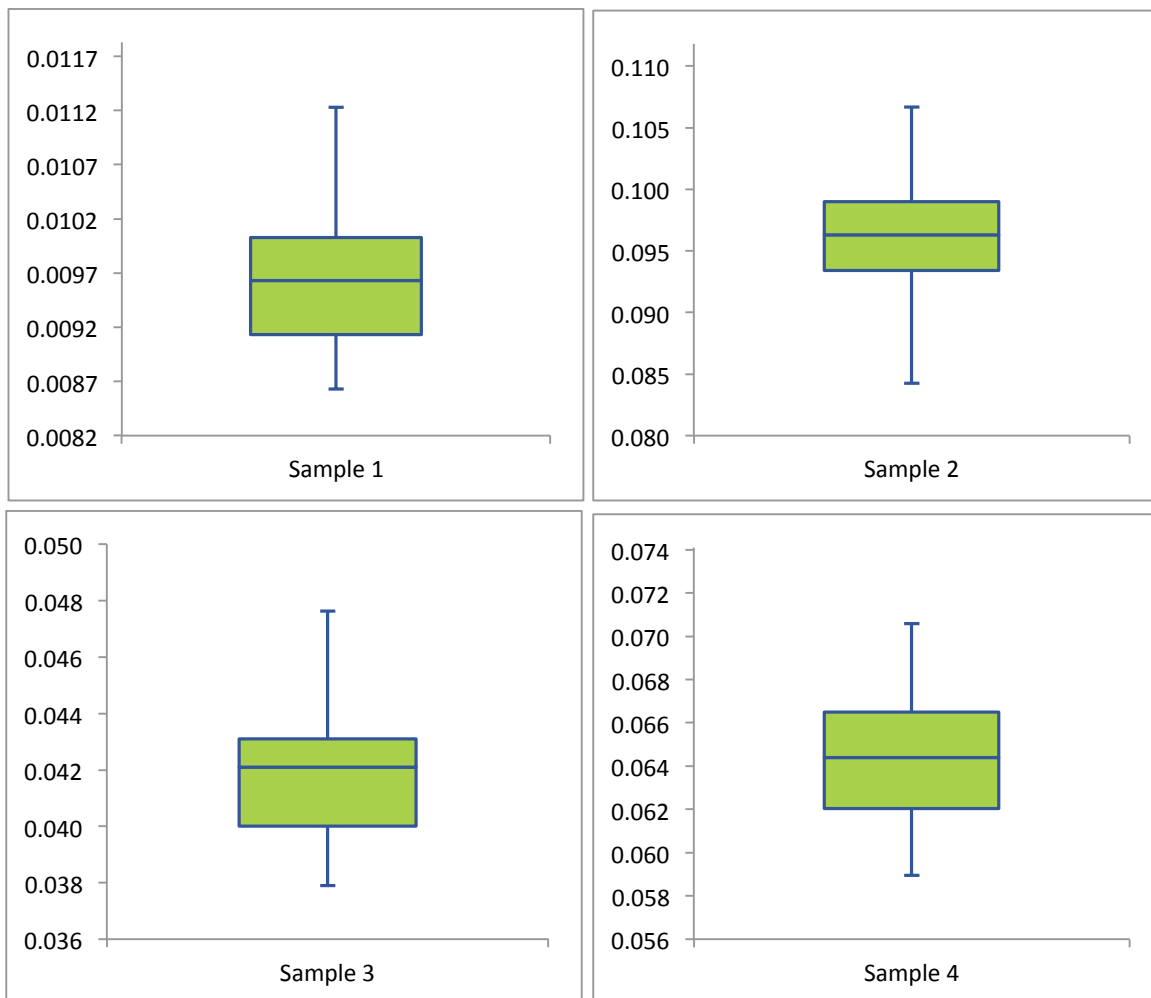
Homogeneity Regression



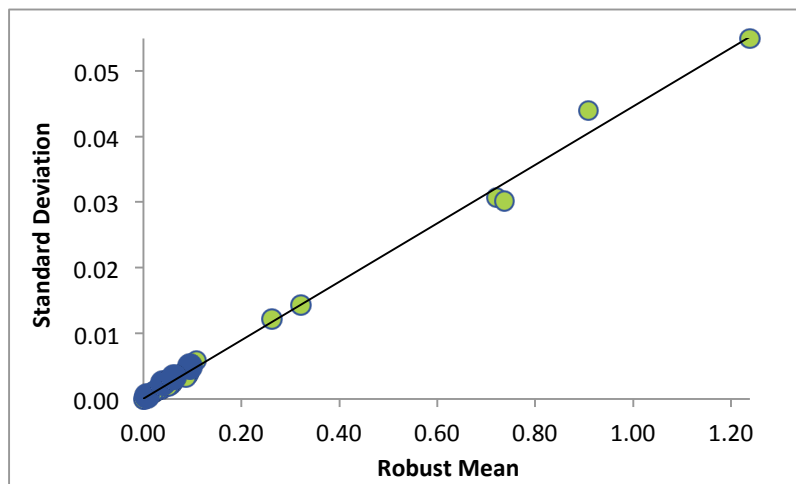
Reported results (Y-axis) plotted against bottling order (X-axis).

BERYLLIUM

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



BORON

Summary Statistics

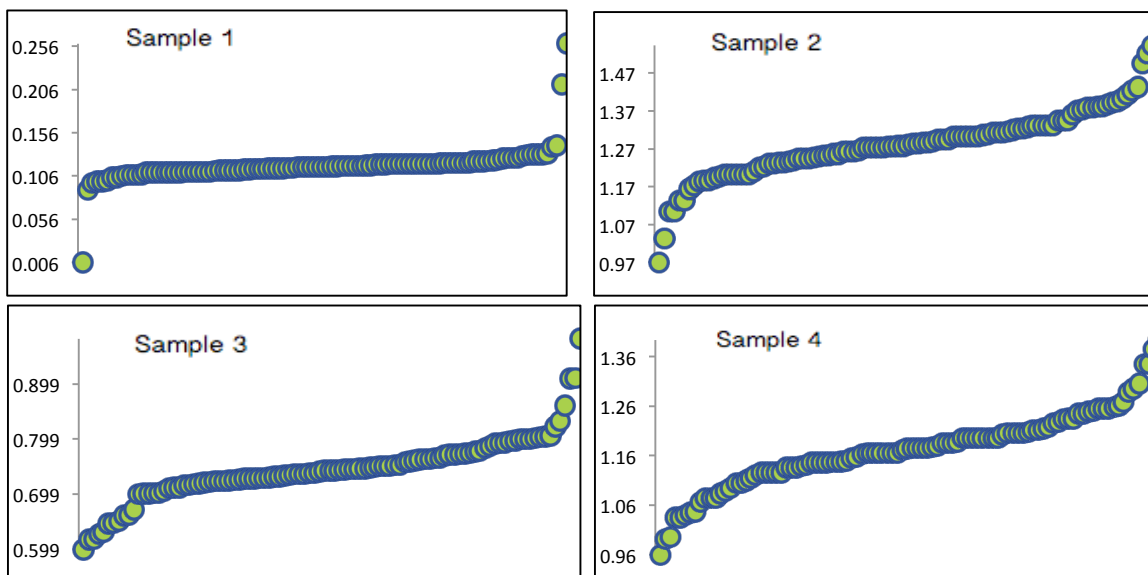
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	100	100	100	100
Median	0.116	1.28	0.742	1.17
Robust Mean	0.117	1.28	0.744	1.17
U	0.000955	0.00959	0.00539	0.00863
Robust Standard Deviation	0.00764	0.0767	0.0431	0.0690
Regression Standard Deviation	0.00875	0.0959	0.0558	0.0875
Stability Flag				
Homogeneity Flag	Homogeneity			
Standard Deviation Used (SDPA)	0.0158	0.0959	0.0558	0.0875
Outliers	0	0	0	0
$ z > 3.0$	3	1	1	0
$2 < z < 3$	0	4	8	5

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	72	72	72	72
ICP/OES (Red)	28	28	28	28

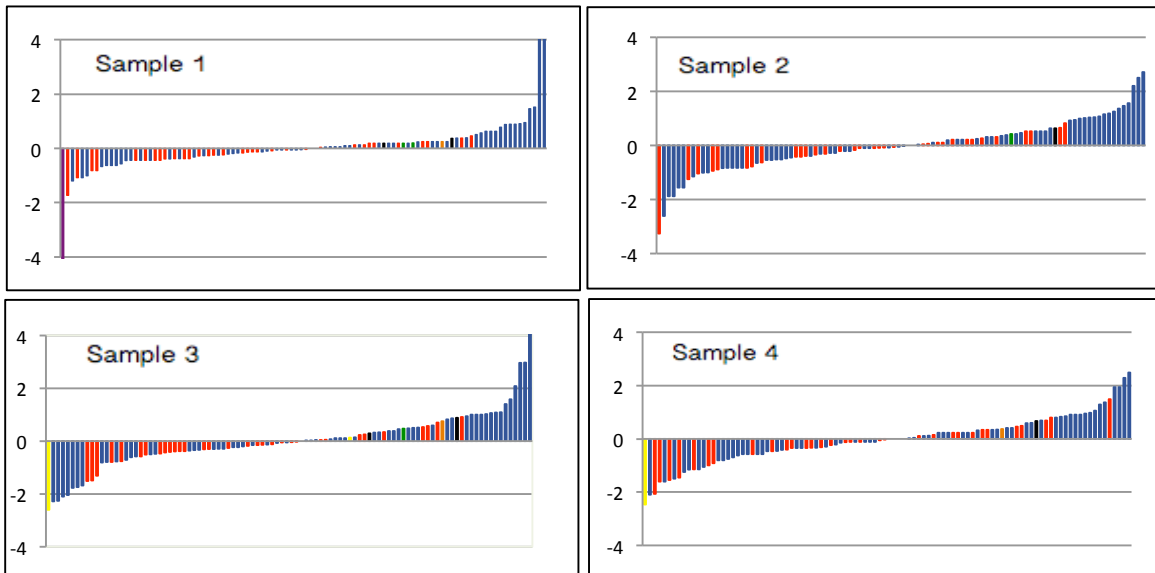
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Sorted Scatter Plots

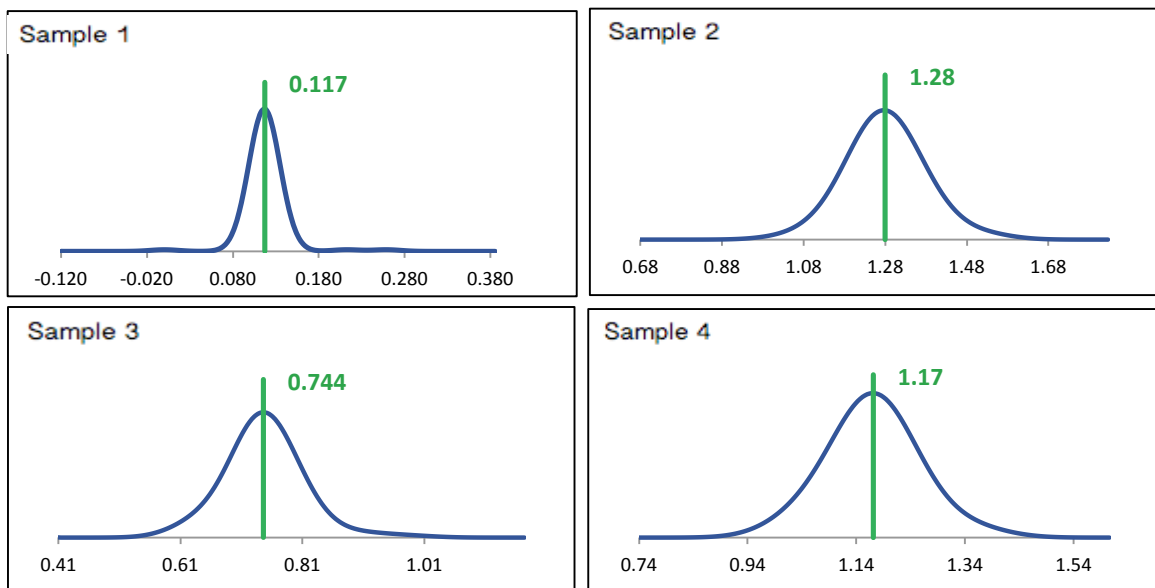


BORON

z-Score Plots

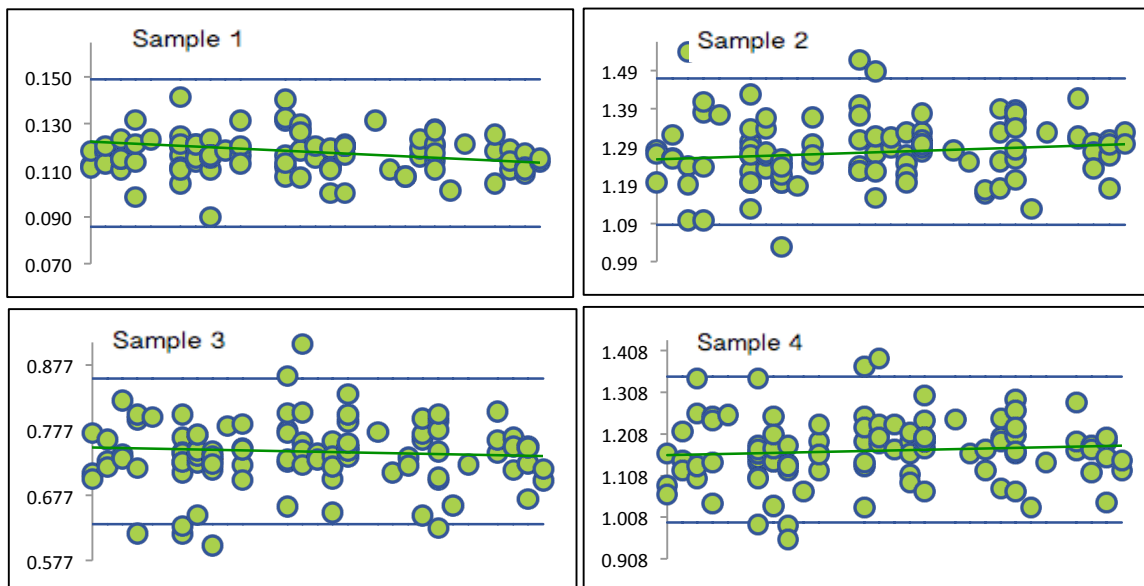


Kernel Density Plots



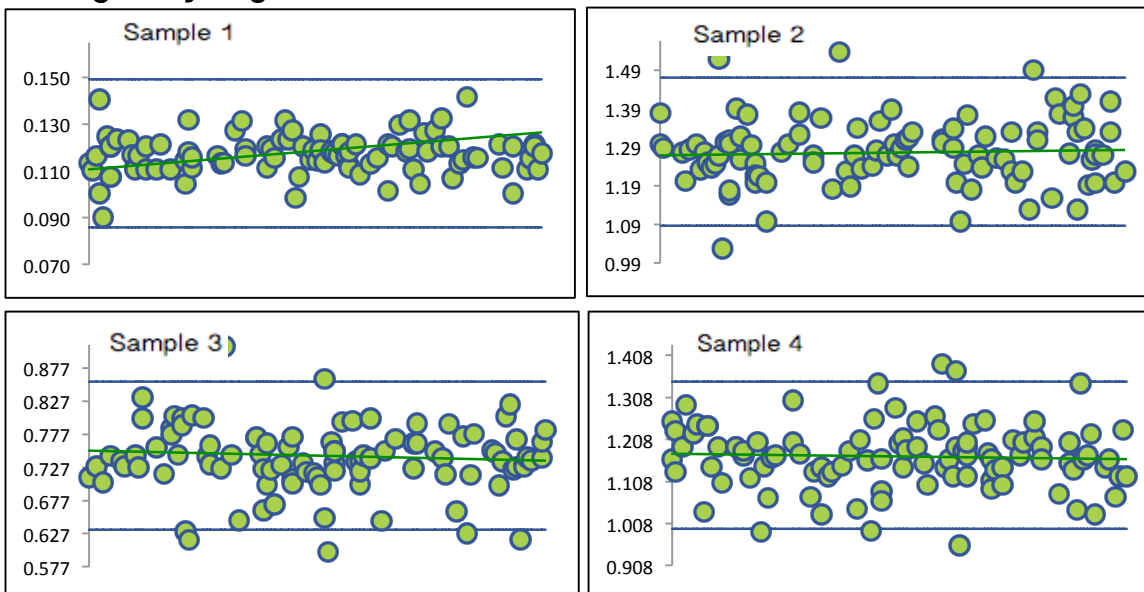
BORON

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

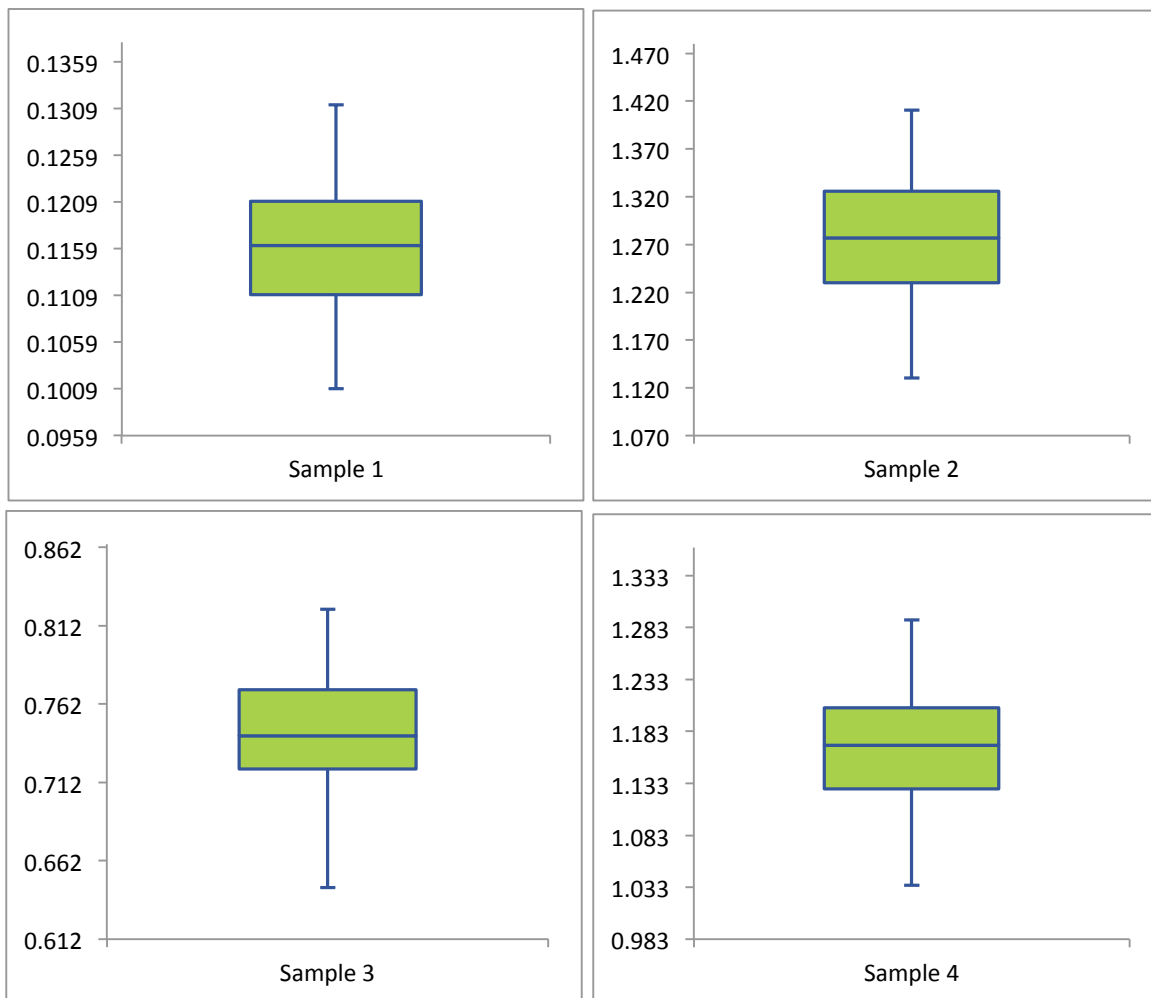
Homogeneity Regression



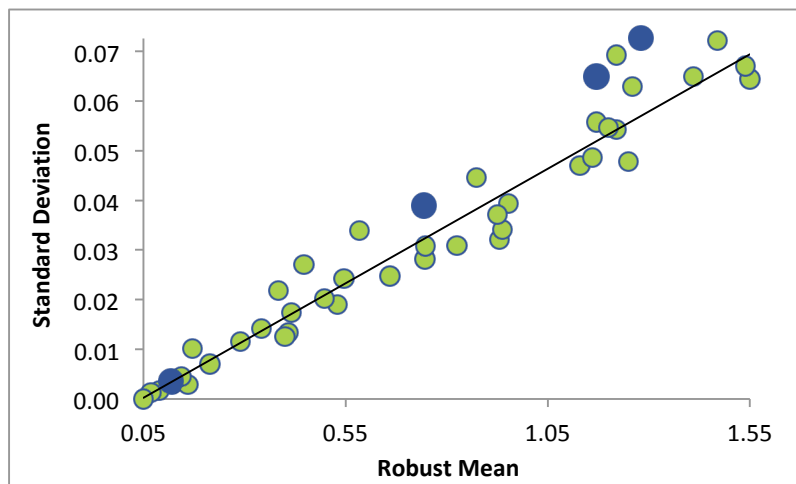
Reported results (Y-axis) plotted against bottling order (X-axis).

BORON

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



CADMIUM

Summary Statistics

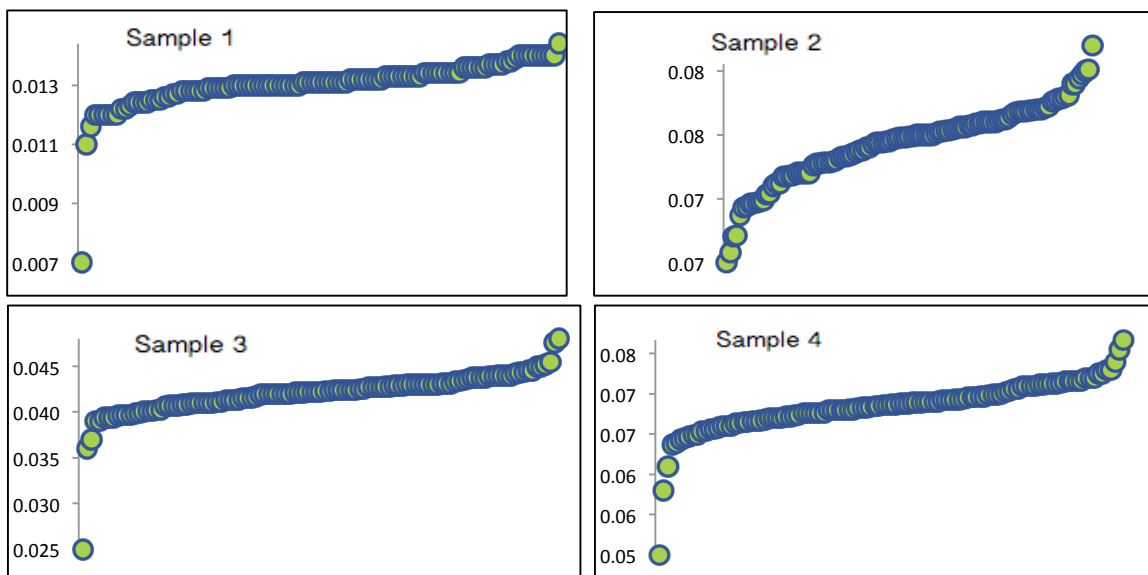
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	111	111	111	111
Median	0.0131	0.0759	0.0422	0.0707
Robust Mean	0.0131	0.0755	0.0421	0.0706
U	0.0000643	0.000335	0.000203	0.000299
Robust Standard Deviation	0.000542	0.00282	0.00171	0.00252
Regression Standard Deviation	0.000983	0.00566	0.00316	0.00530
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.000983	0.00566	0.00316	0.00530
Outliers	0	0	0	0
$ z > 3.0$	1	0	1	1
$2 < z < 3$	1	0	0	0

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	83	83	83	83
ICP/OES (Red)	27	27	27	27
AAG (Green)	1	1	1	1

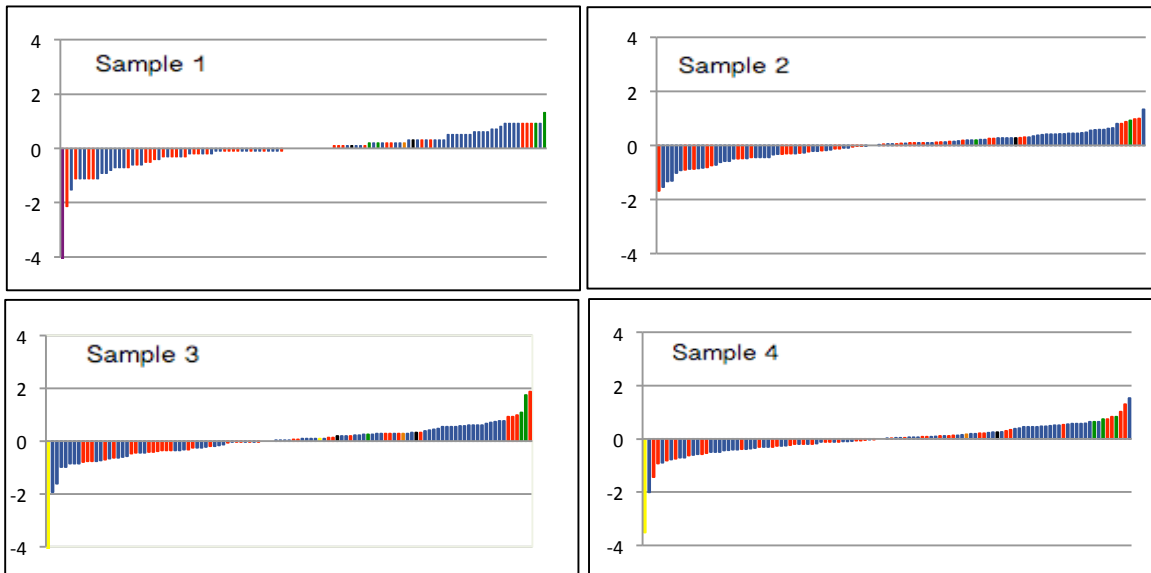
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

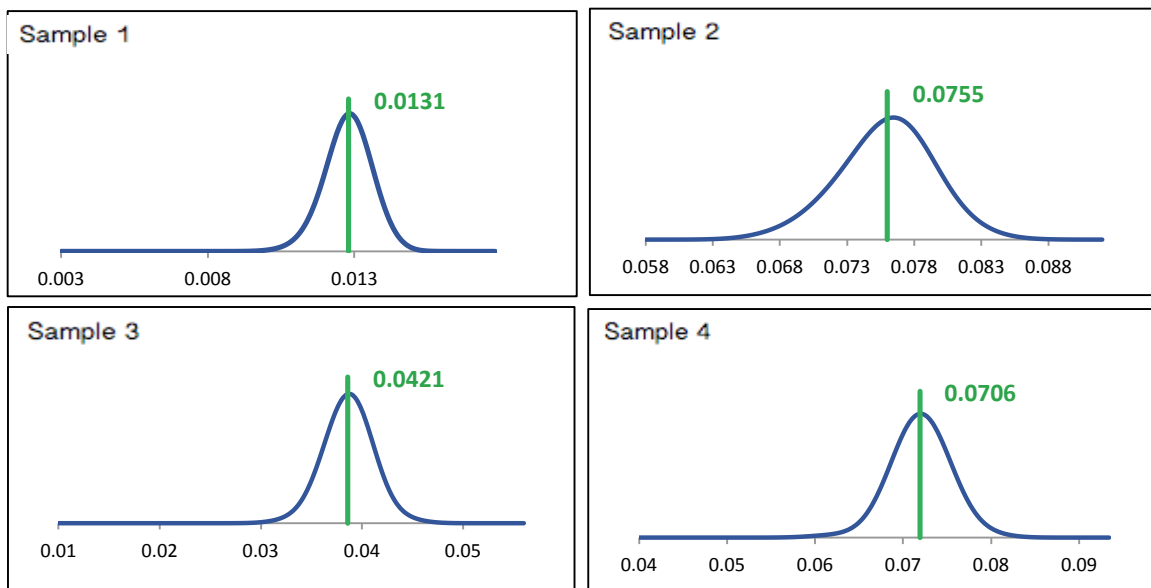


CADMIUM

z-Score Plots

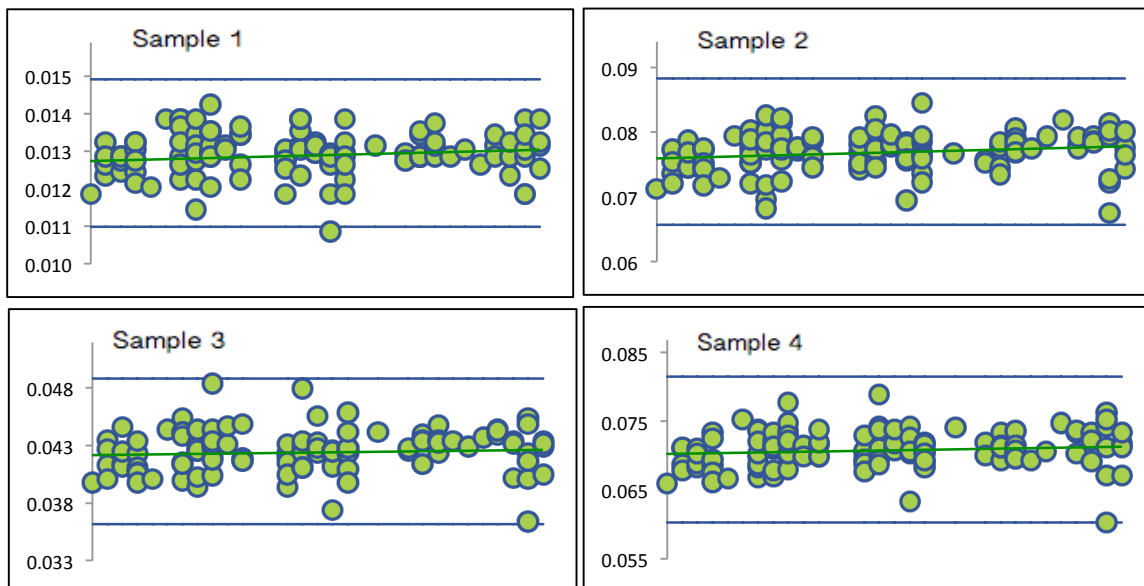


Kernel Density Plots



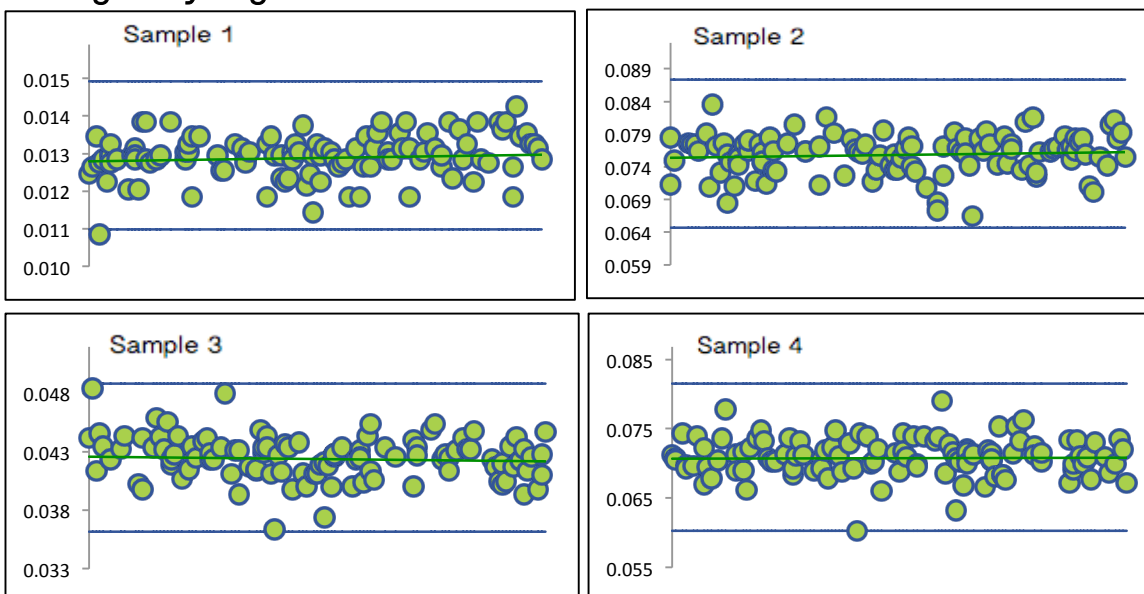
CADMIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

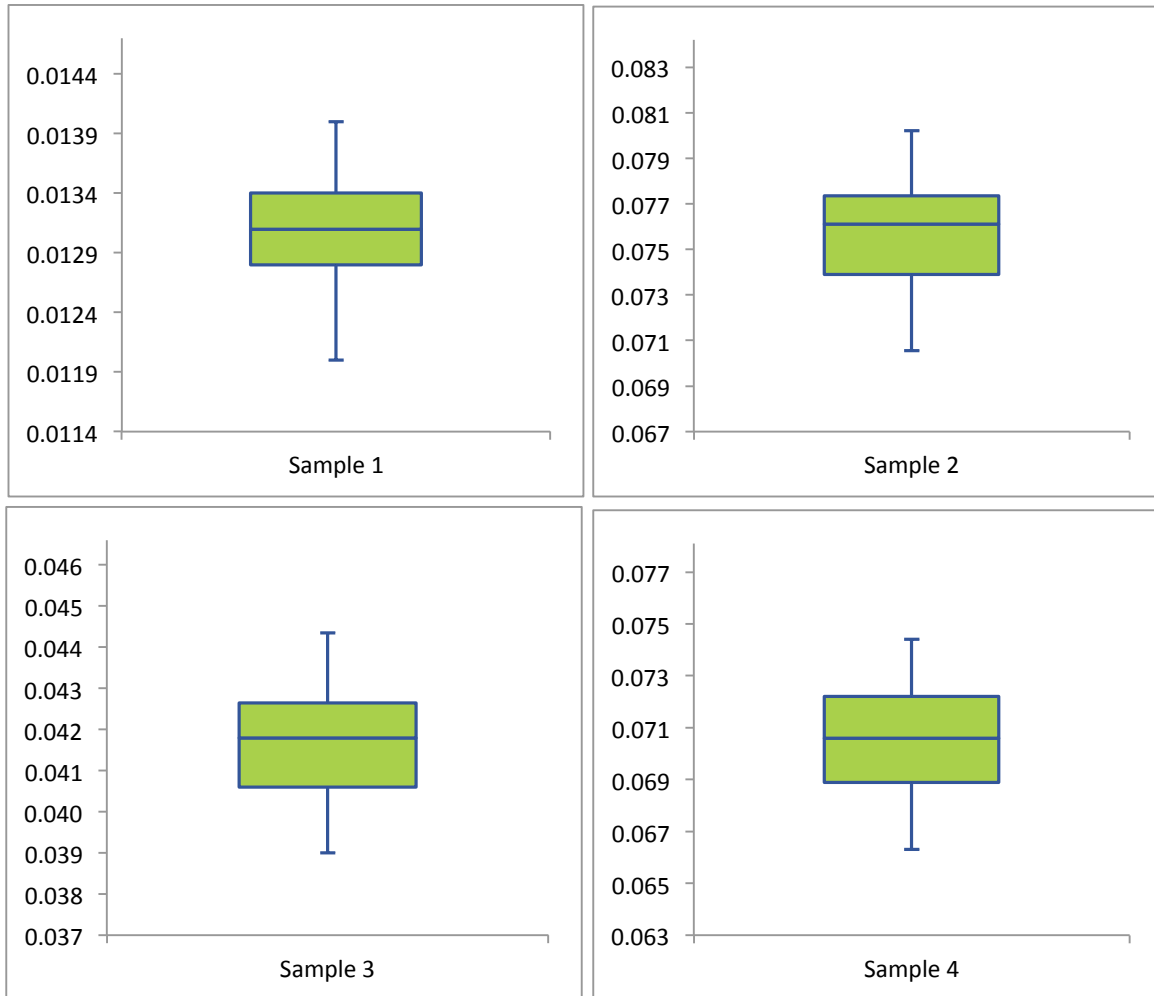
Homogeneity Regression



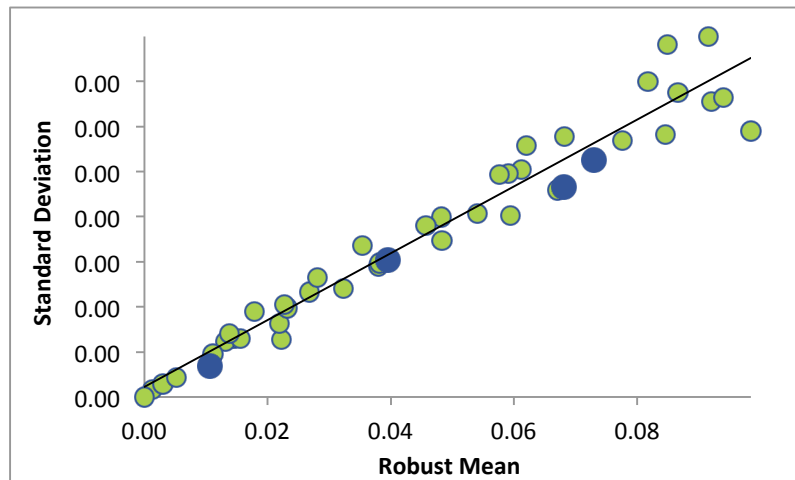
Reported results (Y-axis) plotted against bottling order (X-axis).

