

# Test Group Summary Report

## C02C Metals in Water-Total

### October 2021 PT Round

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**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><math>\pm U</math>:</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](http://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 $\leq 2$	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 5<sup>th</sup> and 95<sup>th</sup> 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

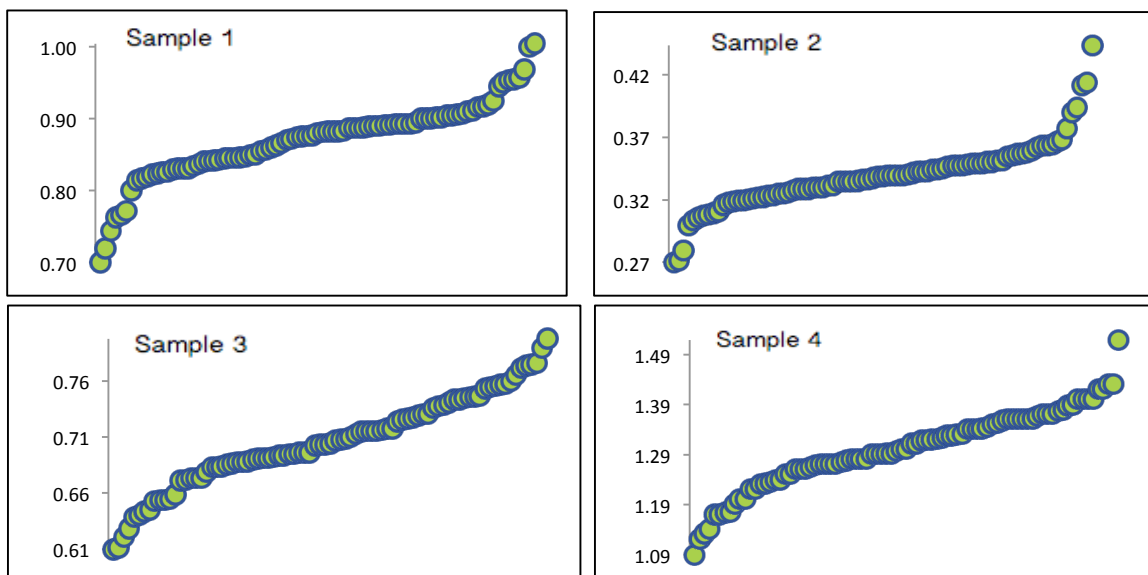
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	85	85	85	85
Median	0.880	0.340	0.700	1.30
Robust Mean	0.872	0.339	0.703	1.30
U	0.00605	0.00278	0.00572	0.0104
Robust Standard Deviation	0.0446	0.0205	0.0422	0.0768
Regression Standard Deviation	0.0654	0.0254	0.0527	0.098
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0654	0.0254	0.0527	0.098
Outliers	0	0	0	0
$ z  > 3.0$	0	1	0	0
$2 <  z  < 3$	3	7	0	2

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES (Blue)	37	37	37	37
ICP/MS (Red)	48	48	48	48

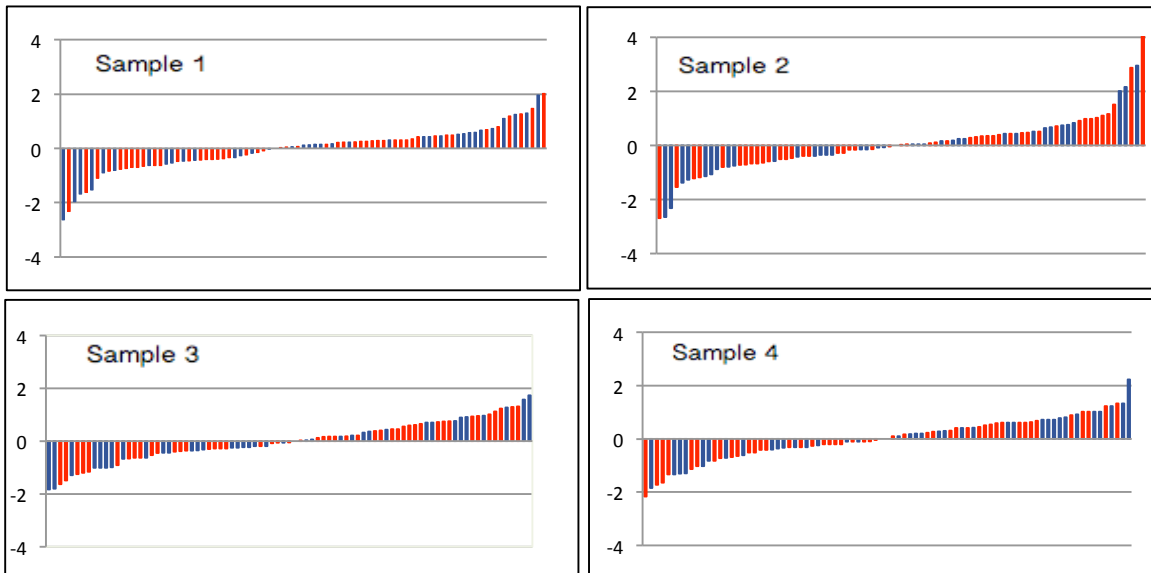
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

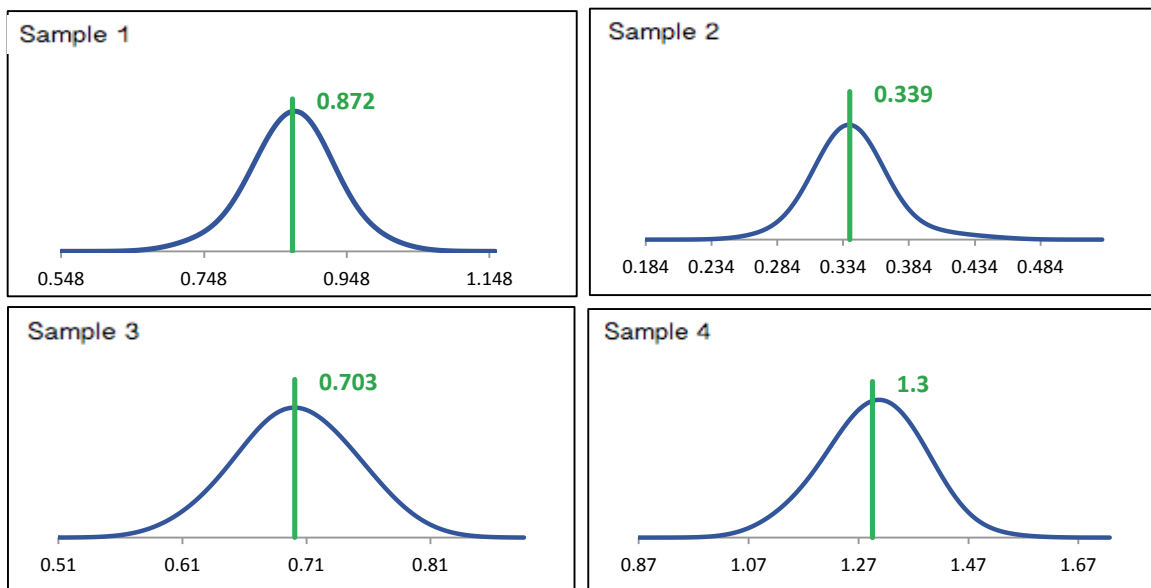


## ALUMINUM

### z-Score Plots

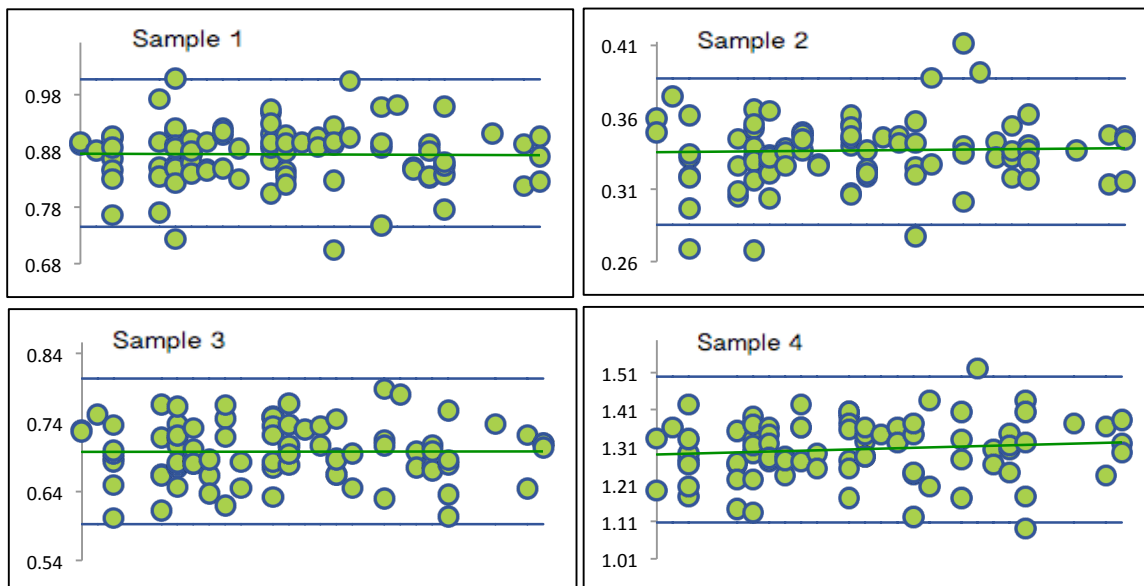


### Kernel Density Plots



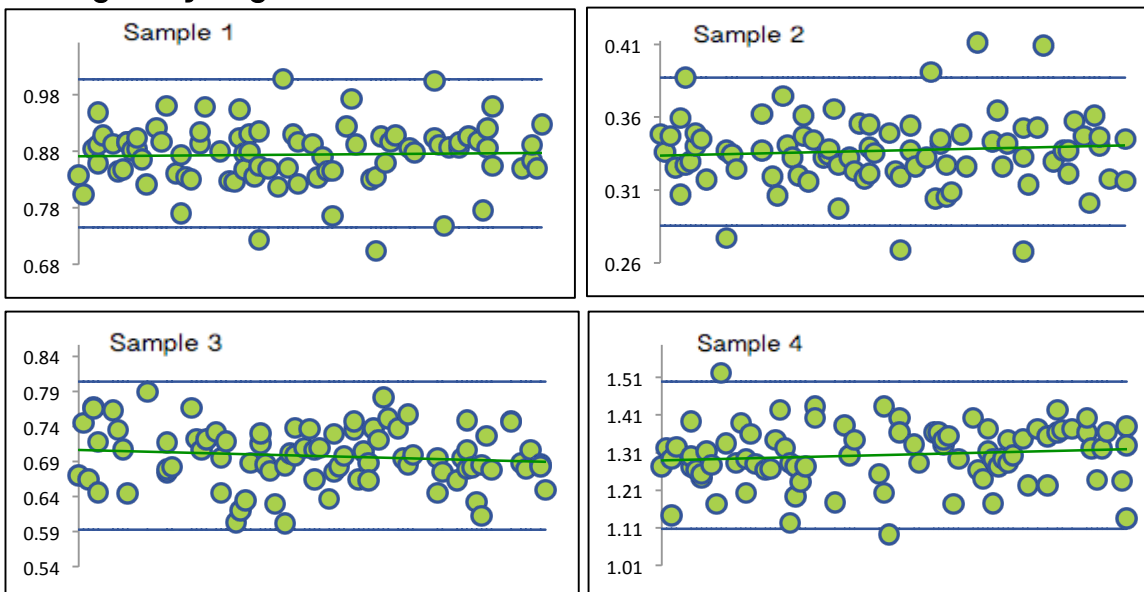
## ALUMINUM

### Stability Regression



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

### Homogeneity Regression

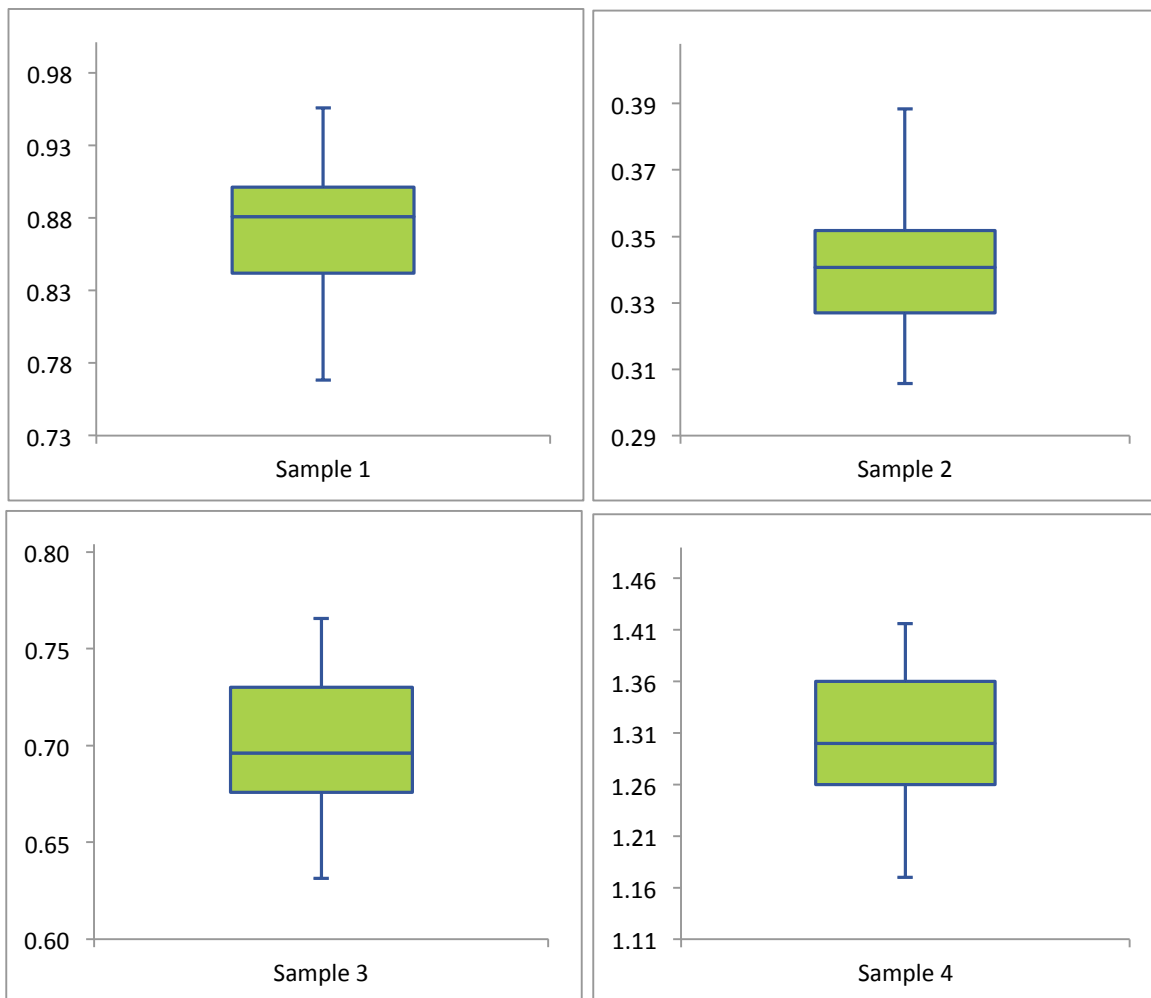


Reported results (Y-axis) plotted against bottling order (X-axis).

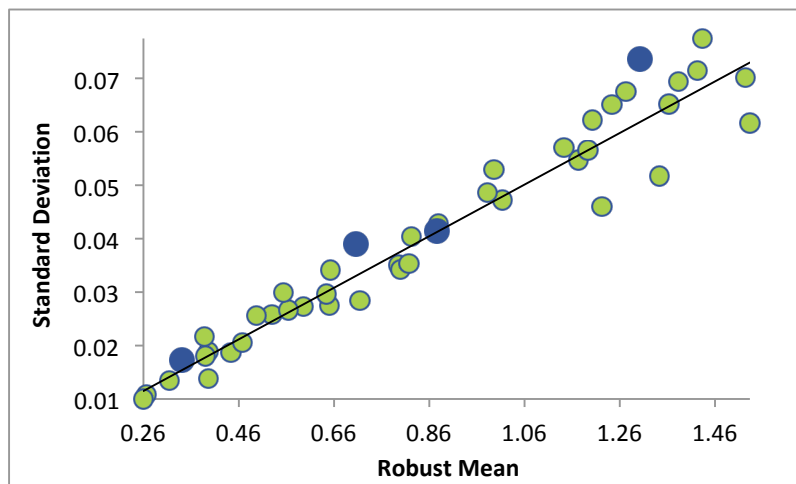


## ALUMINUM

### Box and Whisker Plots



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



## ANTIMONY

## Summary Statistics

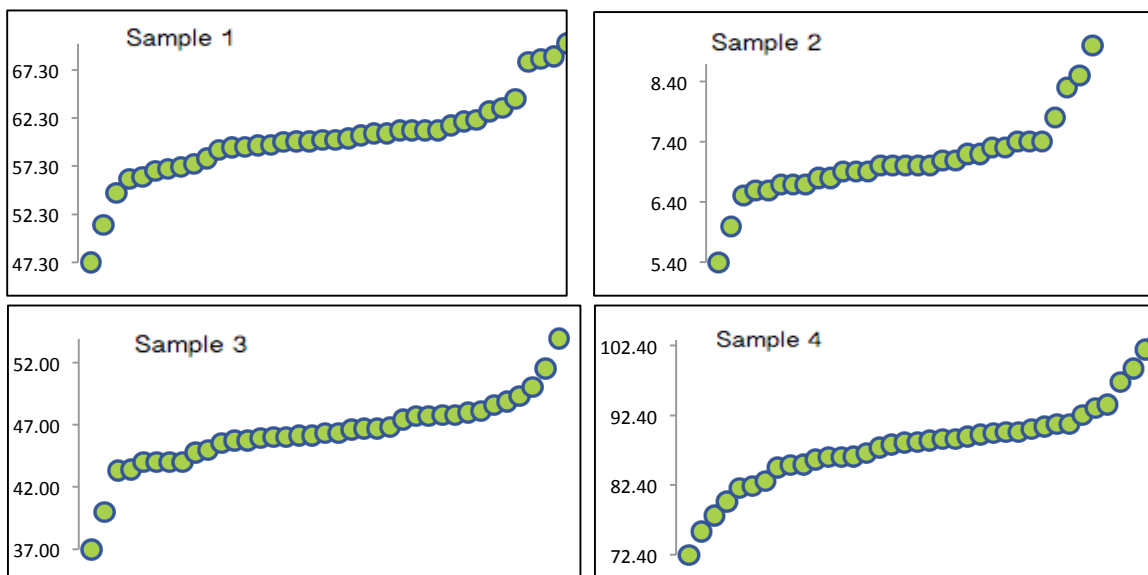
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	38	31	37	38
Median	60.0	7.00	46.3	88.7
Robust Mean	60.1	7.03	46.4	88.2
U	0.627	0.0952	0.454	1
Robust Standard Deviation	3.09	0.424	2.21	4.94
Regression Standard Deviation	6.01	0.703	4.64	8.82
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	6.01	0.703	4.64	8.82
Outliers	1	1	1	1
$ z  > 3.0$	0	0	0	0
$2 <  z  < 3$	1	3	1	0

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	29	26	29	29
ICP/OES (Red)	9	5	8	9

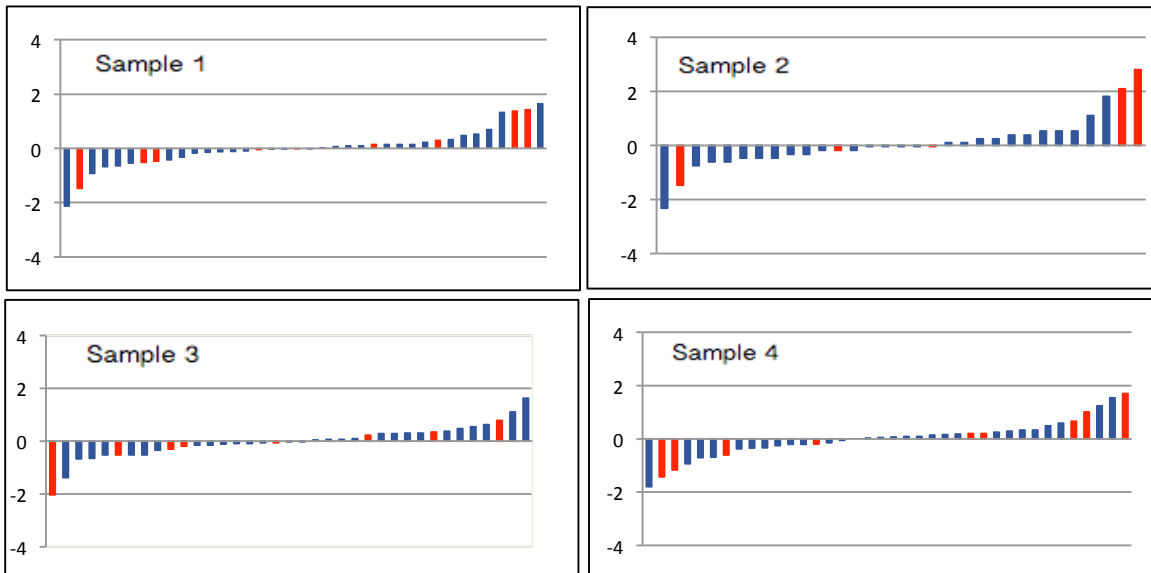
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

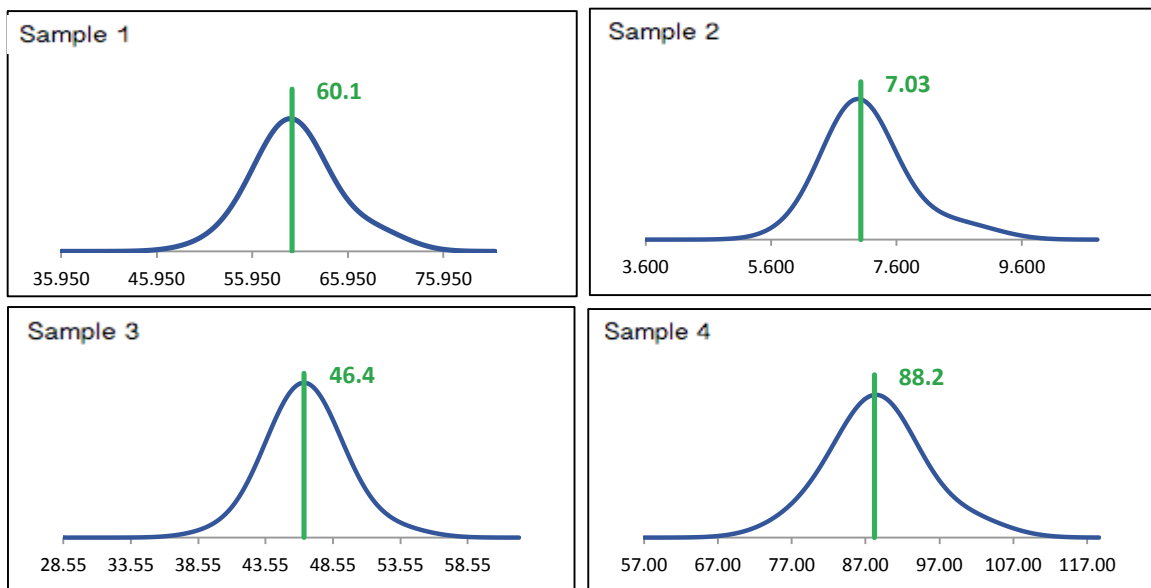


## ANTIMONY

### z-Score Plots

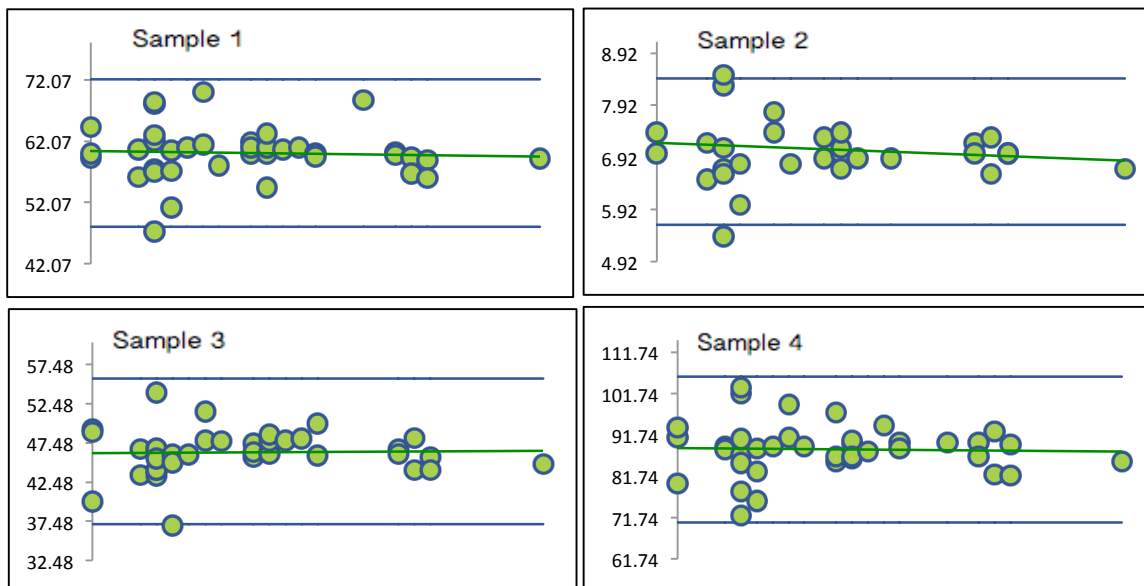


### Kernel Density Plots



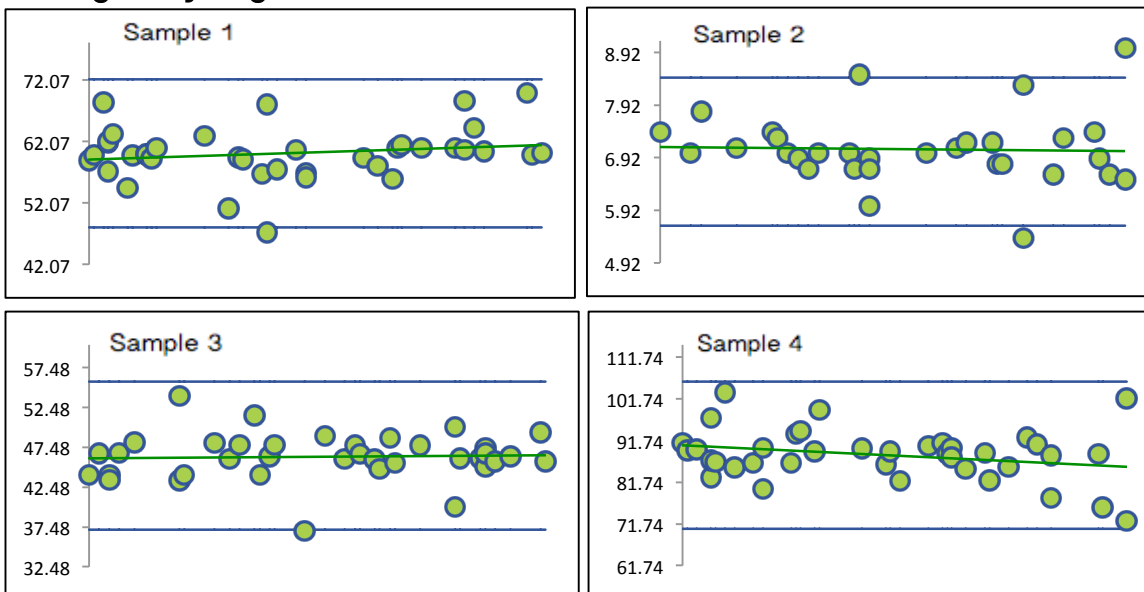
## ANTIMONY

### Stability Regression



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

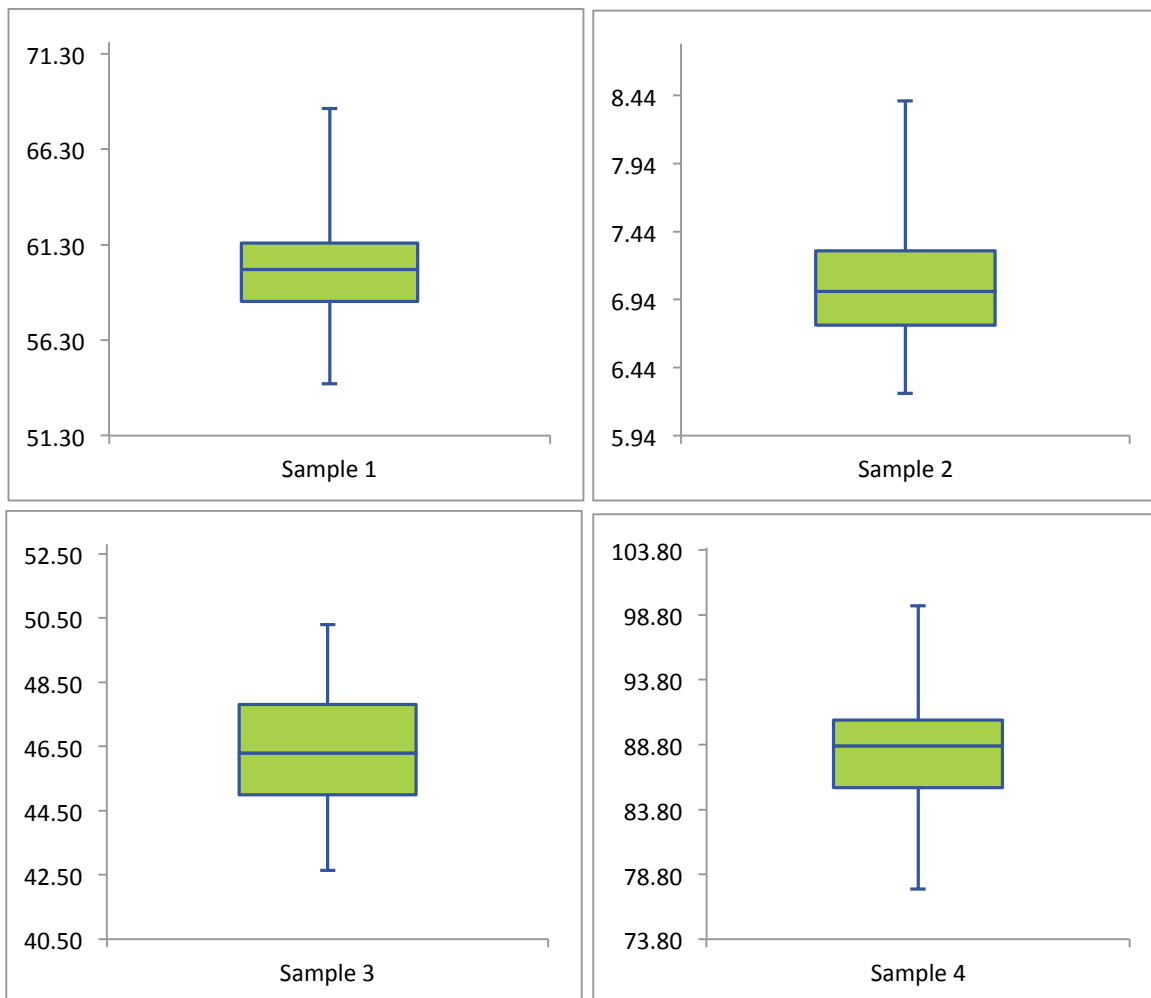
### Homogeneity Regression



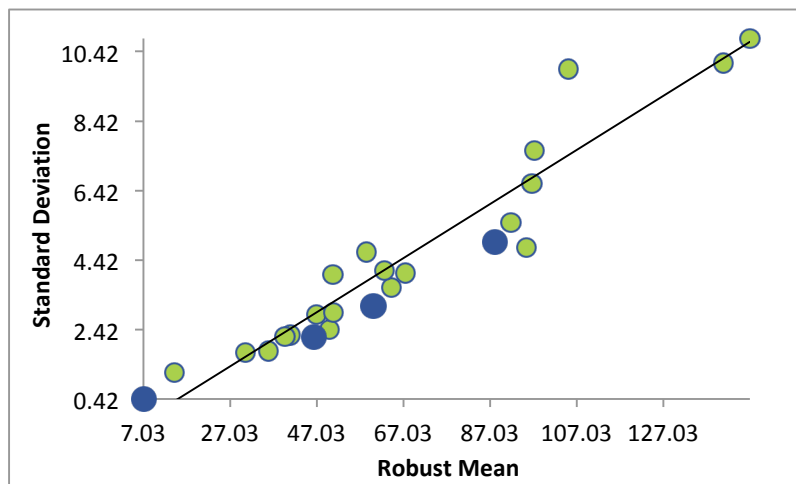
Reported results (Y-axis) plotted against bottling order (X-axis).