CADMIUM

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



CHROMIUM

Summary Statistics

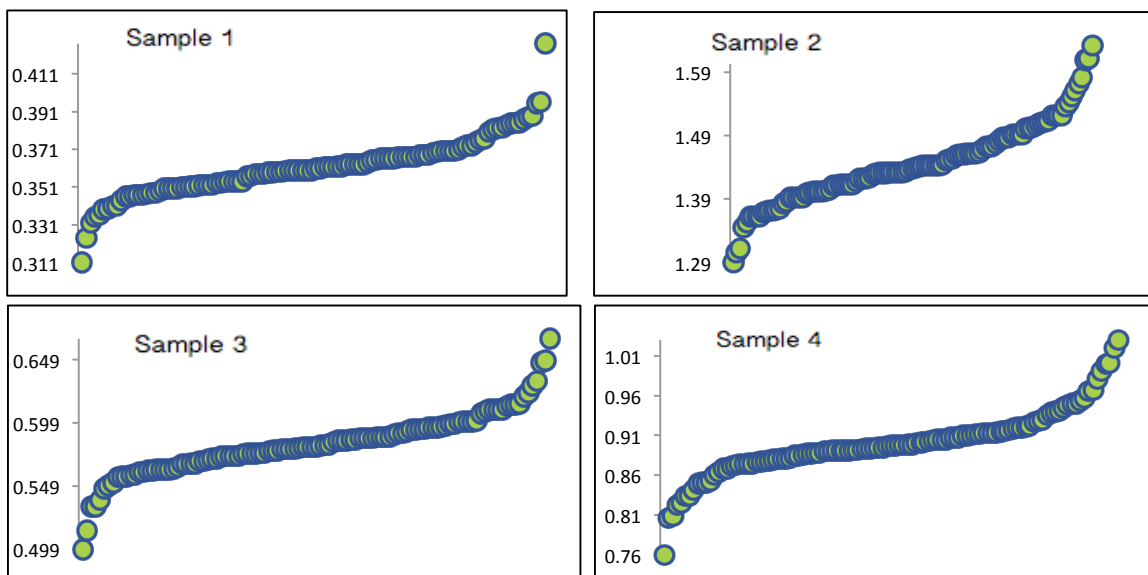
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	108	109	109	109
Median	0.360	1.44	0.580	0.897
Robust Mean	0.361	1.44	0.582	0.899
U	0.00162	0.00705	0.00253	0.0039
Robust Standard Deviation	0.0135	0.0589	0.0211	0.0326
Regression Standard Deviation	0.0271	0.108	0.0437	0.0674
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0271	0.108	0.0437	0.0674
Outliers	1	0	0	0
$ z > 3.0$	0	0	0	0
$2 < z < 3$	1	0	0	1

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	81	82	82	82
ICP/OES (Red)	26	26	26	26
AAG (Green)	1	1	1	1

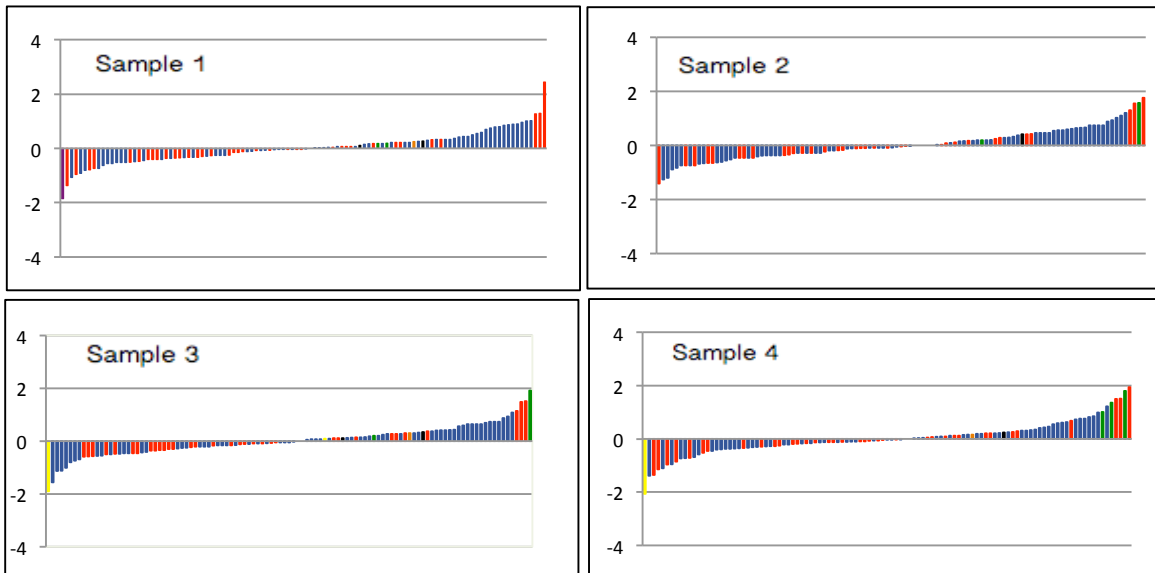
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

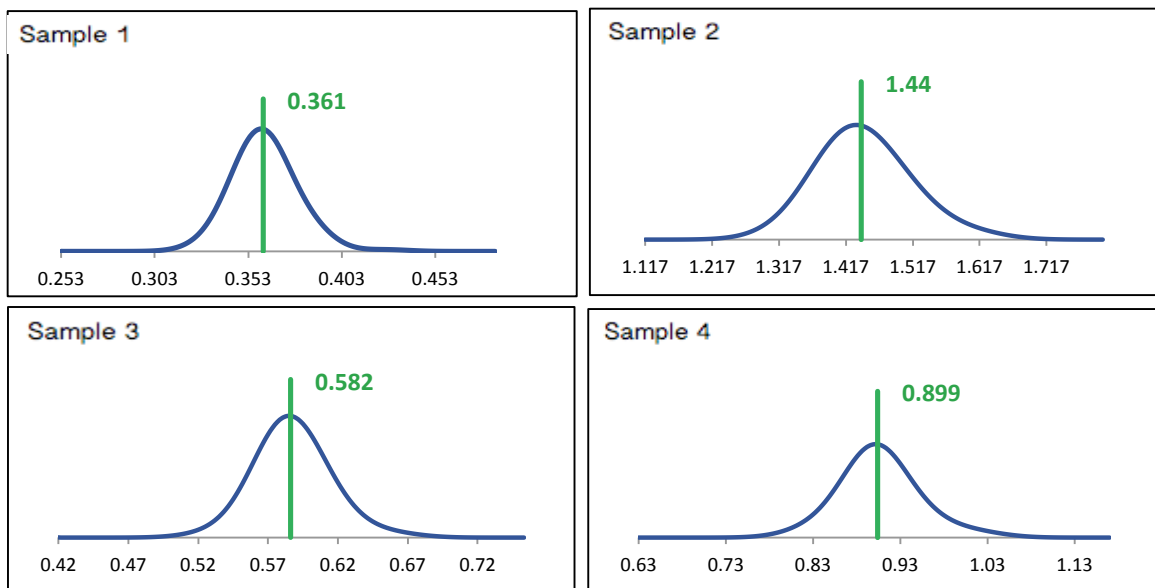


CHROMIUM

z-Score Plots

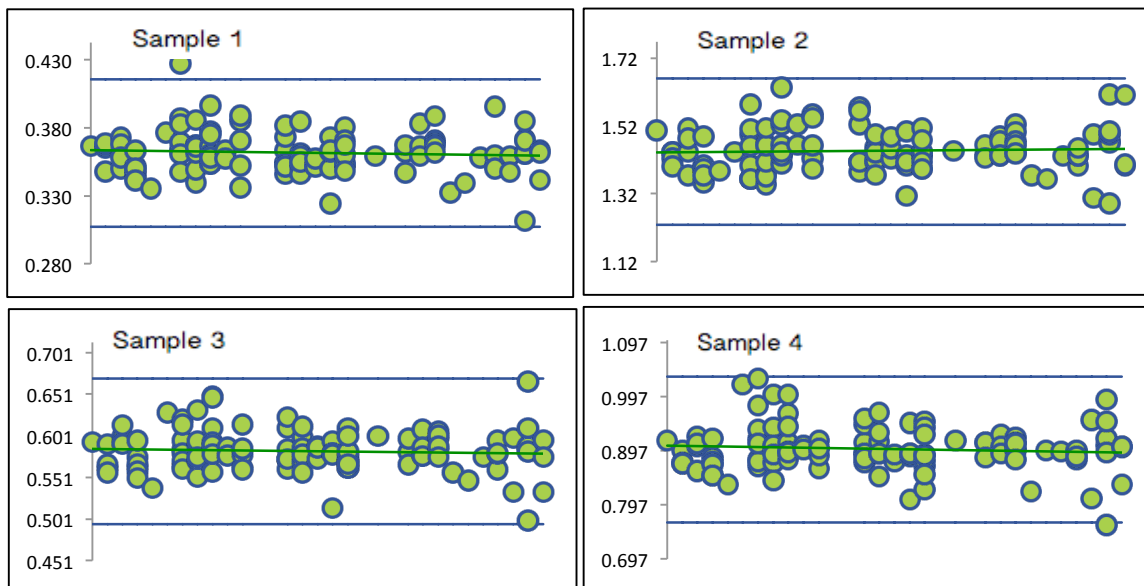


Kernel Density Plots



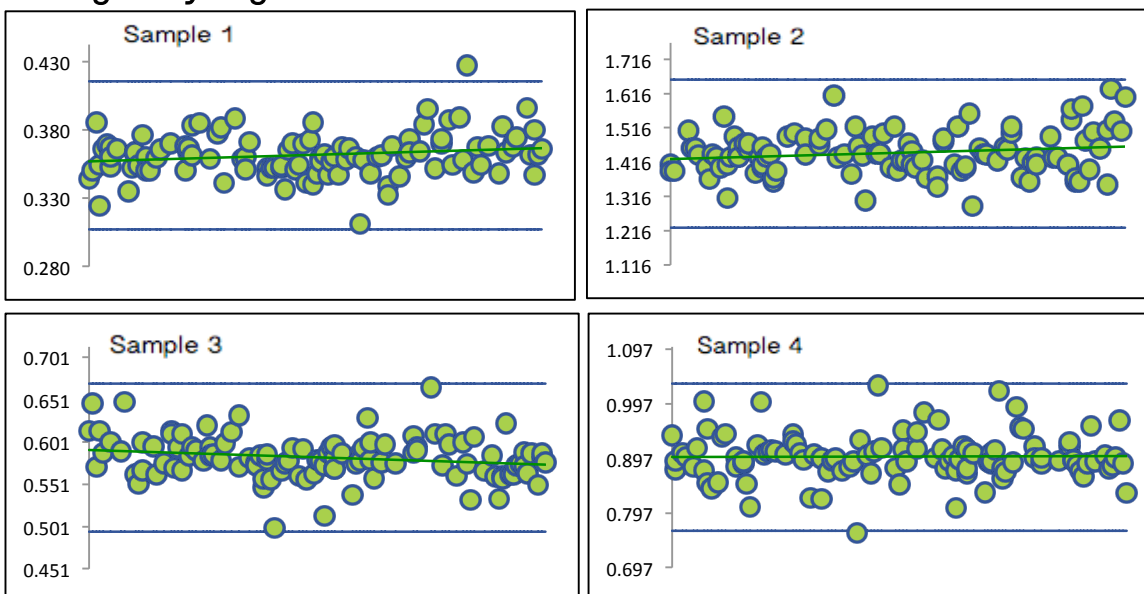
CHROMIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

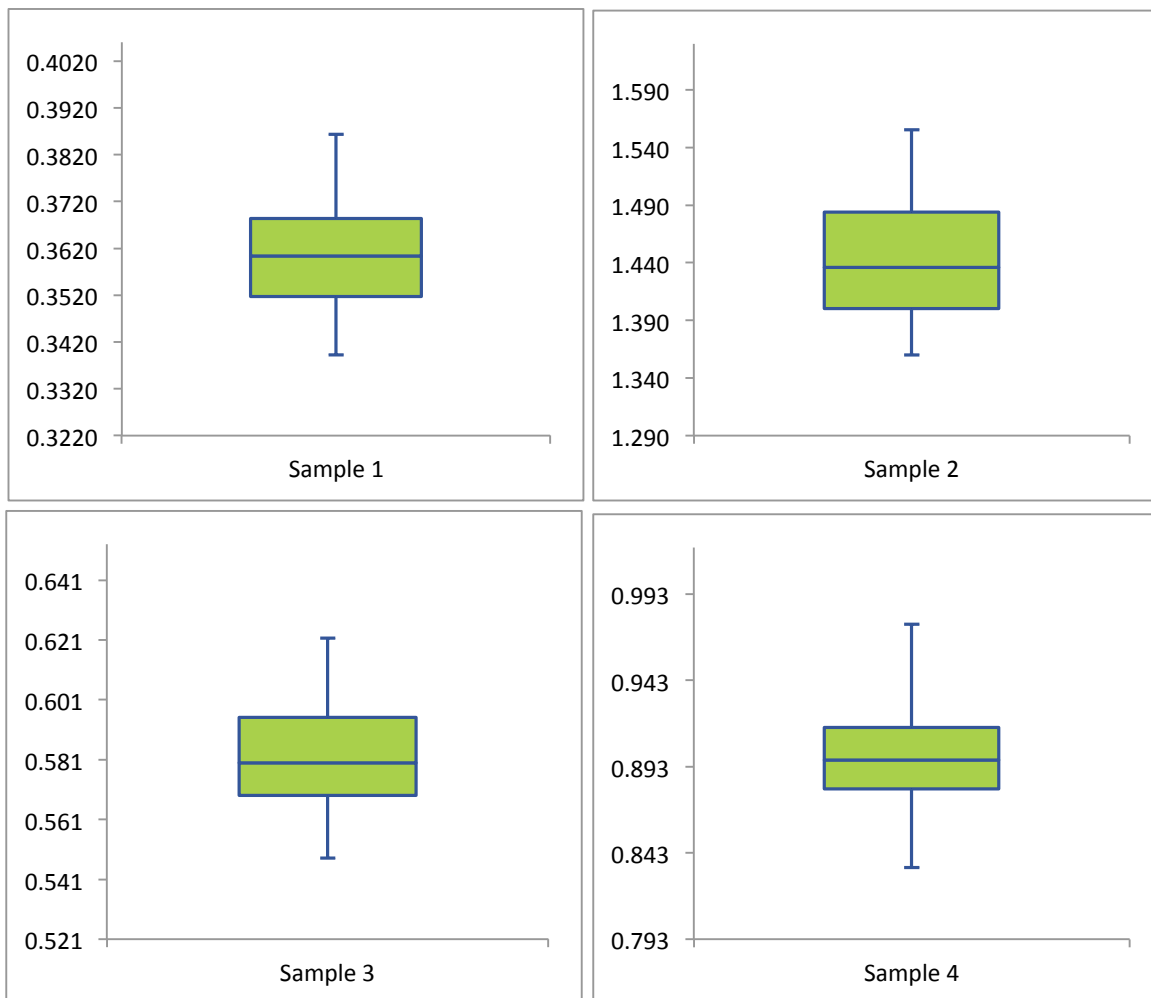
Homogeneity Regression



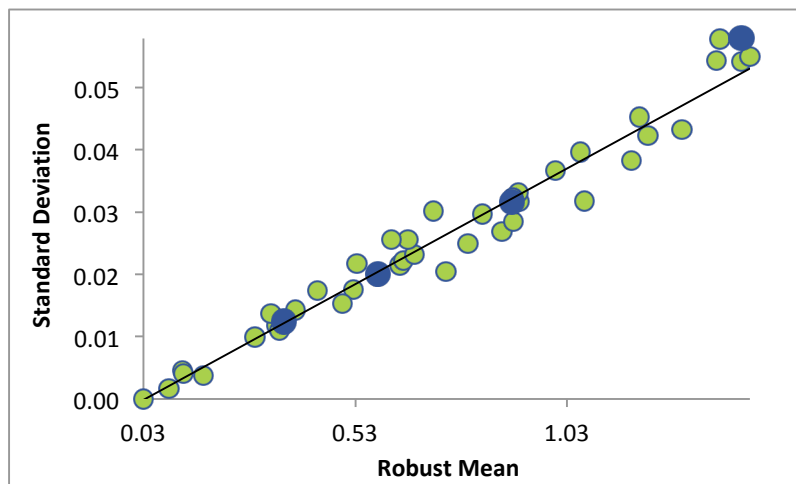
Reported results (Y-axis) plotted against bottling order (X-axis).

CHROMIUM

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



COBALT

Summary Statistics

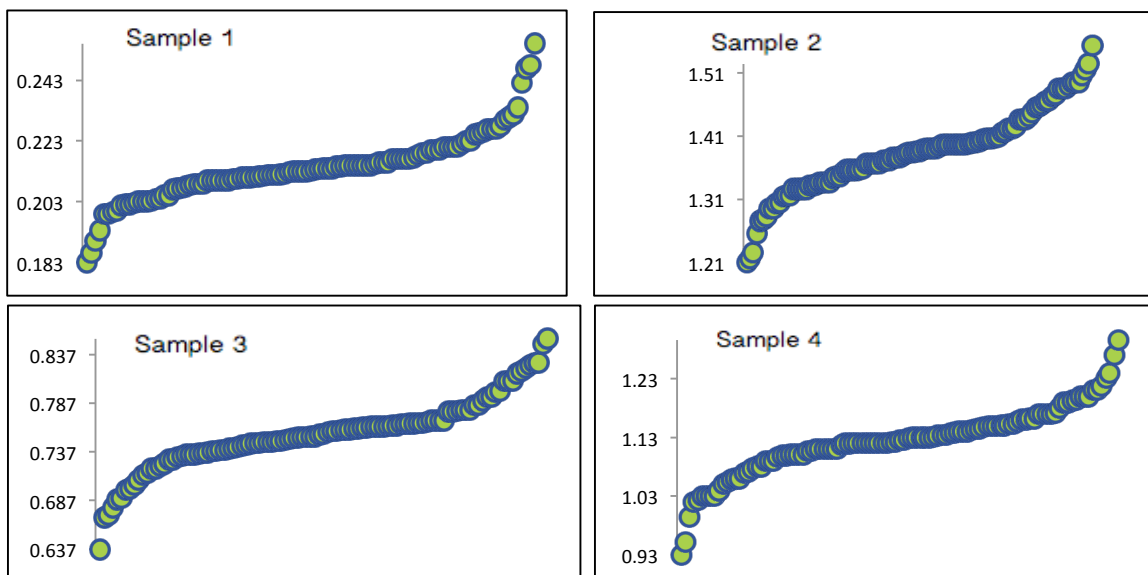
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	105	105	105	105
Median	0.213	1.39	0.755	1.13
Robust Mean	0.214	1.39	0.755	1.13
U	0.0011	0.00775	0.0037	0.00614
Robust Standard Deviation	0.00899	0.0635	0.0303	0.0503
Regression Standard Deviation	0.0160	0.104	0.0567	0.0844
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0160	0.104	0.0567	0.0844
Outliers	0	0	0	0
$ z > 3.0$	0	0	0	0
$2 < z < 3$	3	0	1	2

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	78	78	78	78
ICP/OES (Red)	26	26	26	26
AAG (Green)	1	1	1	1

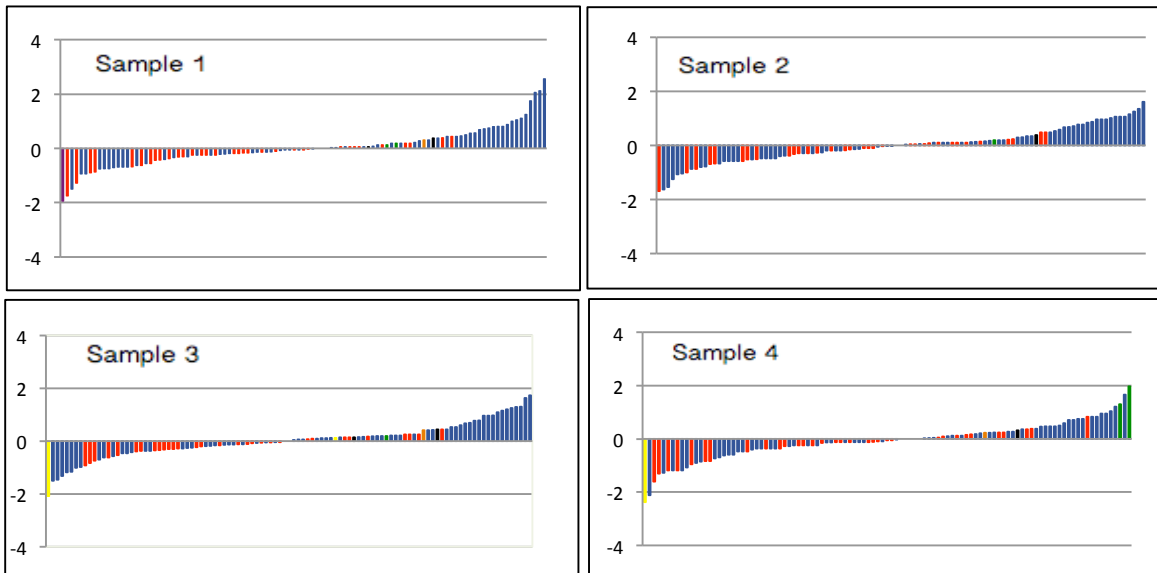
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

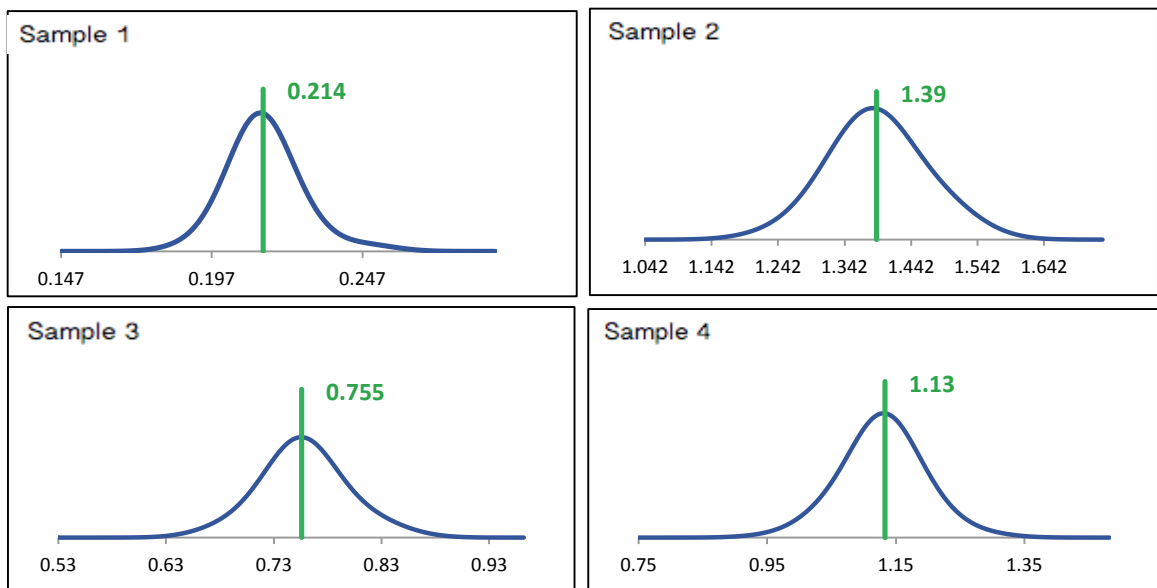


COBALT

z-Score Plots

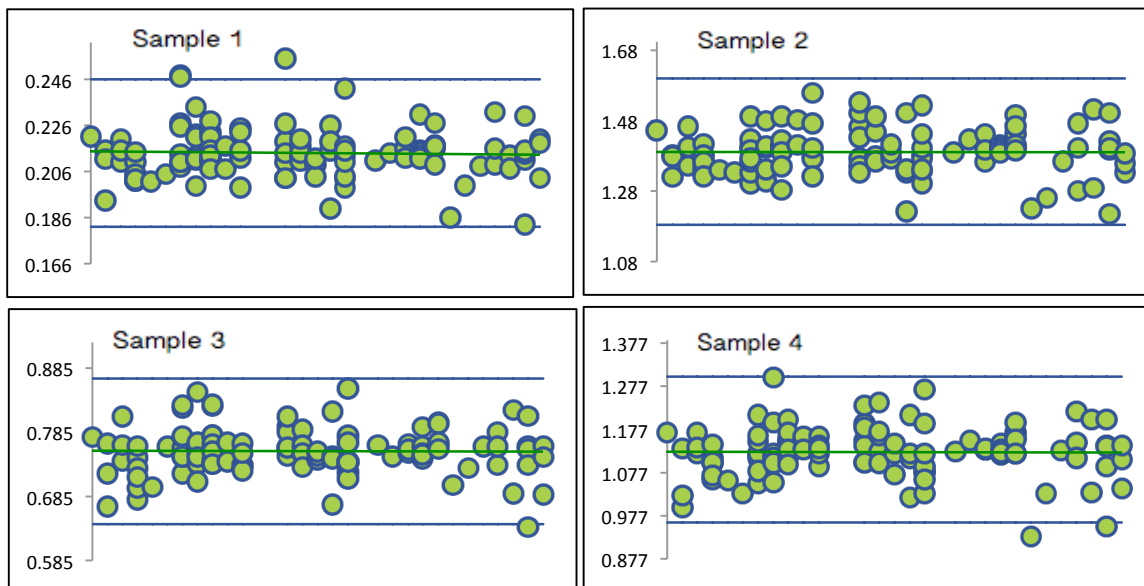


Kernel Density Plots



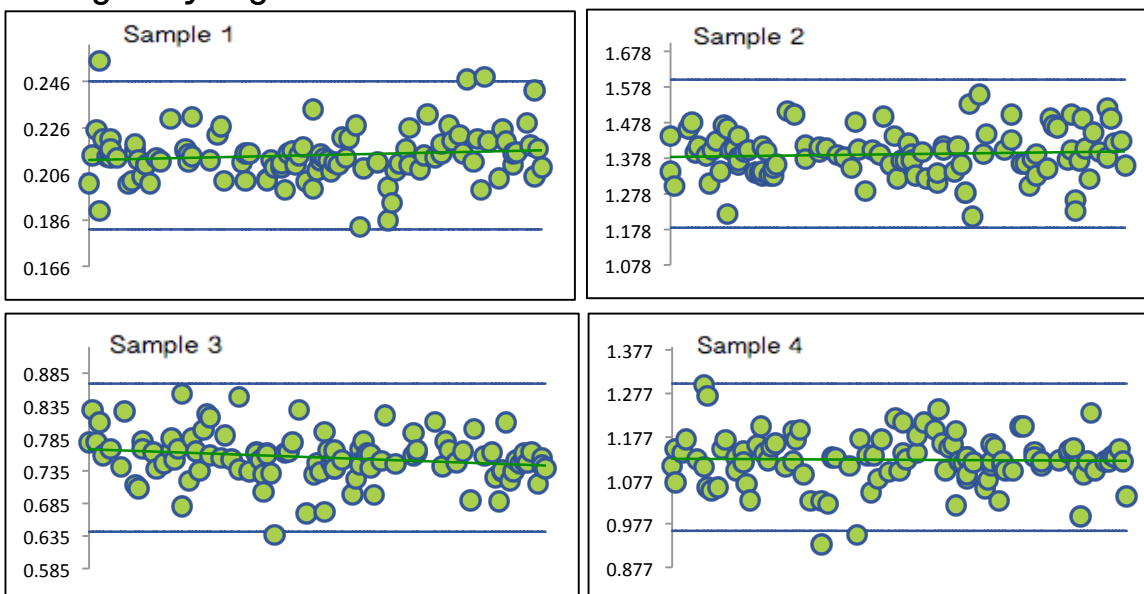
COBALT

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

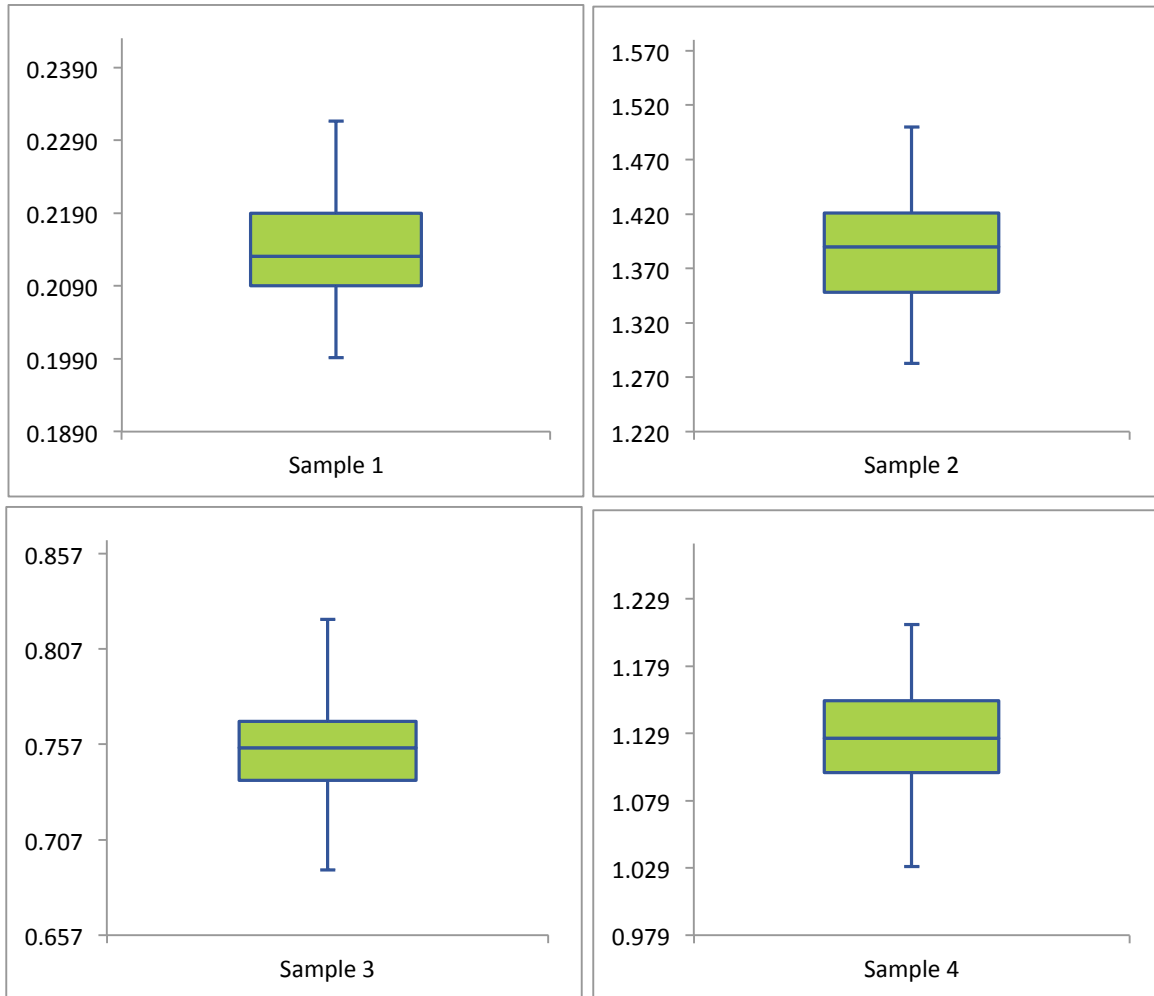
Homogeneity Regression



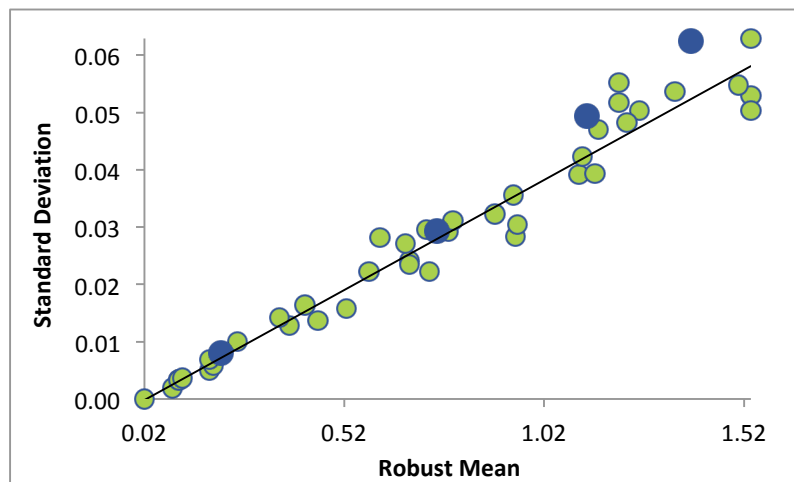
Reported results (Y-axis) plotted against bottling order (X-axis).

COBALT

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



COPPER

Summary Statistics

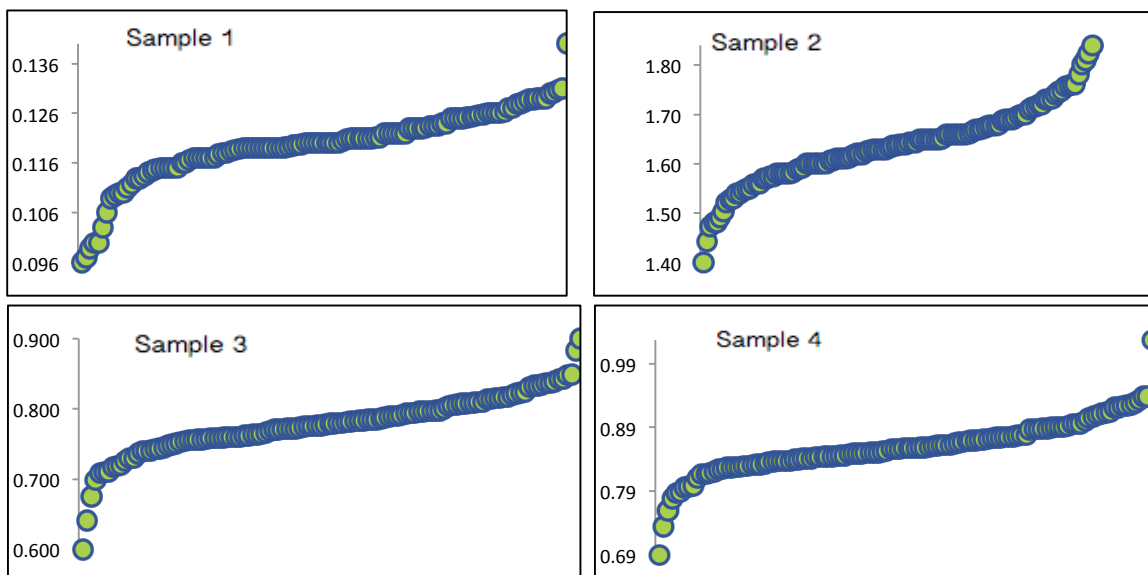
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	118	118	118	118
Median	0.120	1.64	0.779	0.860
Robust Mean	0.120	1.64	0.780	0.862
U	0.000667	0.00835	0.0043	0.0041
Robust Standard Deviation	0.00580	0.0726	0.0374	0.0356
Regression Standard Deviation	0.00902	0.123	0.0585	0.0647
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00902	0.123	0.0585	0.0647
Outliers	0	0	0	0
$ z > 3.0$	0	0	1	0
$2 < z < 3$	6	0	2	2

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	29	29	29	29
ICP/MS (Red)	87	87	87	87
AAG (Green)	1	1	1	1

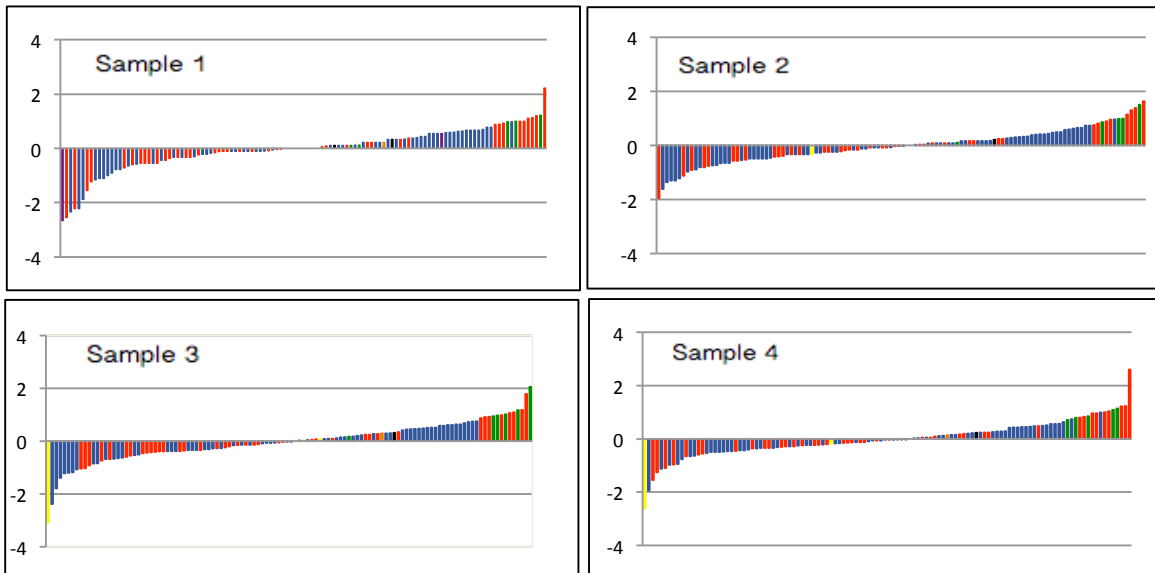
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