## ANTIMONY

### Box and Whisker Plots



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



## ARSENIC

## Summary Statistics

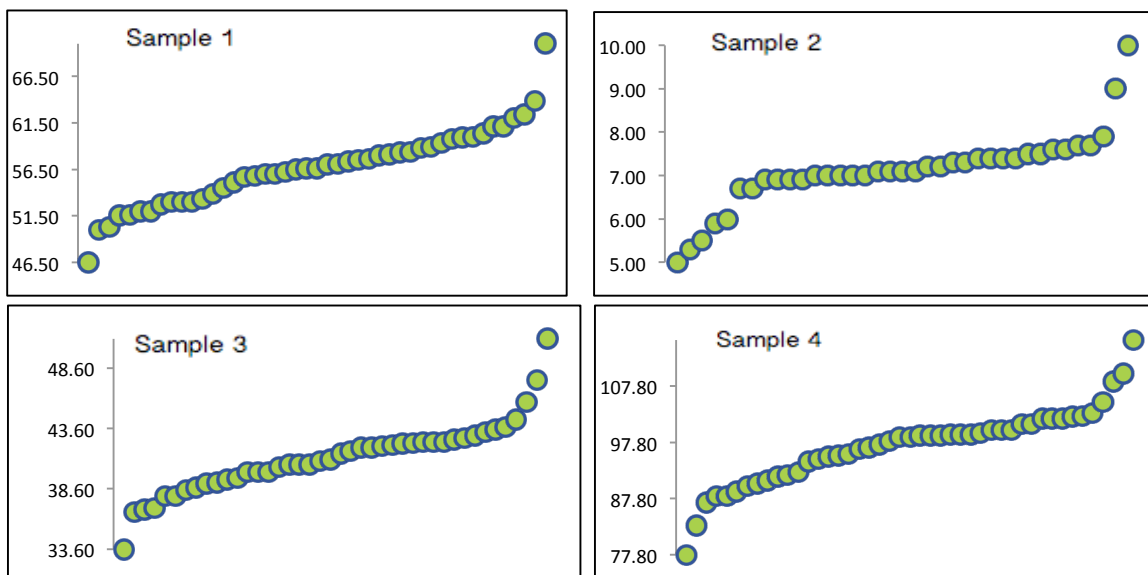
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	45	37	42	45
Median	56.6	7.10	41.3	98.8
Robust Mean	56.5	7.14	41.1	97.2
U	0.734	0.0997	0.482	1.13
Robust Standard Deviation	3.94	0.485	2.50	6.09
Regression Standard Deviation	5.65	0.714	4.11	9.72
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	5.65	0.714	4.11	9.72
Outliers	0	0	1	0
$ z  > 3.0$	0	1	0	0
$2 <  z  < 3$	1	4	1	0

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	32	29	32	32
ICP/OES (Red)	13	8	10	13

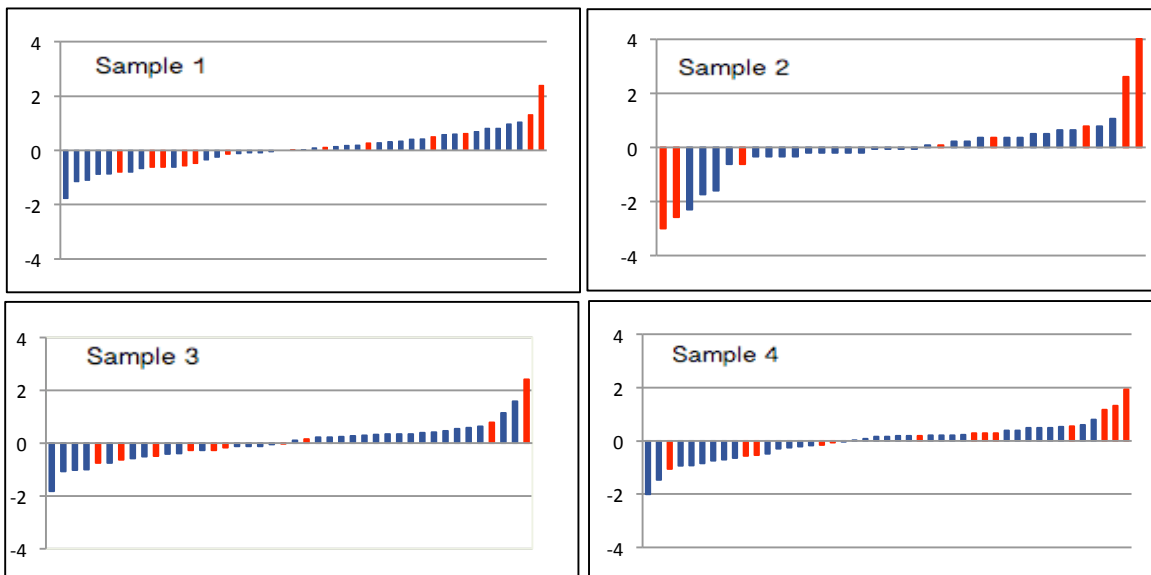
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

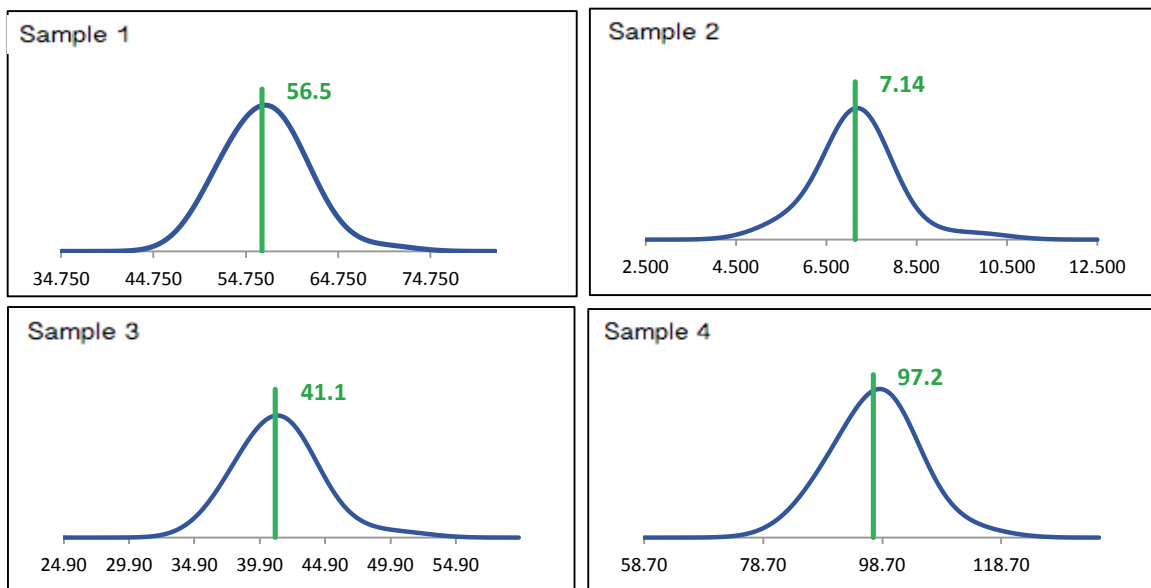


## ARSENIC

### z-Score Plots

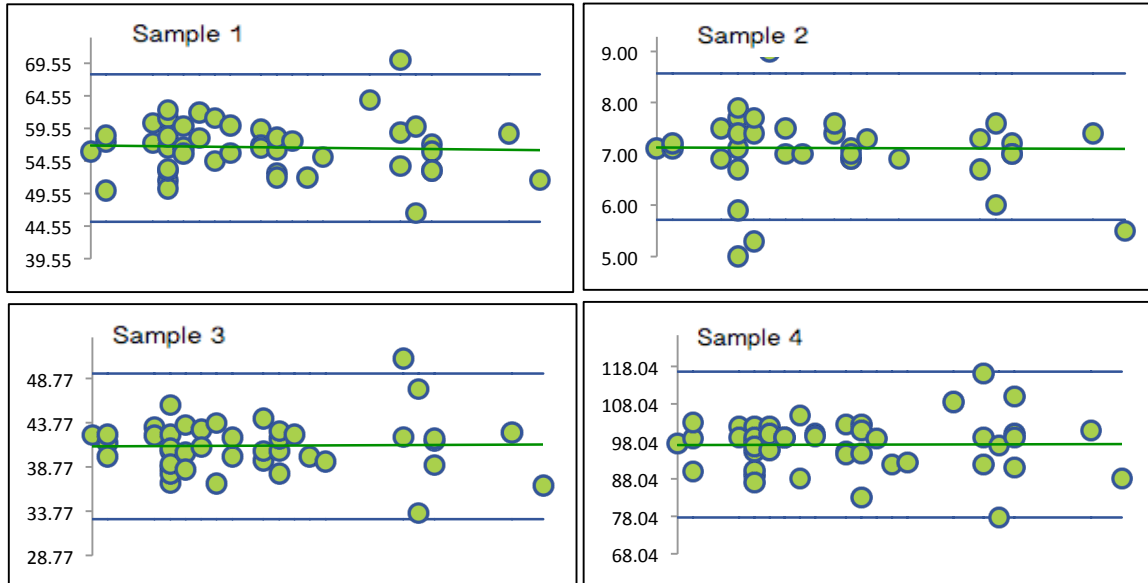


### Kernel Density Plots



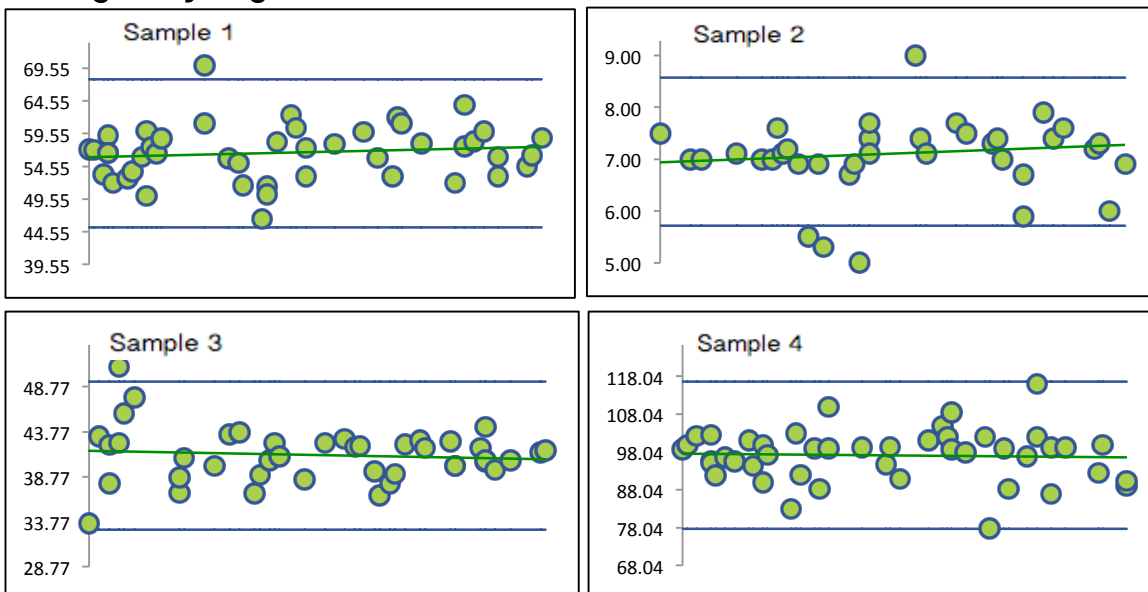
## ARSENIC

### Stability Regression



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

### Homogeneity Regression

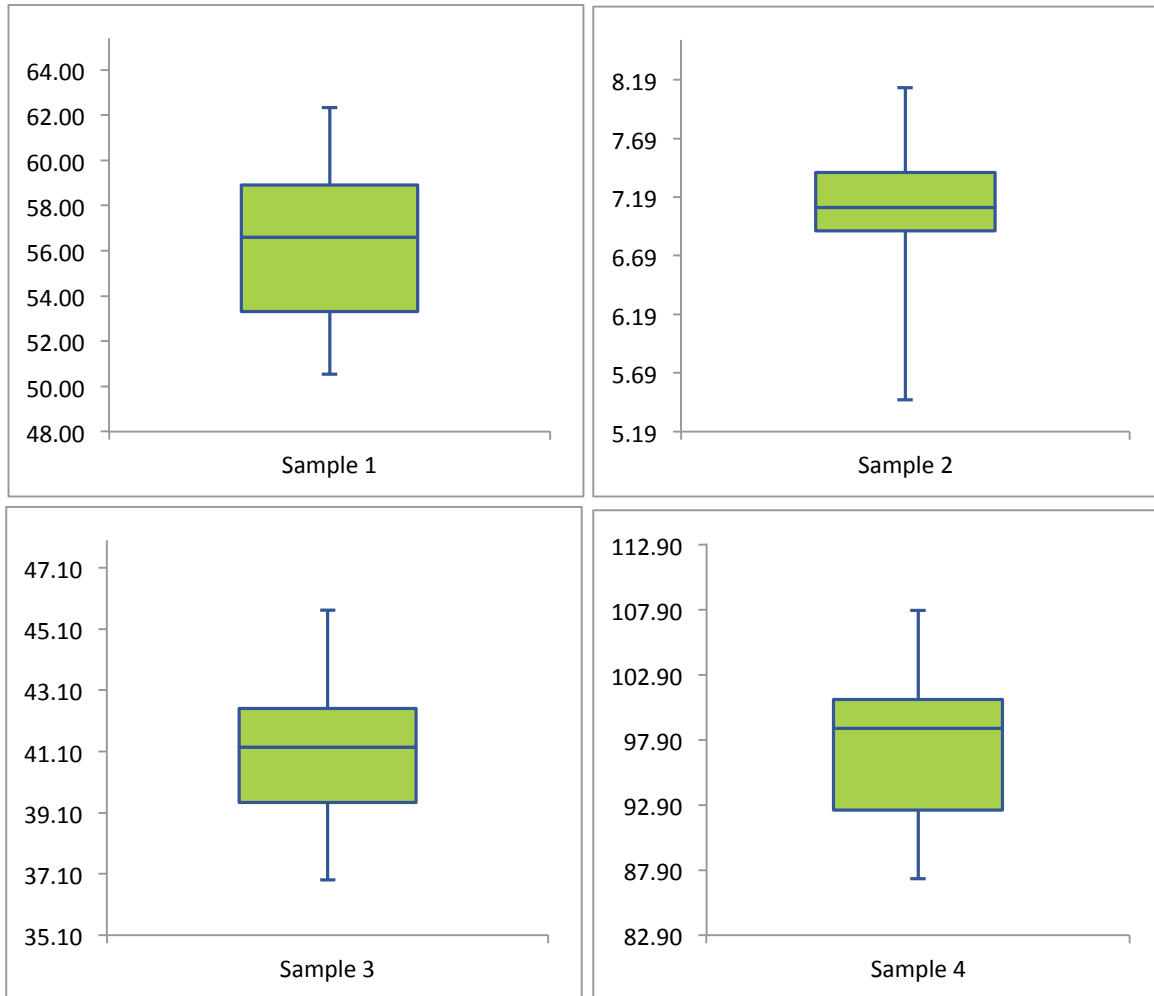


Reported results (Y-axis) plotted against bottling order (X-axis).