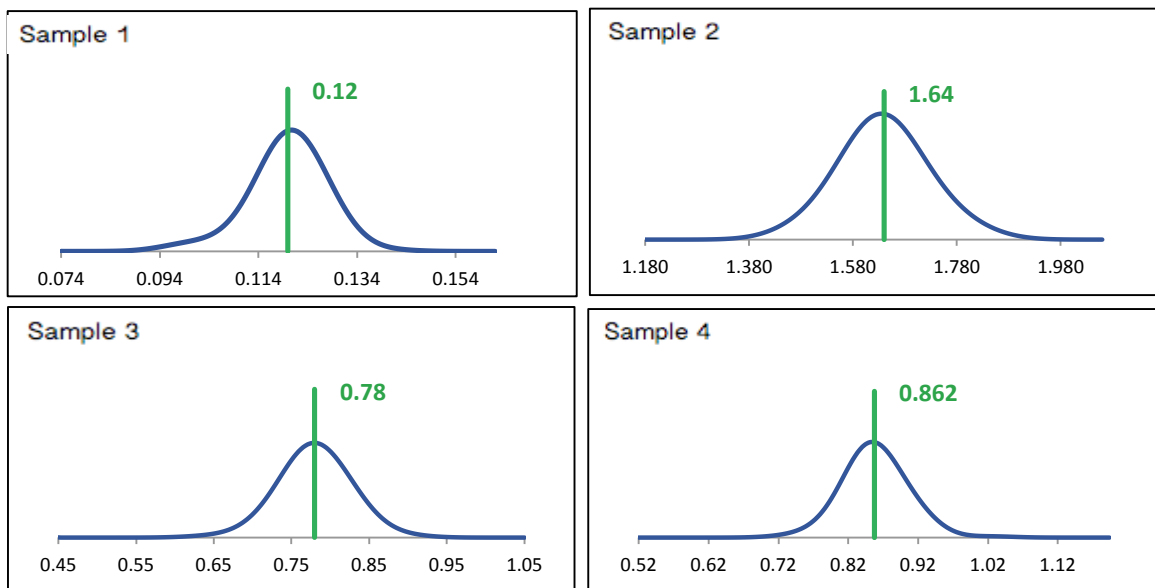


COPPER

z-Score Plots

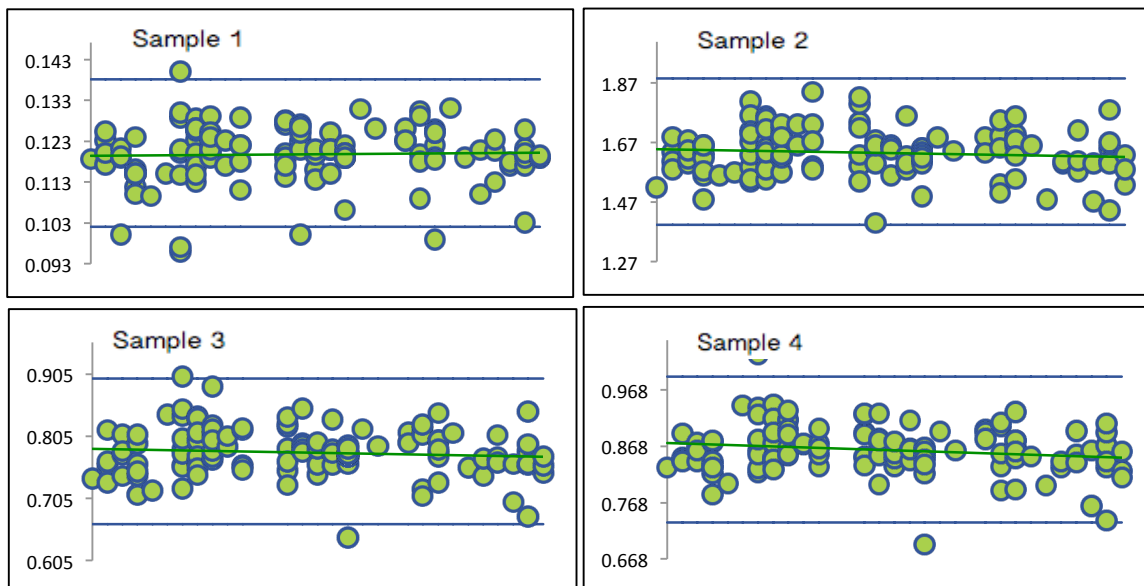


Kernel Density Plots



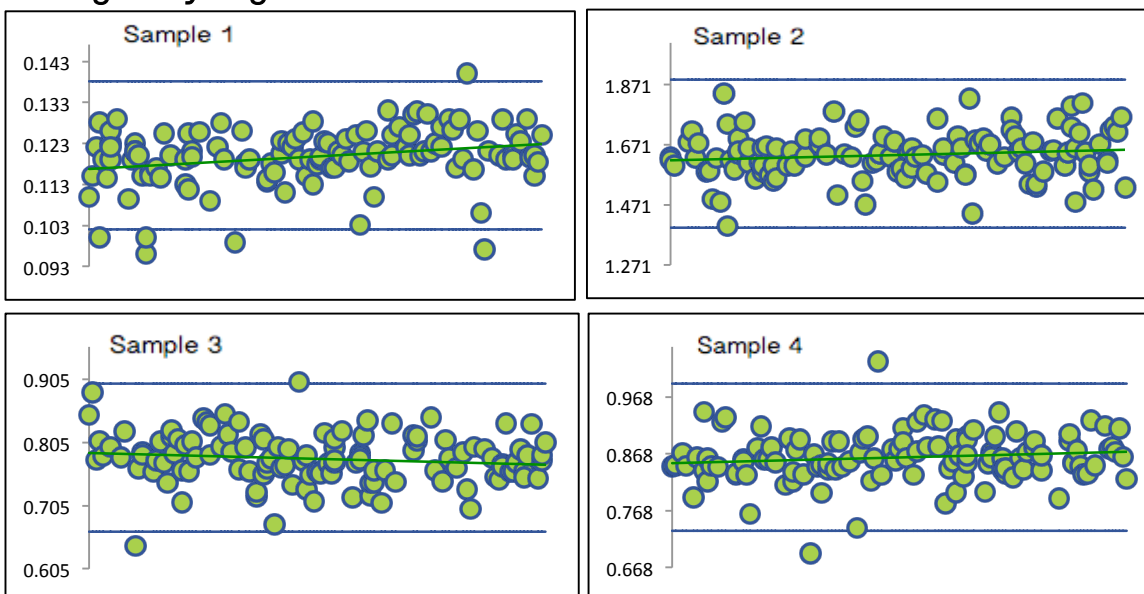
COPPER

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

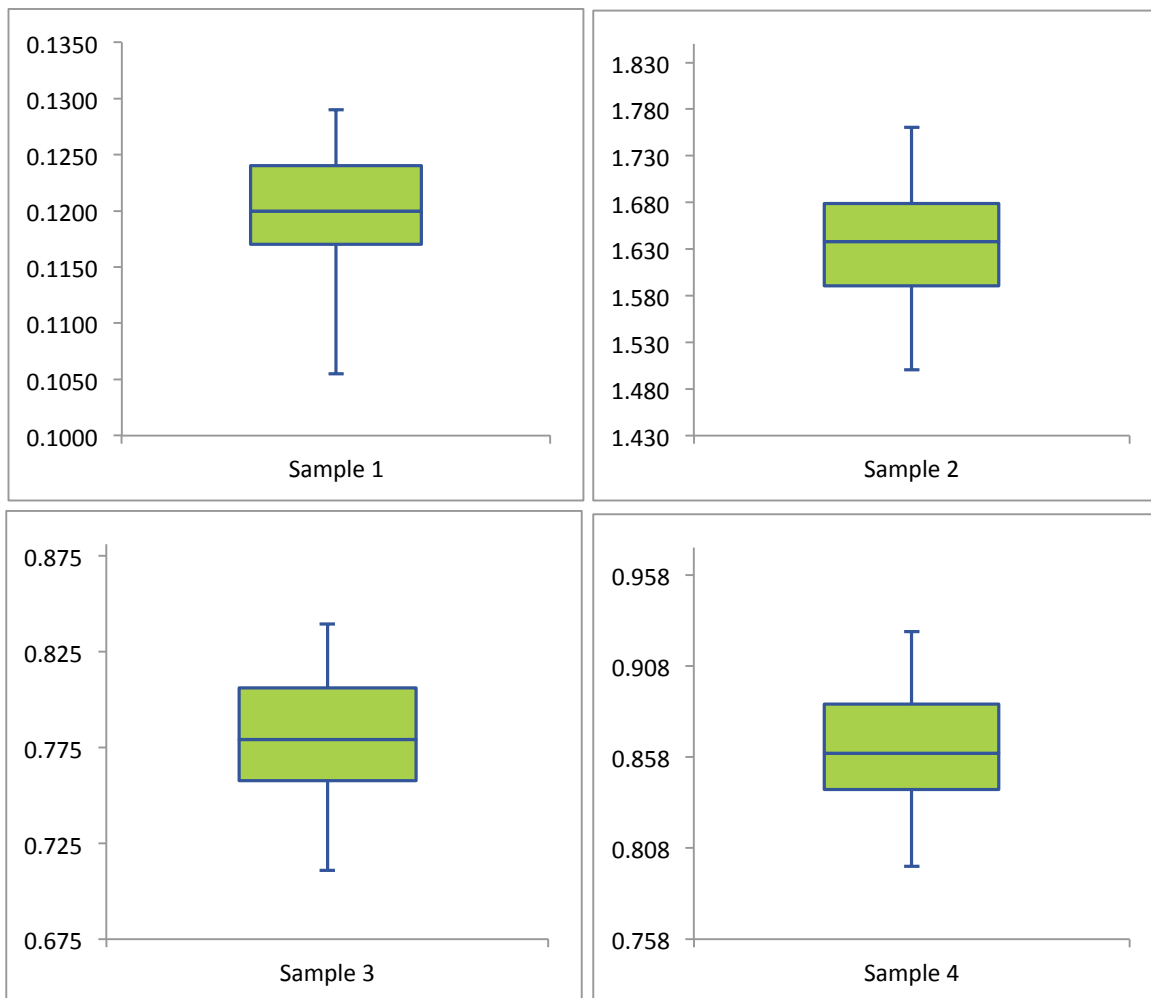
Homogeneity Regression



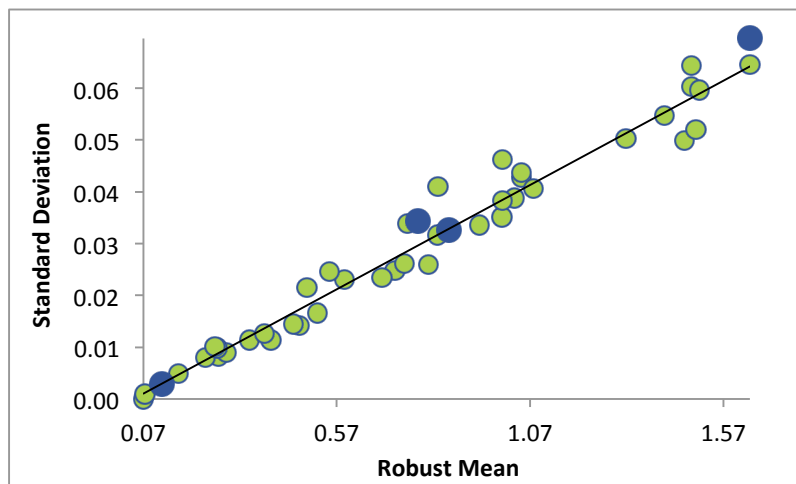
Reported results (Y-axis) plotted against bottling order (X-axis).

COPPER

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



IRON

Summary Statistics

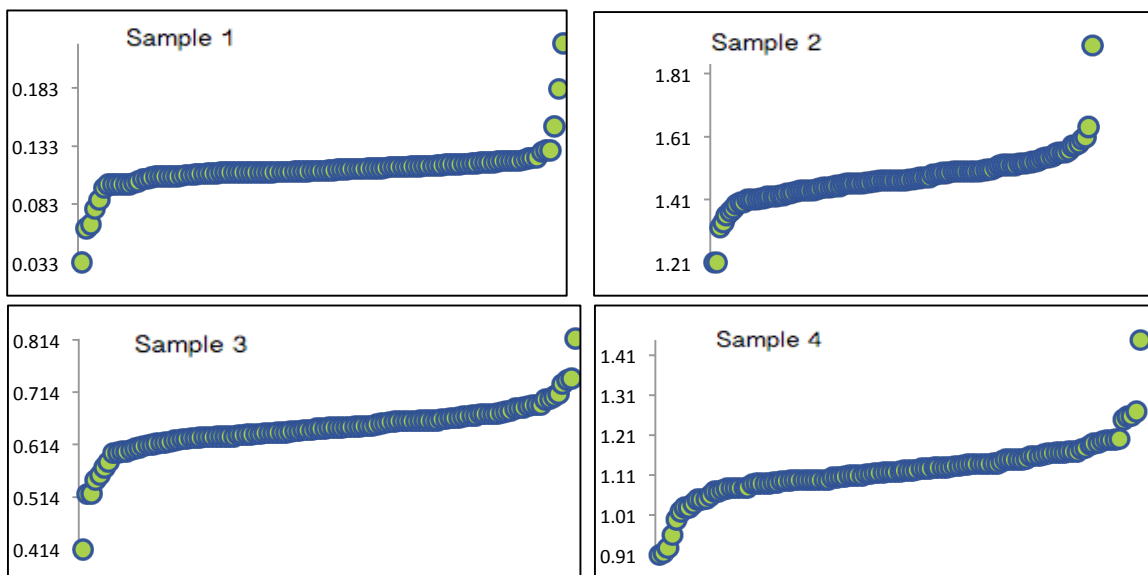
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	112	115	115	115
Median	0.112	1.47	0.646	1.12
Robust Mean	0.112	1.48	0.646	1.12
U	0.000777	0.00653	0.00354	0.00556
Robust Standard Deviation	0.00658	0.0560	0.0304	0.0477
Regression Standard Deviation	0.00843	0.111	0.0484	0.0842
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00843	0.111	0.0484	0.0842
Outliers	0	0	0	0
$ z > 3.0$	7	1	2	1
$2 < z < 3$	3	2	3	3

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	35	36	36	36
ICP/MS (Red)	75	77	77	77
AAG (Green)	1	1	1	1
AA (Orange)	1	1	1	1

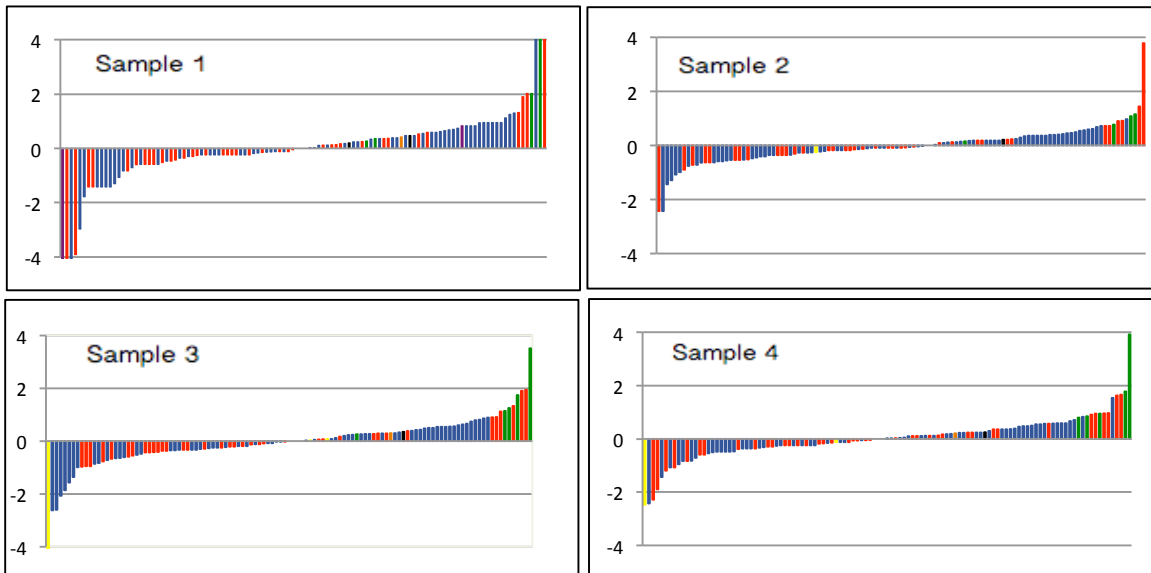
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

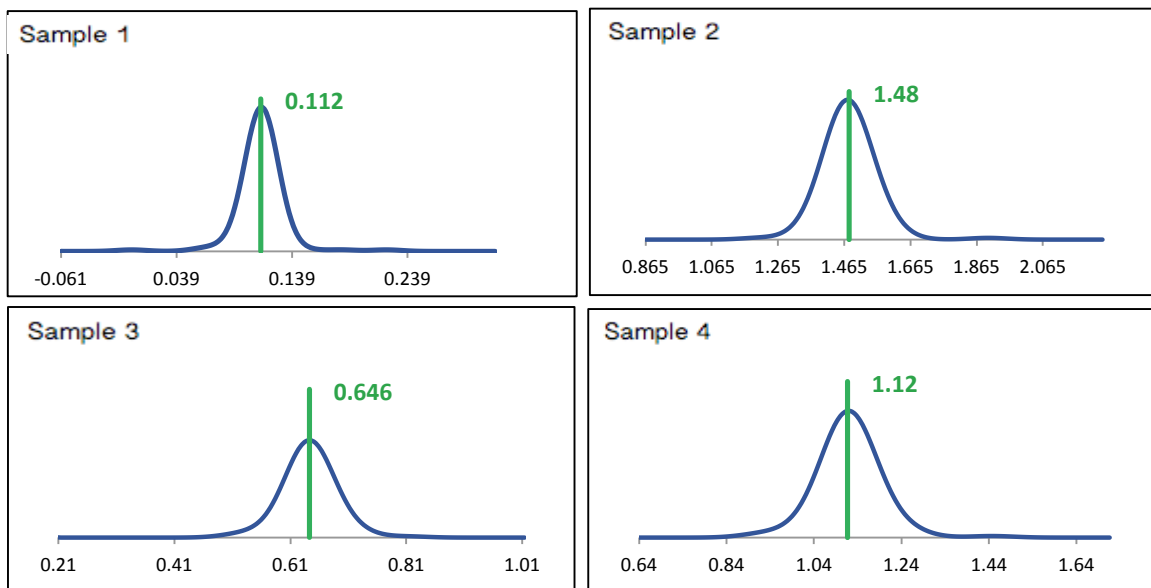


IRON

z-Score Plots

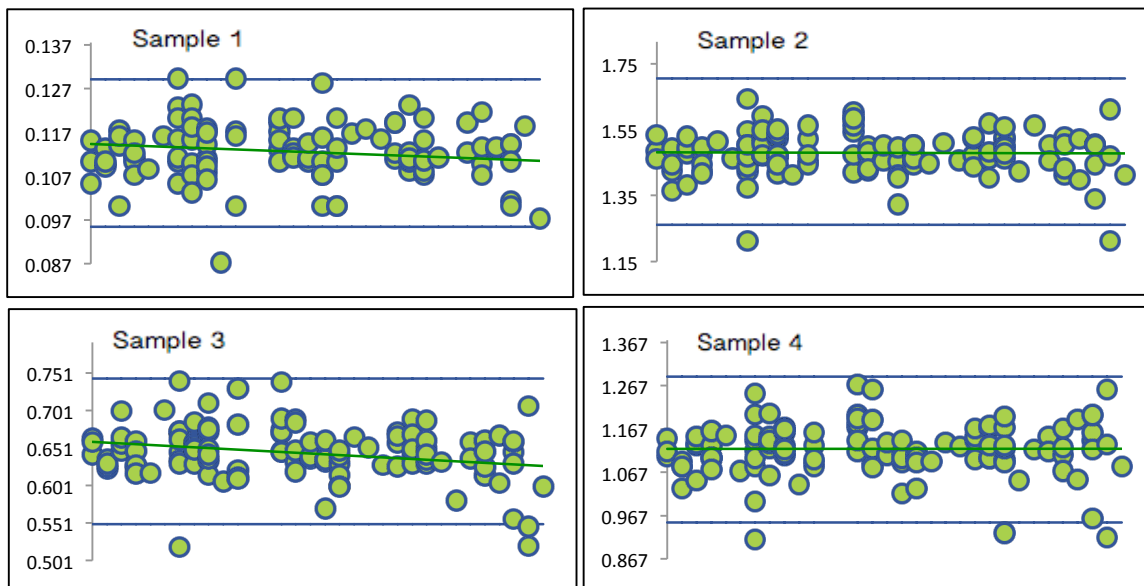


Kernel Density Plots



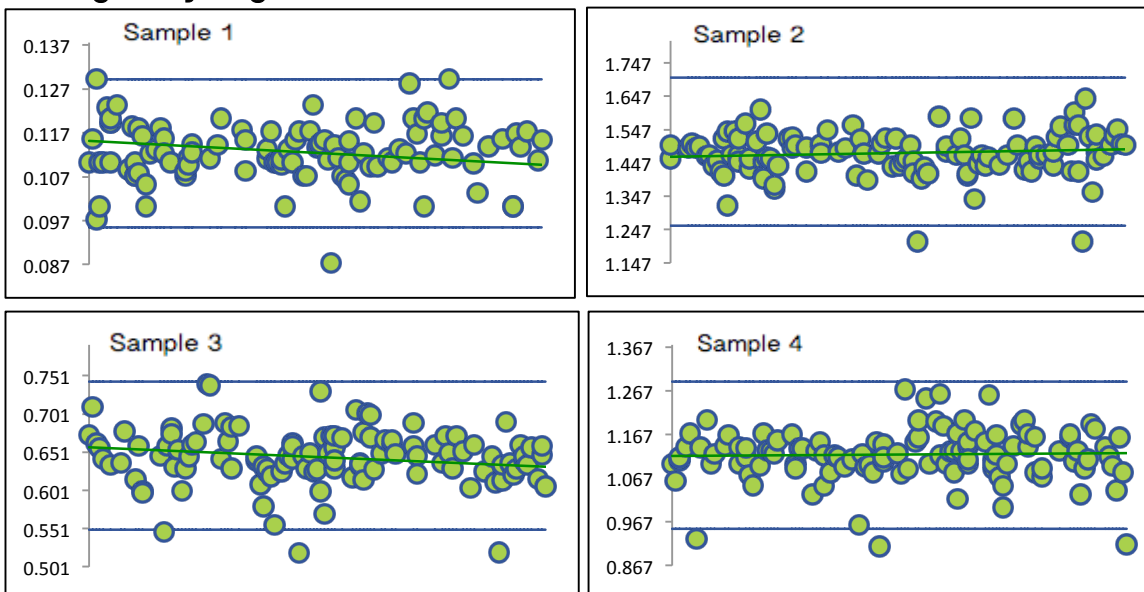
IRON

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

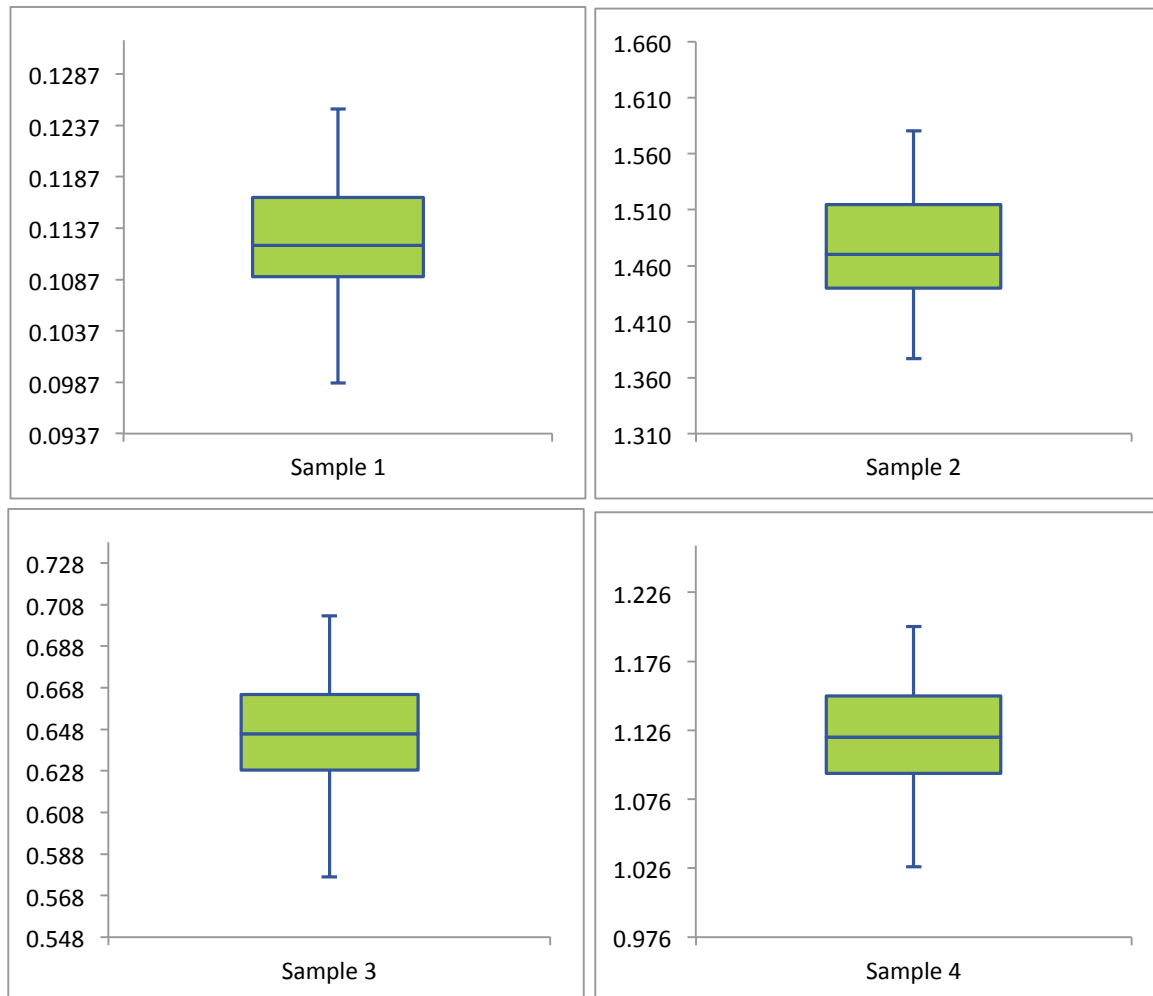
Homogeneity Regression



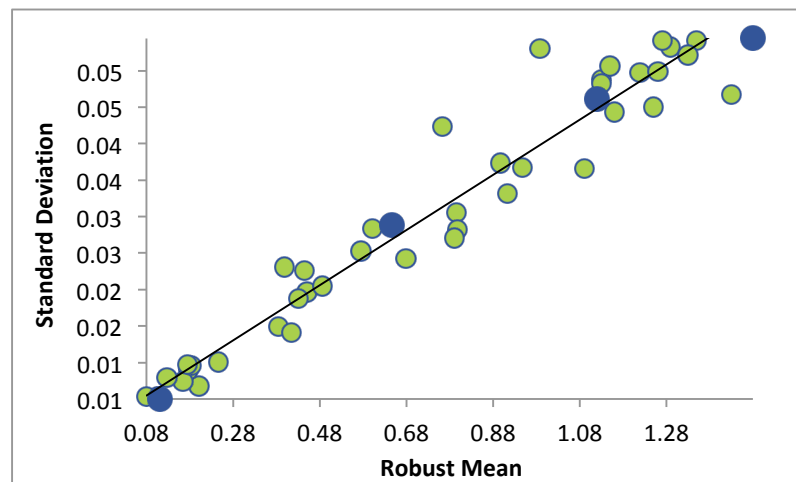
Reported results (Y-axis) plotted against bottling order (X-axis).

IRON

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



LEAD

Summary Statistics

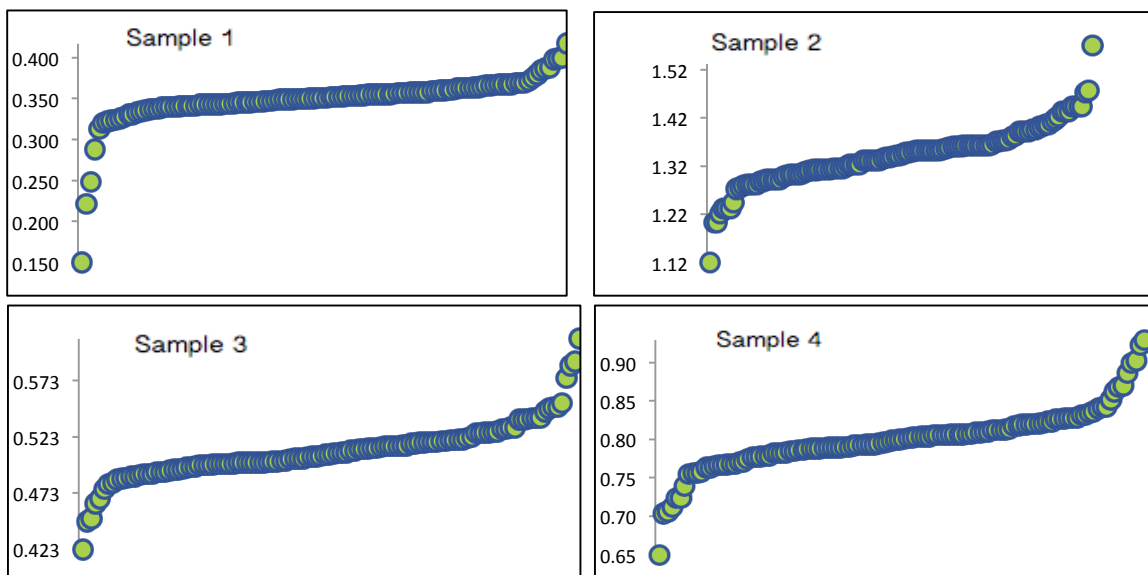
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	116	116	116	116
Median	0.351	1.34	0.508	0.798
Robust Mean	0.351	1.34	0.509	0.797
U	0.00168	0.00605	0.00224	0.00337
Robust Standard Deviation	0.0145	0.0521	0.0193	0.0290
Regression Standard Deviation	0.0263	0.100	0.0382	0.0598
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0263	0.100	0.0382	0.0598
Outliers	0	0	0	0
$ z > 3.0$	3	0	0	0
$2 < z < 3$	2	2	4	3

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	88	88	88	88
ICP/OES (Red)	26	26	26	26
AAG (Green)	1	1	1	1

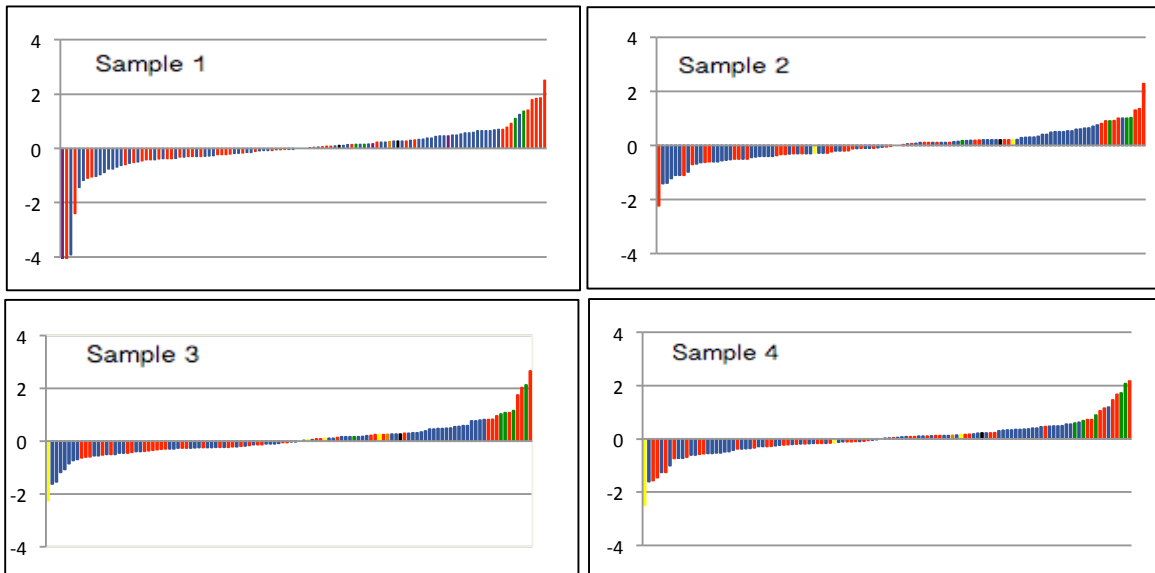
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

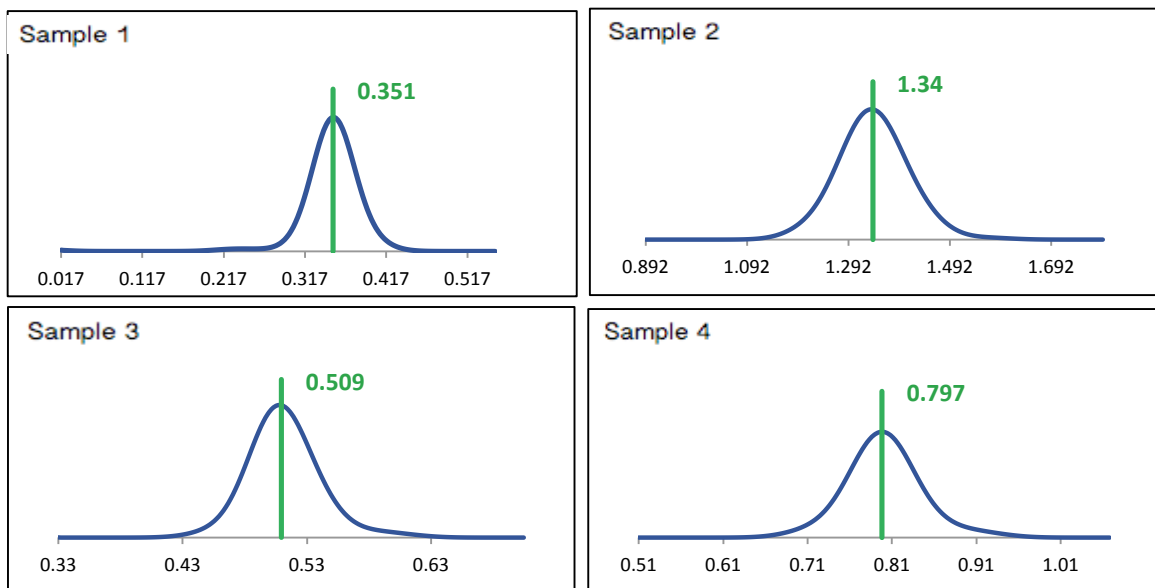


LEAD

z-Score Plots

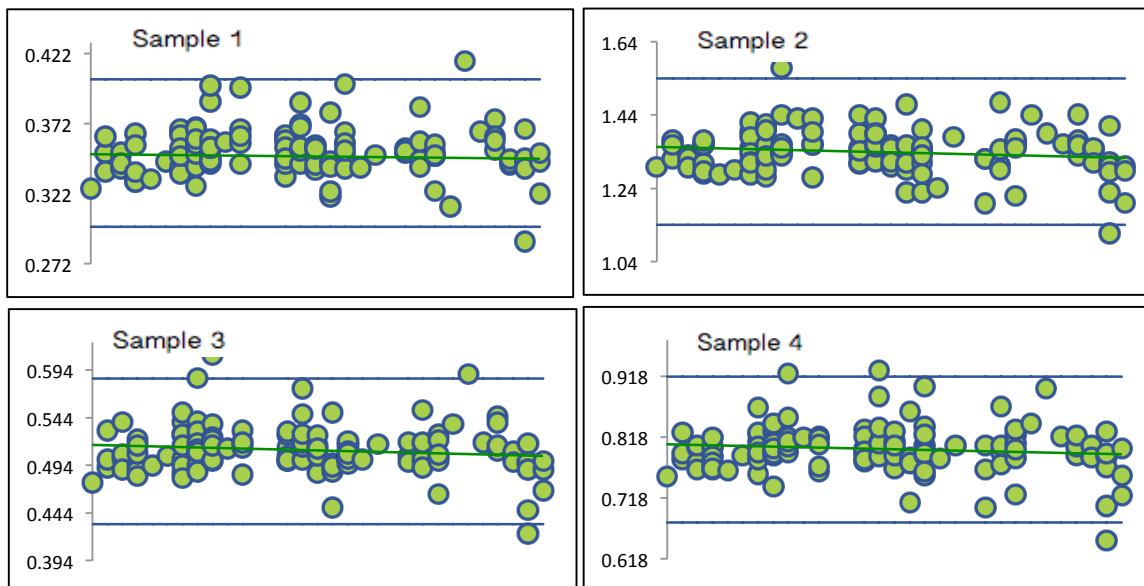


Kernel Density Plots



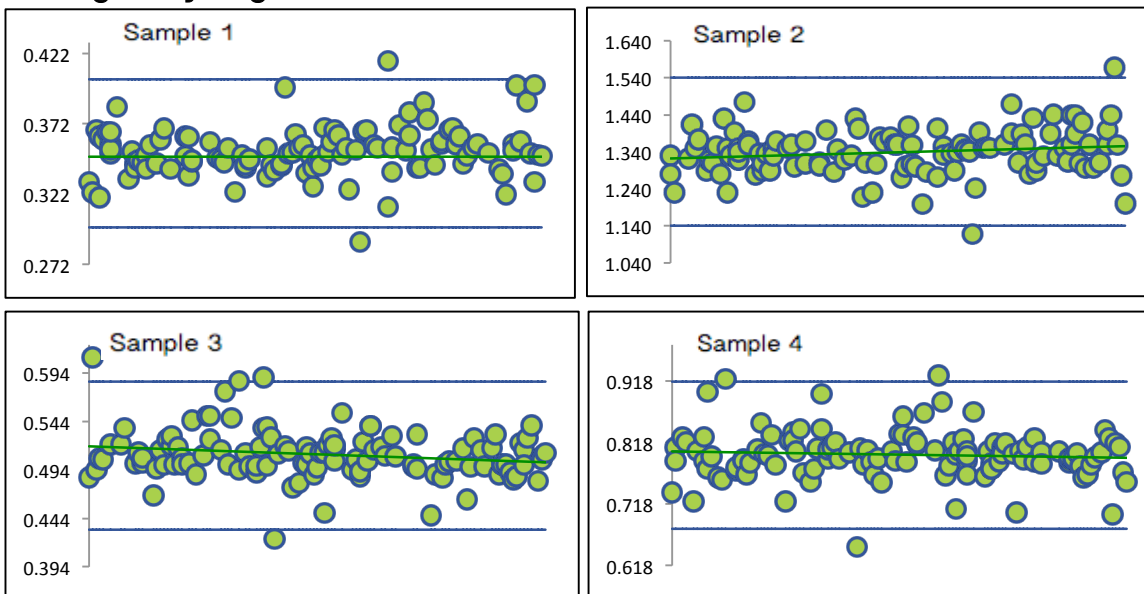
LEAD

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

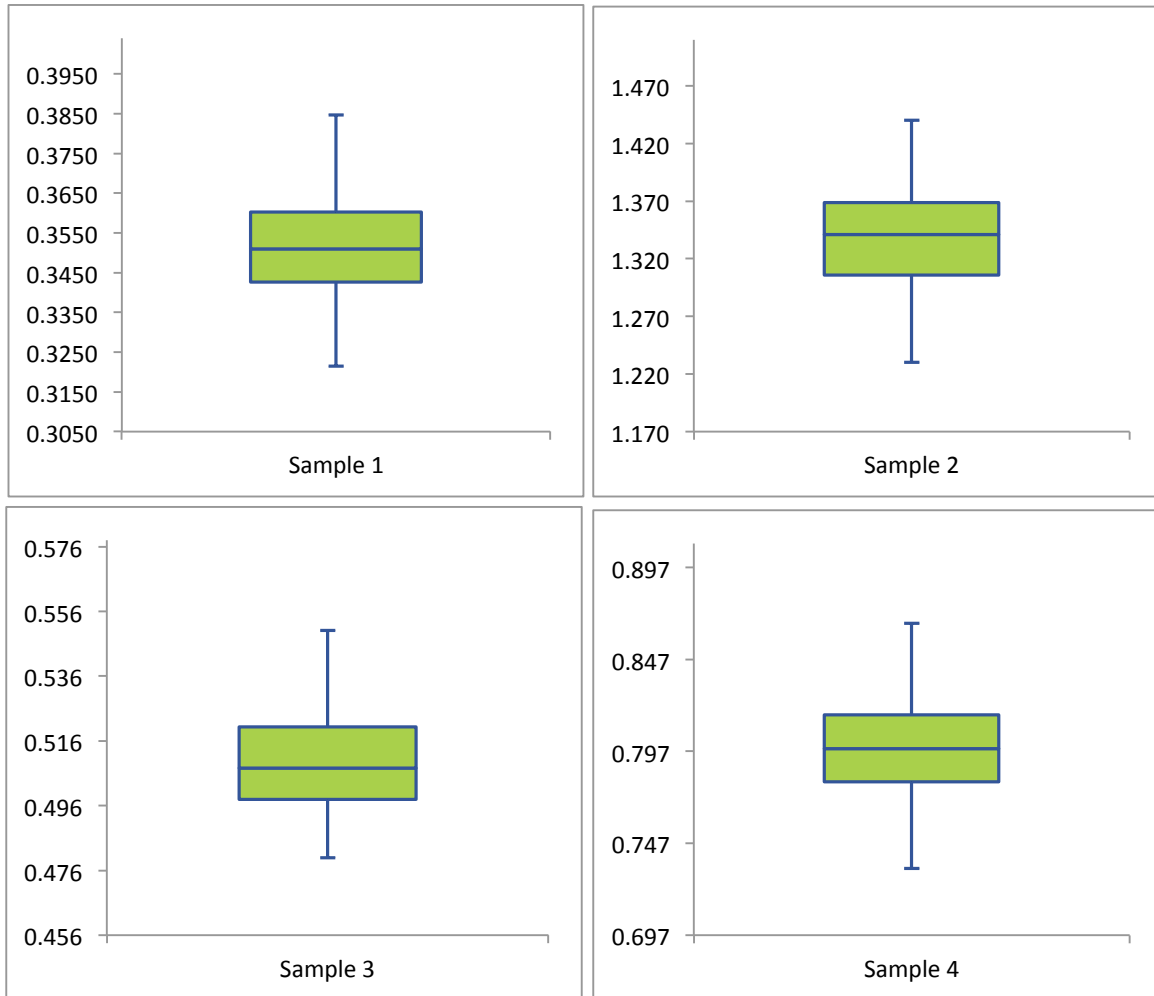
Homogeneity Regression



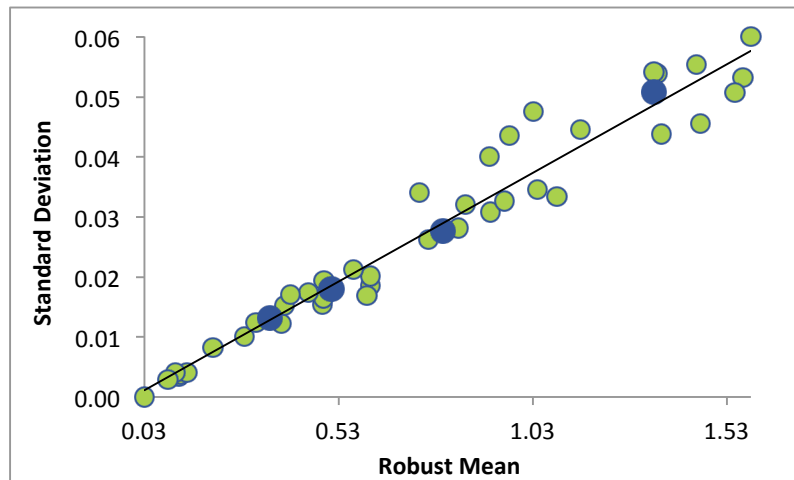
Reported results (Y-axis) plotted against bottling order (X-axis).

LEAD

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



MANGANESE

Summary Statistics

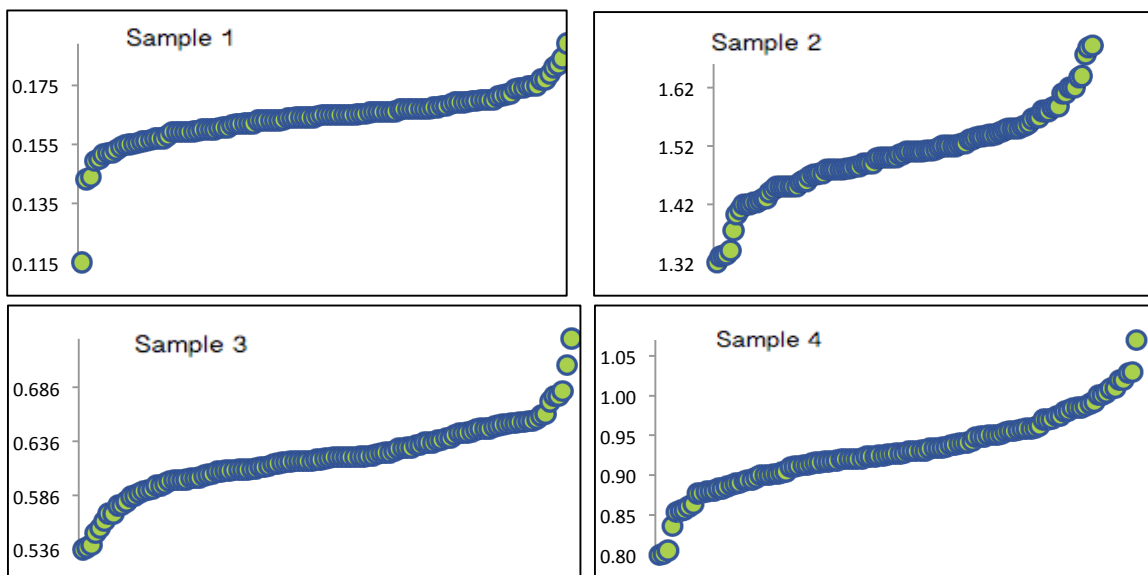
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	114	114	114	114
Median	0.165	1.51	0.620	0.927
Robust Mean	0.164	1.50	0.621	0.930
U	0.000801	0.00727	0.00317	0.00502
Robust Standard Deviation	0.00684	0.0621	0.0271	0.0429
Regression Standard Deviation	0.0123	0.113	0.0466	0.0698
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0123	0.113	0.0466	0.0698
Outliers	0	0	0	0
$ z > 3.0$	1	0	0	0
$2 < z < 3$	1	0	1	1

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	34	34	34	34
ICP/MS (Red)	78	78	78	78
AAG (Green)	1	1	1	1
AA (Orange)	1	1	1	1

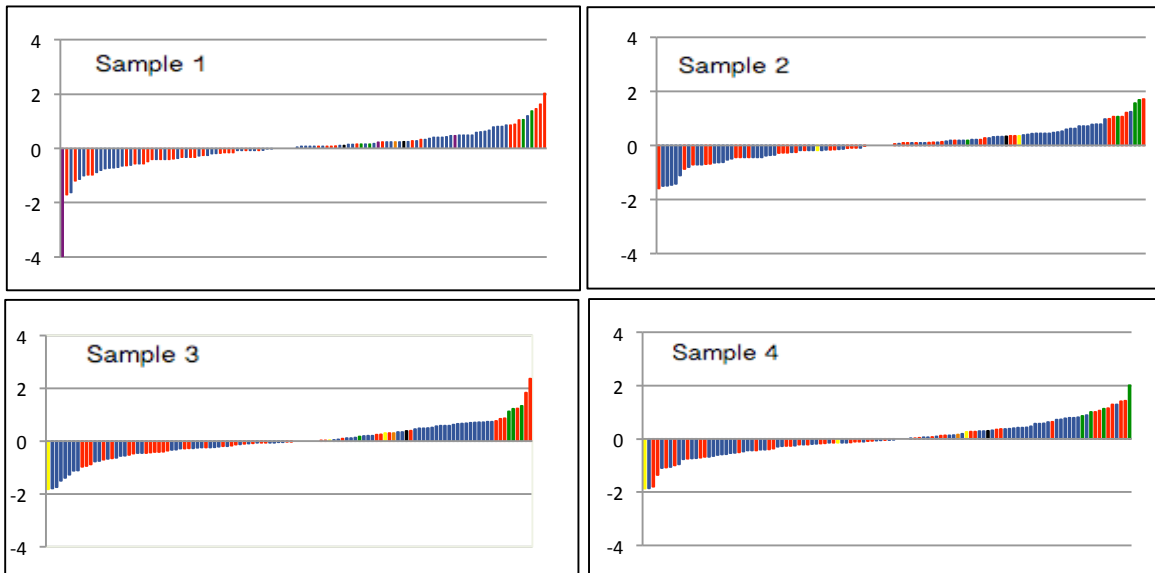
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

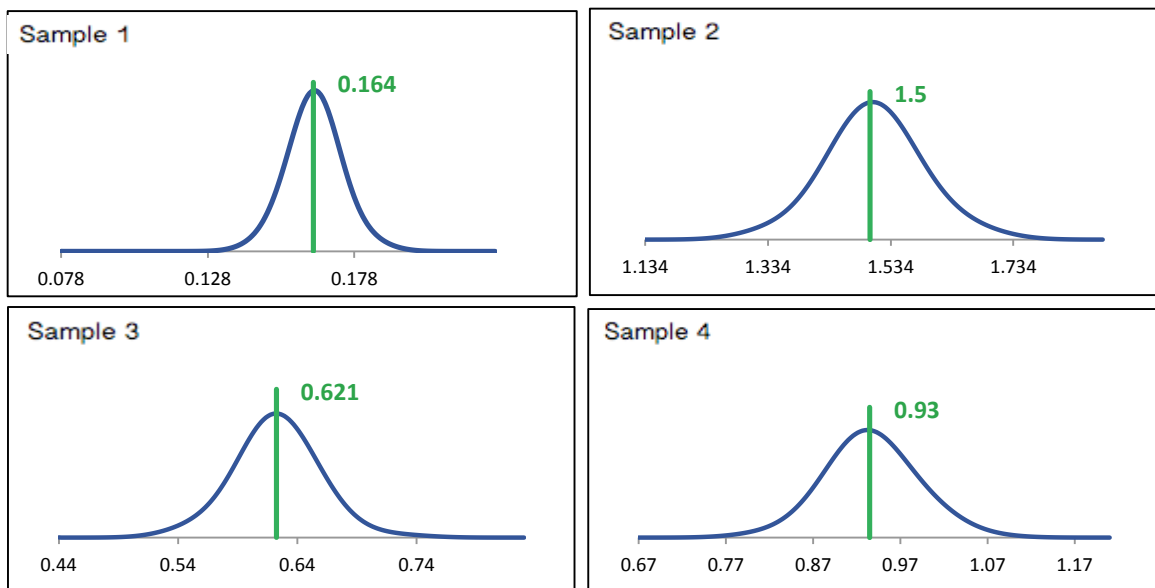


MANGANESE

z-Score Plots

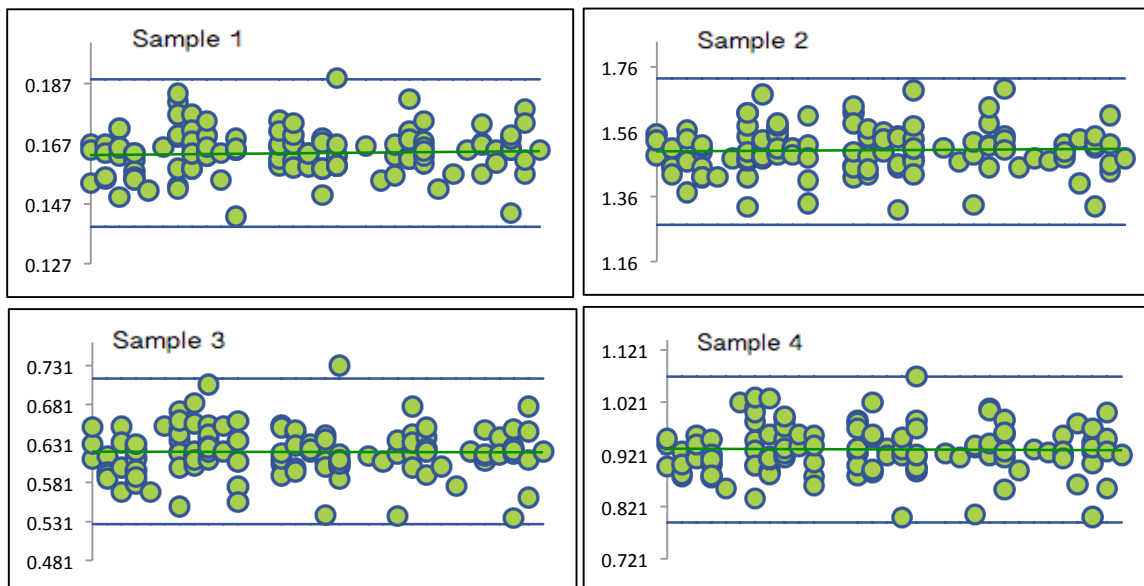


Kernel Density Plots



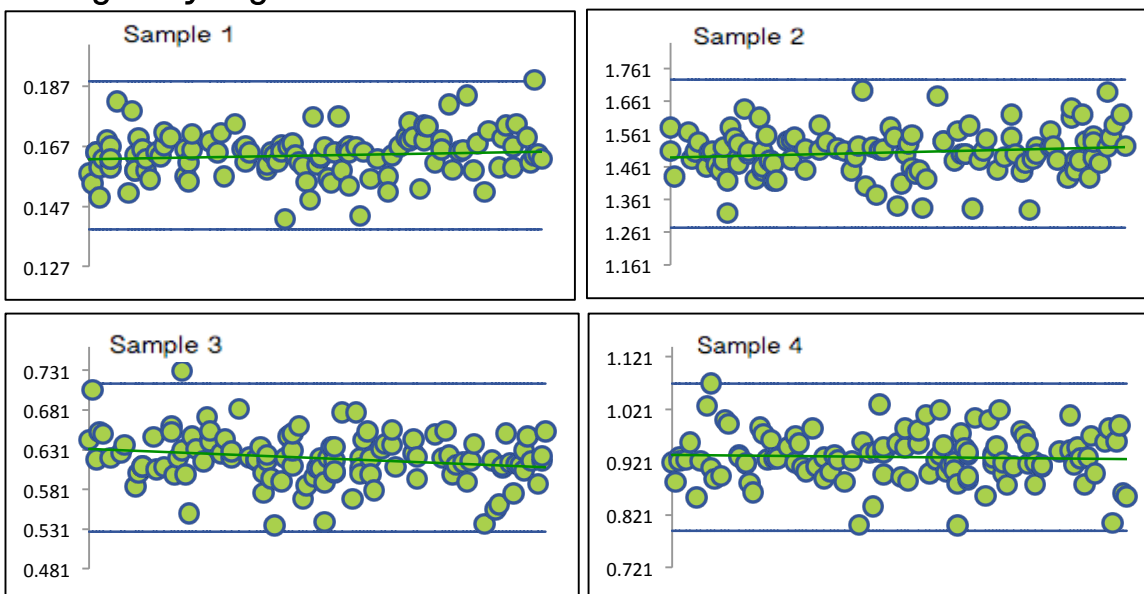
MANGANESE

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

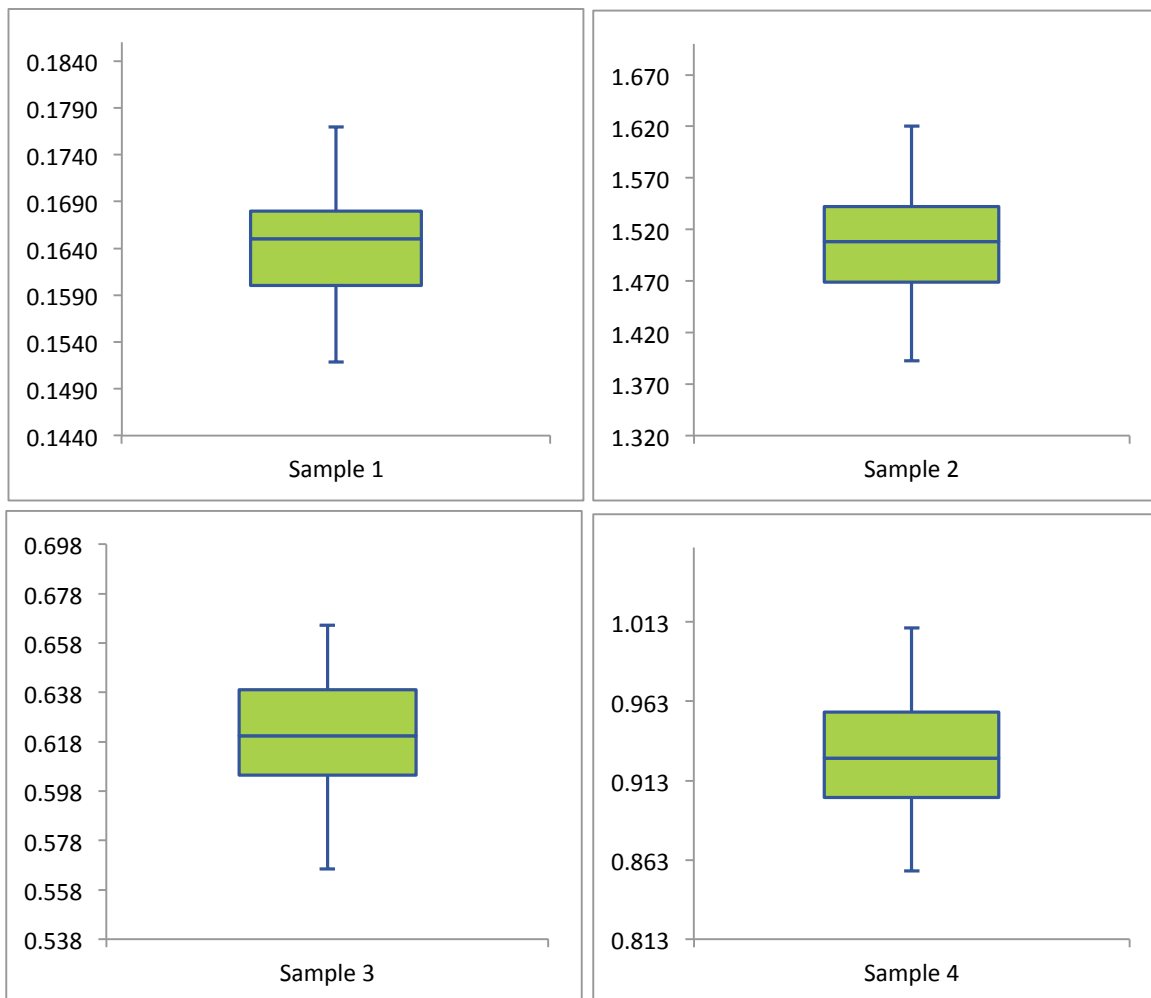
Homogeneity Regression



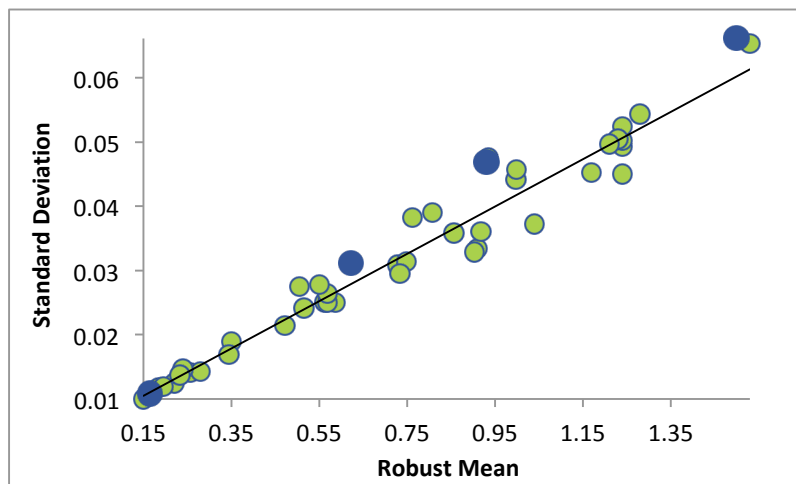
Reported results (Y-axis) plotted against bottling order (X-axis).

MANGANESE

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



MOLYBDENUM

Summary Statistics

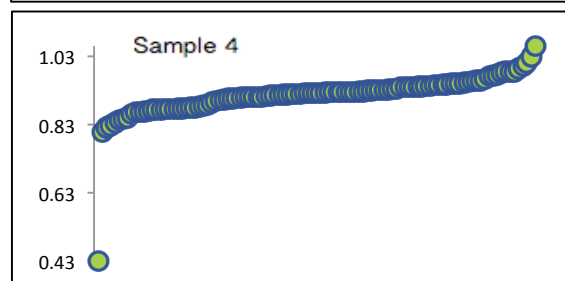
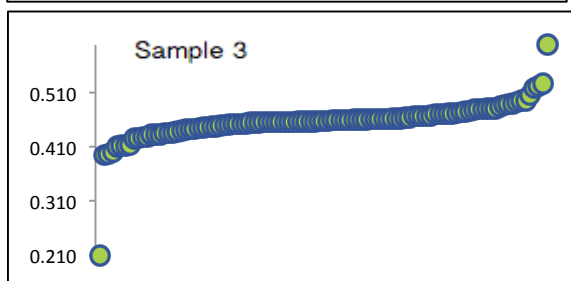
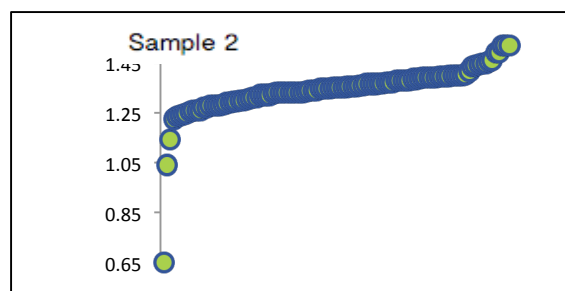
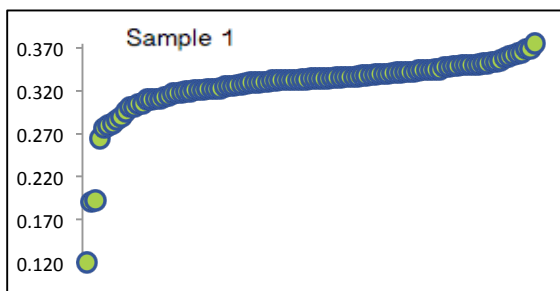
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	105	105	105	105
Median	0.334	1.35	0.458	0.922
Robust Mean	0.332	1.35	0.458	0.919
U	0.00231	0.00778	0.00245	0.00498
Robust Standard Deviation	0.0189	0.0638	0.0201	0.0408
Regression Standard Deviation	0.0249	0.101	0.0343	0.0689
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0249	0.101	0.0343	0.0689
Outliers	0	0	0	0
$ z > 3.0$	3	2	2	1
$2 < z < 3$	4	1	1	1

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	23	23	23	23
ICP/MS (Red)	81	81	81	81
AAG (Green)	1	1	1	1

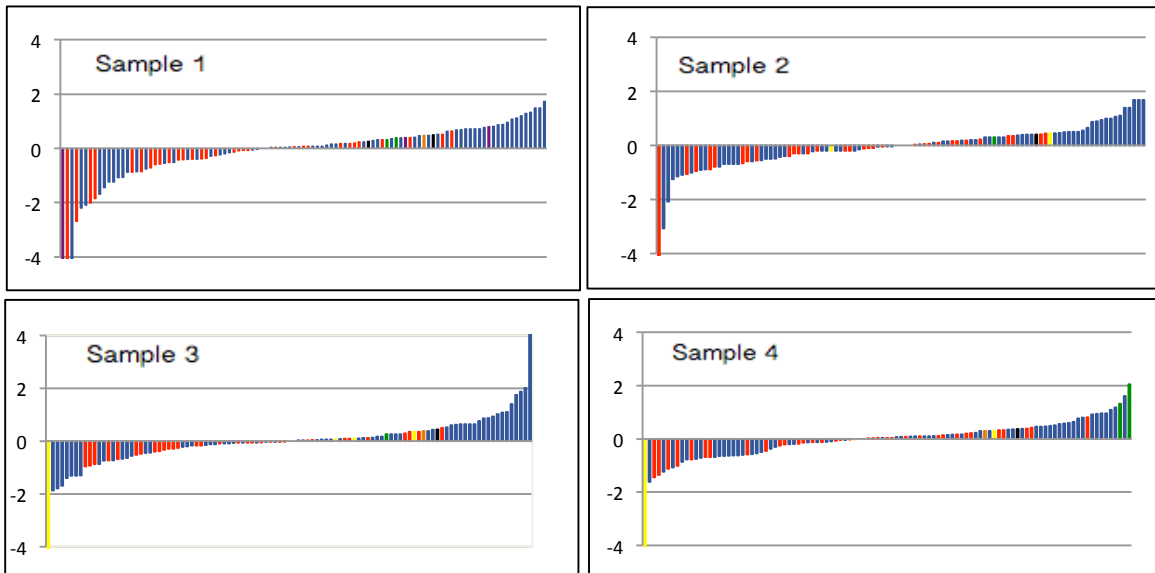
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

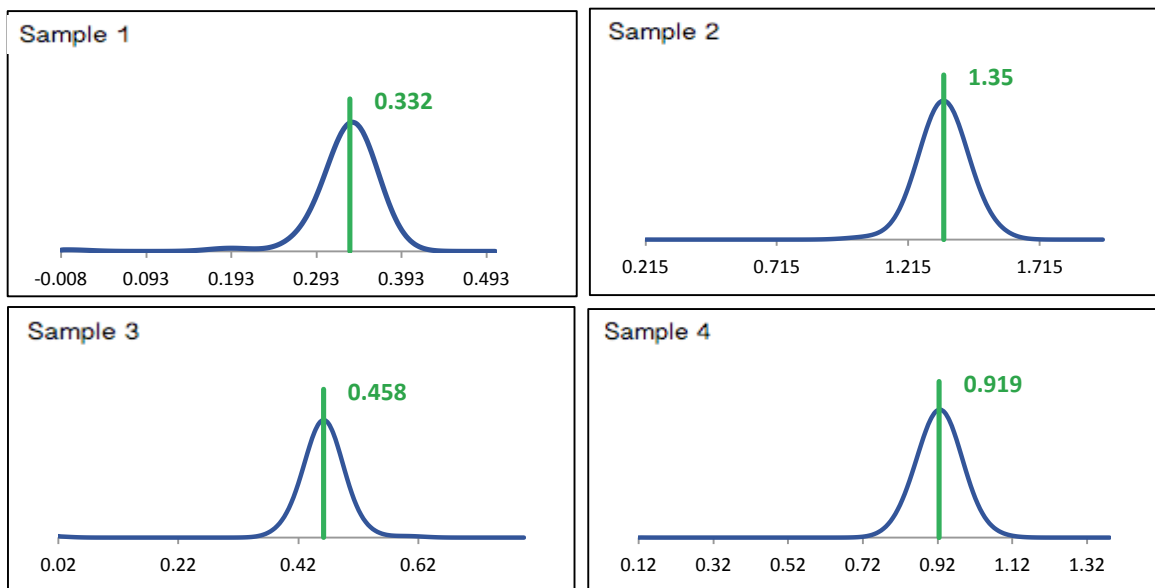


MOLYBDENUM

z-Score Plots

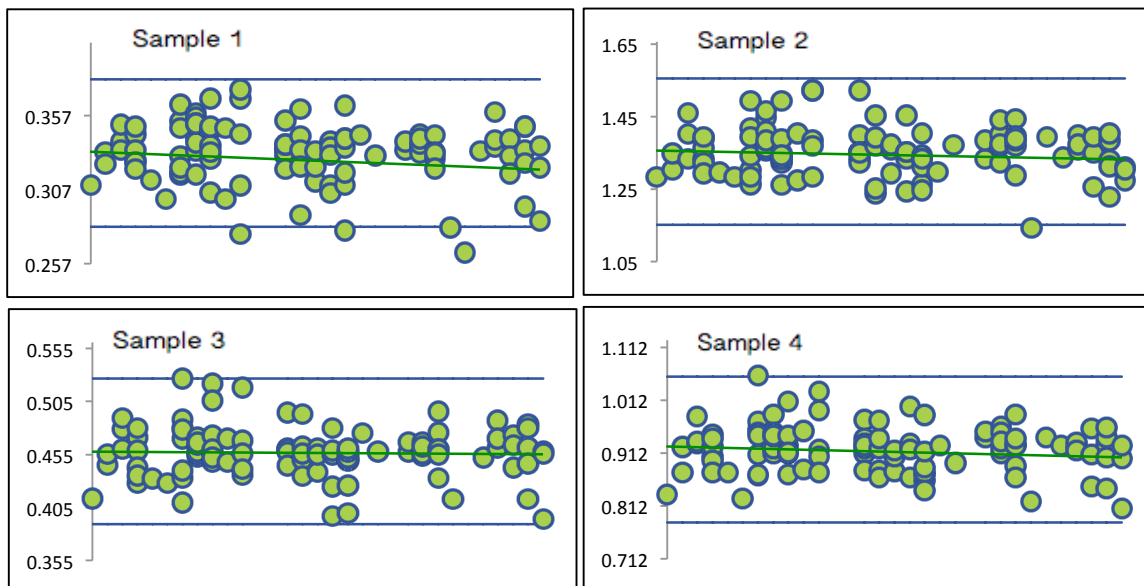


Kernel Density Plots



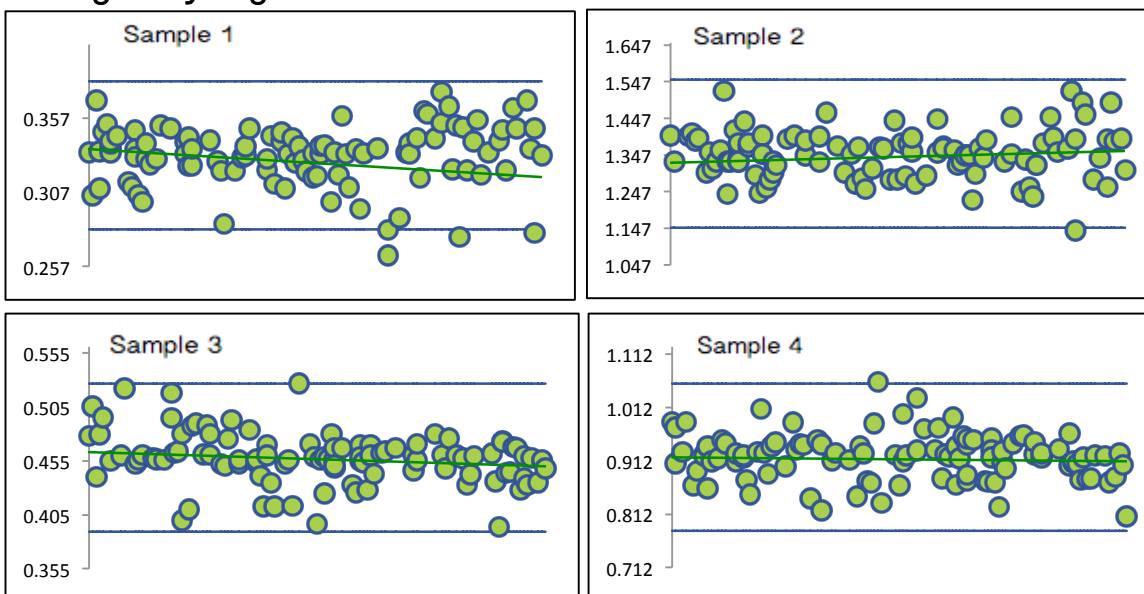
MOLYBDENUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

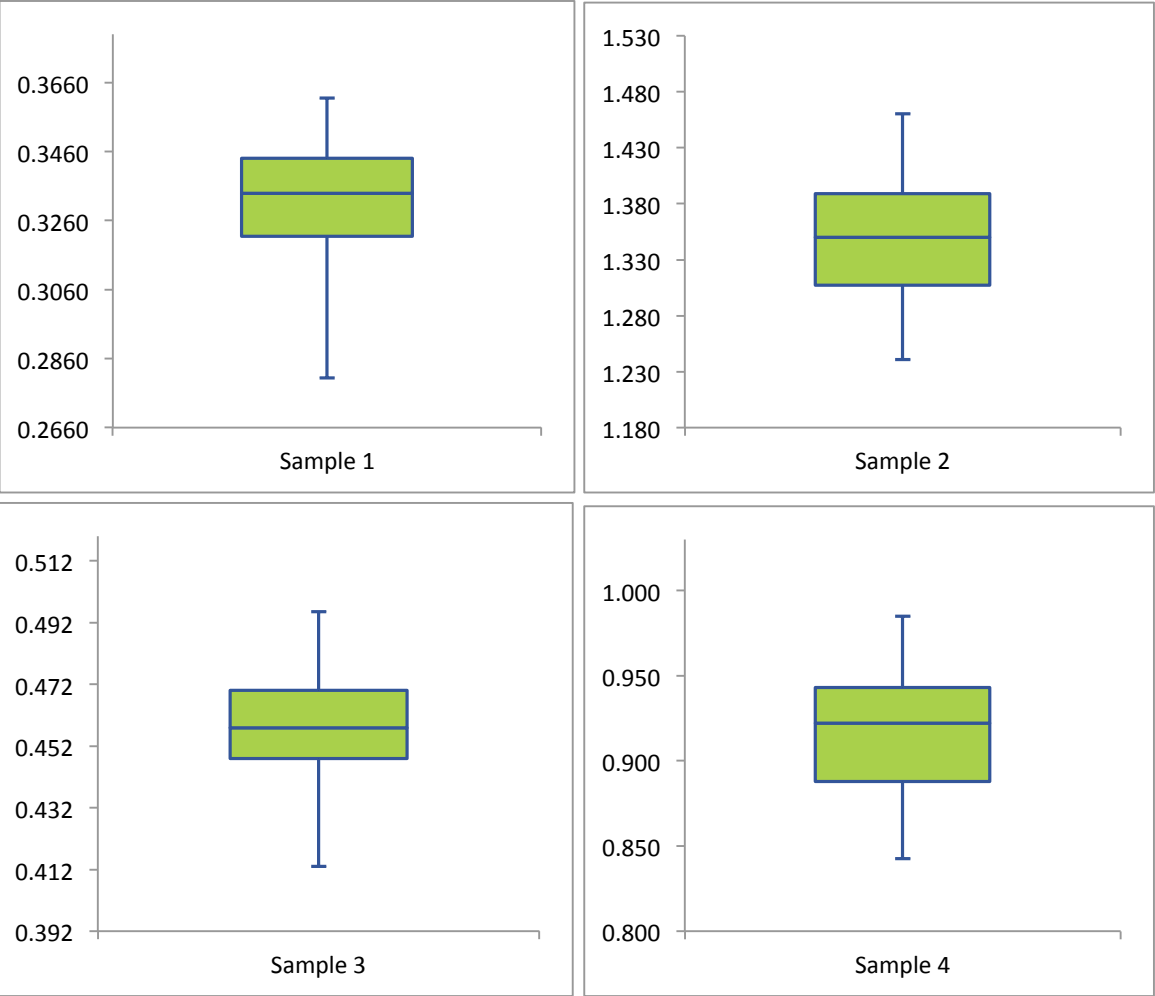
Homogeneity Regression



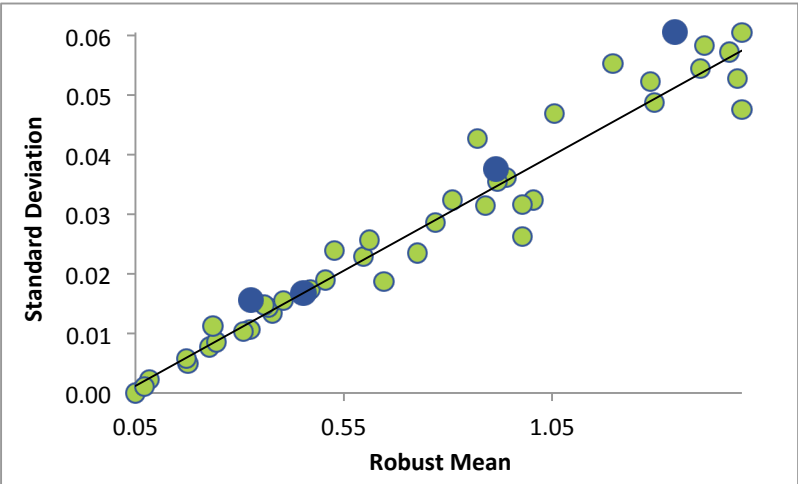
Reported results (Y-axis) plotted against bottling order (X-axis).