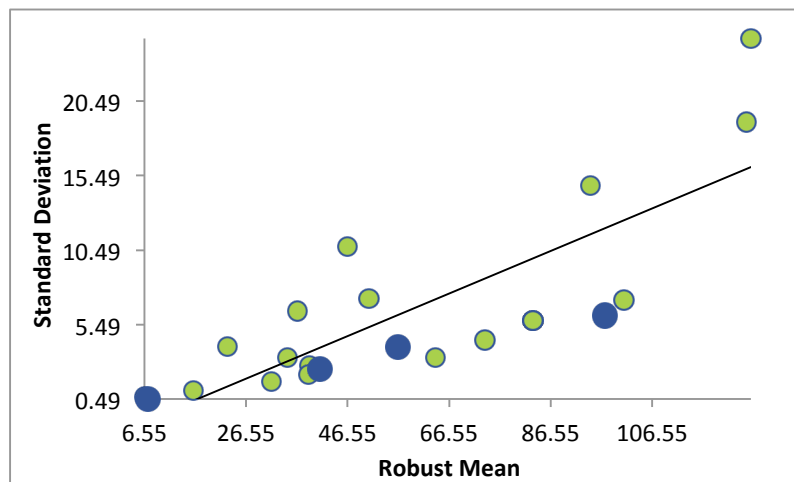


## ARSENIC

### Box and Whisker Plots



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



## BARIUM

## Summary Statistics

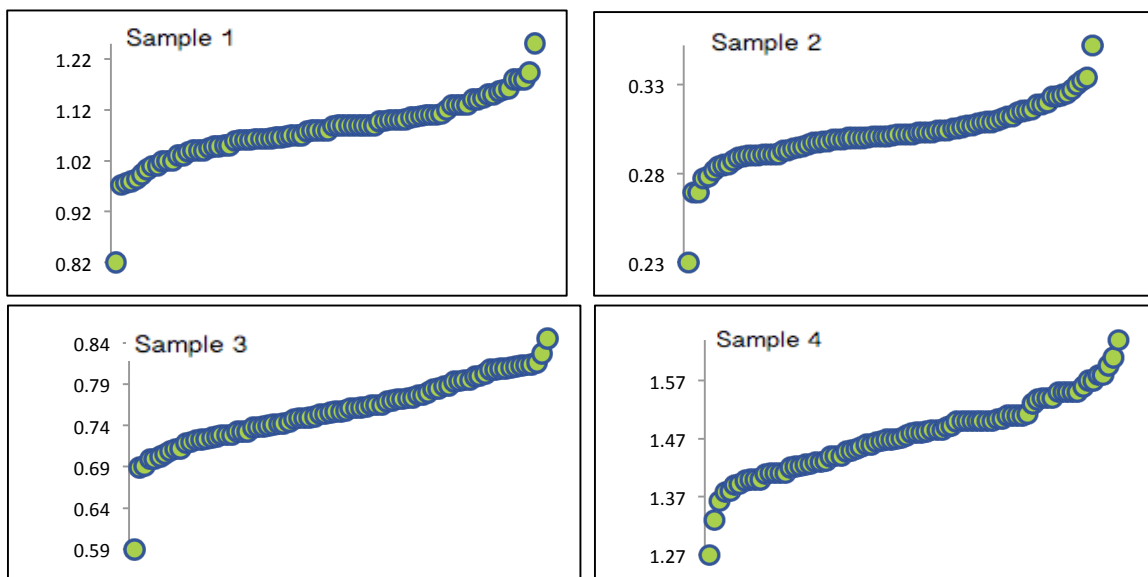
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	82	82	81	82
Median	1.08	0.302	0.758	1.48
Robust Mean	1.08	0.303	0.760	1.48
U	0.00729	0.00182	0.00551	0.00897
Robust Standard Deviation	0.0528	0.0132	0.0397	0.0650
Regression Standard Deviation	0.0811	0.0227	0.0570	0.111
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0811	0.0227	0.0570	0.111
Outliers	0	0	1	0
$ z  > 3.0$	1	1	0	0
$2 <  z  < 3$	1	1	1	0

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	50	50	49	50
ICP/OES (Red)	32	32	32	32

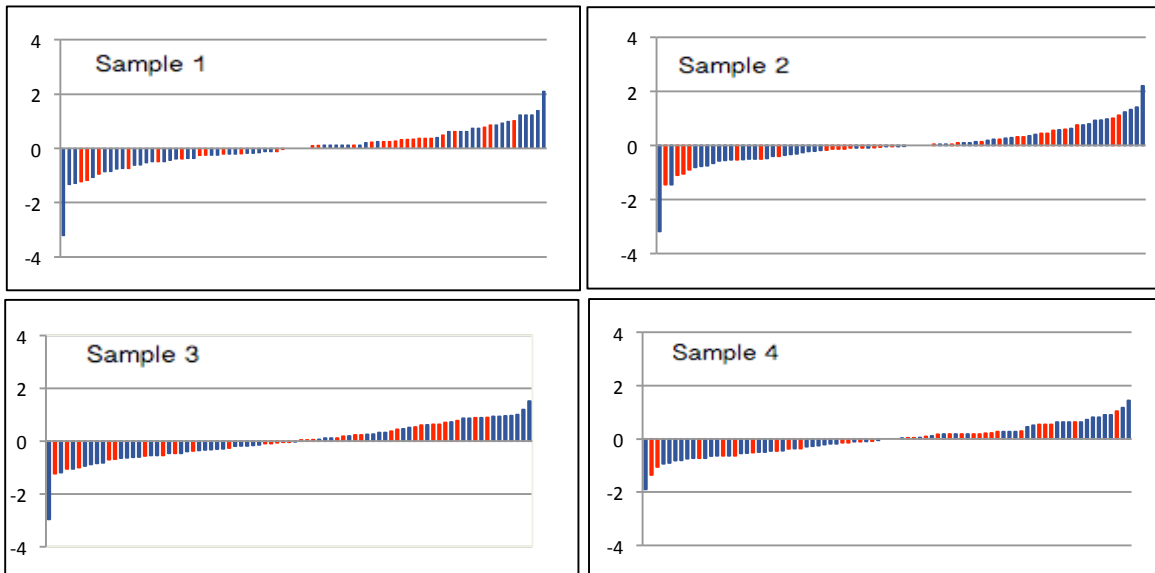
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

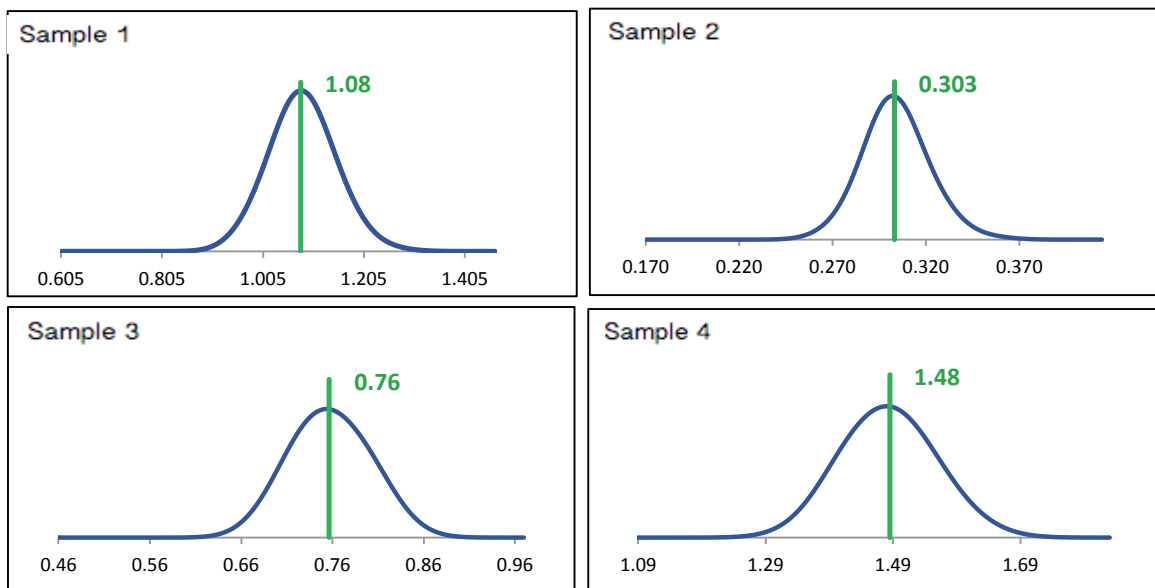


## BARIUM

### z-Score Plots

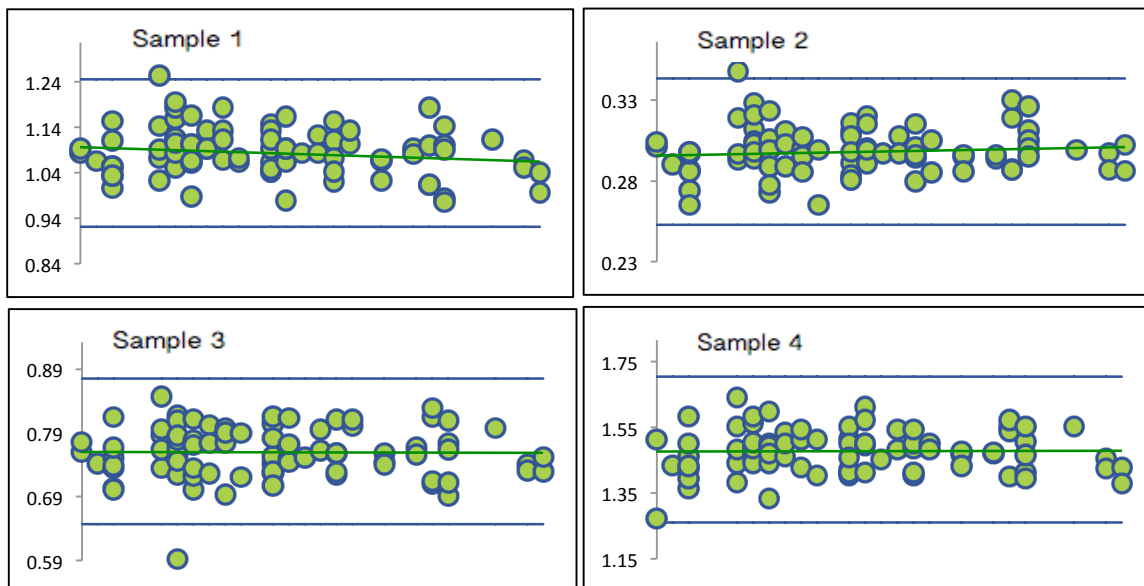


### Kernel Density Plots



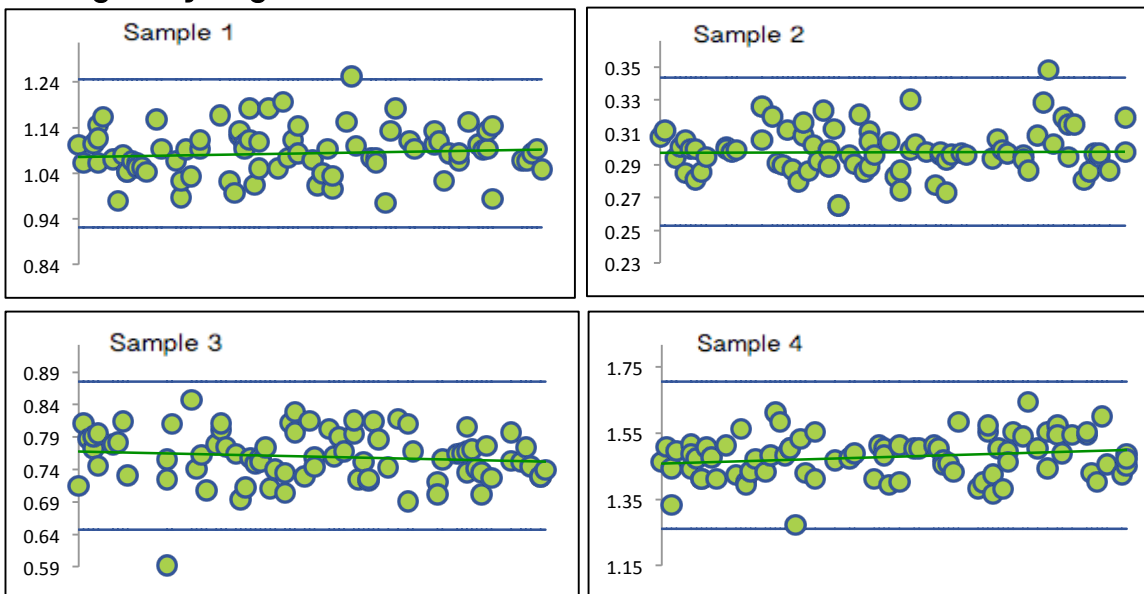
## BARIUM

### Stability Regression



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

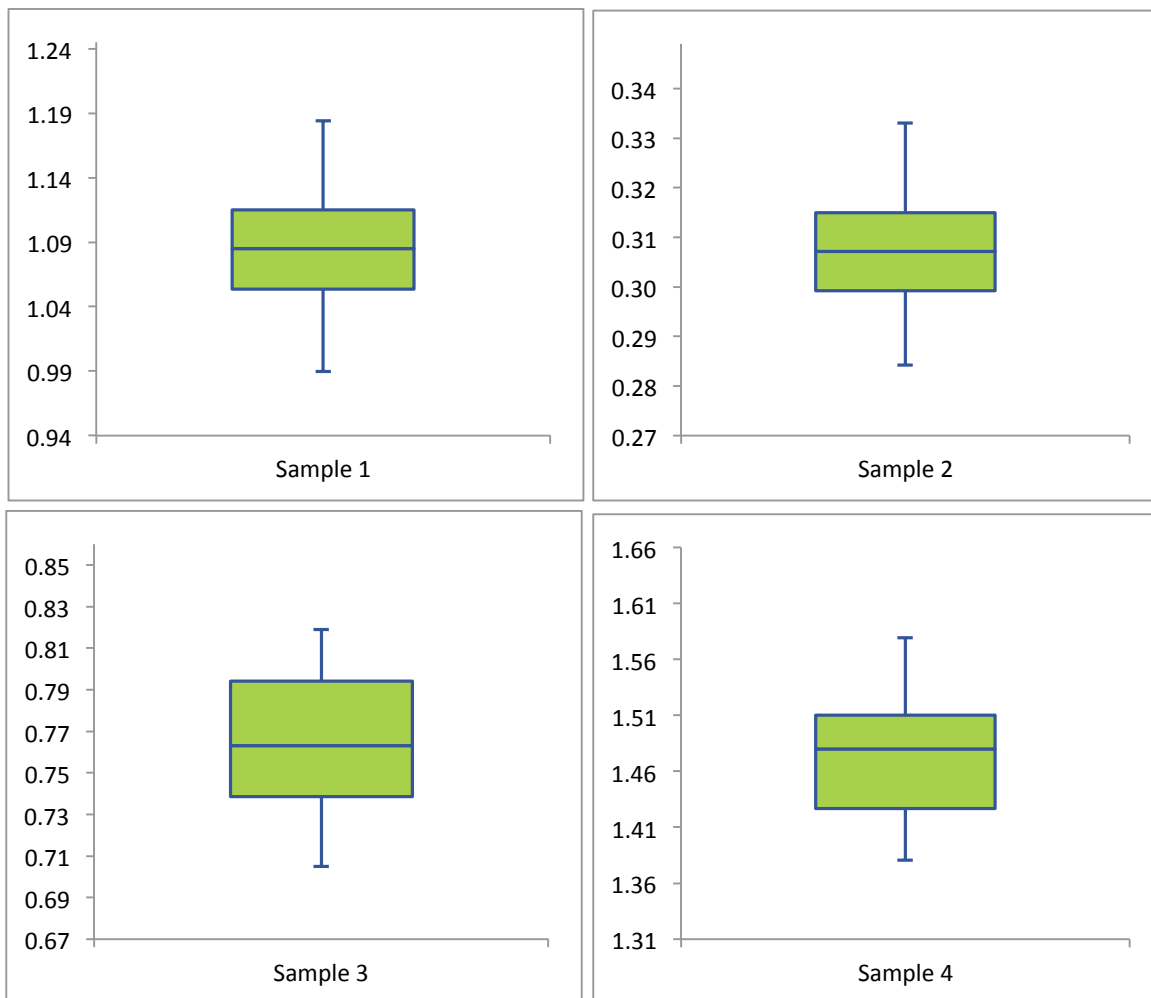
### Homogeneity Regression



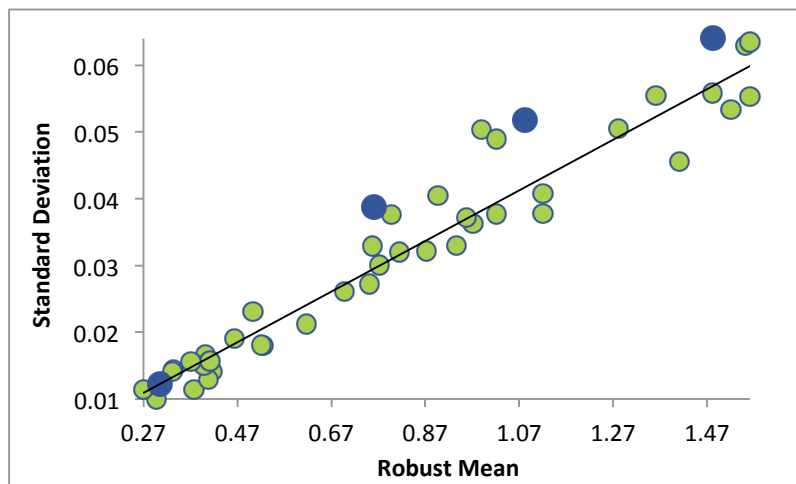
Reported results (Y-axis) plotted against bottling order (X-axis).