MOLYBDENUM

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



NICKEL

Summary Statistics

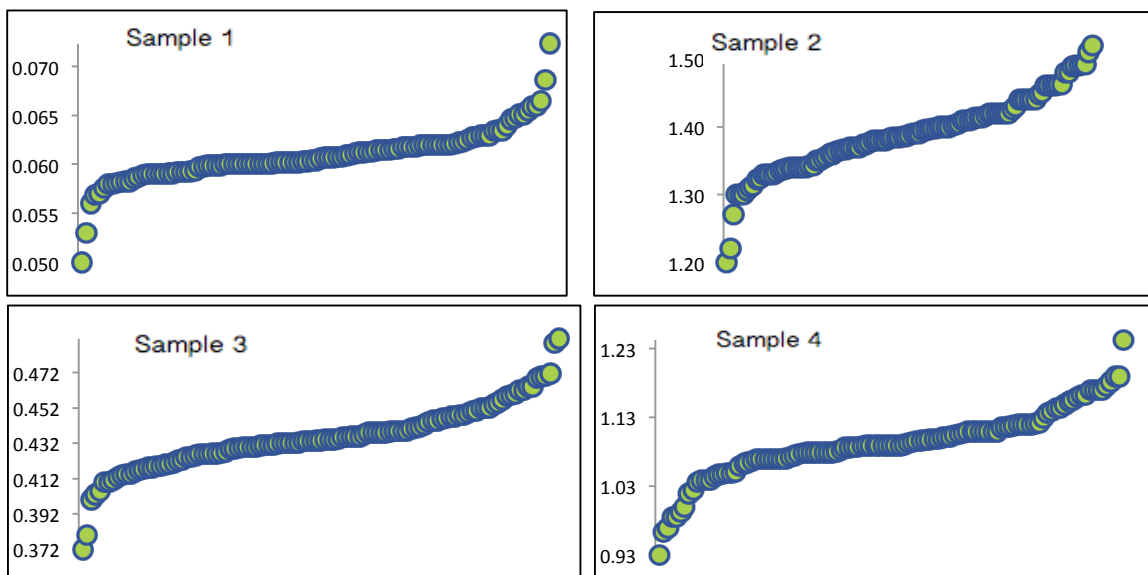
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	109	111	111	111
Median	0.0604	1.39	0.434	1.09
Robust Mean	0.0608	1.39	0.435	1.09
U	0.000235	0.00643	0.00193	0.00492
Robust Standard Deviation	0.00196	0.0542	0.0163	0.0415
Regression Standard Deviation	0.00456	0.104	0.0326	0.0821
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00456	0.104	0.0326	0.0821
Outliers	2	0	0	0
$ z > 3.0$	0	0	0	0
$2 < z < 3$	2	0	0	0

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	24	25	25	25
ICP/MS (Red)	84	85	85	85
AAG (Green)	1	1	1	1

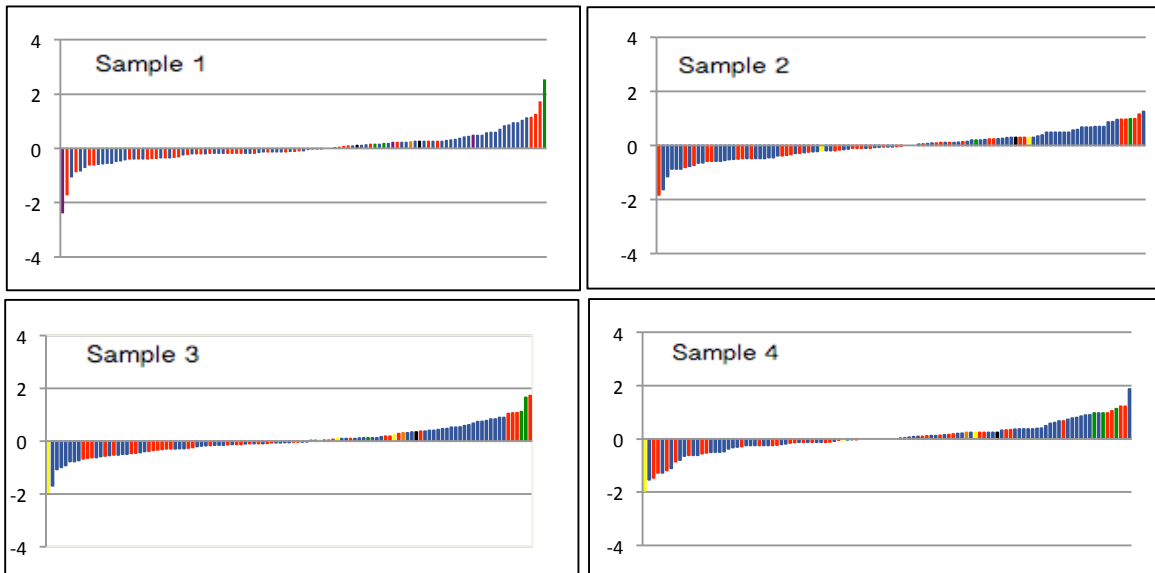
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

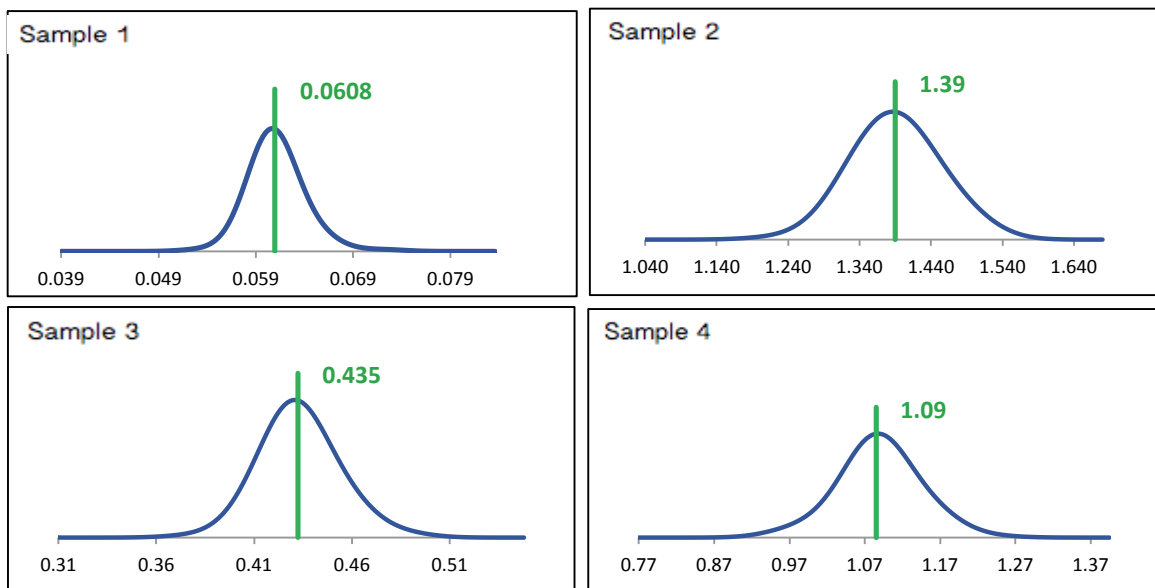


NICKEL

z-Score Plots

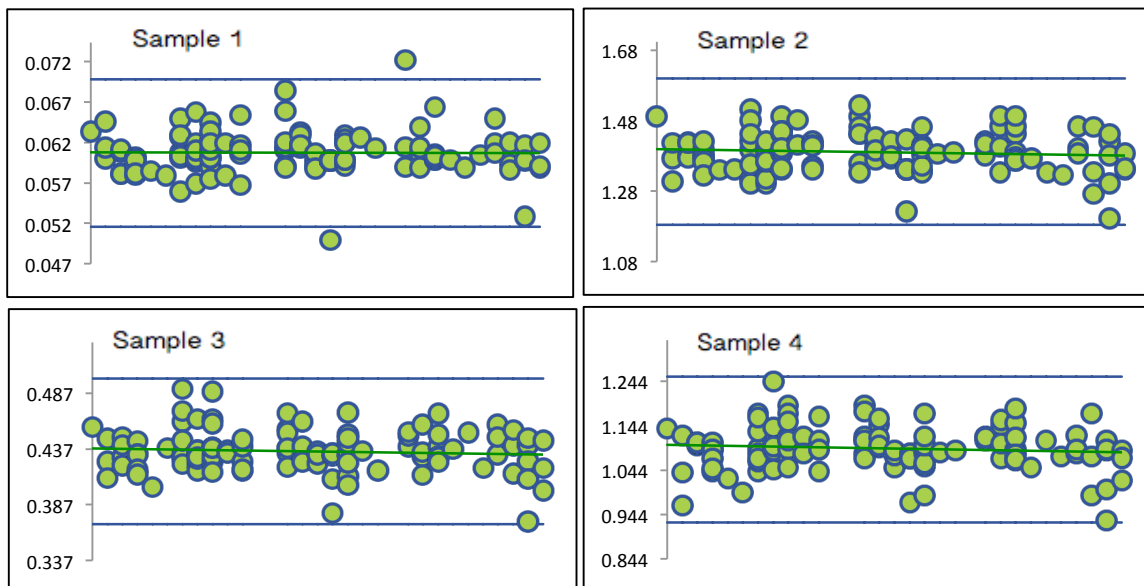


Kernel Density Plots



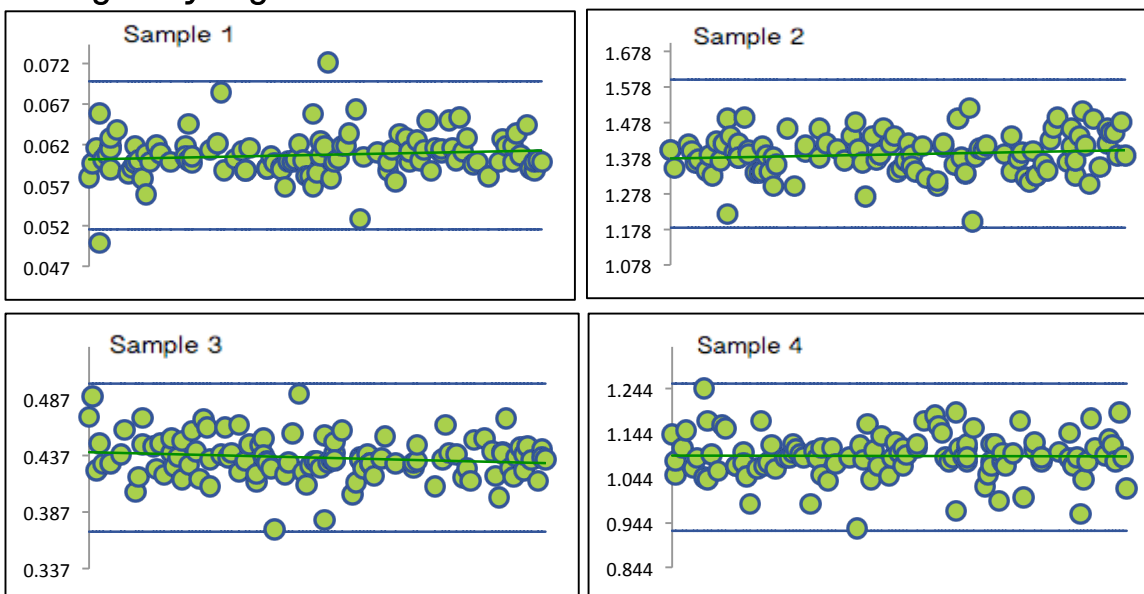
NICKEL

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

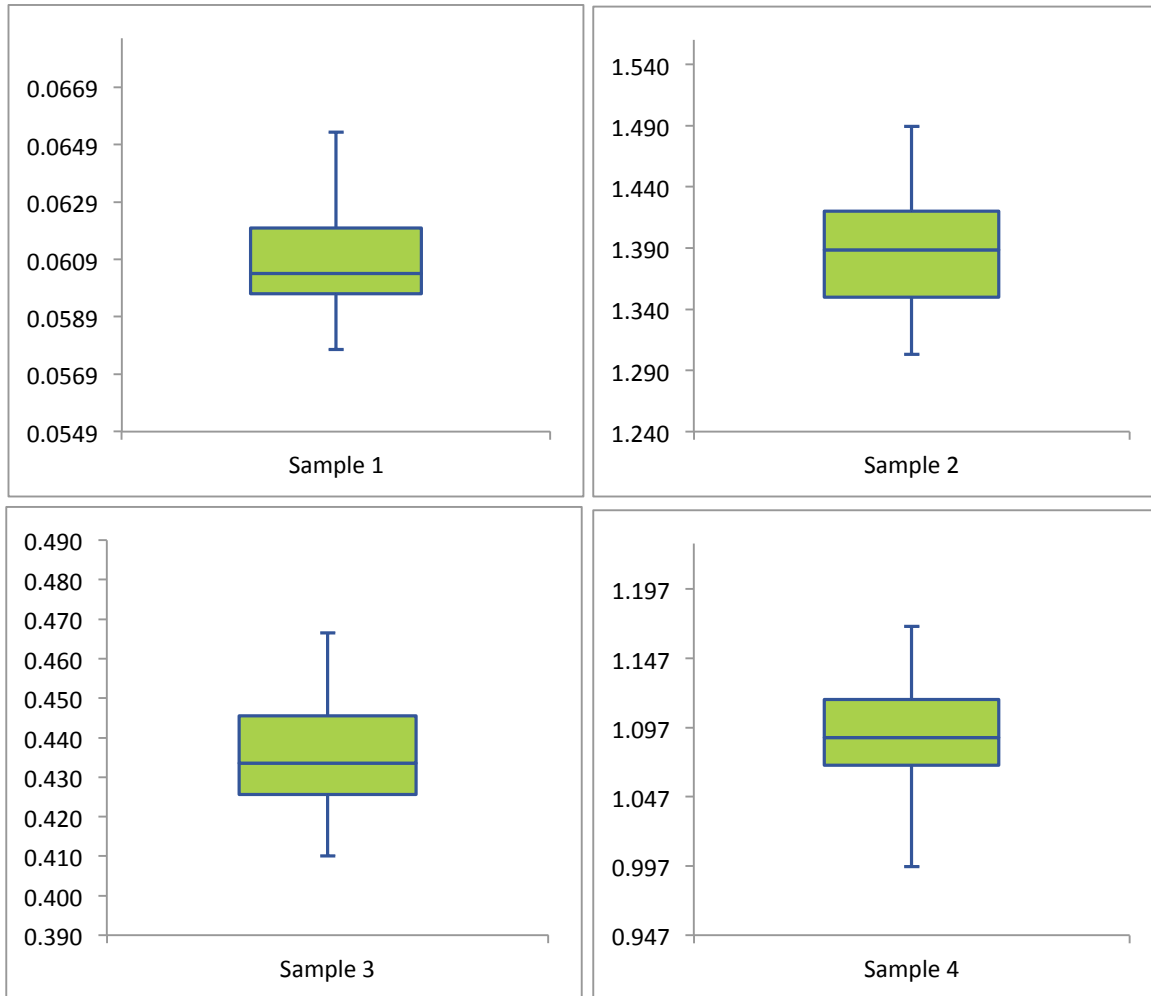
Homogeneity Regression



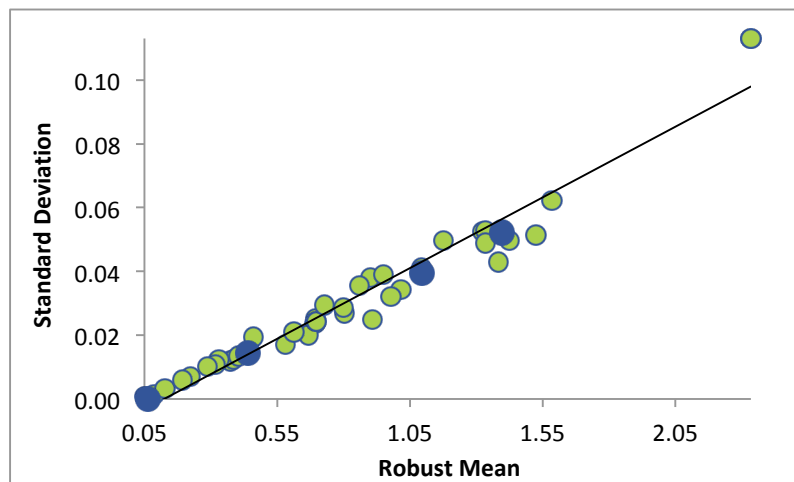
Reported results (Y-axis) plotted against bottling order (X-axis).

NICKEL

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



SELENIUM

Summary Statistics

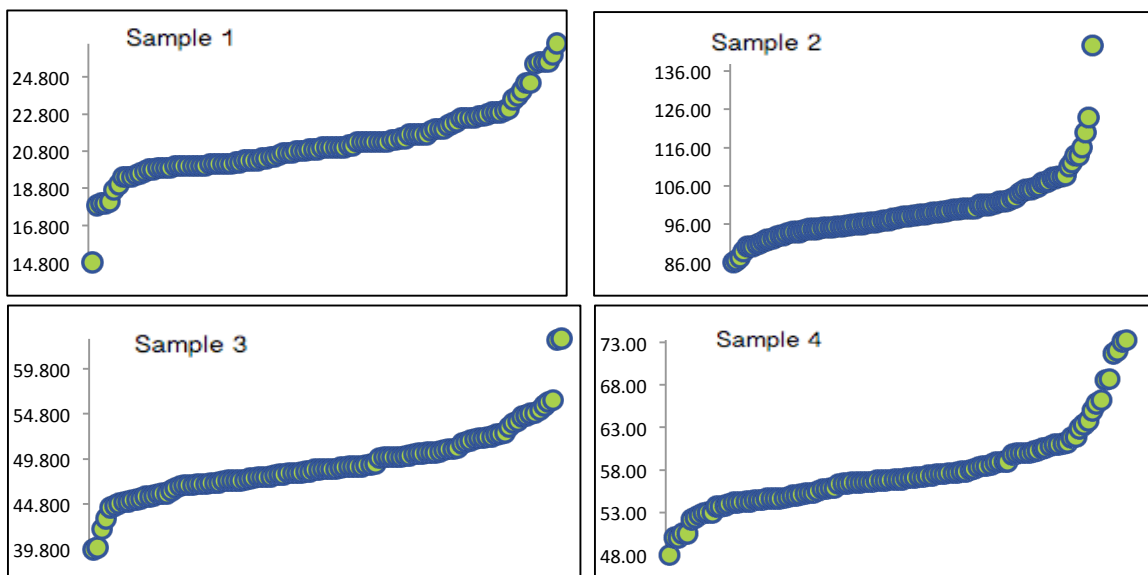
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	108	109	109	109
Median	21.0	98.2	48.7	56.9
Robust Mean	21.1	98.7	49.0	57.2
U	0.176	0.718	0.363	0.408
Robust Standard Deviation	1.46	6.00	3.03	3.41
Regression Standard Deviation	2.11	9.87	4.90	5.72
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	2.11	9.87	4.90	5.72
Outliers	0	0	0	0
$ z > 3.0$	0	1	0	0
$2 < z < 3$	7	2	2	5

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICPHY (Blue)	2	2	2	2
ICP/OES (Red)	15	16	16	16
ICP/MS (Green)	87	87	87	87
AAG (Orange)	1	1	1	1
AAHY (Black)	2	2	2	2
CVAFS (Yellow)	1	1	1	1

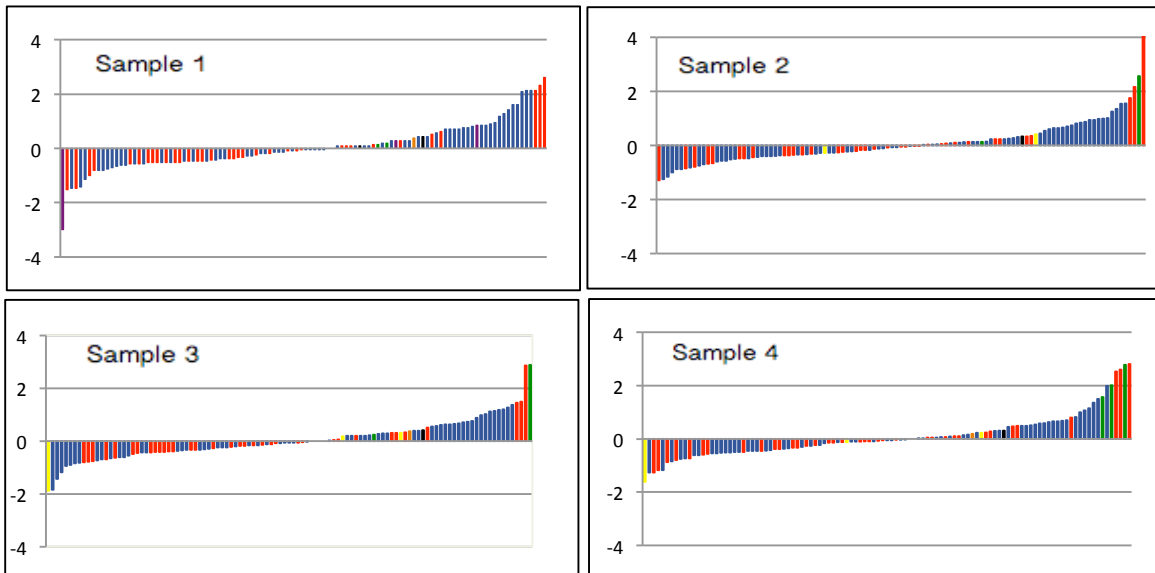
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

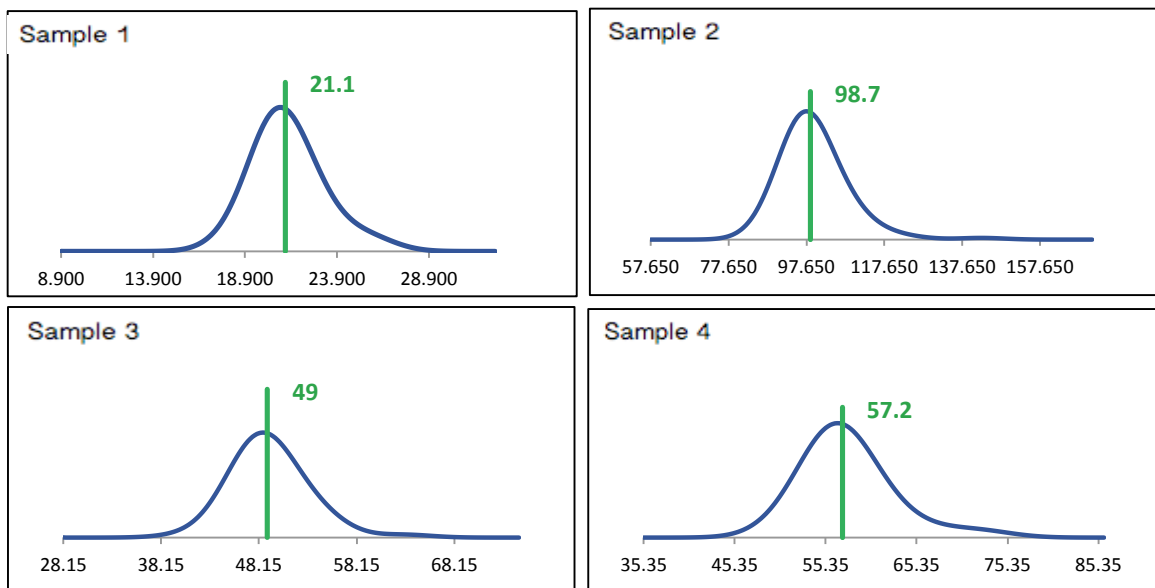


SELENIUM

z-Score Plots

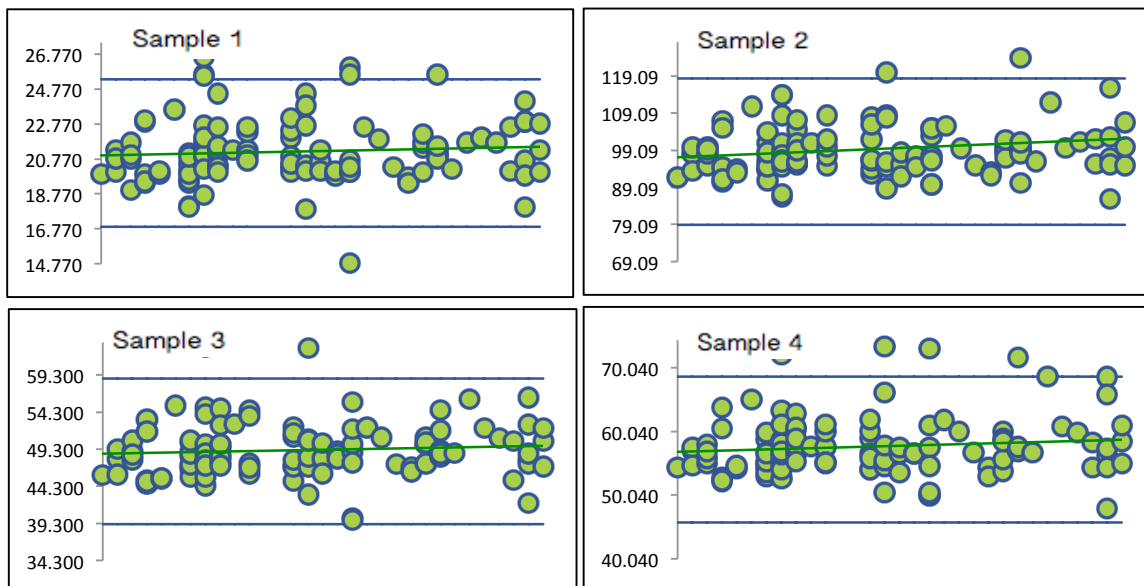


Kernel Density Plots



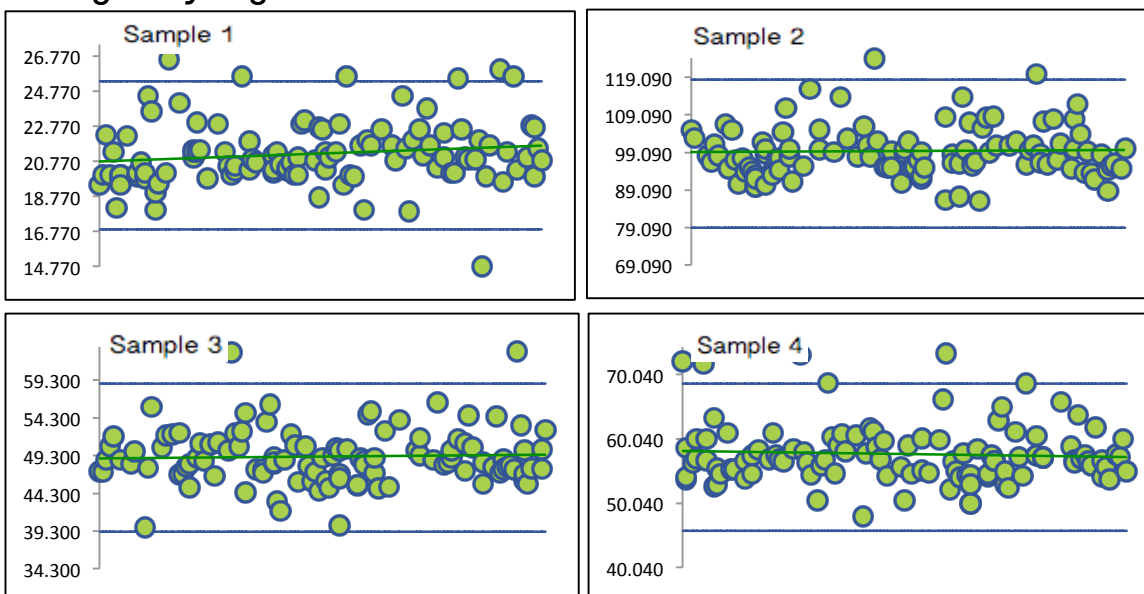
SELENIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

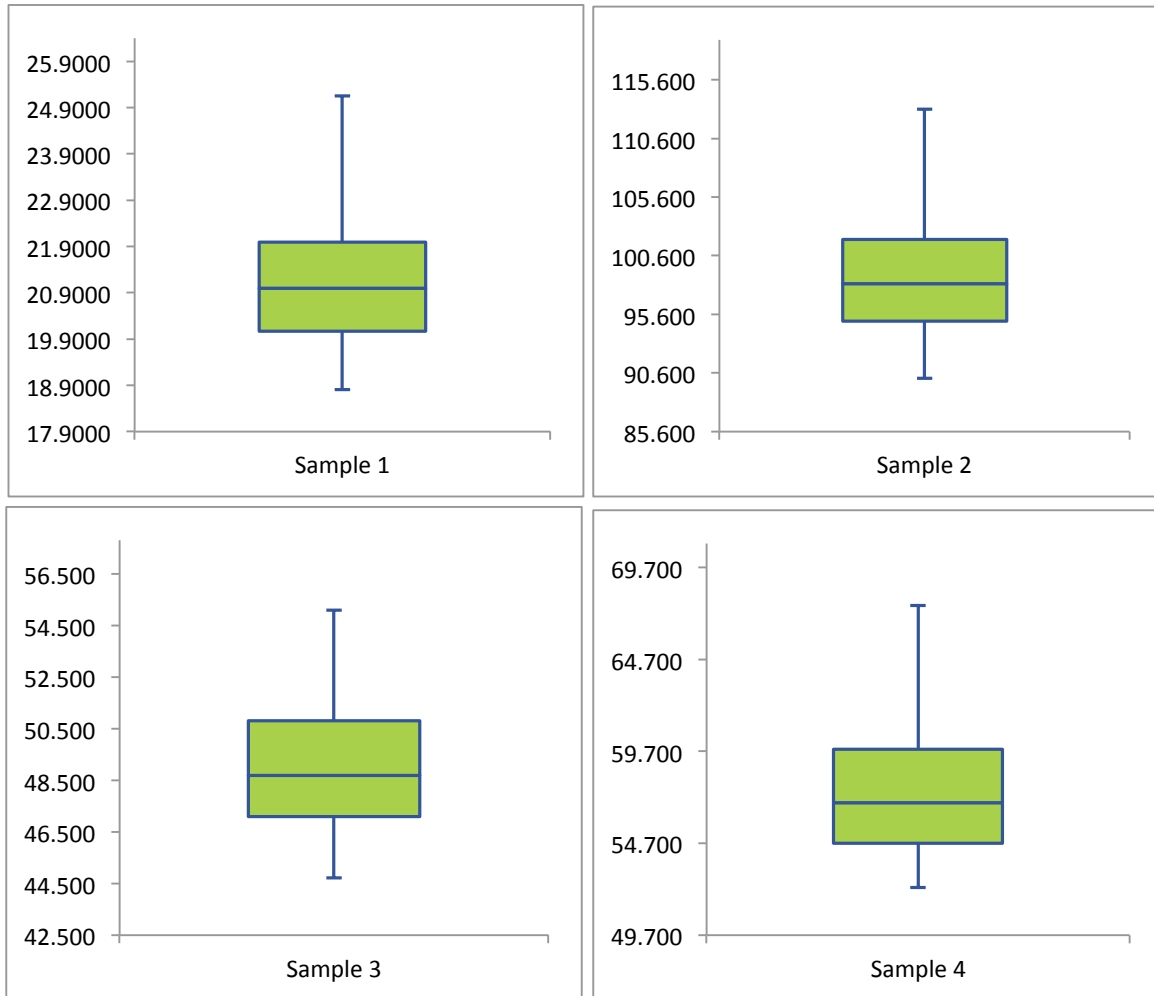
Homogeneity Regression



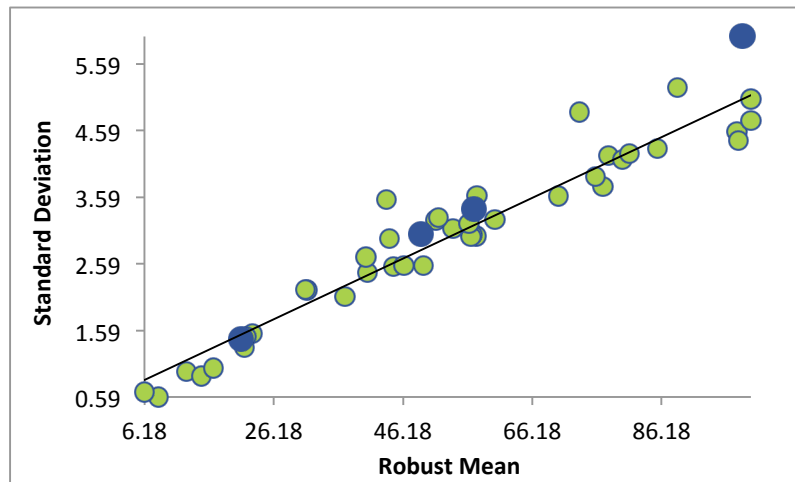
Reported results (Y-axis) plotted against bottling order (X-axis).

SELENIUM

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



SILVER

Summary Statistics

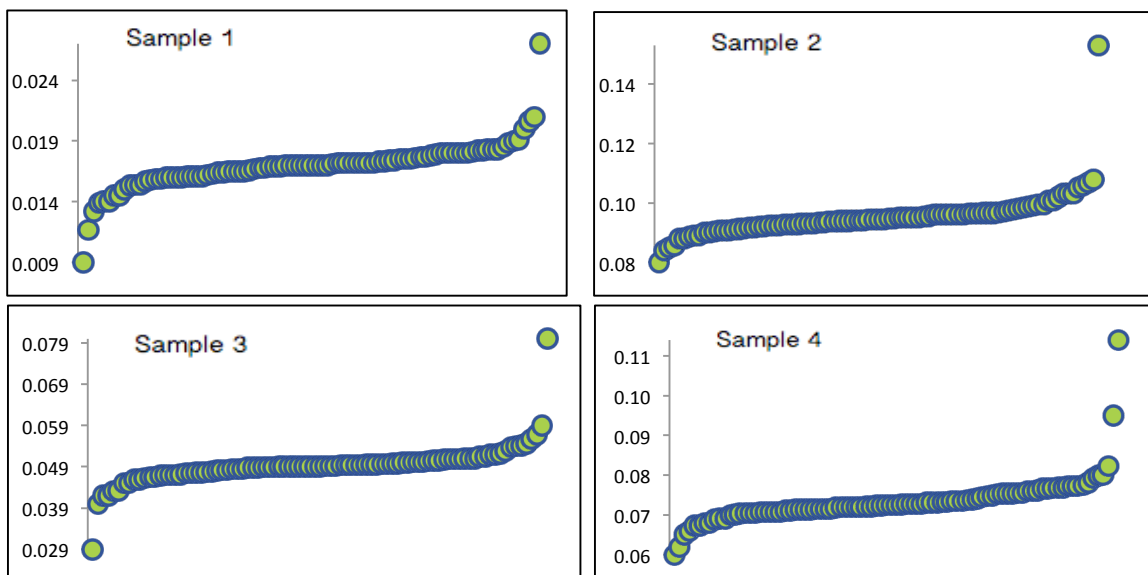
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	89	89	89	89
Median	0.0170	0.0915	0.0491	0.0675
Robust Mean	0.0169	0.0917	0.0491	0.0680
U	0.000158	0.000539	0.000297	0.000439
Robust Standard Deviation	0.00119	0.00407	0.00224	0.00331
Regression Standard Deviation	0.00127	0.00687	0.00369	0.00510
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00127	0.00687	0.00369	0.00510
Outliers	1	1	1	1
$ z > 3.0$	4	1	2	2
$2 < z < 3$	6	1	3	2

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	18	18	18	18
ICP/MS (Red)	71	71	71	71

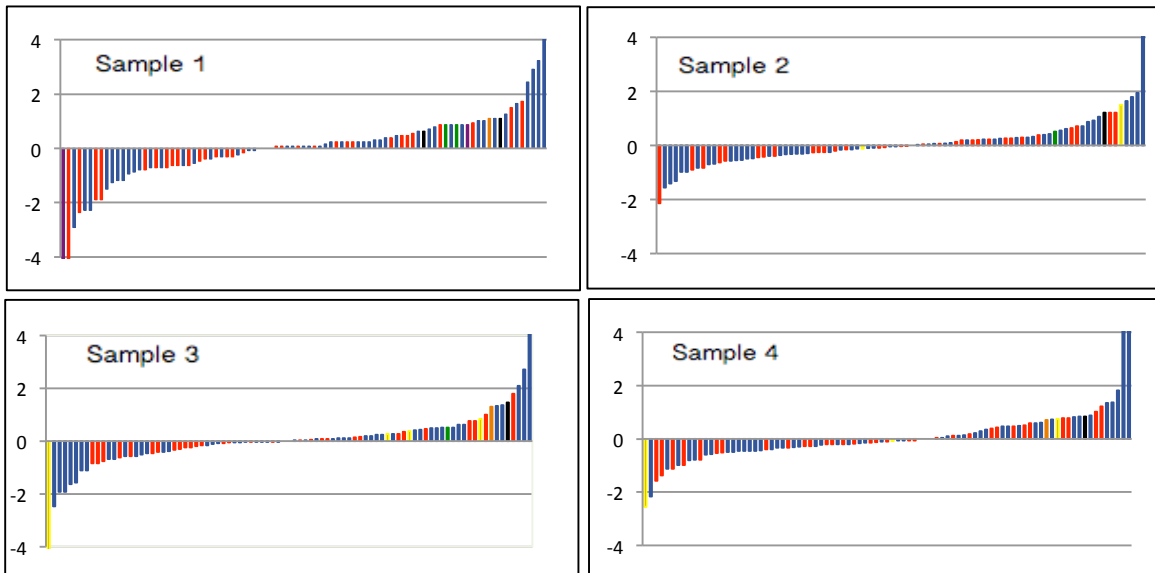
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

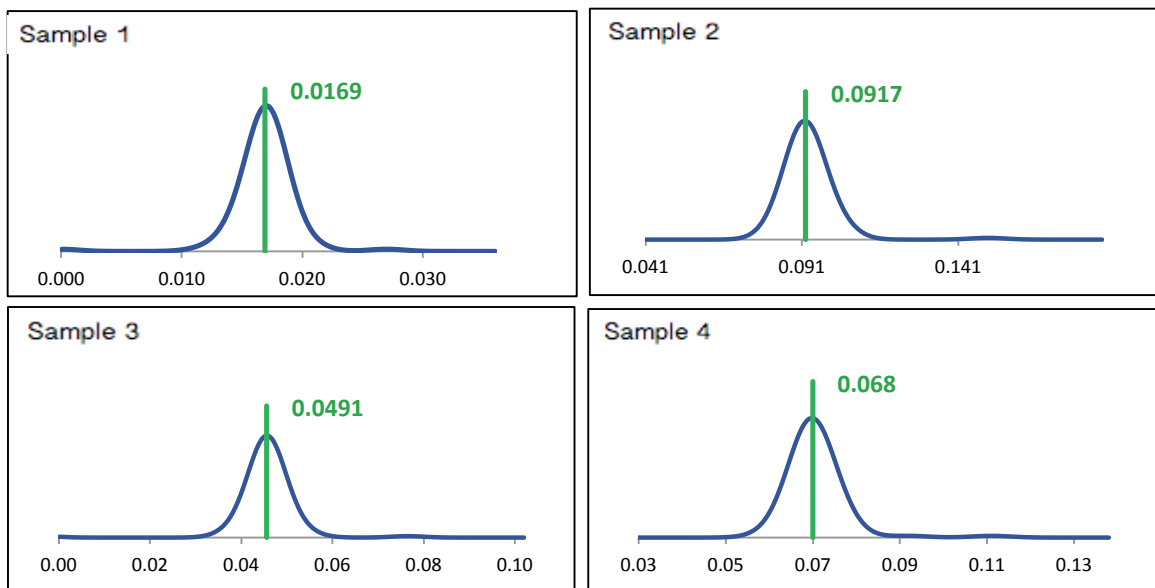


SILVER

z-Score Plots

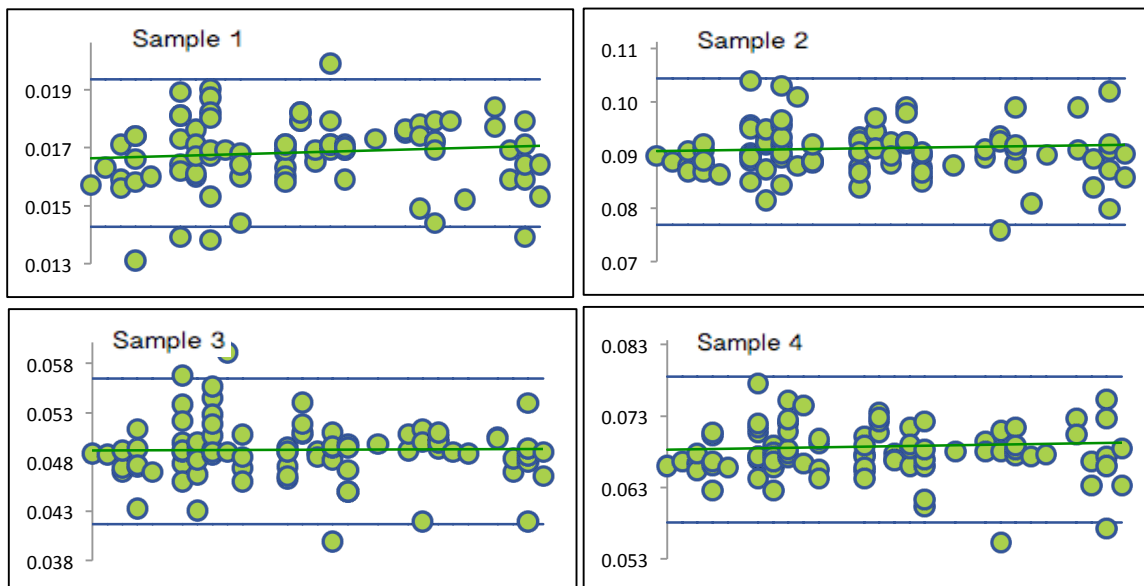


Kernel Density Plots



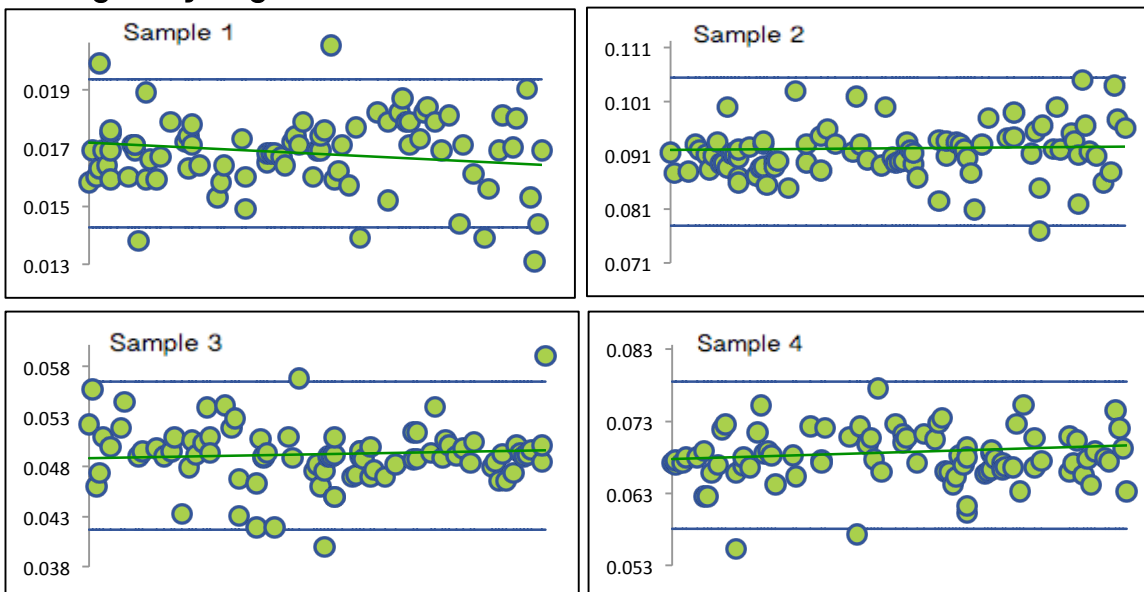
SILVER

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

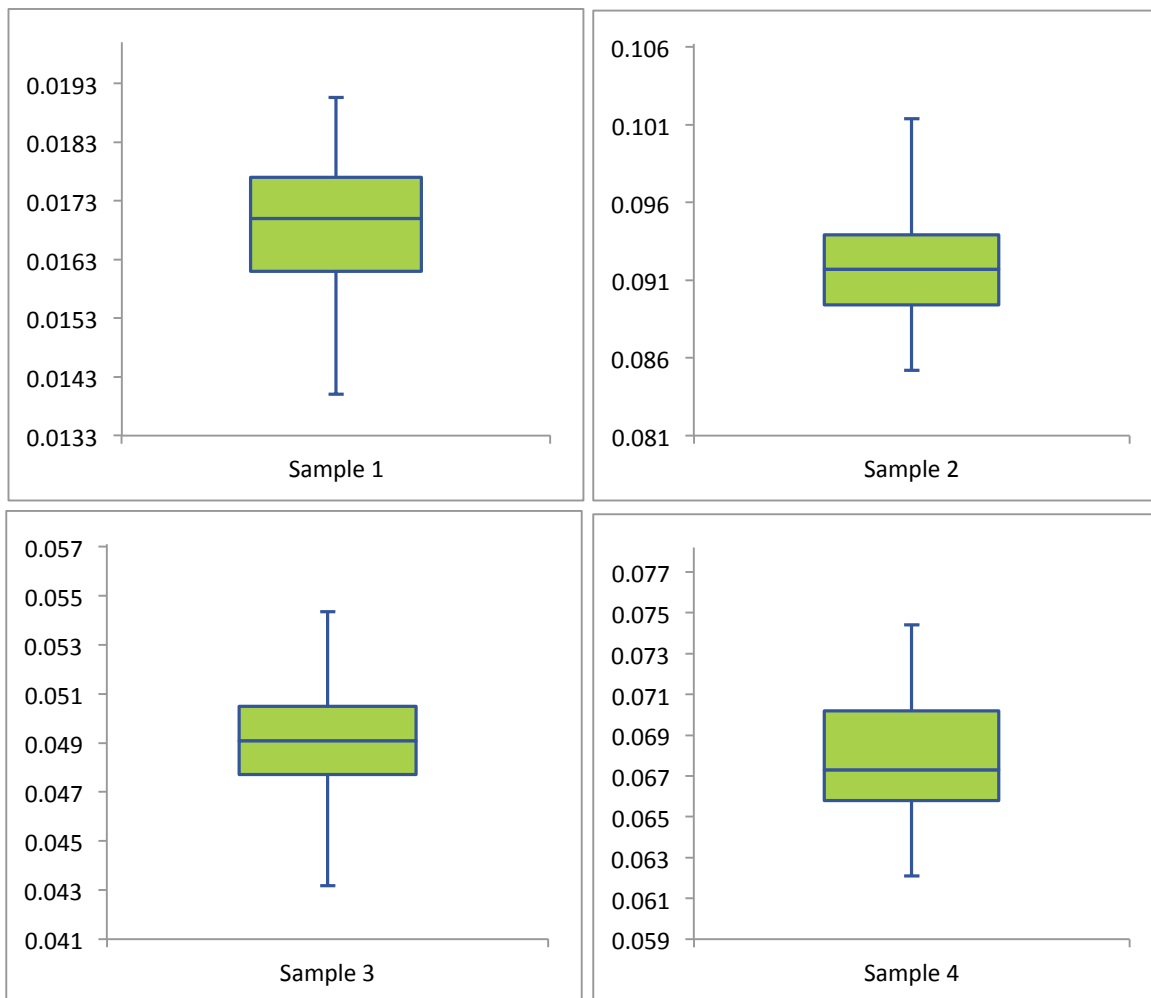
Homogeneity Regression



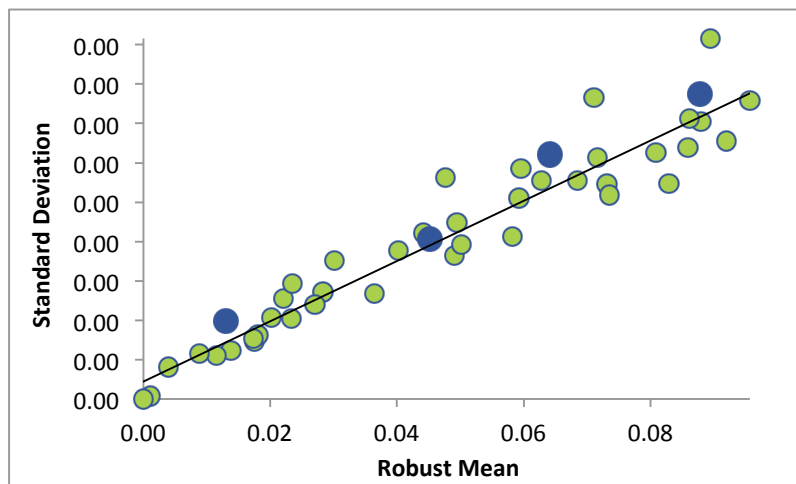
Reported results (Y-axis) plotted against bottling order (X-axis).