## BARIUM

### Box and Whisker Plots



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



## BERYLLIUM

## Summary Statistics

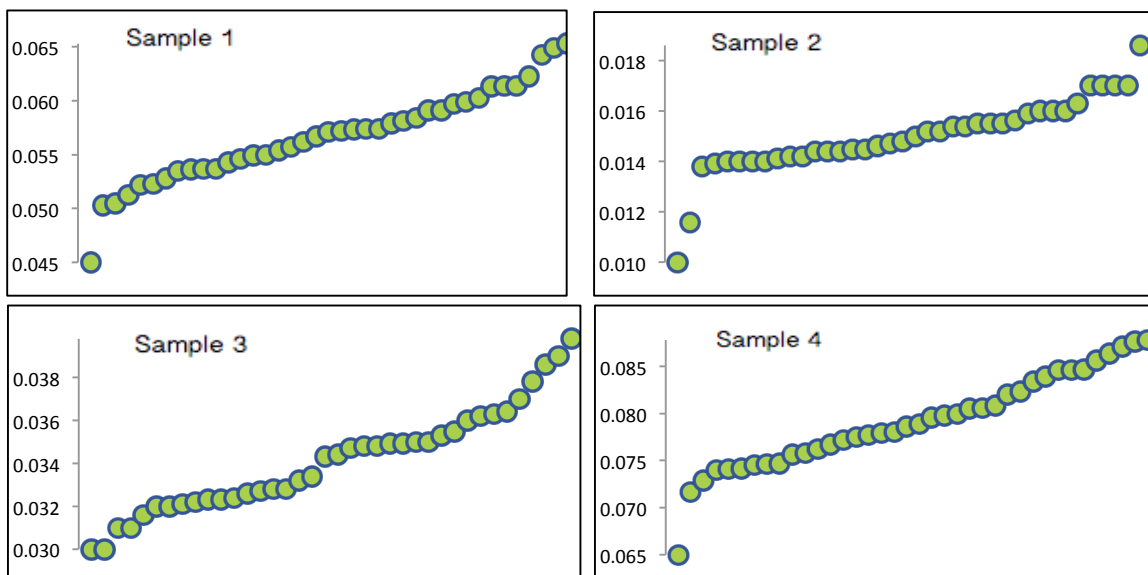
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	39	38	38	38
Median	0.0568	0.0149	0.0344	0.0792
Robust Mean	0.0564	0.0150	0.0340	0.0797
U	0.000847	0.000239	0.000501	0.00106
Robust Standard Deviation	0.00423	0.00118	0.00247	0.00522
Regression Standard Deviation	0.00423	0.00113	0.00255	0.00598
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00423	0.00118	0.00255	0.00598
Outliers	0	0	1	1
$ z  > 3.0$	0	2	0	0
$2 <  z  < 3$	2	1	1	1

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	29	29	29	28
ICP/OES (Red)	10	9	9	10

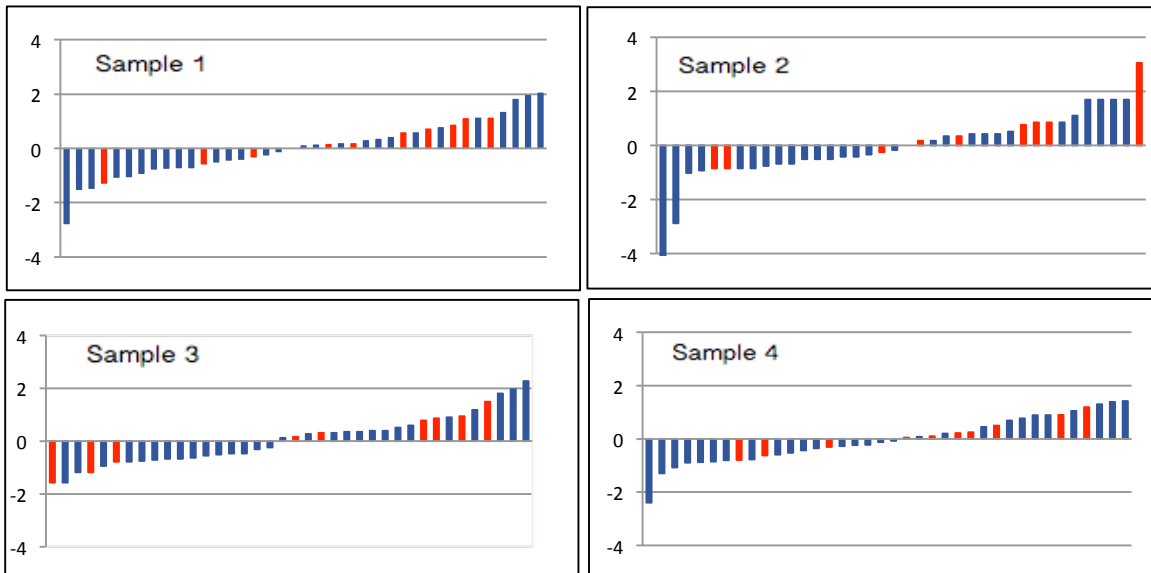
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

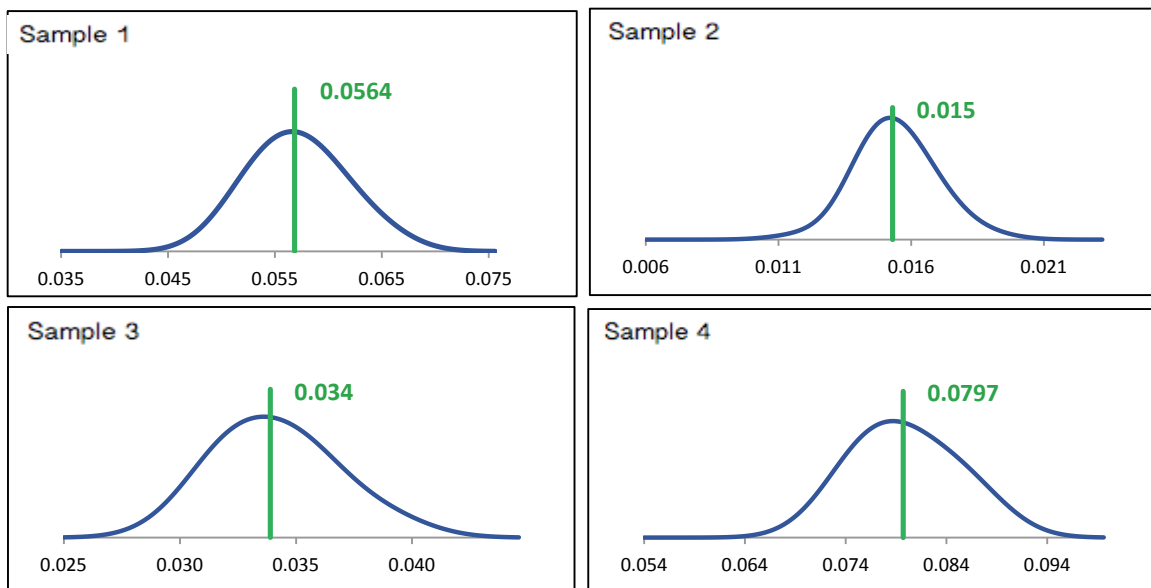


## BERYLLIUM

### z-Score Plots

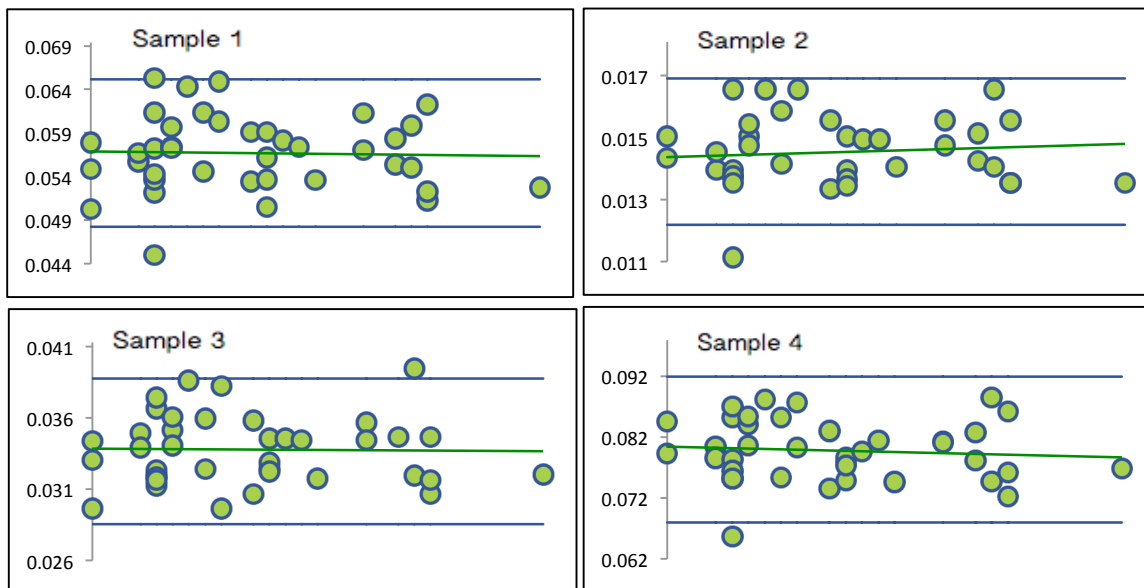


### Kernel Density Plots



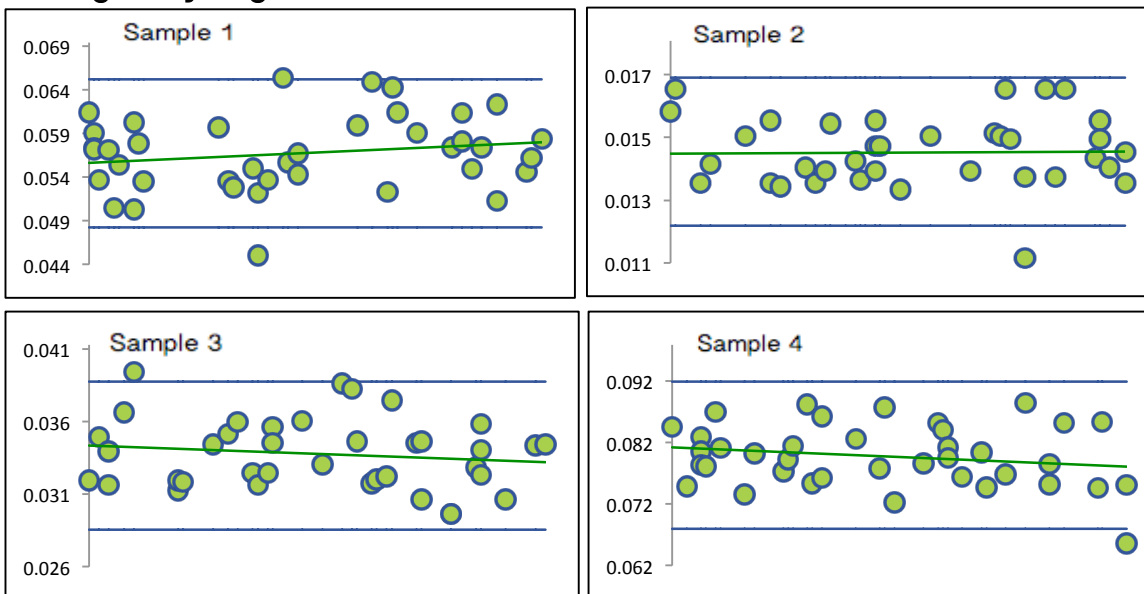
## BERYLLIUM

### 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).



## Page 23 of 99

Figure 1 displays four box plots showing the distribution of the number of visits for four different samples (Sample 1, Sample 2, Sample 3, and Sample 4). The y-axis represents the number of visits, and the x-axis labels the samples.

For Sample 1, the y-axis ranges from 0.048 to 0.066. The median number of visits is approximately 0.057. The interquartile range (IQR) is from approximately 0.054 to 0.0595. The whiskers extend from approximately 0.0505 to 0.0645.

For Sample 2, the y-axis ranges from 0.013 to 0.018. The median number of visits is approximately 0.0151. The IQR is from approximately 0.0144 to 0.016. The whiskers extend from approximately 0.0137 to 0.0173.

For Sample 3, the y-axis ranges from 0.029 to 0.039. The median number of visits is approximately 0.034. The IQR is from approximately 0.032 to 0.0352. The whiskers extend from approximately 0.0308 to 0.0388.

For Sample 4, the y-axis ranges from 0.069 to 0.089. The median number of visits is approximately 0.079. The IQR is from approximately 0.0765 to 0.0835. The whiskers extend from approximately 0.0735 to 0.0865.

[illegible]

## BORON

## Summary Statistics

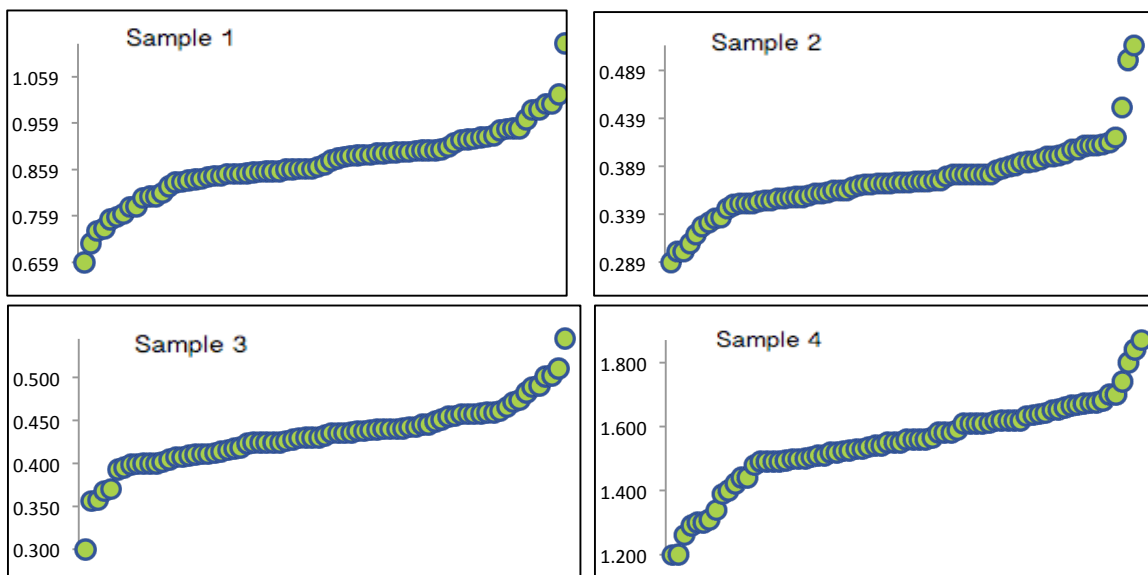
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	75	75	75	75
Median	0.870	0.372	0.432	1.56
Robust Mean	0.873	0.373	0.432	1.56
U	0.00917	0.00398	0.00429	0.0157
Robust Standard Deviation	0.0635	0.0276	0.0297	0.109
Regression Standard Deviation	0.0655	0.0280	0.0324	0.117
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0655	0.0280	0.0324	0.117
Outliers	0	0	0	0
$ z  > 3.0$	2	2	2	2
$2 <  z  < 3$	4	5	5	8

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	45	45	45	45
ICP/OES (Red)	30	30	30	30

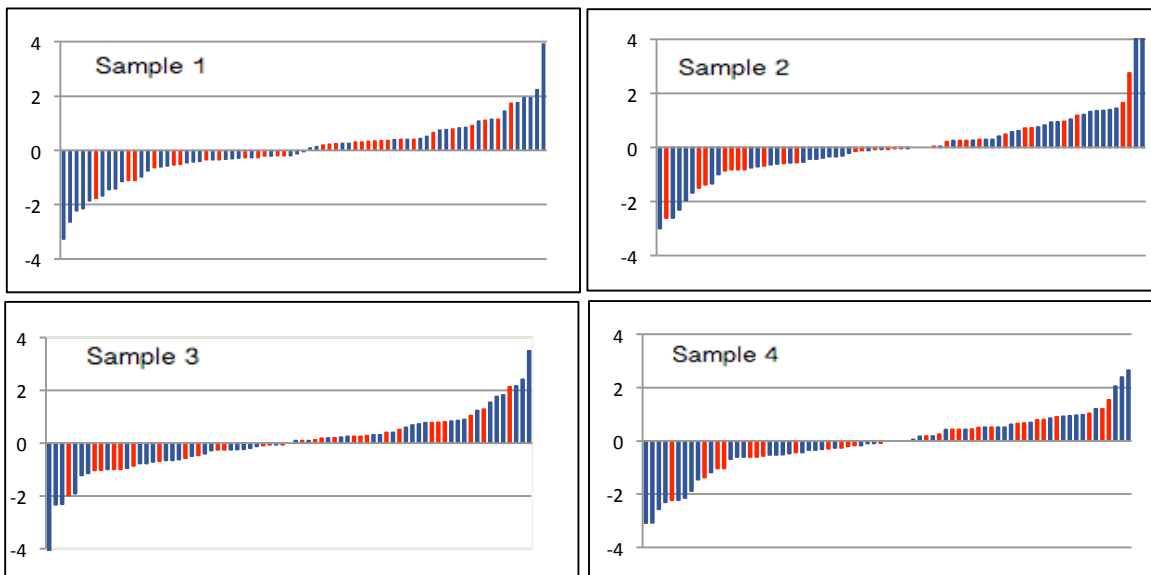
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

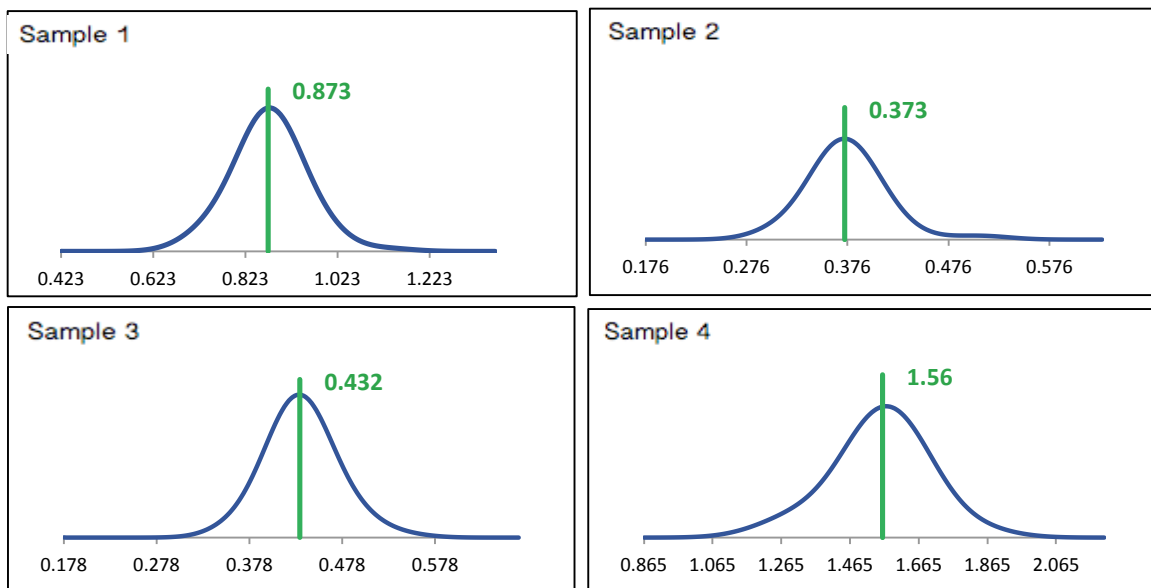


## BORON

### z-Score Plots

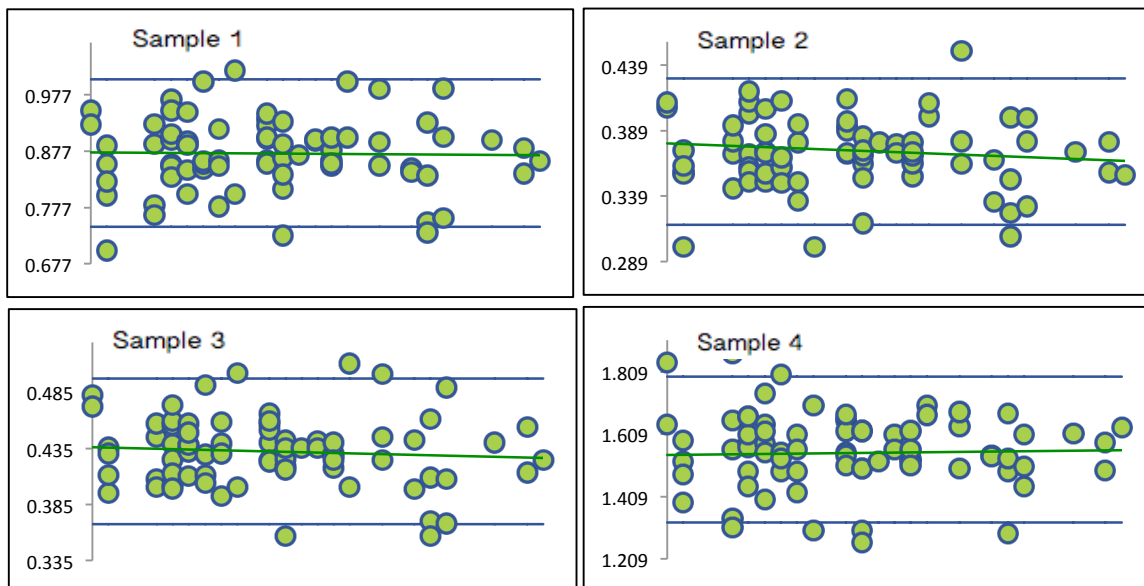


### Kernel Density Plots



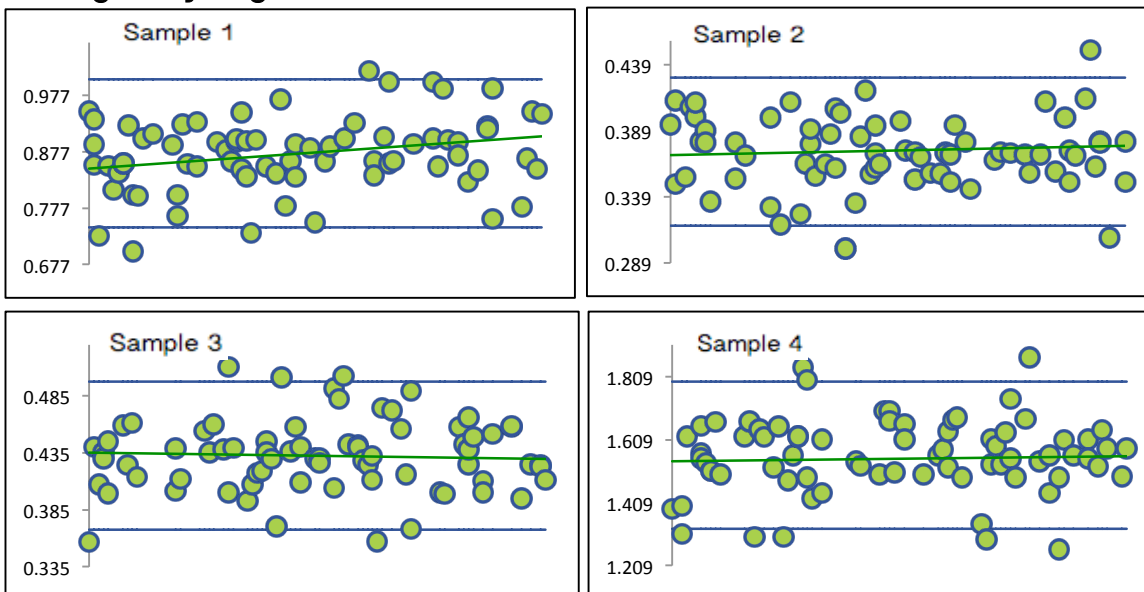
## BORON

### Stability Regression



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

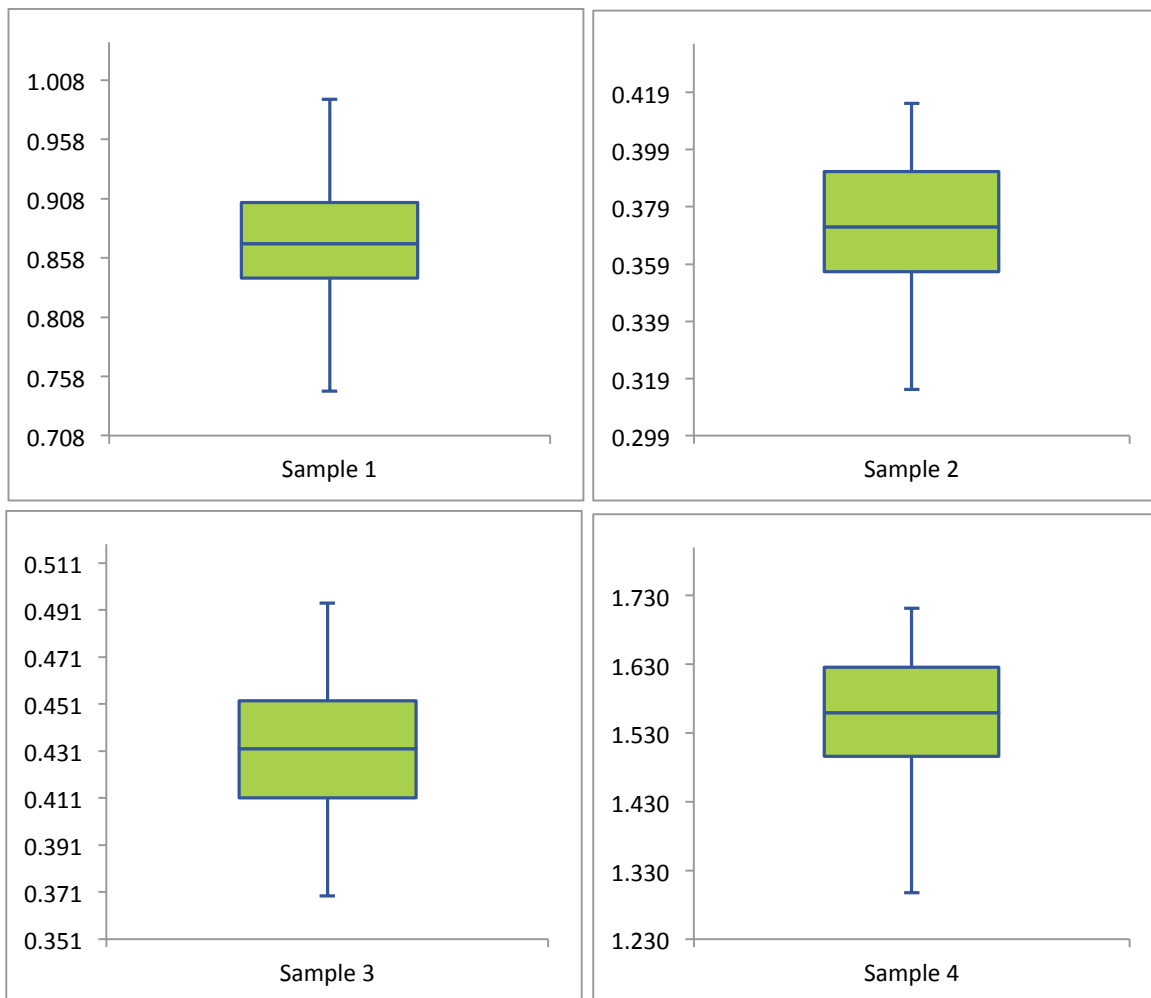
### Homogeneity Regression



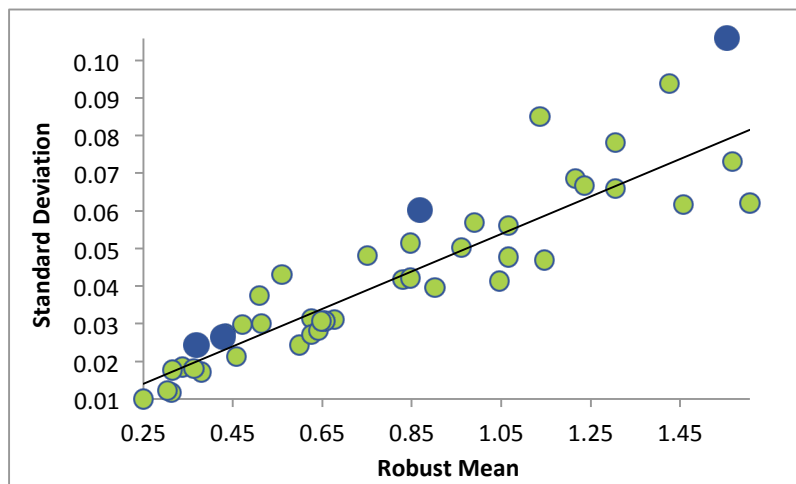
Reported results (Y-axis) plotted against bottling order (X-axis).

## BORON

### Box and Whisker Plots



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



## CADMIUM

## Summary Statistics

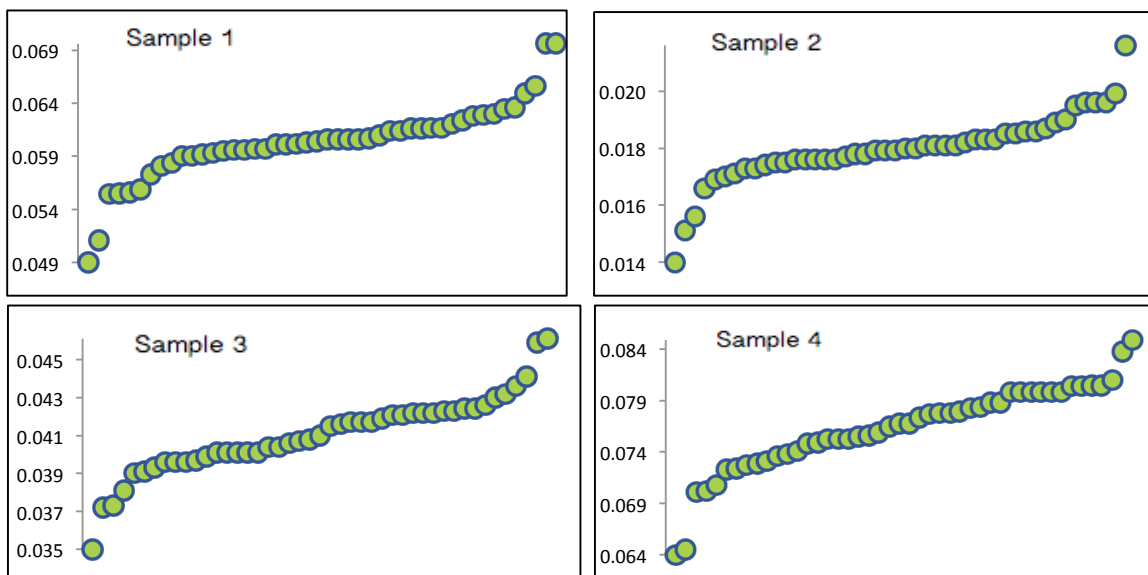
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	46	46	45	46
Median	0.0609	0.0184	0.0409	0.0770
Robust Mean	0.0608	0.0184	0.0410	0.0767
U	0.000474	0.000163	0.000334	0.000702
Robust Standard Deviation	0.00257	0.00088	0.00179	0.00381
Regression Standard Deviation	0.00456	0.00138	0.00307	0.00576
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00456	0.00138	0.00307	0.00576
Outliers	0	0	1	0
$ z  > 3.0$	0	0	0	0
$2 <  z  < 3$	4	3	0	2

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	33	33	33	33
ICP/OES (Red)	13	13	12	13

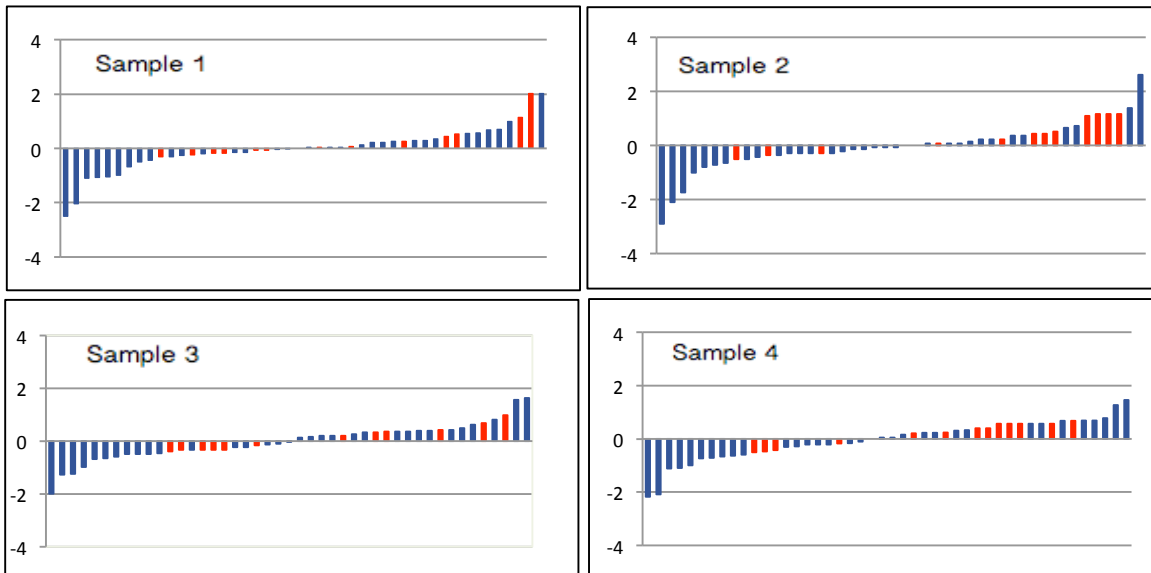
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