SILVER

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



STRONTIUM

Summary Statistics

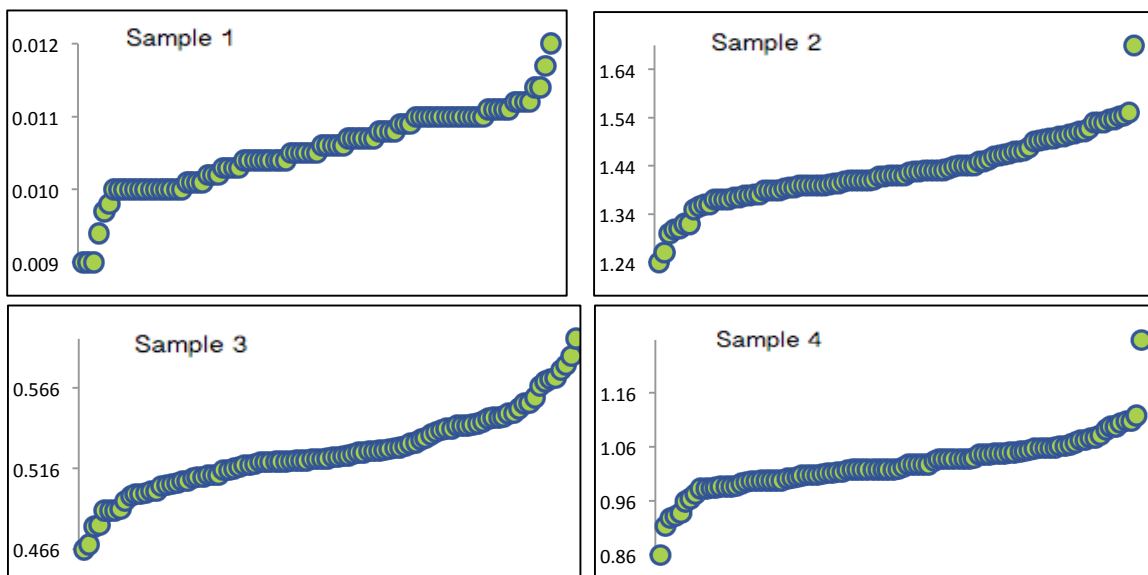
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	91	96	96	96
Median	0.0105	1.42	0.523	1.02
Robust Mean	0.0106	1.43	0.525	1.03
U	0.0000676	0.008	0.00284	0.0049
Robust Standard Deviation	0.000516	0.0627	0.0223	0.0384
Regression Standard Deviation	0.000791	0.107	0.0394	0.0772
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.000791	0.107	0.0394	0.0772
Outliers	3	0	0	0
$ z > 3.0$	0	0	0	0
$2 < z < 3$	3	1	0	2

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	71	73	73	73
ICP/OES (Red)	19	22	22	22
AAG (Green)	1	1	1	1

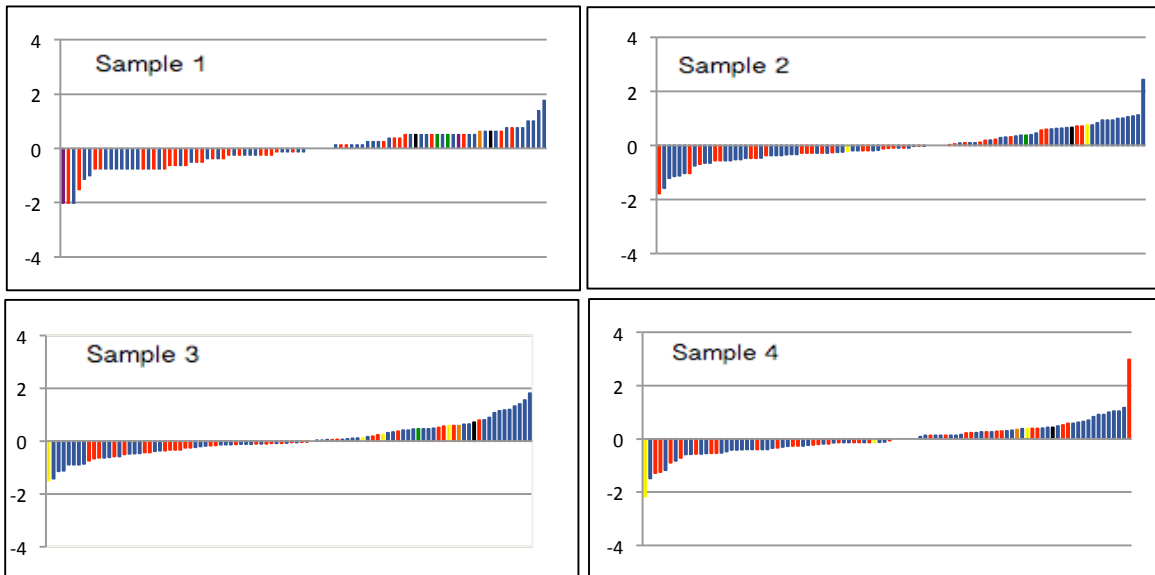
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

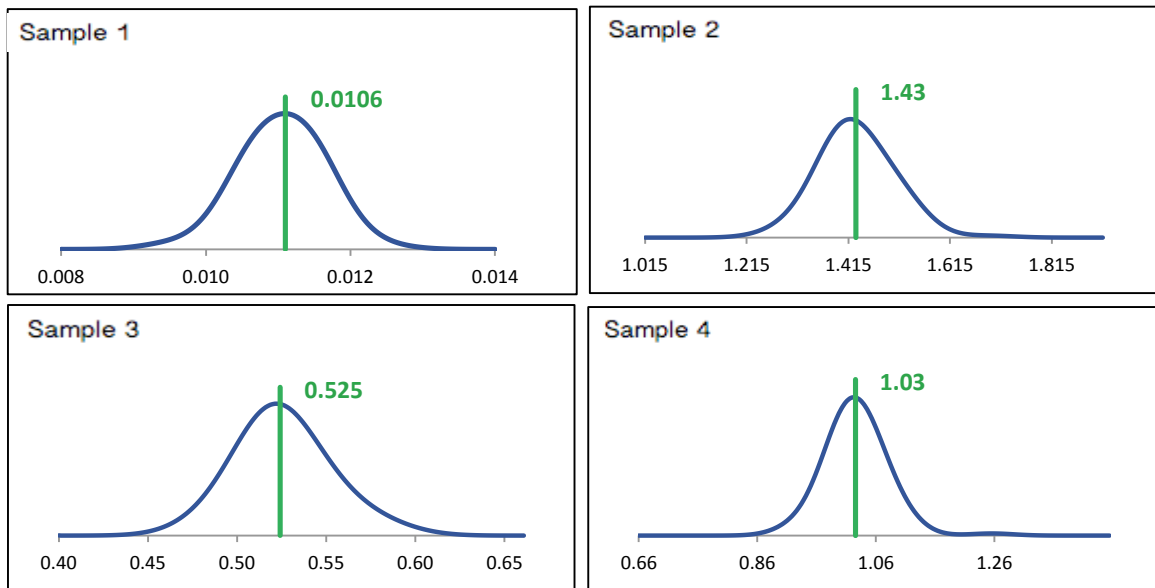


STRONTIUM

z-Score Plots

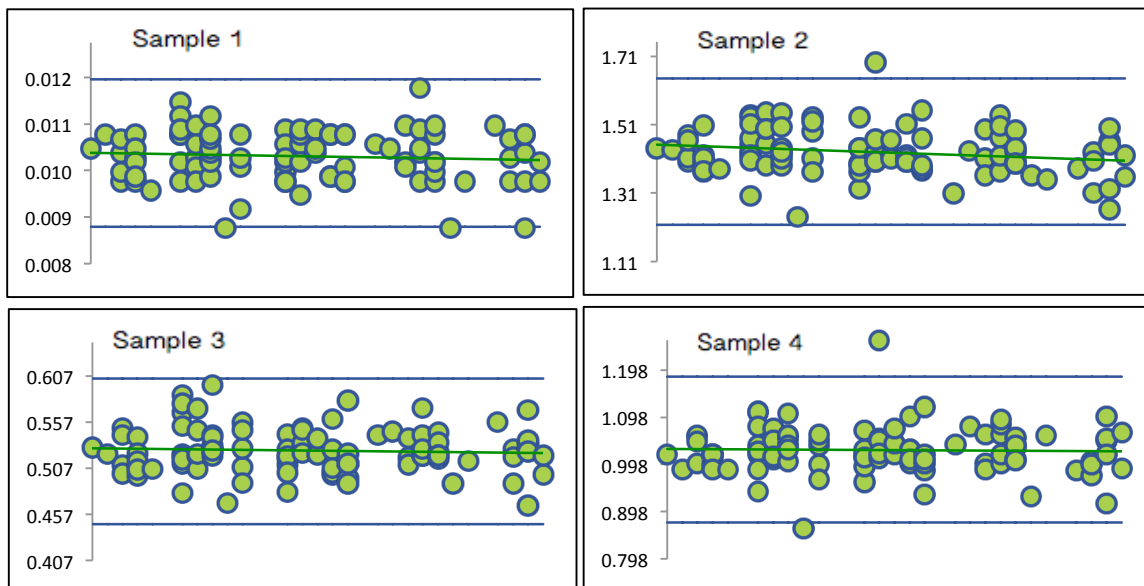


Kernel Density Plots



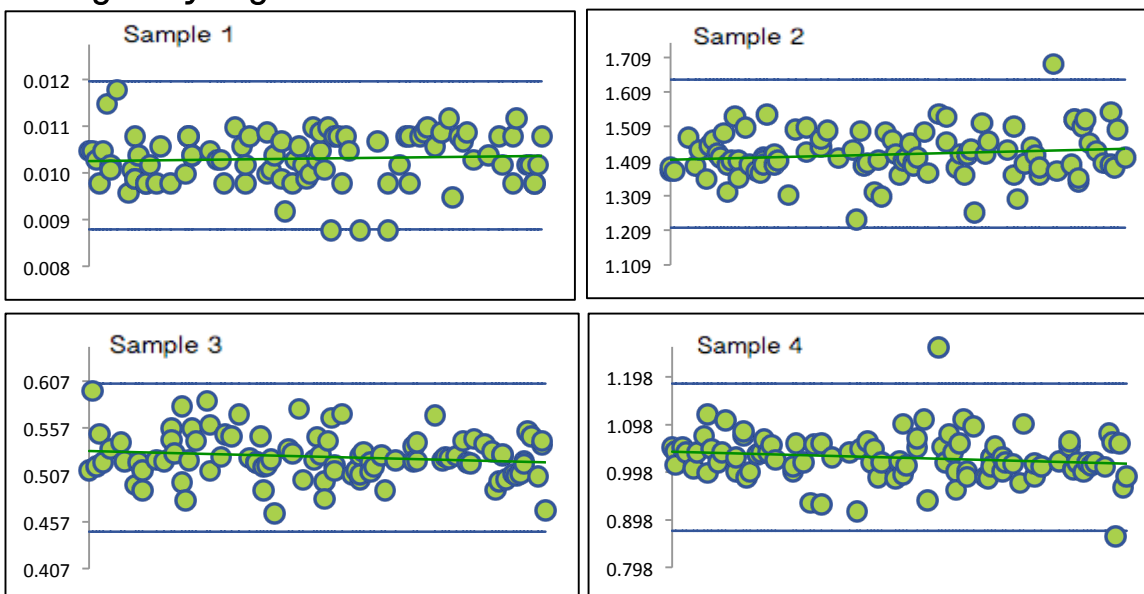
STRONTIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

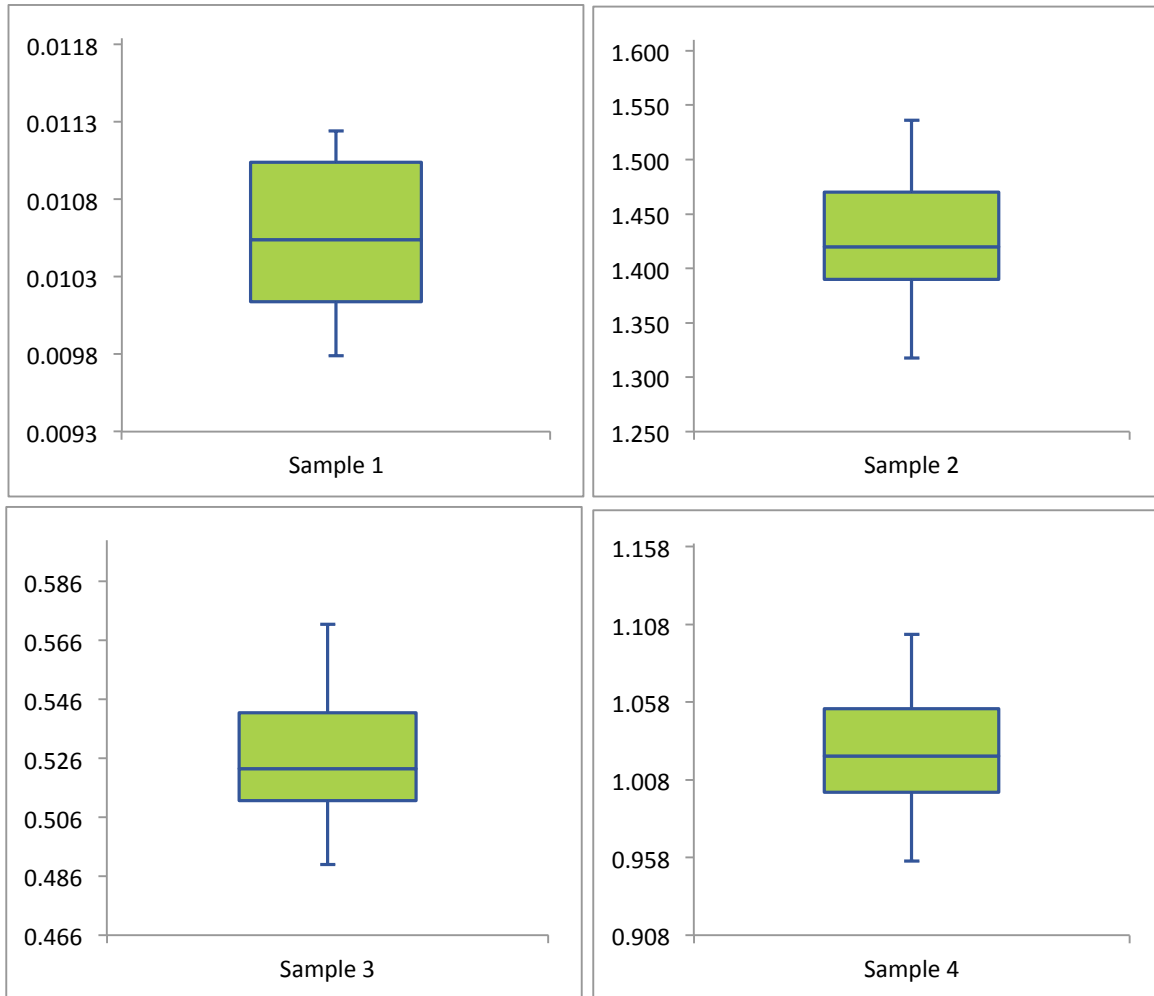
Homogeneity Regression



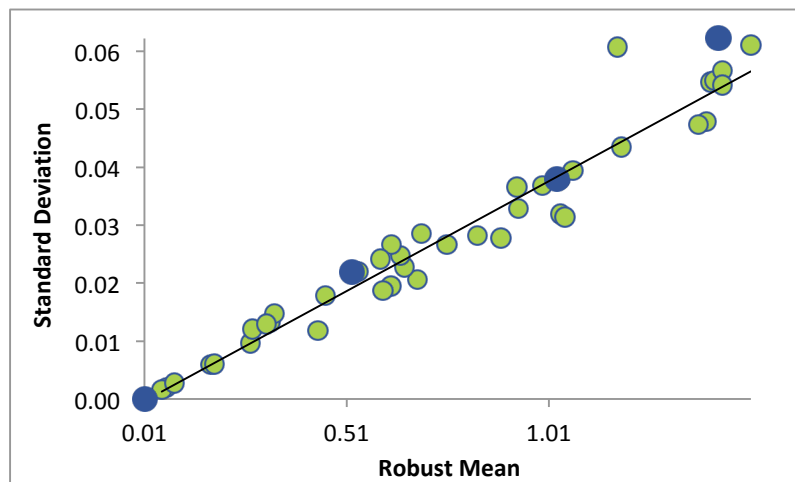
Reported results (Y-axis) plotted against bottling order (X-axis).

STRONTIUM

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



THALLIUM

Summary Statistics

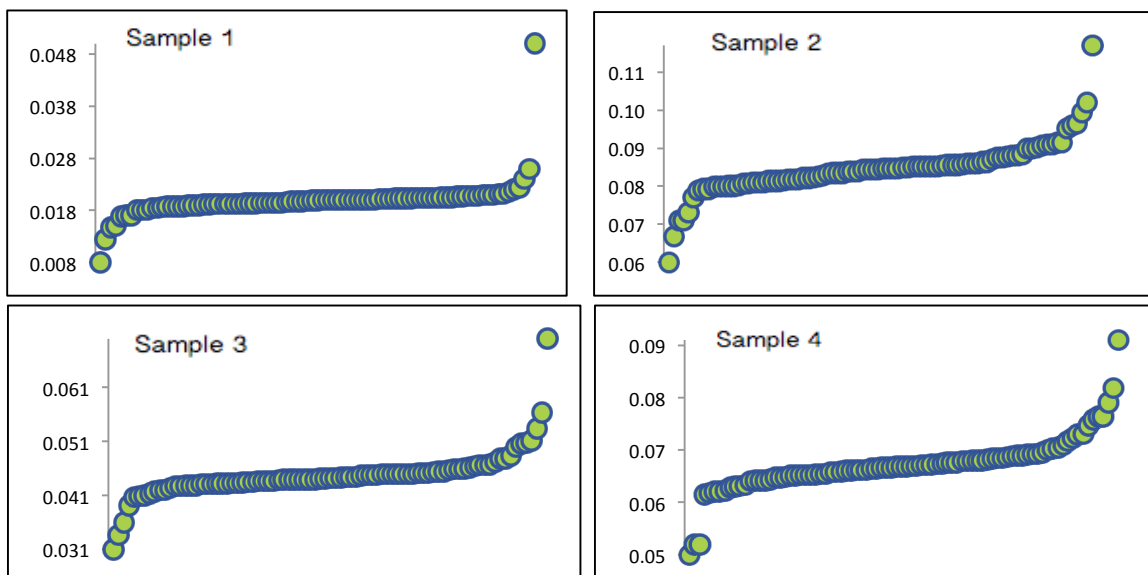
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	85	86	85	86
Median	0.0199	0.0836	0.0442	0.0679
Robust Mean	0.0197	0.0834	0.0444	0.0679
U	0.000144	0.000594	0.000274	0.000435
Robust Standard Deviation	0.00106	0.00441	0.00202	0.00323
Regression Standard Deviation	0.00197	0.00834	0.00444	0.00679
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00197	0.00834	0.00444	0.00679
Outliers	0	0	0	0
$ z > 3.0$	4	1	2	1
$2 < z < 3$	3	3	3	4

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	12	13	12	13
ICP/MS (Red)	73	73	73	73

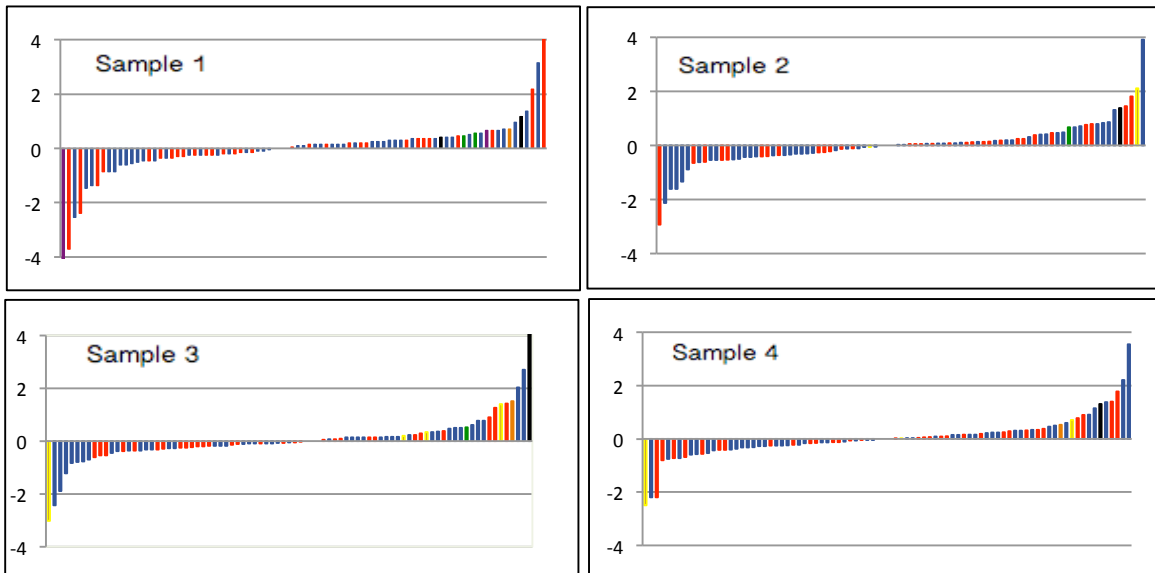
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

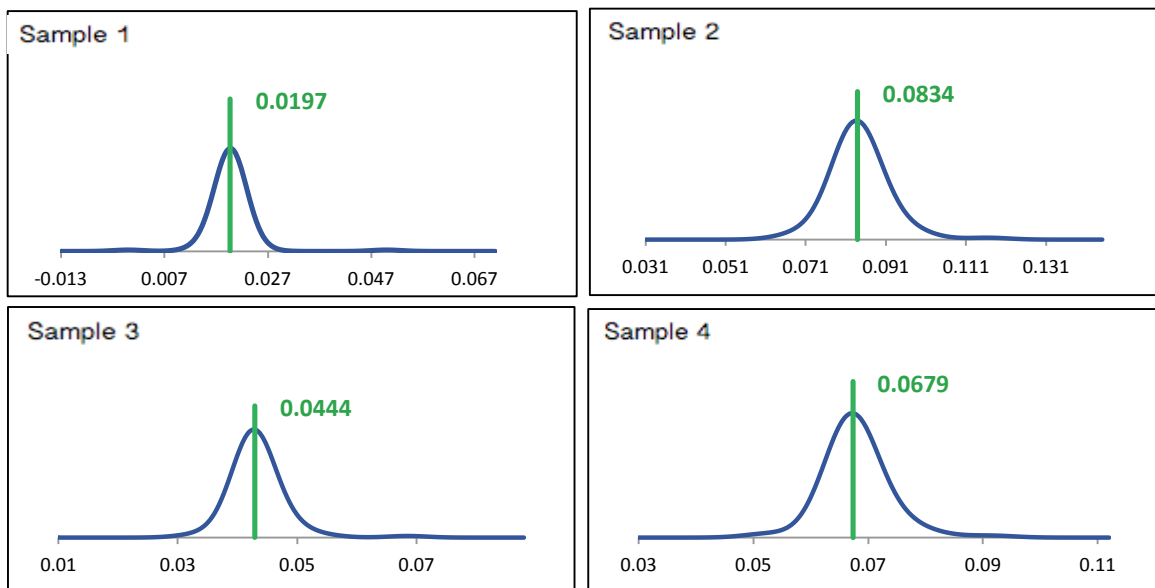


THALLIUM

z-Score Plots

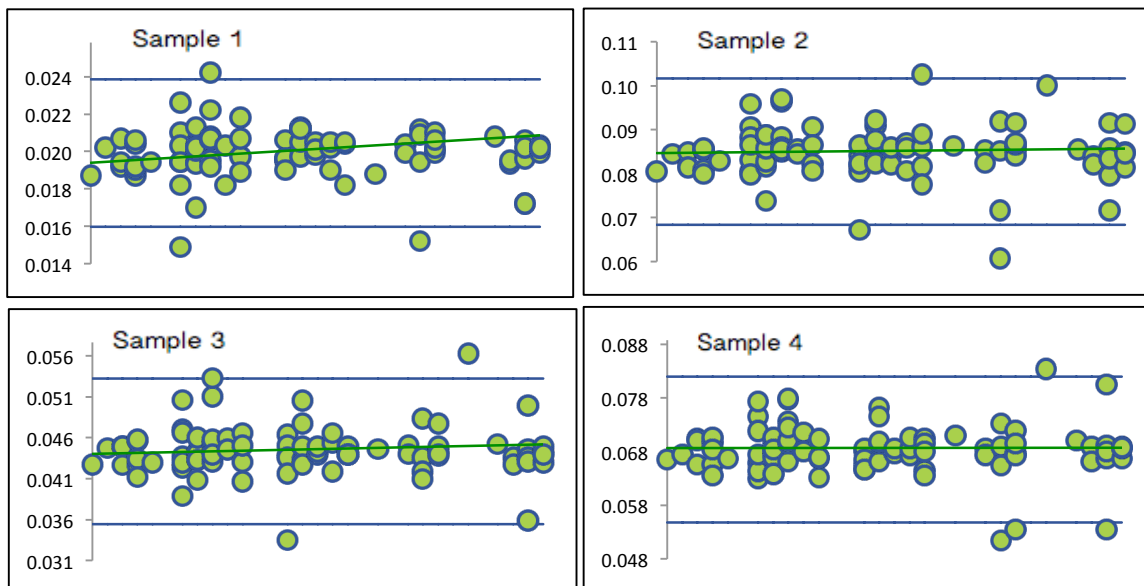


Kernel Density Plots



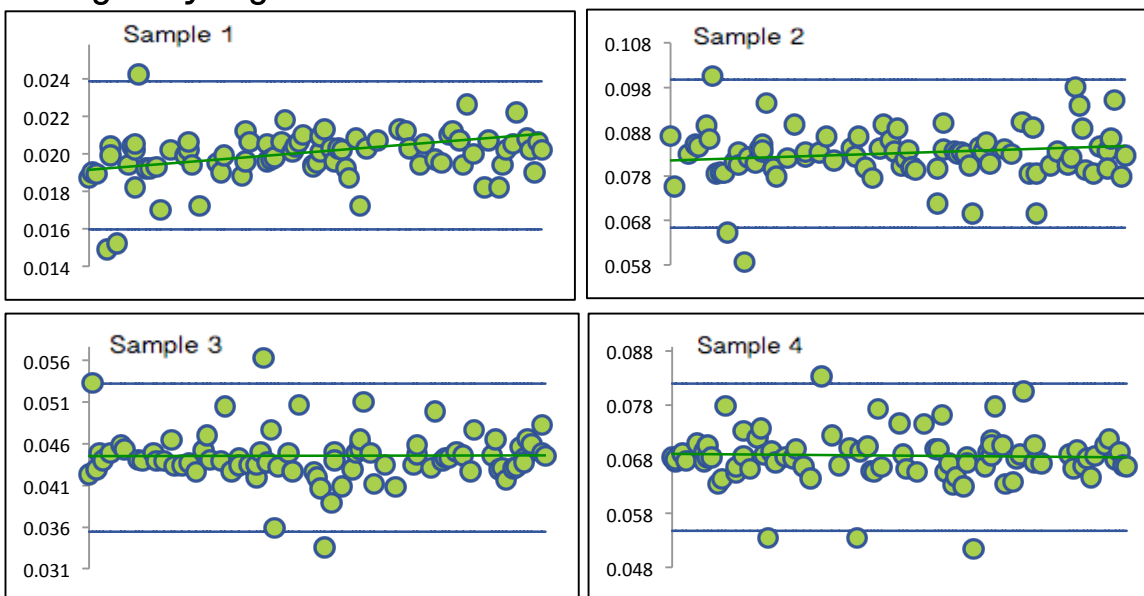
THALLIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

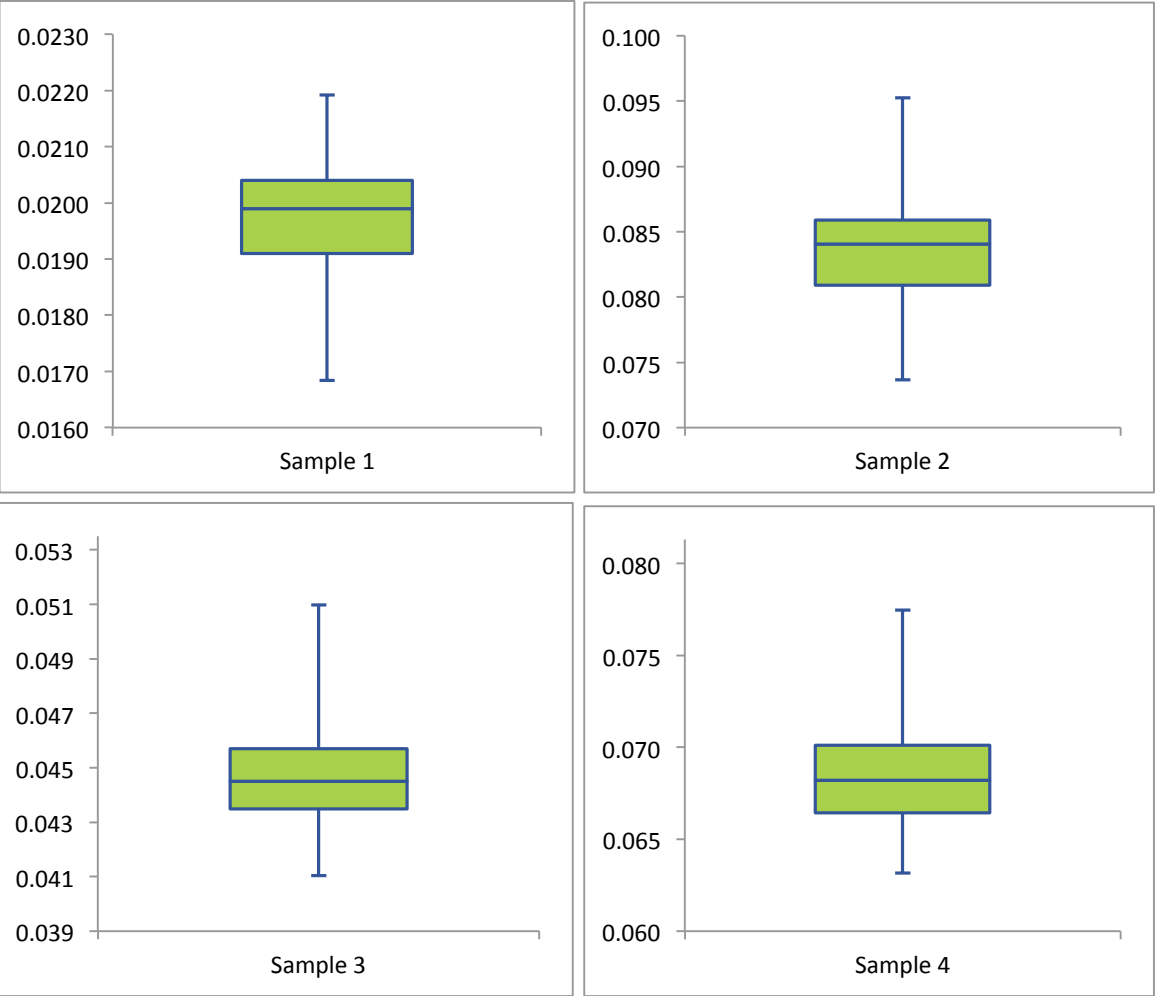
Homogeneity Regression



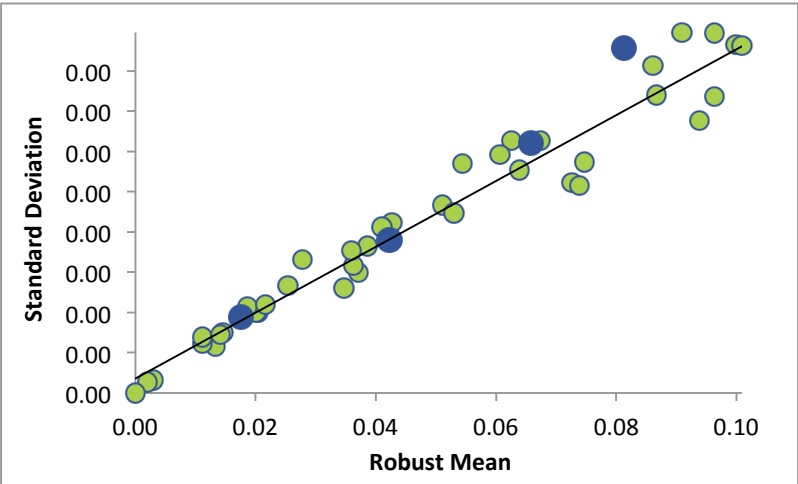
Reported results (Y-axis) plotted against bottling order (X-axis).