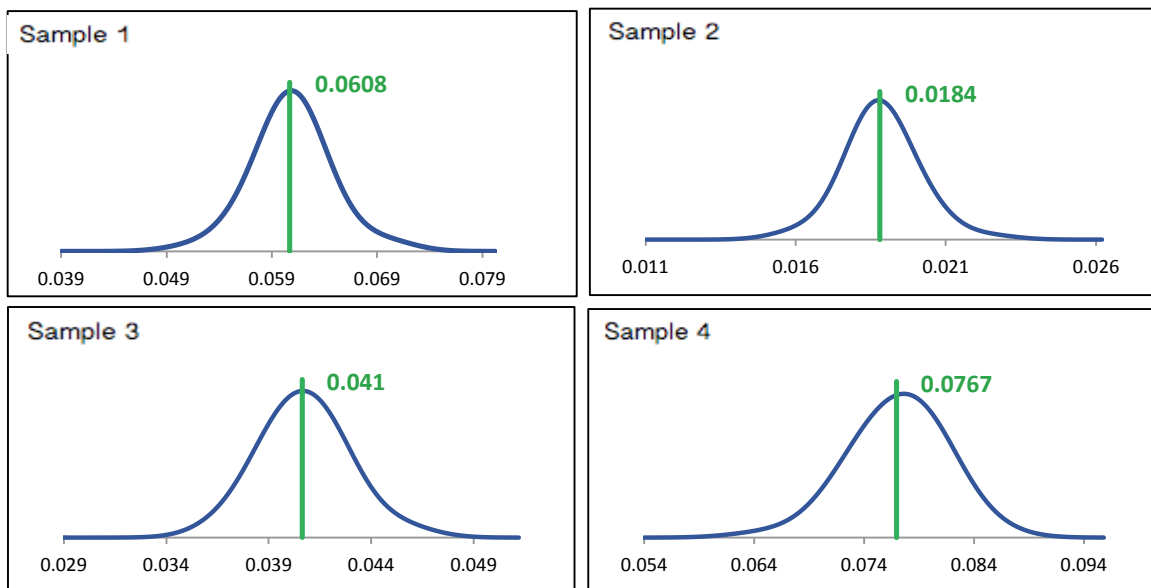


## CADMIUM

### z-Score Plots

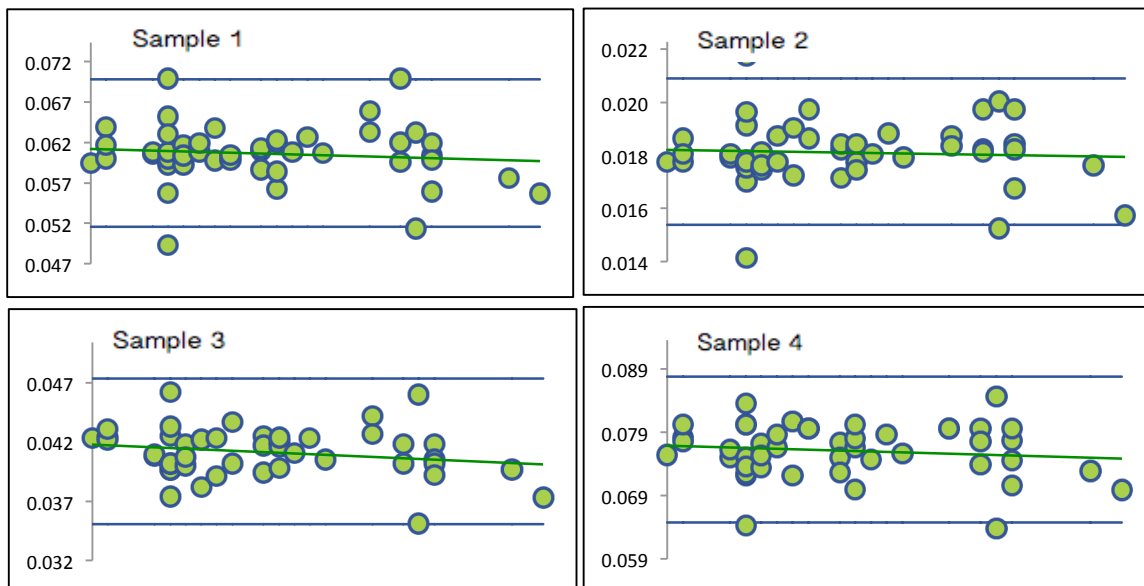


### Kernel Density Plots



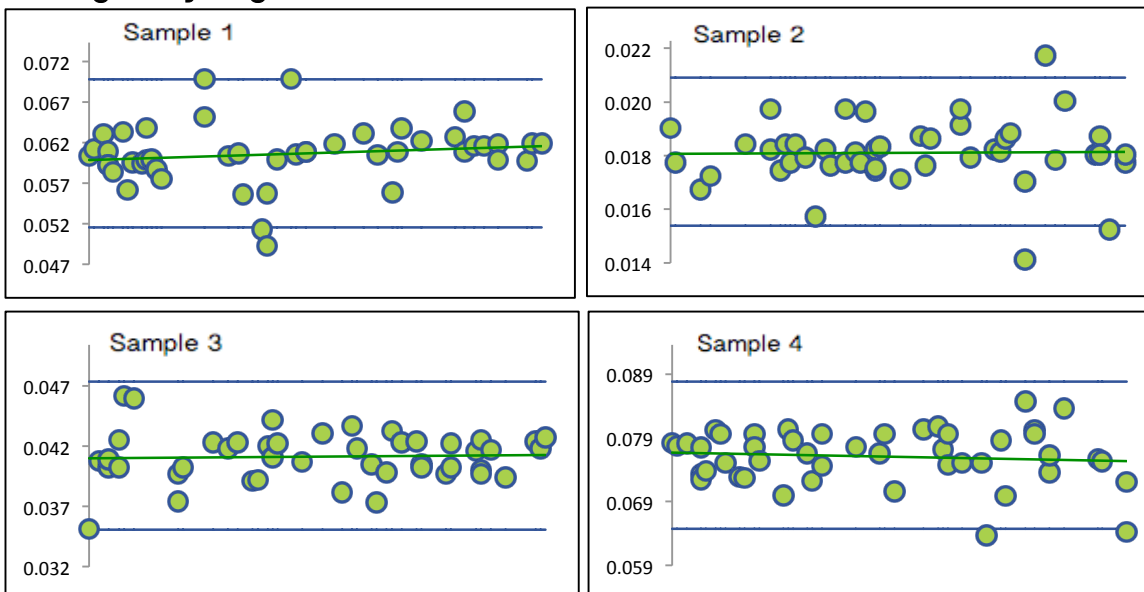
## CADMIUM

### Stability Regression



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

### Homogeneity Regression

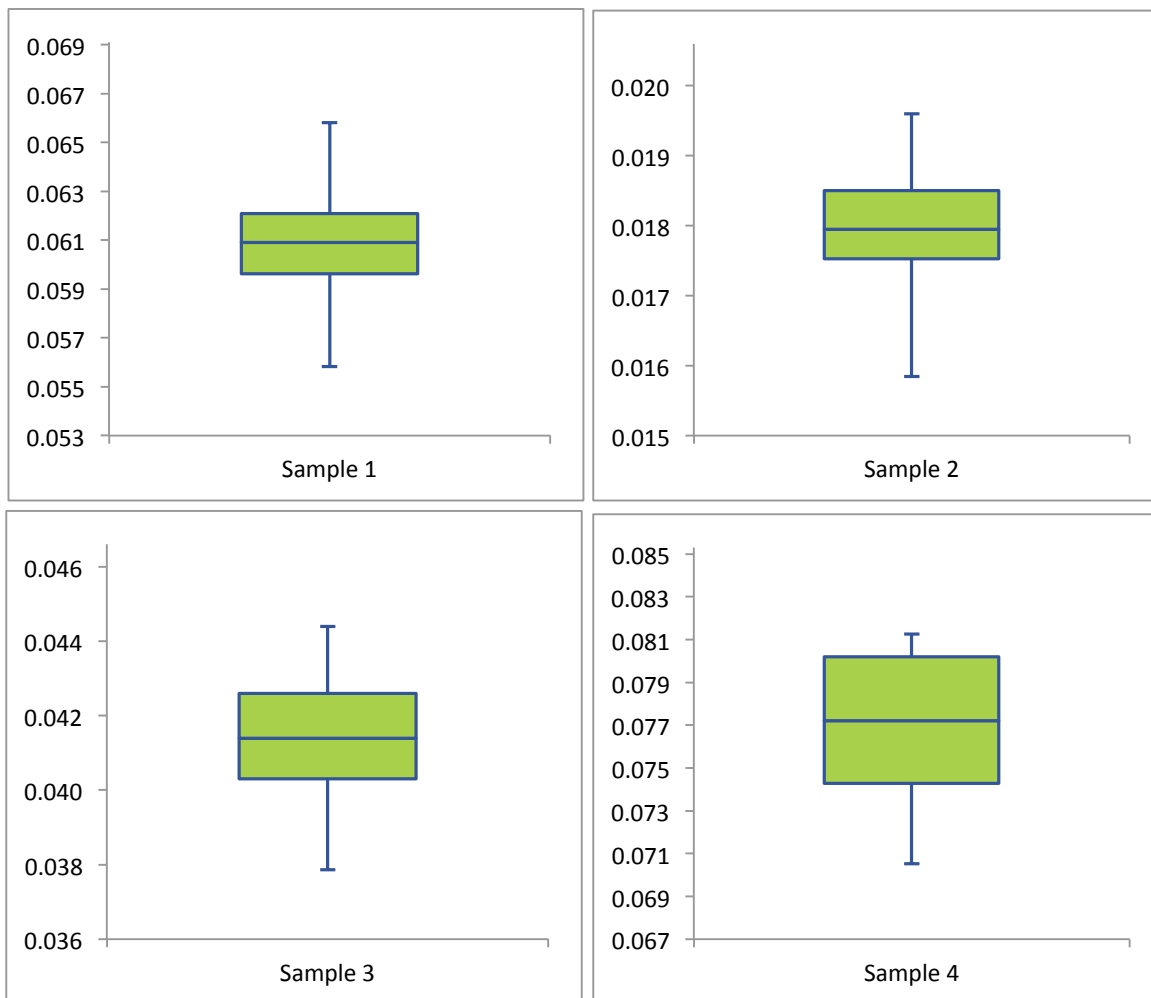


Reported results (Y-axis) plotted against bottling order (X-axis).

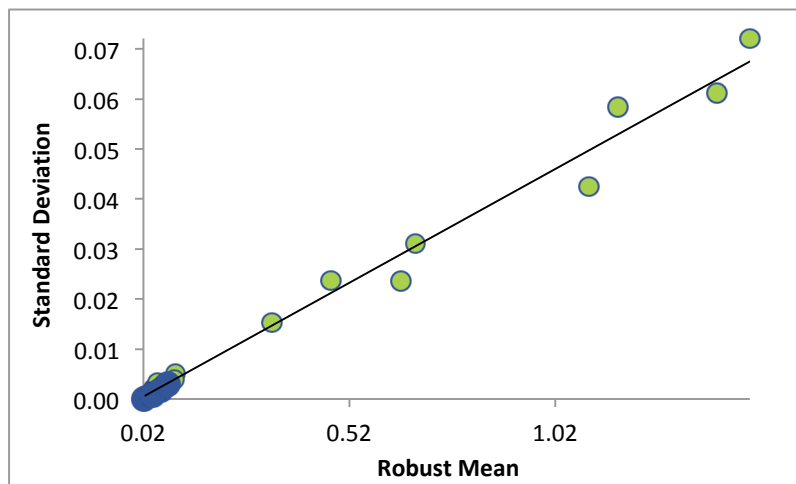


## CADMIUM

### Box and Whisker Plots



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



## CHROMIUM

## Summary Statistics

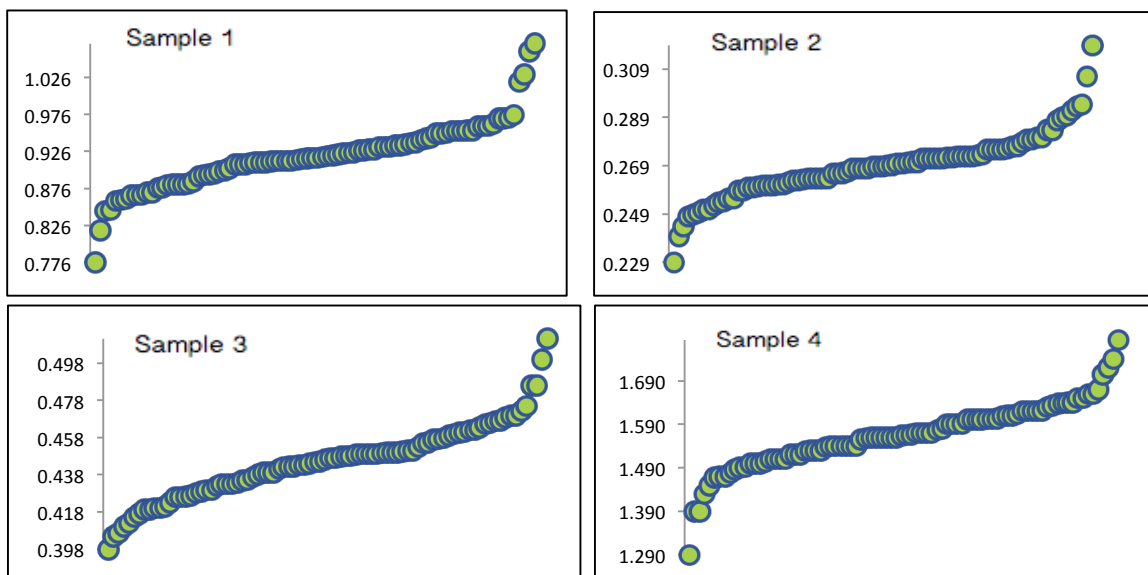
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	86	85	86	86
Median	0.917	0.269	0.447	1.56
Robust Mean	0.917	0.269	0.445	1.57
U	0.00515	0.00153	0.00259	0.00903
Robust Standard Deviation	0.0382	0.0113	0.0192	0.0670
Regression Standard Deviation	0.0688	0.0201	0.0333	0.117
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0688	0.0201	0.0333	0.117
Outliers	0	1	0	0
$ z  > 3.0$	0	0	0	0
$2 <  z  < 3$	3	1	0	1

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	52	51	52	52
ICP/OES (Red)	34	34	34	34

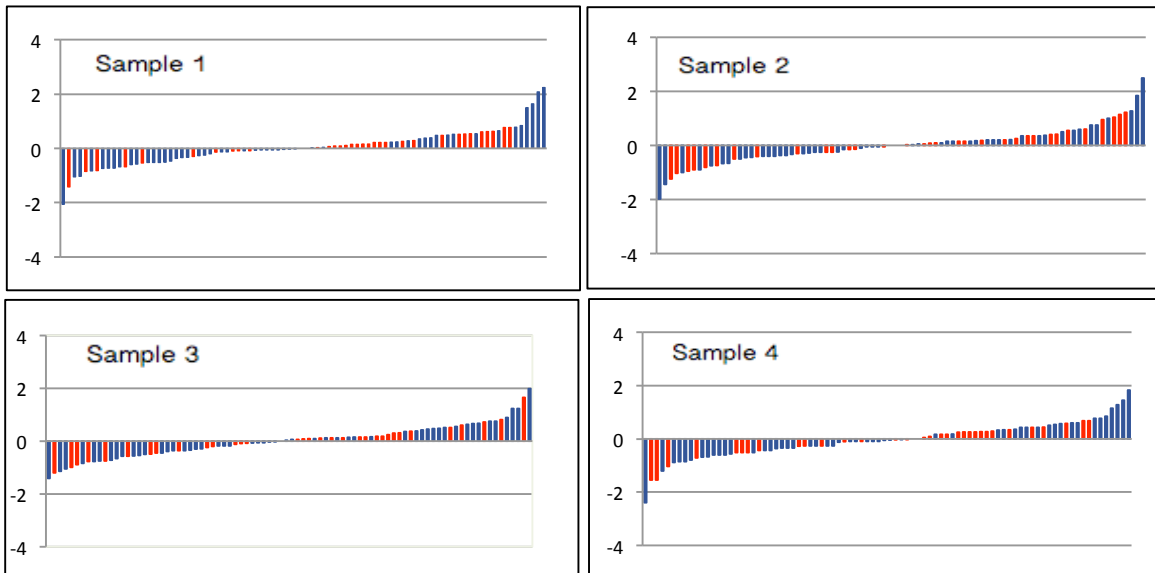
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