THALLIUM

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



TIN

Summary Statistics

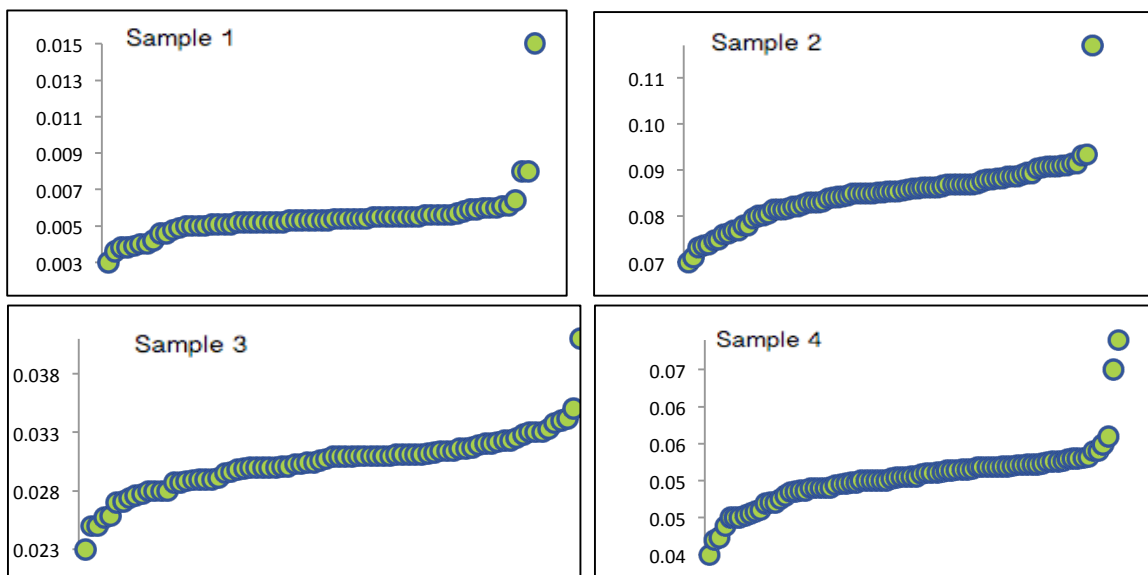
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	67	82	79	82
Median	0.00530	0.0893	0.0309	0.0516
Robust Mean	0.00532	0.0888	0.0304	0.0514
U	0.0000791	0.000694	0.000287	0.000364
Robust Standard Deviation	0.000518	0.00503	0.00204	0.00264
Regression Standard Deviation	0.000532	0.00888	0.00304	0.00514
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.000532	0.00888	0.00304	0.00514
Outliers	1	0	0	0
$ z > 3.0$	5	1	1	1
$2 < z < 3$	7	0	1	2

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	60	65	65	65
ICP/OES (Red)	7	17	14	17

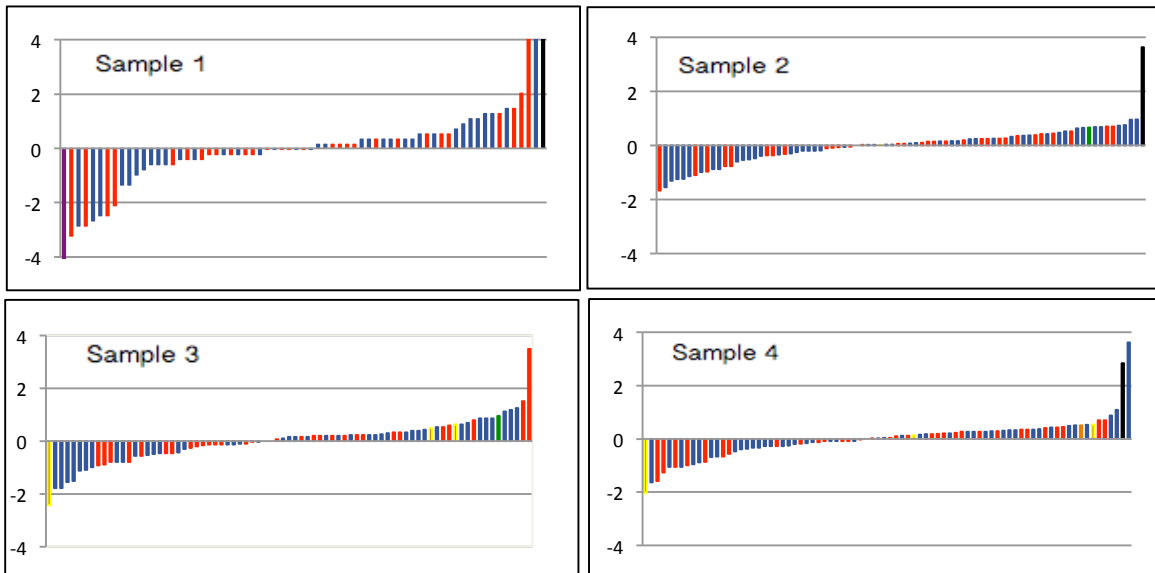
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

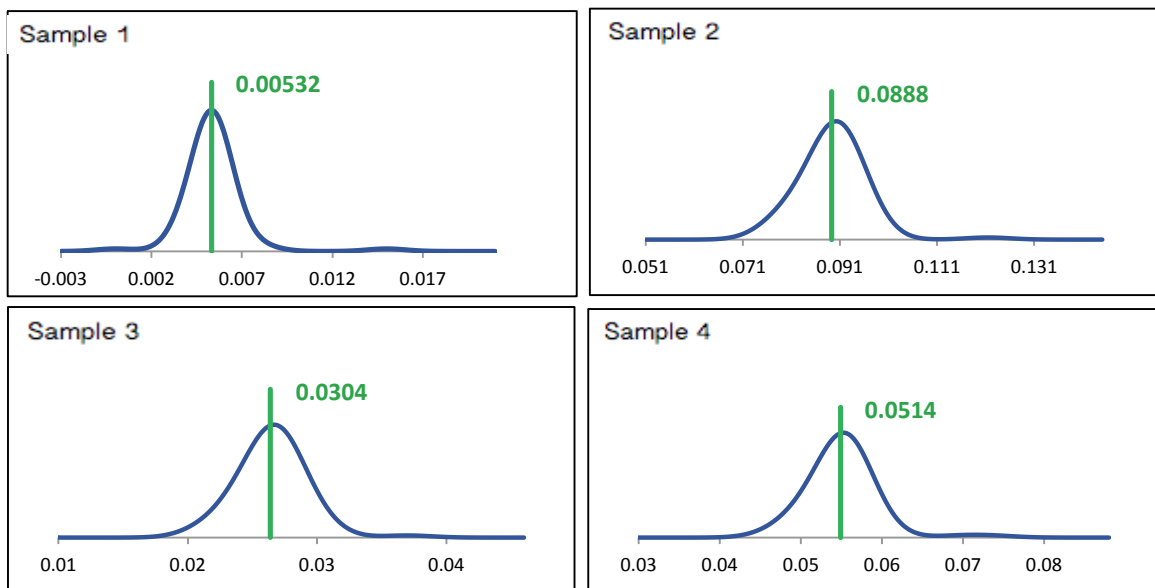


TIN

z-Score Plots

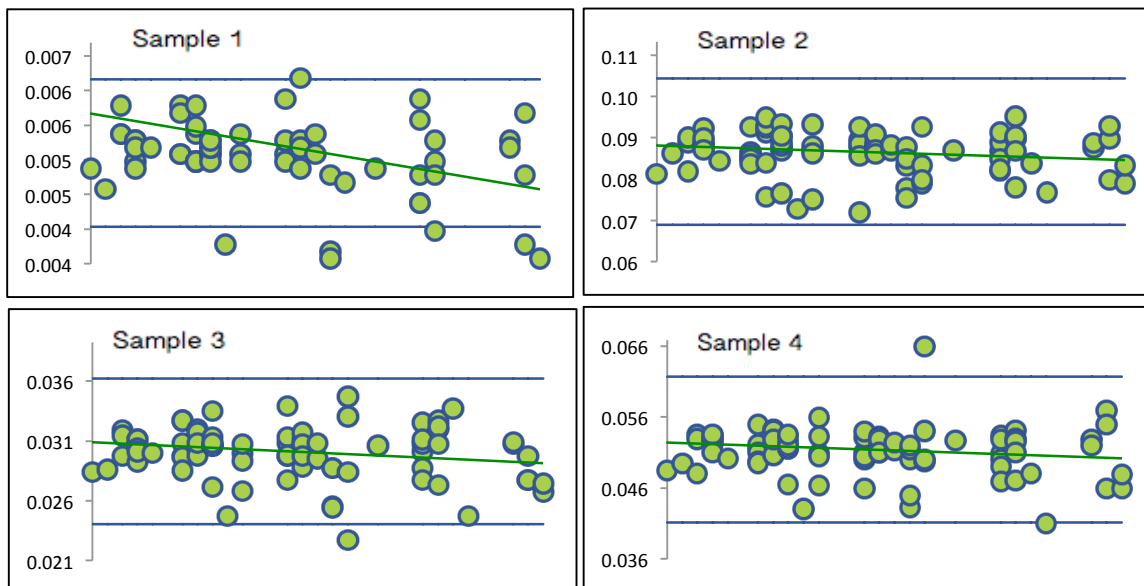


Kernel Density Plots



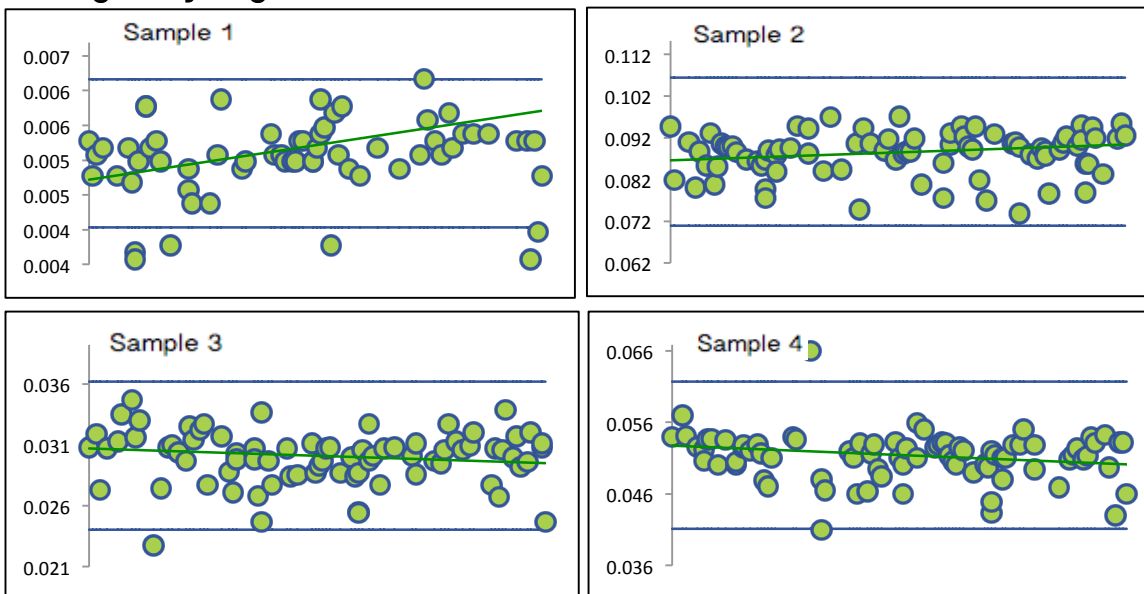
TIN

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

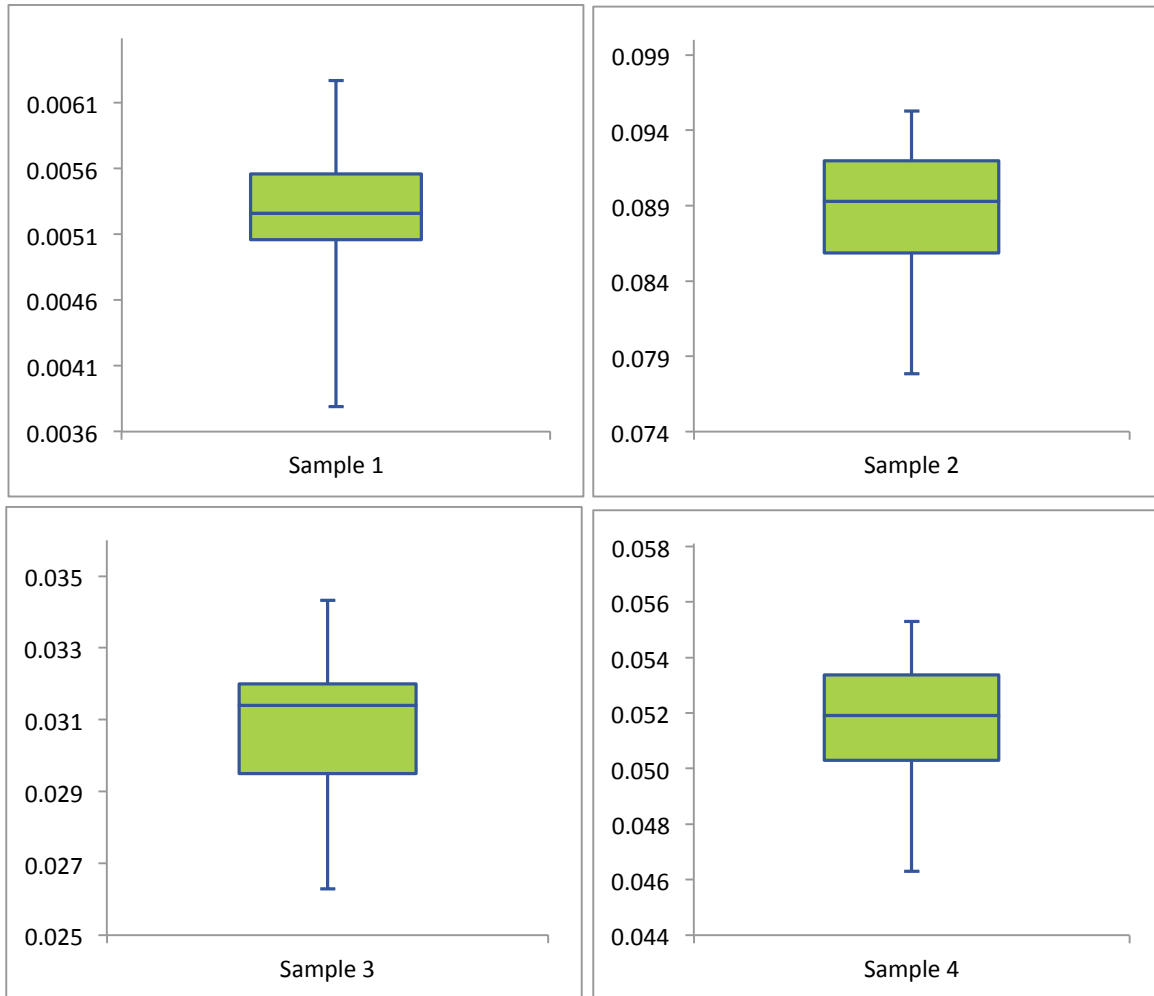
Homogeneity Regression



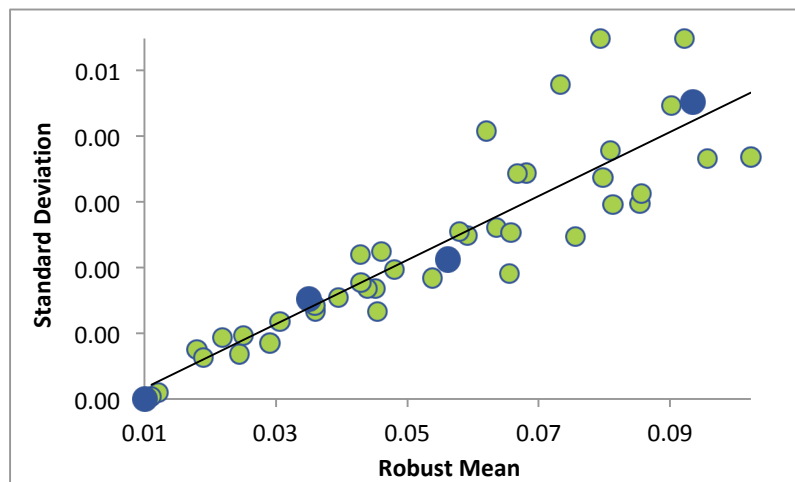
Reported results (Y-axis) plotted against bottling order (X-axis).

TIN

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



TITANIUM

Summary Statistics

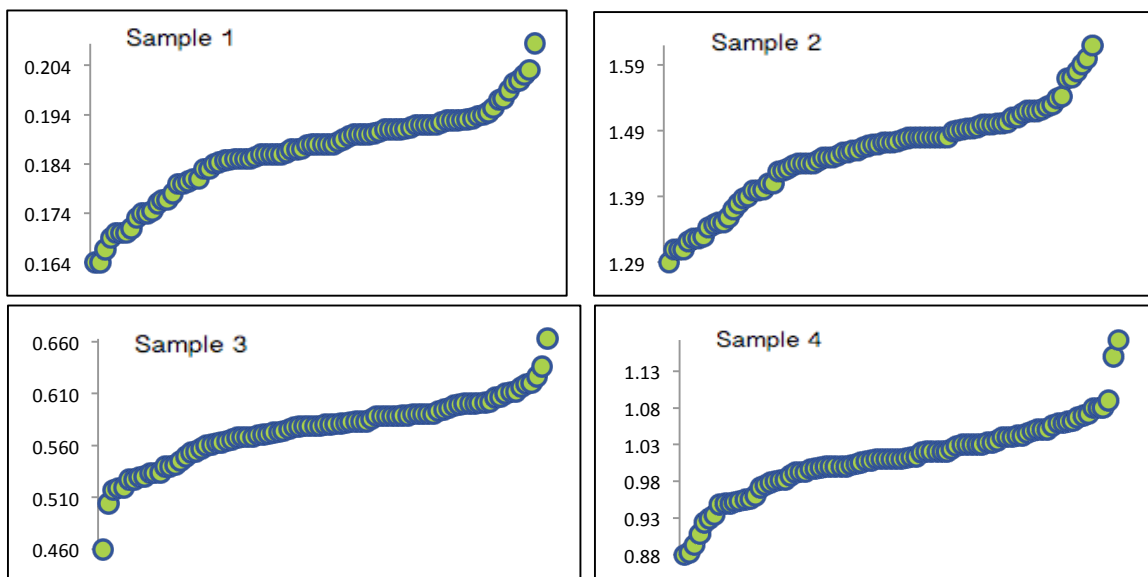
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	86	86	87	87
Median	0.188	1.47	0.580	1.01
Robust Mean	0.187	1.46	0.576	1.01
U	0.0011	0.00942	0.00383	0.00595
Robust Standard Deviation	0.00813	0.0699	0.0286	0.0444
Regression Standard Deviation	0.0140	0.109	0.0432	0.0759
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0140	0.109	0.0432	0.0759
Outliers	1	1	0	0
$ z > 3.0$	0	0	0	0
$2 < z < 3$	0	0	1	1

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	20	20	20	20
ICP/MS (Red)	66	66	67	67

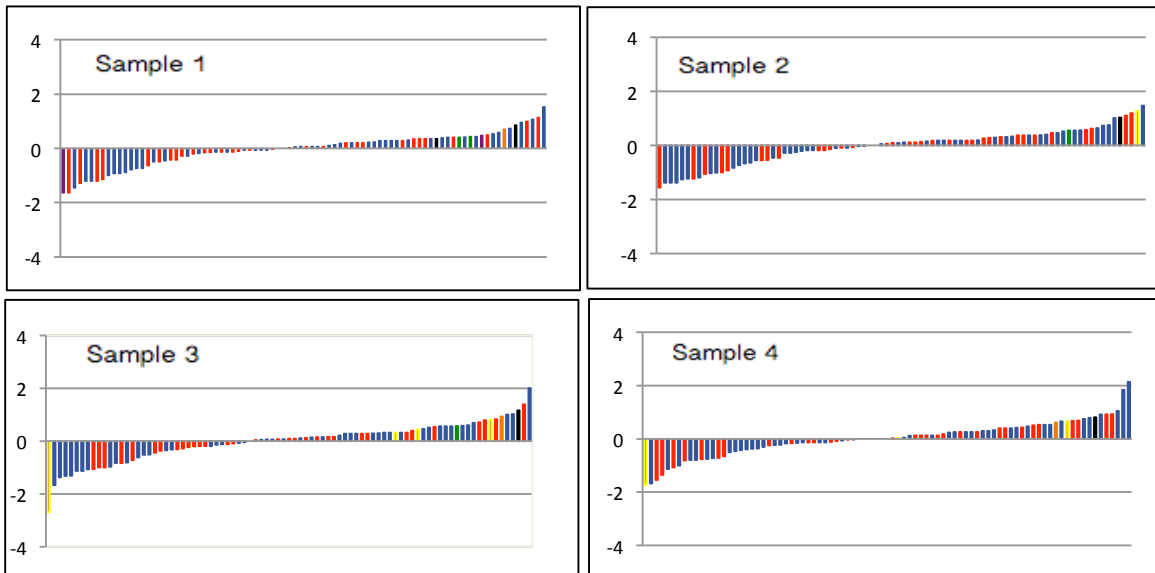
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

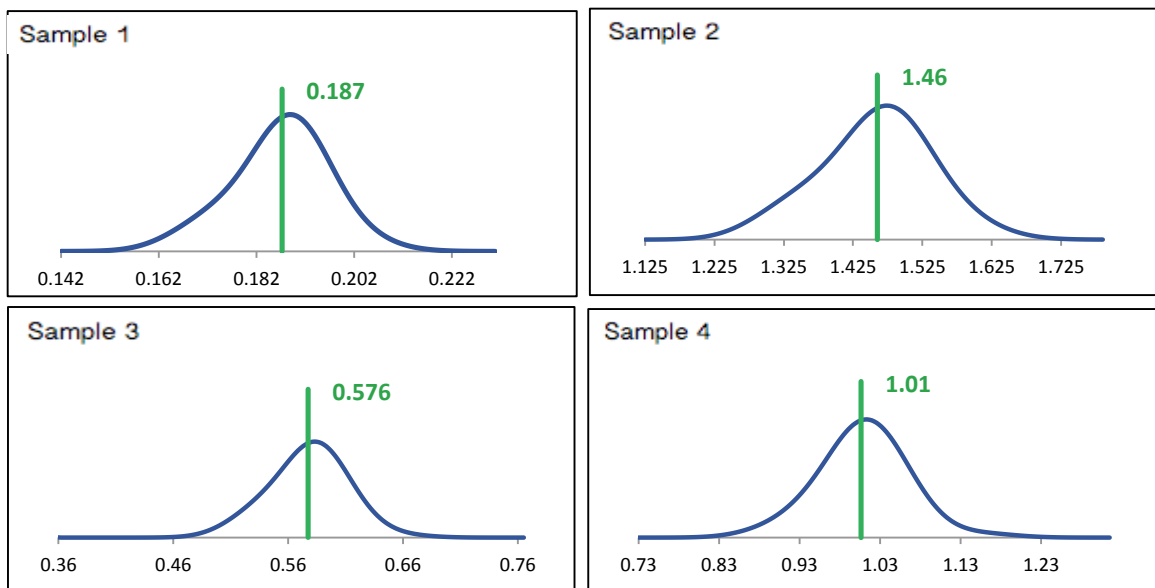


TITANIUM

z-Score Plots

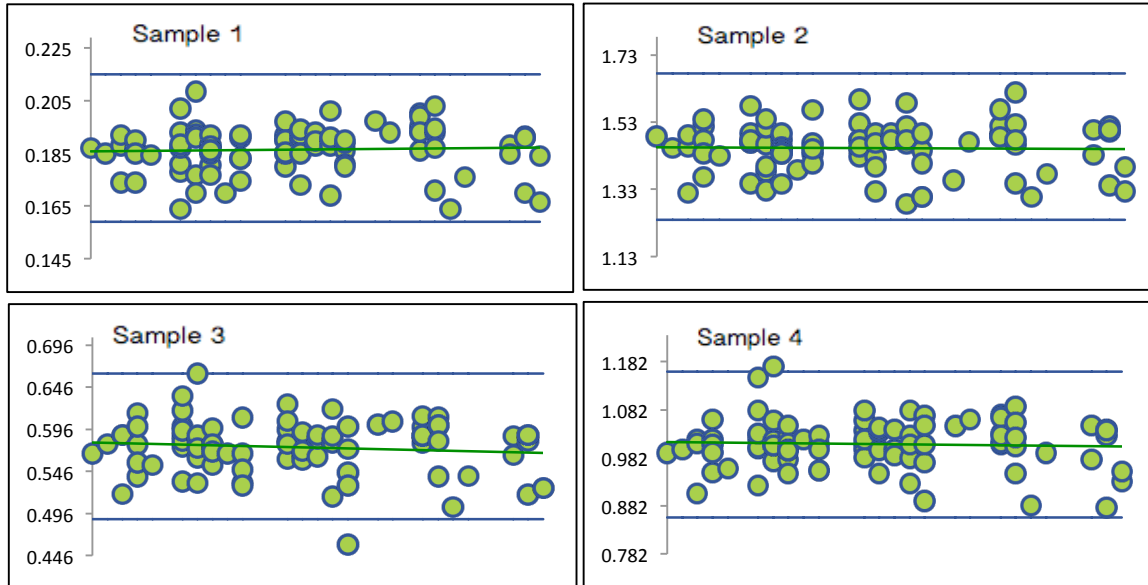


Kernel Density Plots



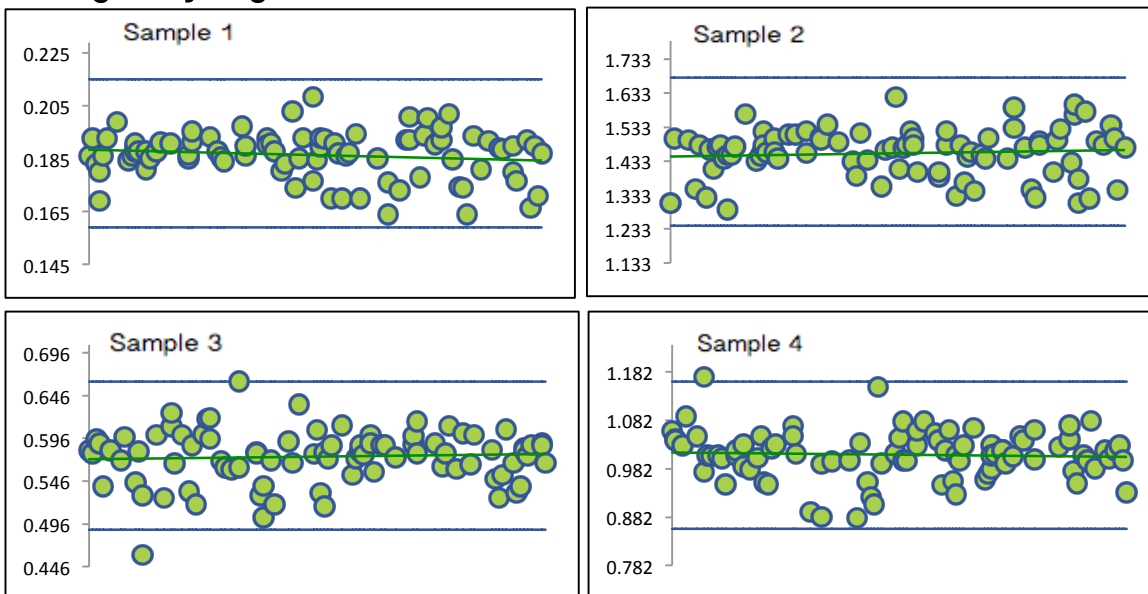
TITANIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

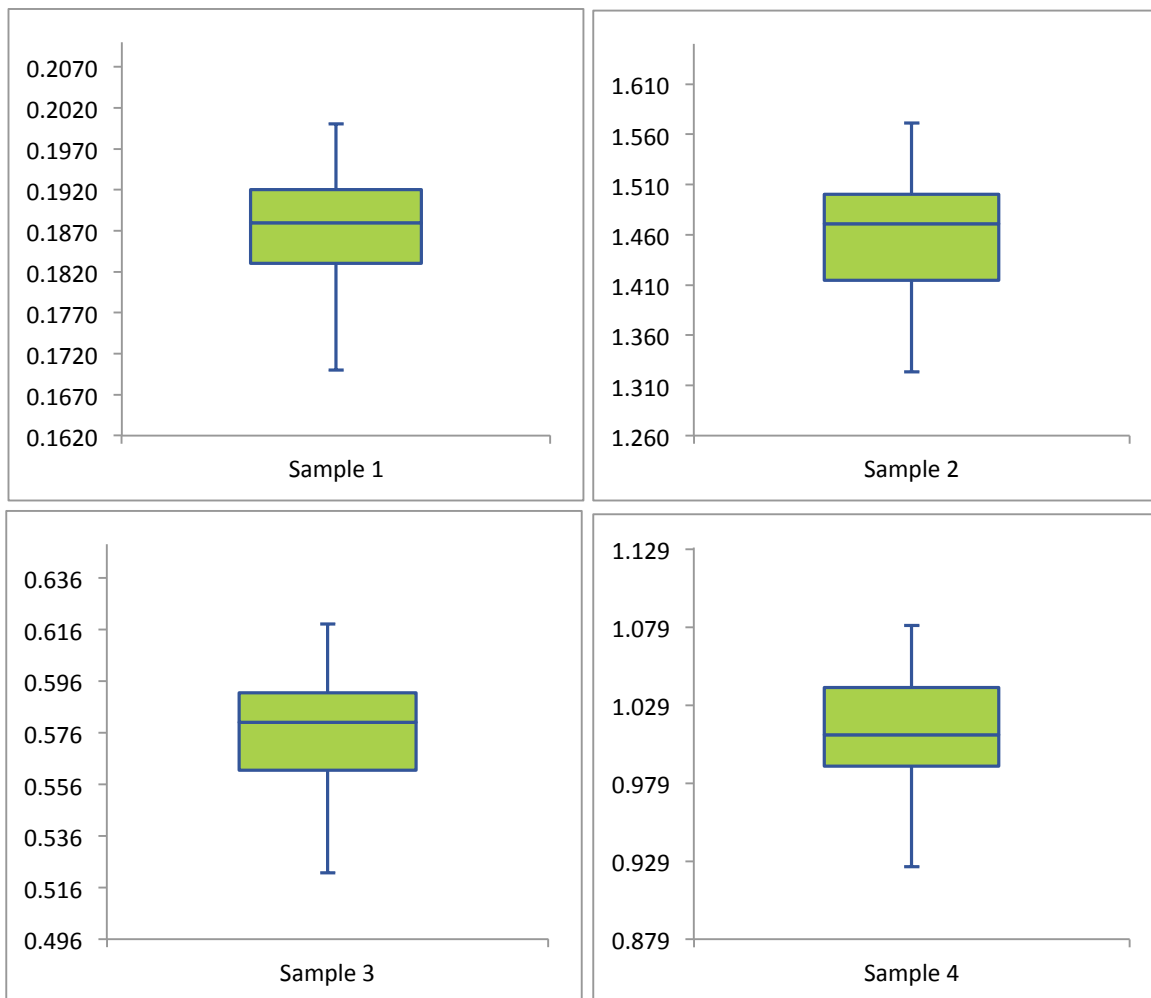
Homogeneity Regression



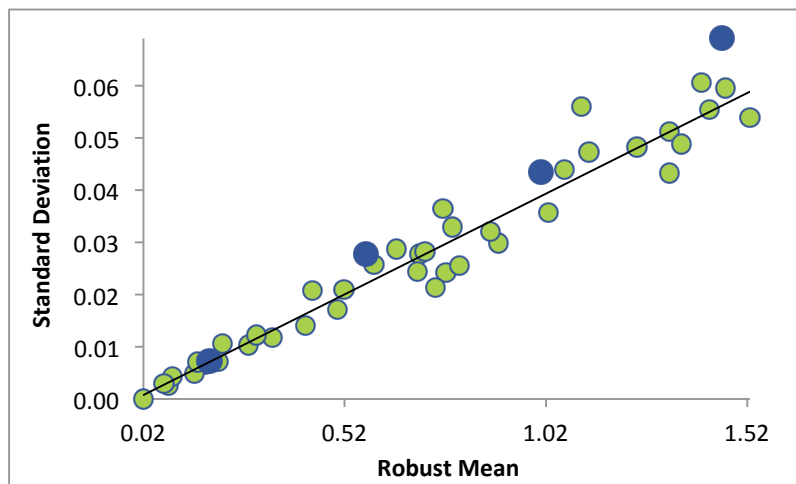
Reported results (Y-axis) plotted against bottling order (X-axis).

TITANIUM

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



URANIUM

Summary Statistics

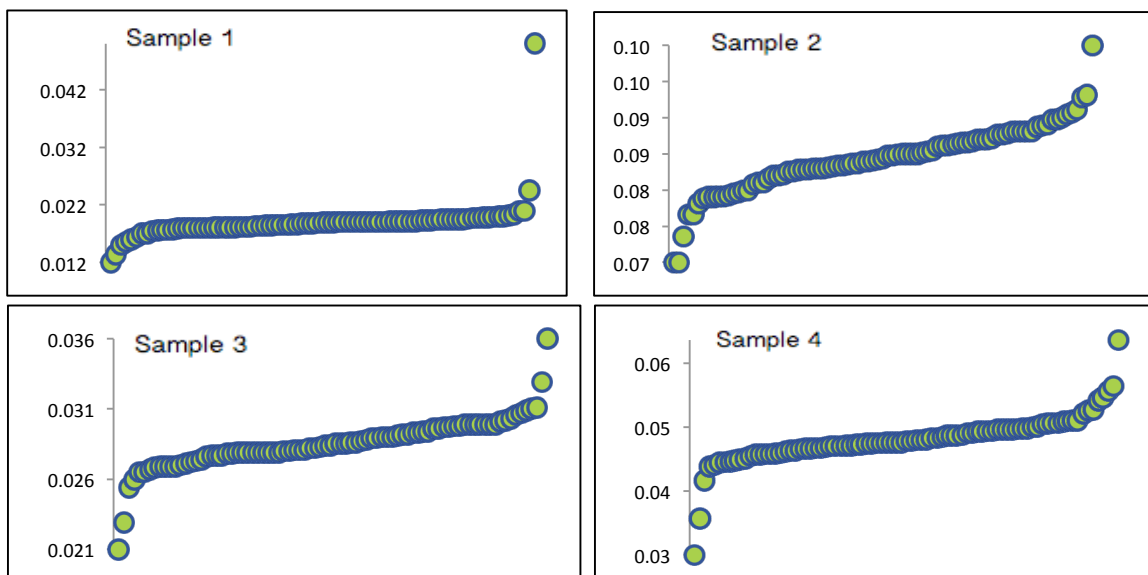
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	83	85	84	85
Median	0.0189	0.0843	0.0286	0.0522
Robust Mean	0.0187	0.0844	0.0286	0.0524
U	0.000131	0.000561	0.000191	0.000342
Robust Standard Deviation	0.000953	0.00414	0.00140	0.00252
Regression Standard Deviation	0.00141	0.00633	0.00215	0.00393
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00141	0.00633	0.00215	0.00393
Outliers	1	0	0	0
$ z > 3.0$	4	0	2	3
$2 < z < 3$	2	3	2	1

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	77	78	78	78
ICP/OES (Red)	6	7	6	7

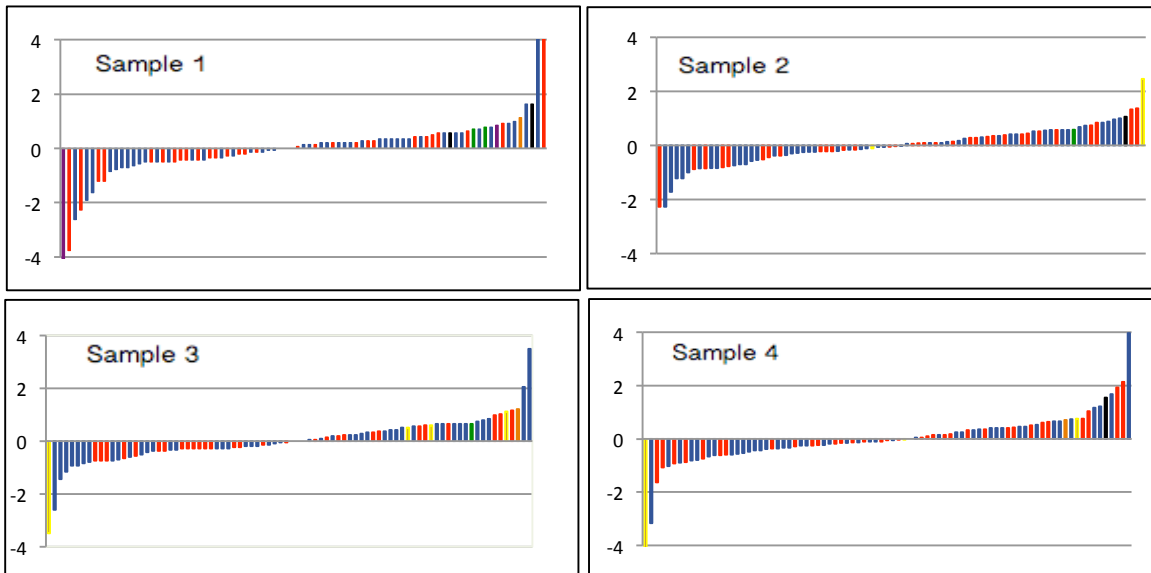
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

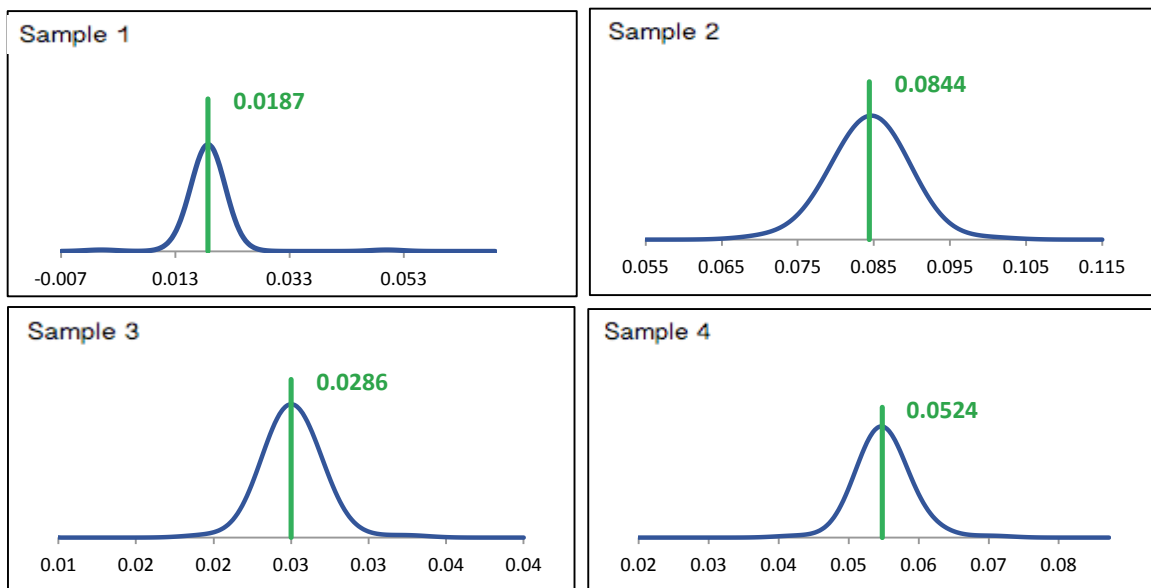


URANIUM

z-Score Plots

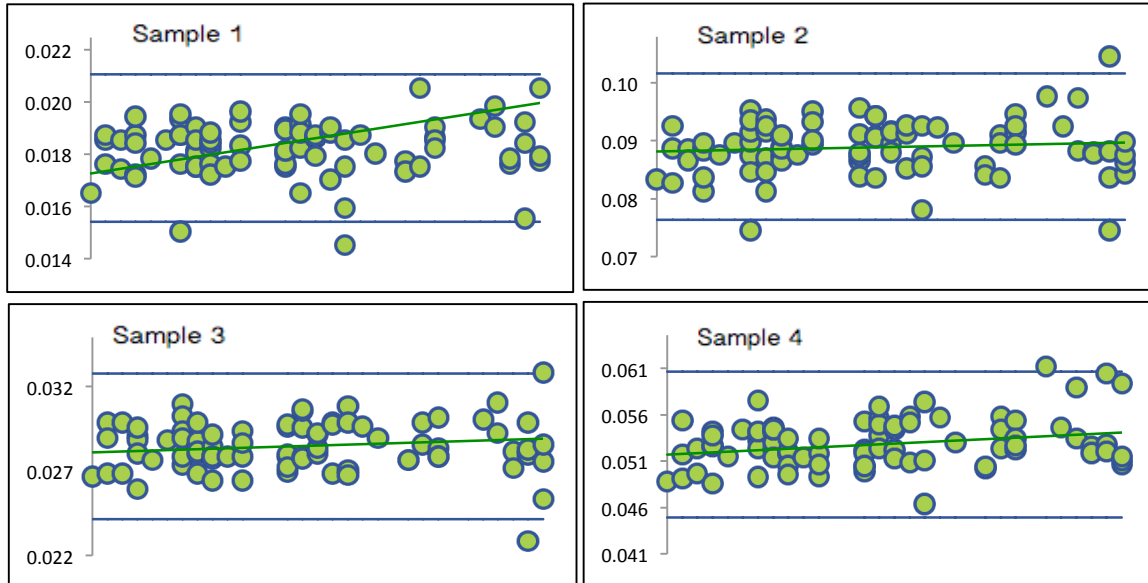


Kernel Density Plots



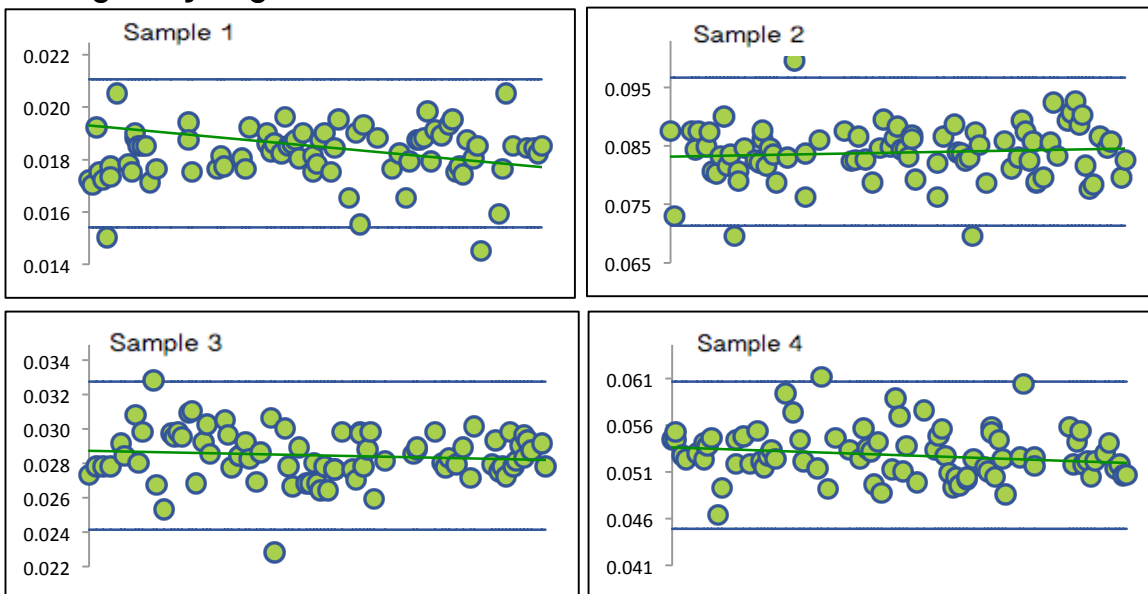
URANIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

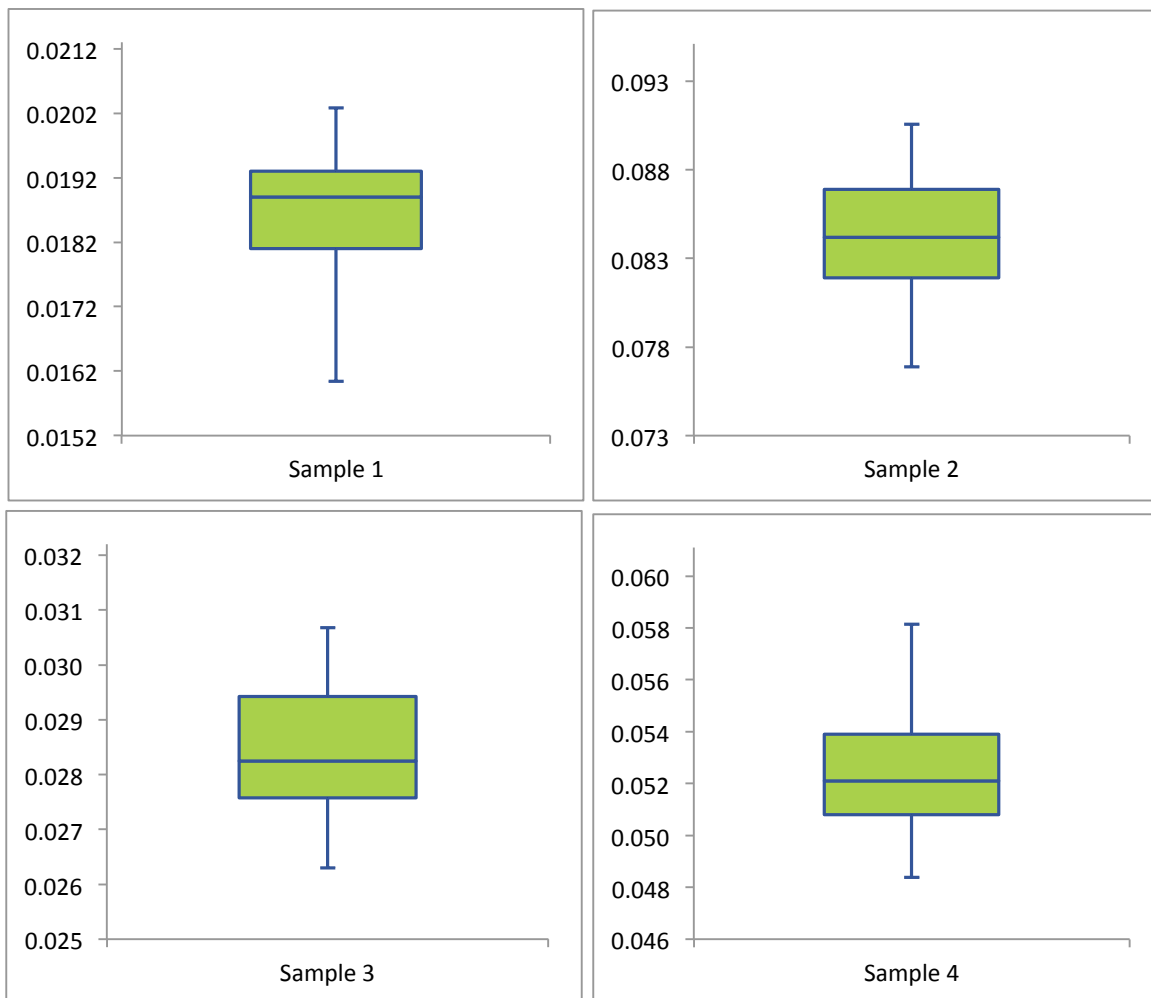
Homogeneity Regression



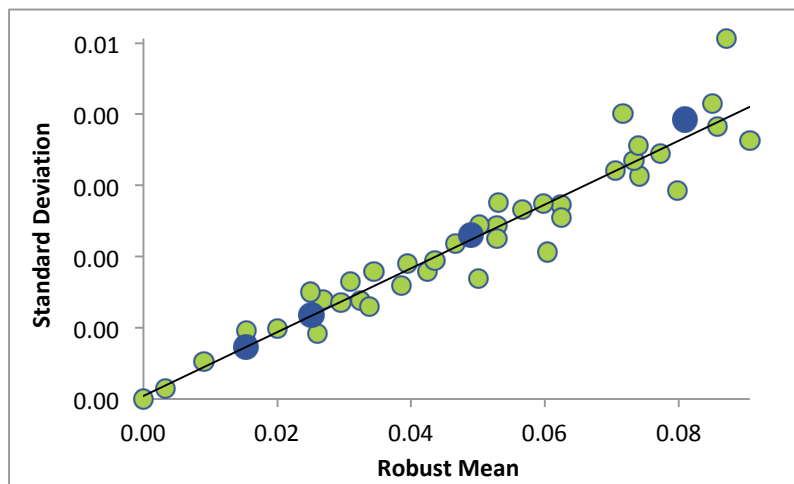
Reported results (Y-axis) plotted against bottling order (X-axis).

URANIUM

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



VANADIUM

Summary Statistics

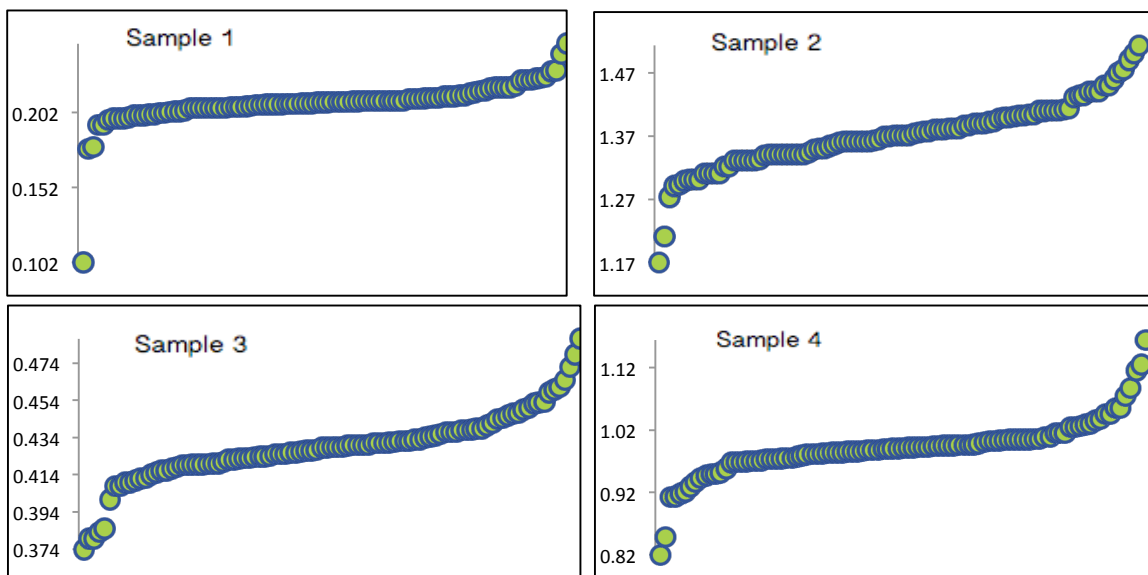
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	96	97	97	97
Median	0.209	1.37	0.429	0.986
Robust Mean	0.209	1.37	0.429	0.986
U	0.000976	0.00622	0.00183	0.00371
Robust Standard Deviation	0.00765	0.0490	0.0144	0.0292
Regression Standard Deviation	0.0157	0.103	0.0322	0.0739
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0157	0.103	0.0322	0.0739
Outliers	1	0	0	0
$ z > 3.0$	1	0	0	0
$2 < z < 3$	2	0	0	2

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	74	75	75	75
ICP/OES (Red)	21	21	21	21
AAG (Green)	1	1	1	1

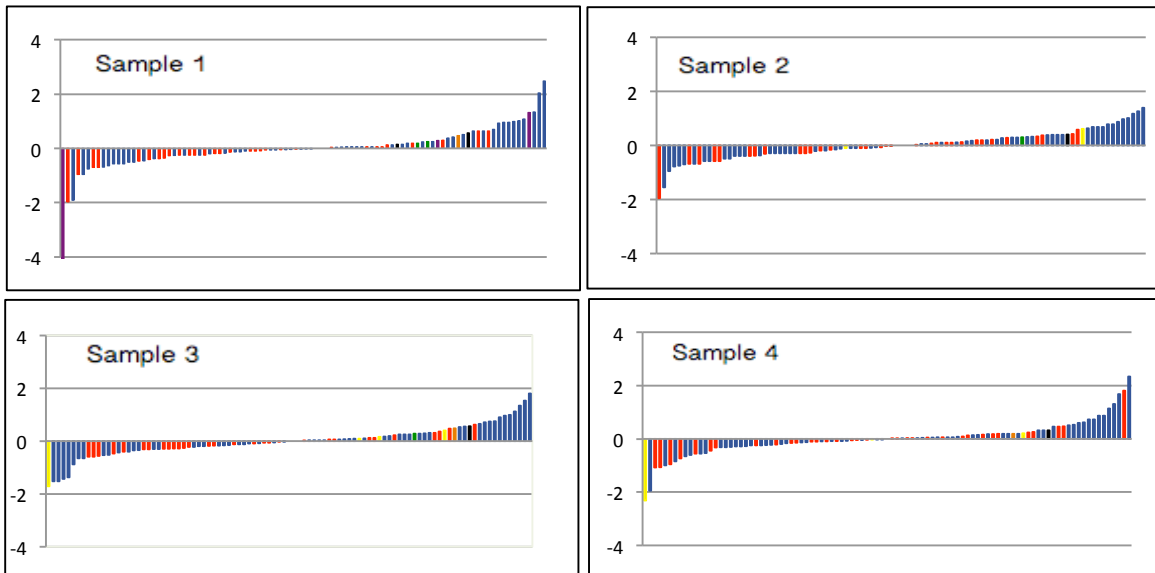
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

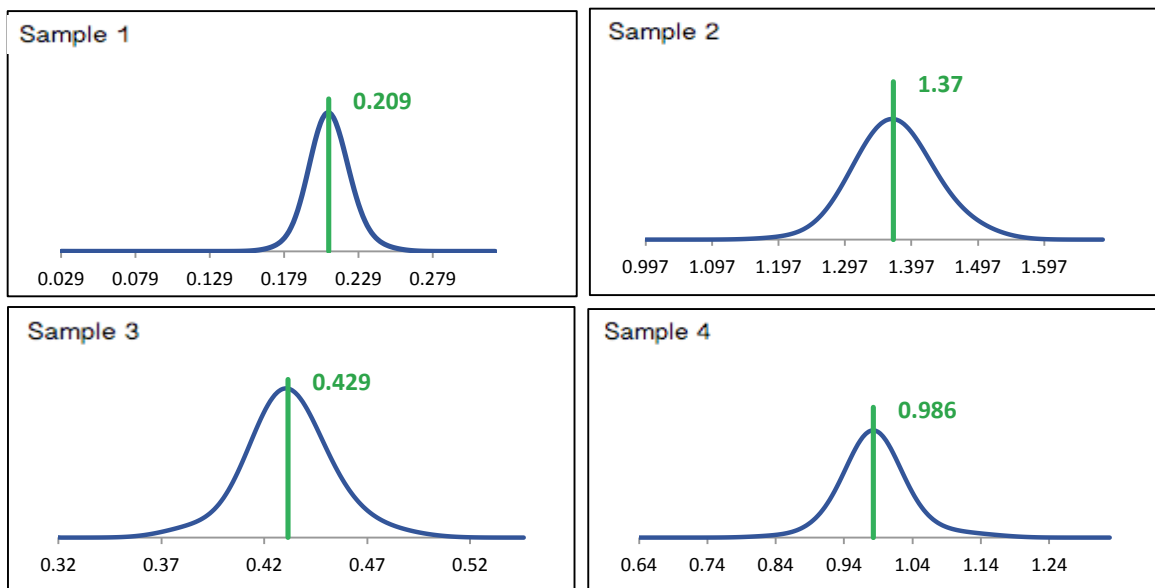


VANADIUM

z-Score Plots

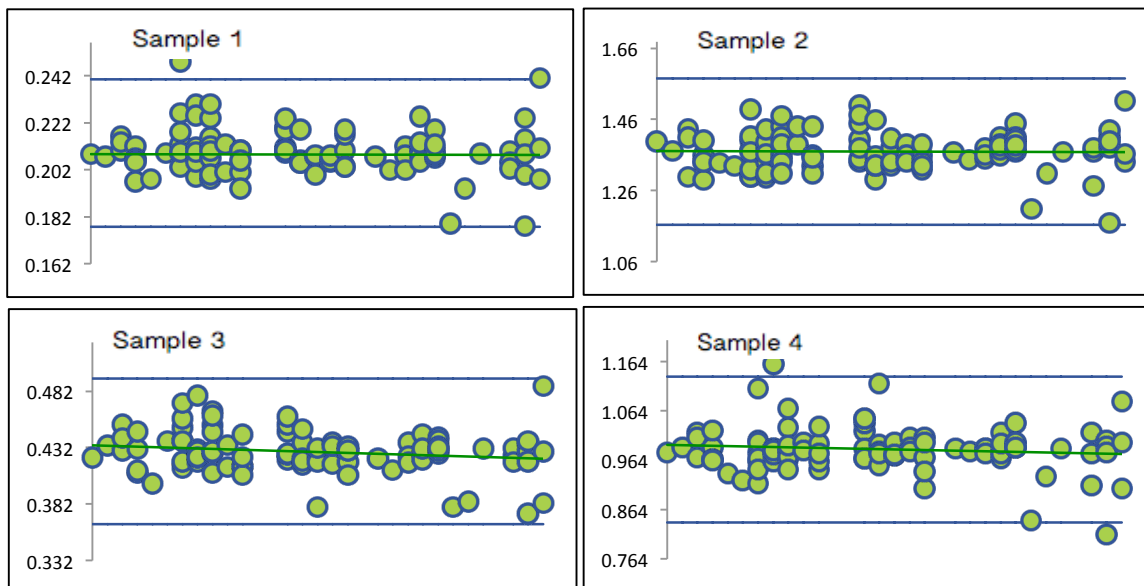


Kernel Density Plots



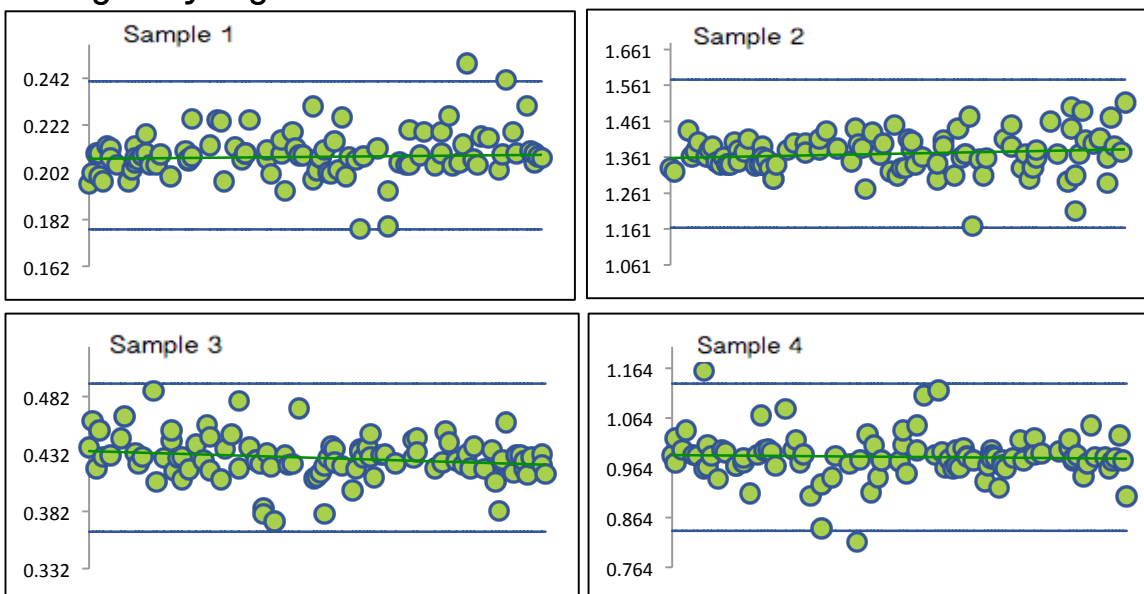
VANADIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

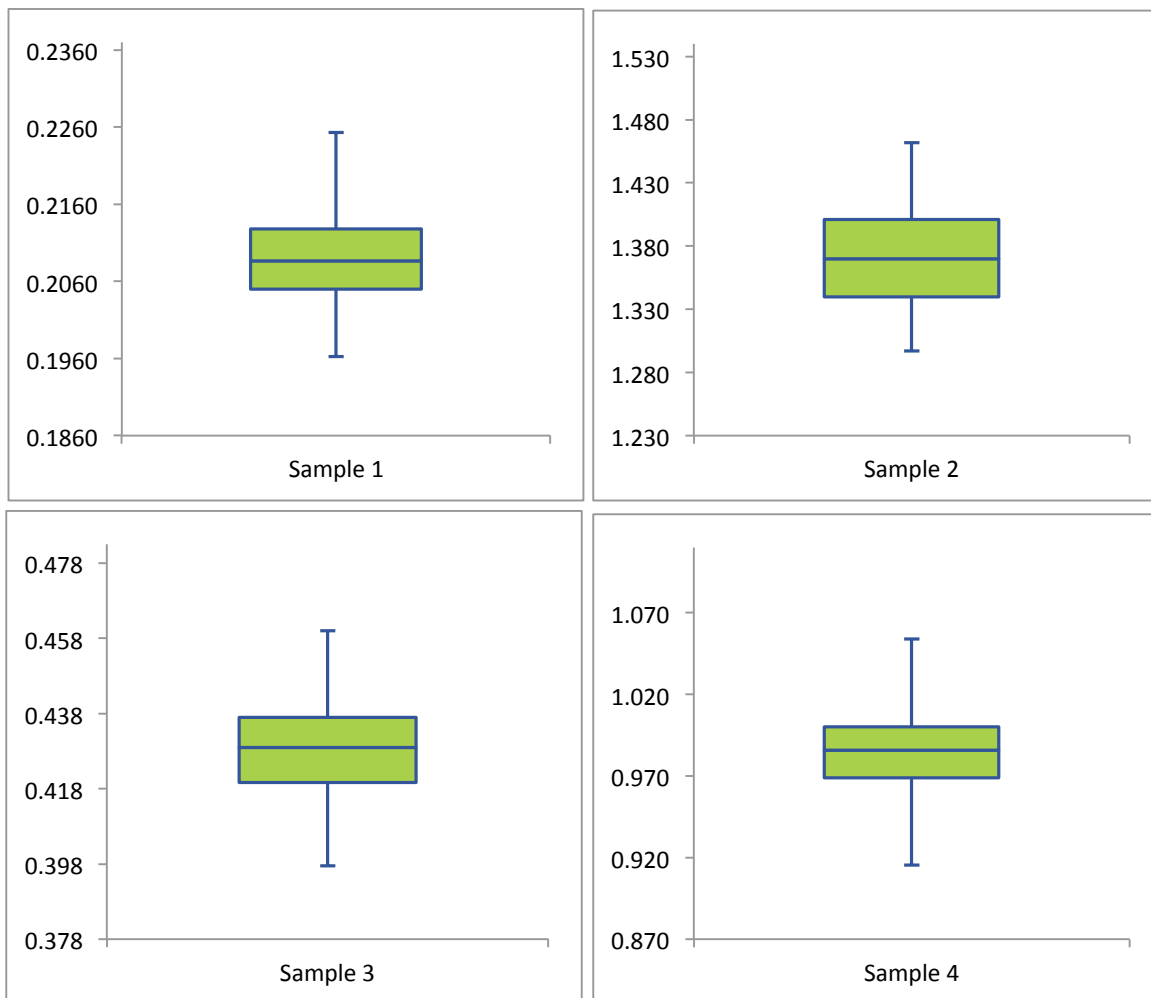
Homogeneity Regression



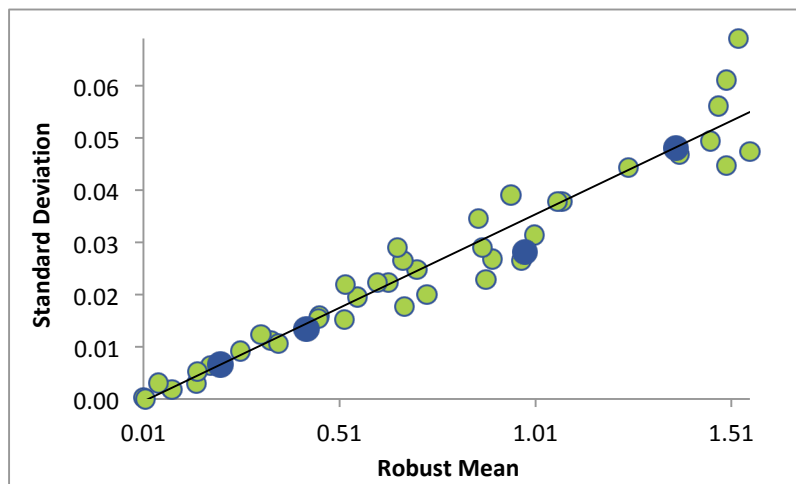
Reported results (Y-axis) plotted against bottling order (X-axis).

VANADIUM

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)



ZINC

Summary Statistics

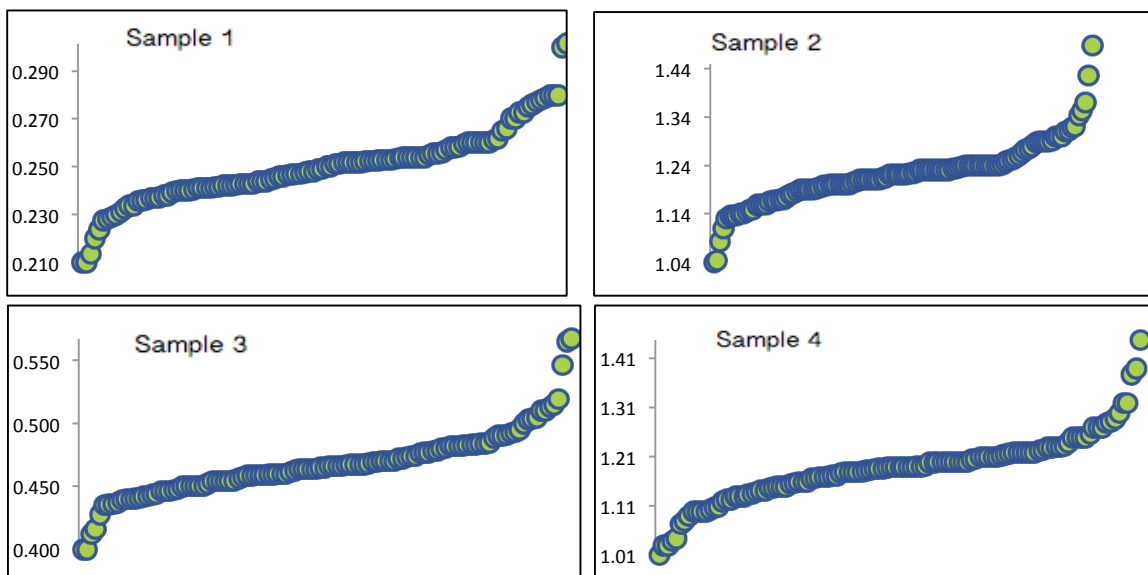
Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	114	115	114	115
Median	0.250	1.22	0.466	1.19
Robust Mean	0.249	1.22	0.466	1.19
U	0.00152	0.00626	0.00253	0.00671
Robust Standard Deviation	0.0130	0.0537	0.0216	0.0576
Regression Standard Deviation	0.0187	0.0915	0.0349	0.0890
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0187	0.0915	0.0349	0.0890
Outliers	1	0	1	0
$ z > 3.0$	0	0	0	0
$2 < z < 3$	4	2	3	3

Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	27	27	26	27
ICP/MS (Red)	86	87	87	87
AA (Green)	1	1	1	1

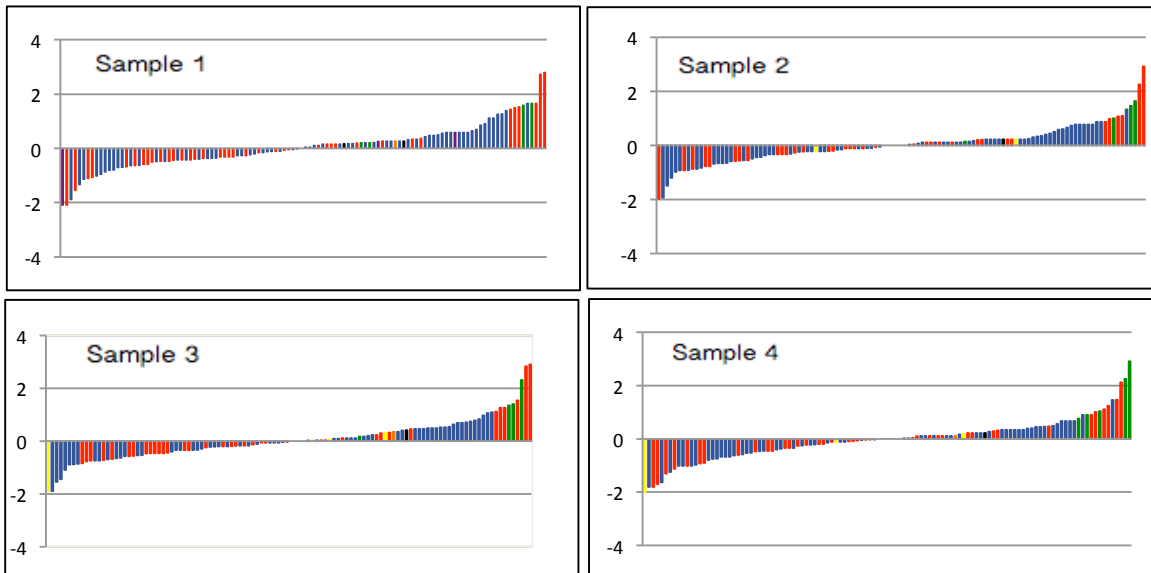
All summary stats and the plots below are based on the data excluding any flagged outliers

Sorted Scatter Plots

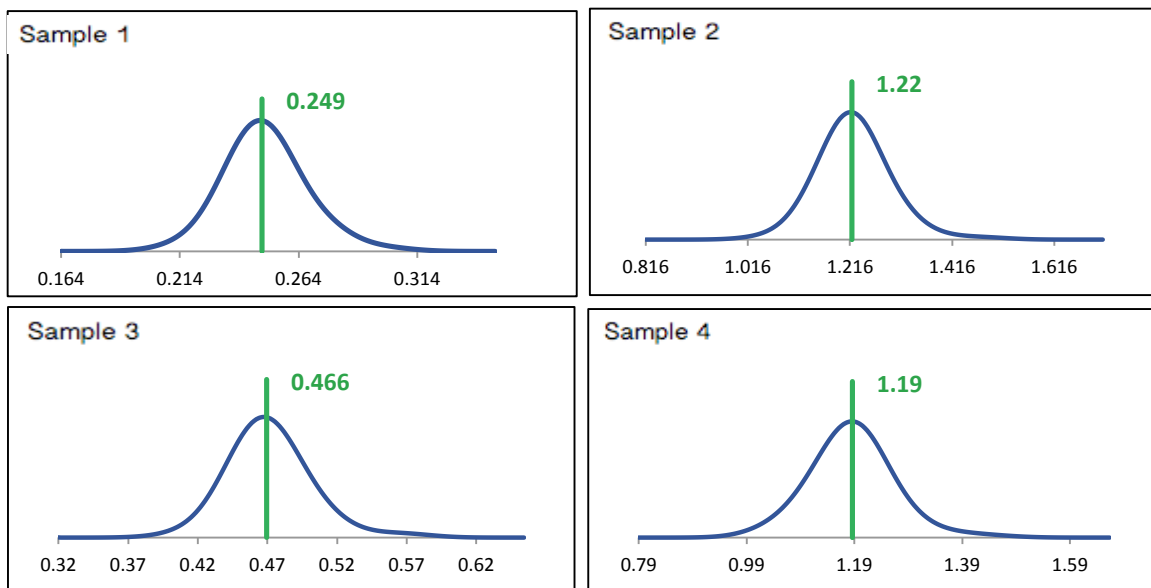


ZINC

z-Score Plots

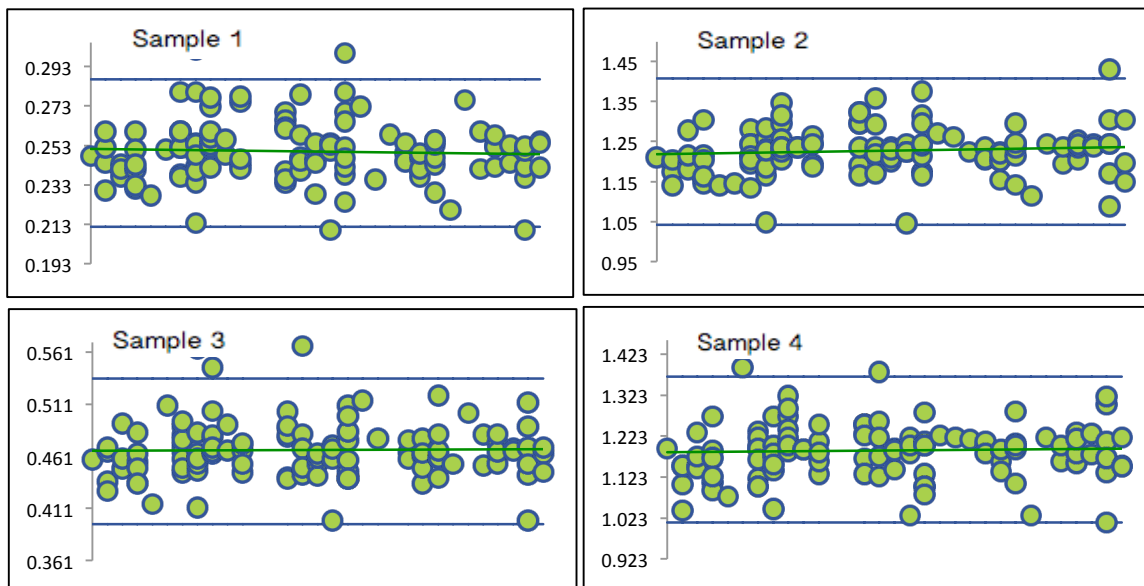


Kernel Density Plots



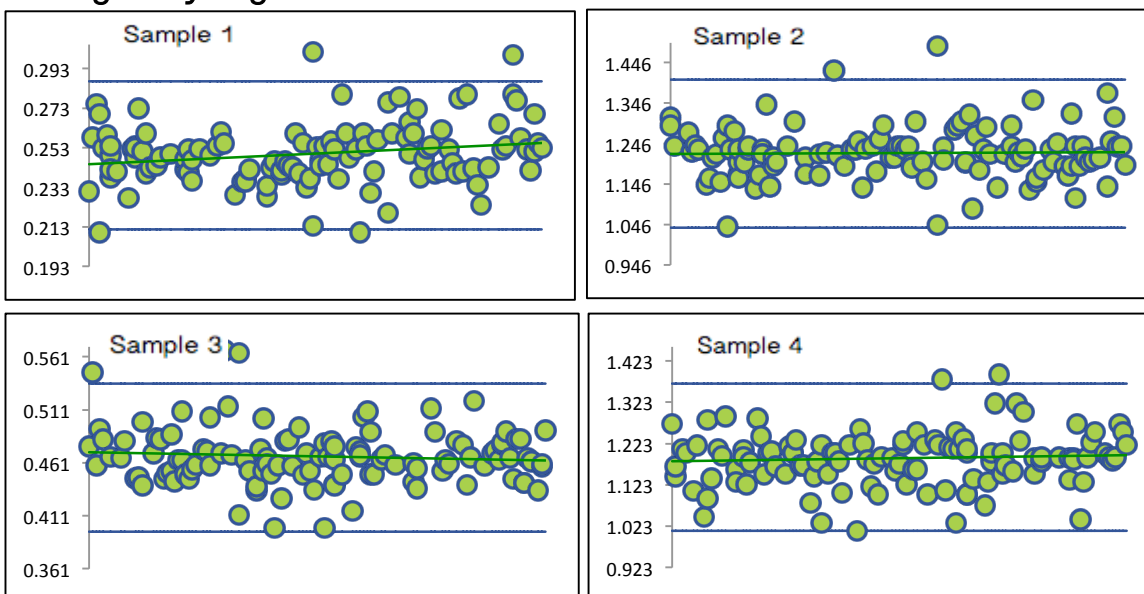
ZINC

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

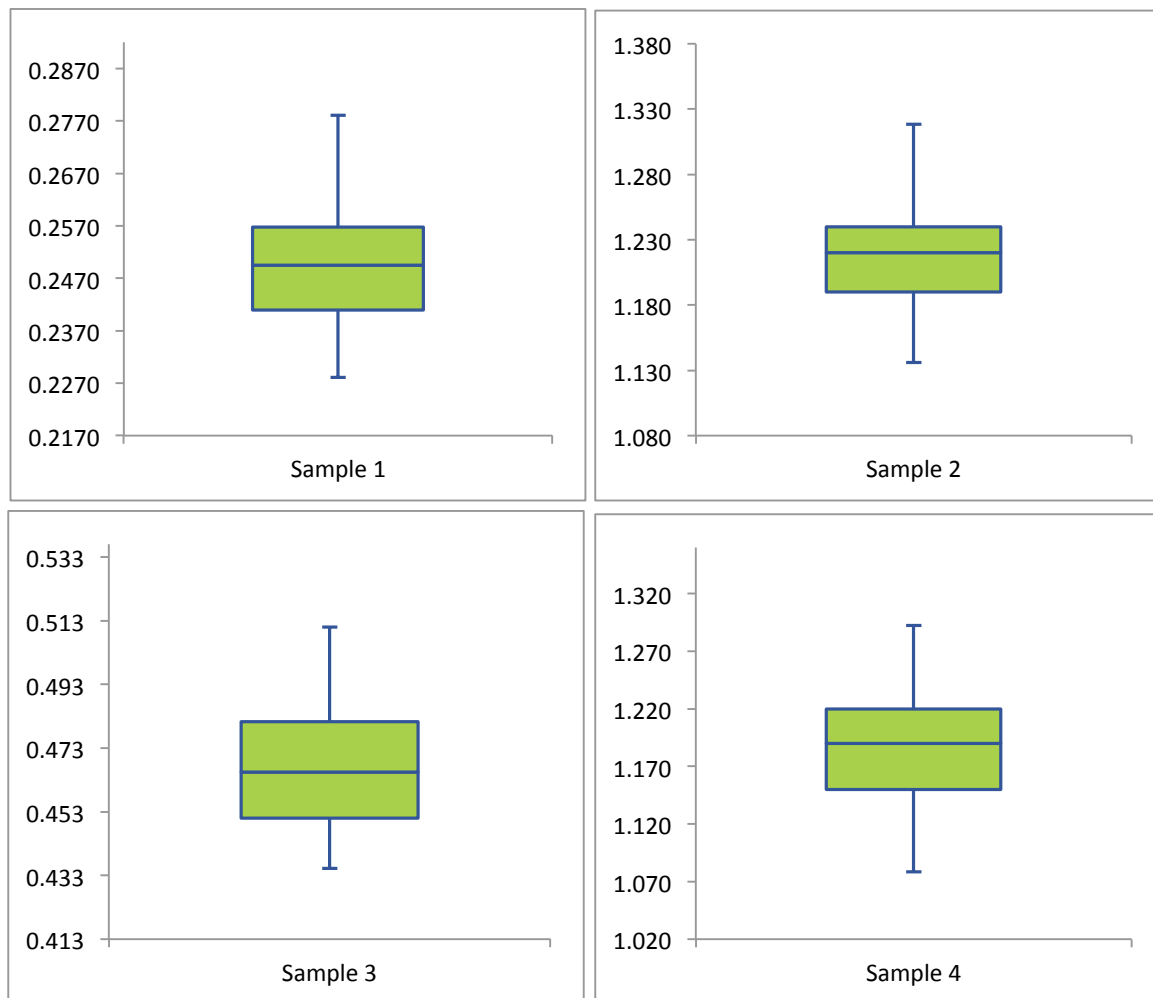
Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

ZINC

Box and Whisker Plots



Current Round (blue) Compared to Historic Rounds (green)