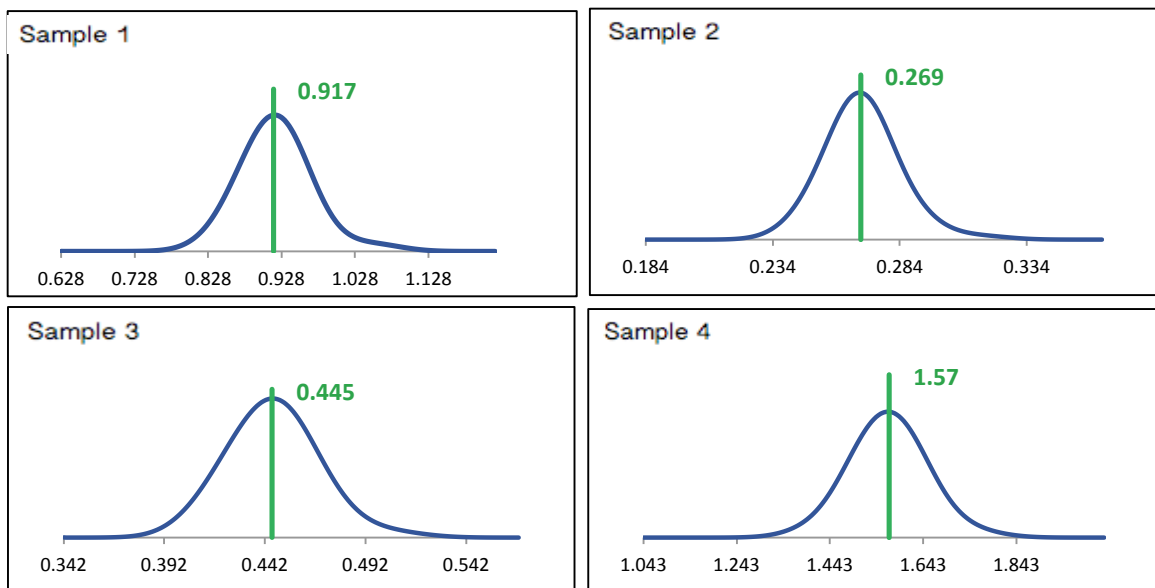


## CHROMIUM

### z-Score Plots

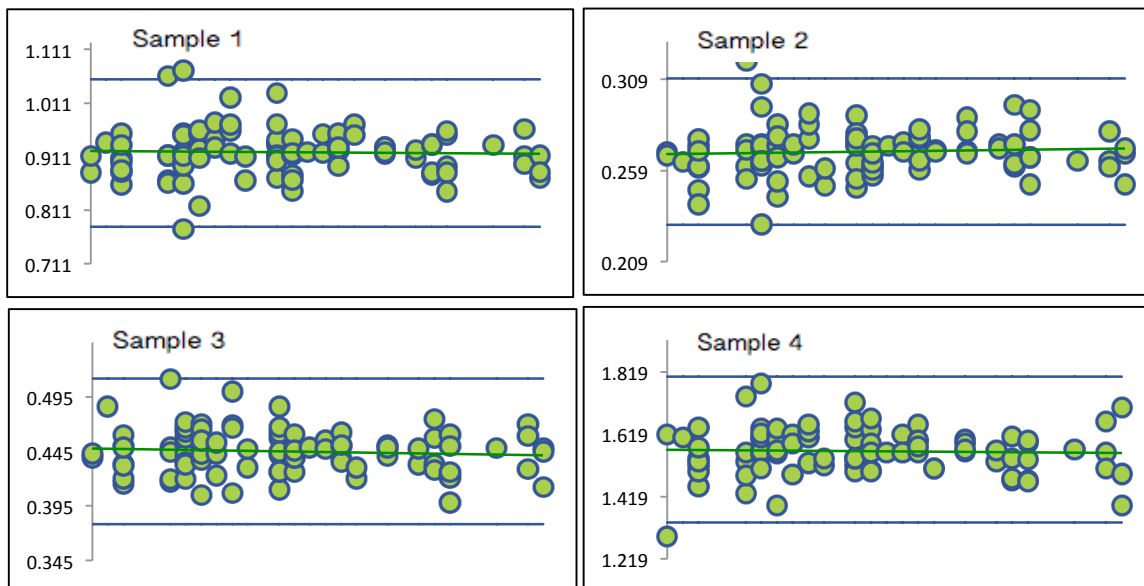


### Kernel Density Plots



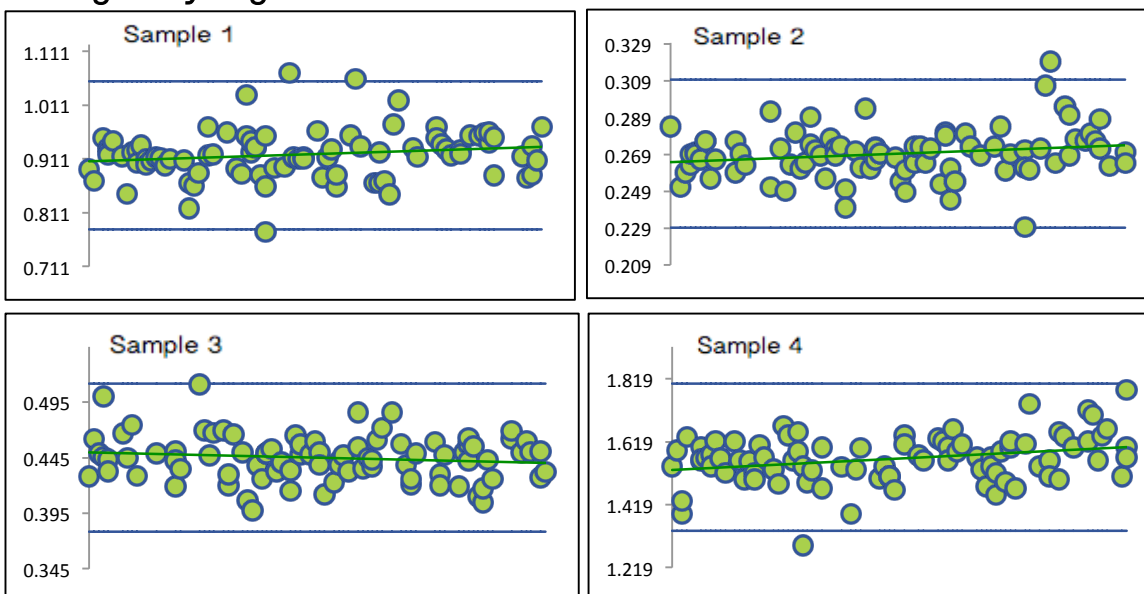
## CHROMIUM

### Stability Regression



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

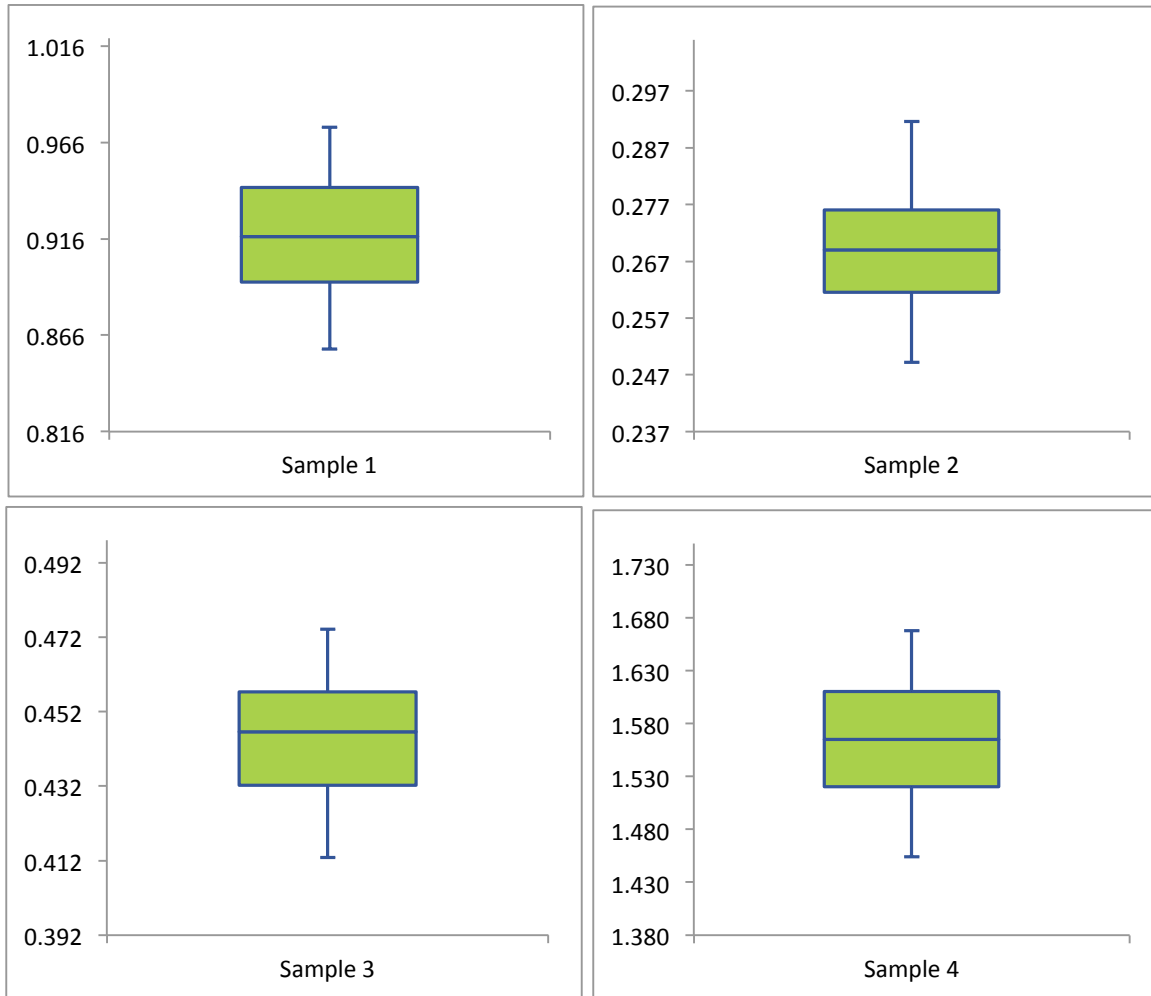
### Homogeneity Regression



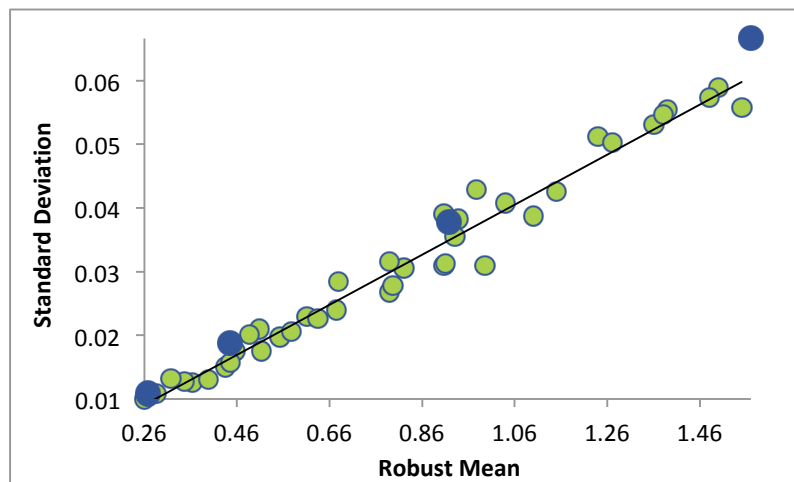
Reported results (Y-axis) plotted against bottling order (X-axis).

## CHROMIUM

### Box and Whisker Plots



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



## COBALT

## Summary Statistics

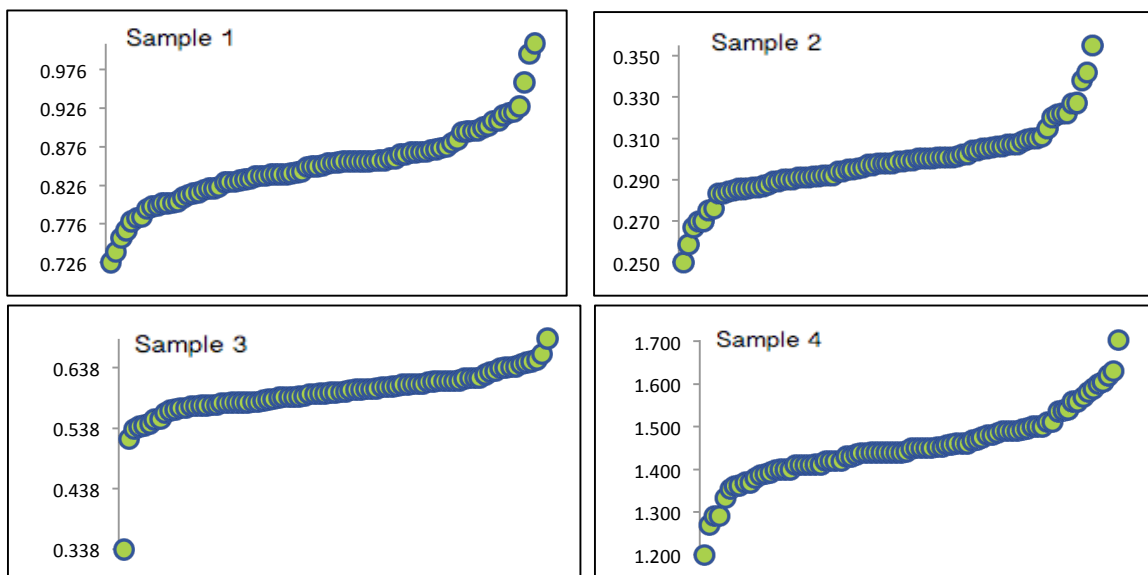
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	83	83	83	83
Median	0.852	0.298	0.596	1.45
Robust Mean	0.850	0.298	0.597	1.45
U	0.00574	0.00167	0.00388	0.00914
Robust Standard Deviation	0.0418	0.0122	0.0283	0.0666
Regression Standard Deviation	0.0637	0.0223	0.0448	0.109
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0637	0.0223	0.0448	0.109
Outliers	0	0	0	0
$ z  > 3.0$	0	0	1	0
$2 <  z  < 3$	2	2	0	2

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	50	50	50	50
ICP/OES (Red)	32	32	32	32
AA (Green)	1	1	1	1

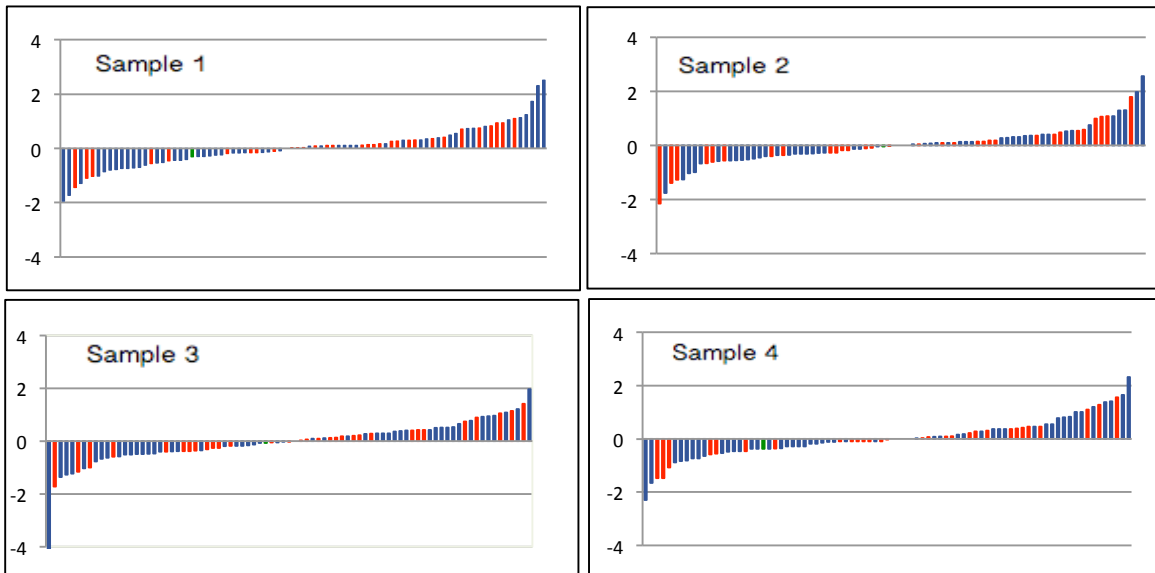
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

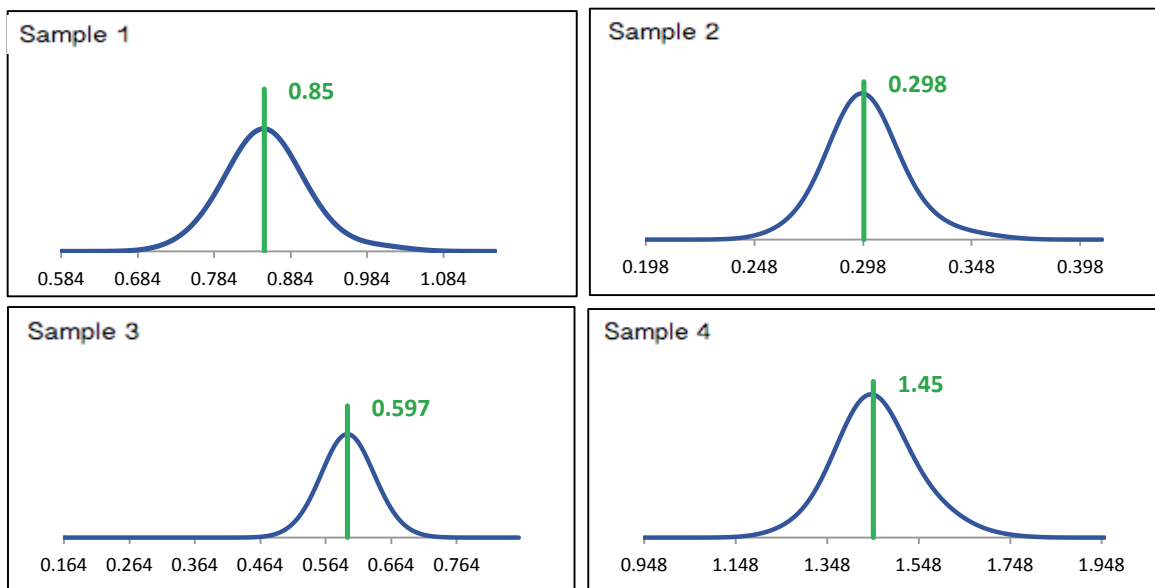


## COBALT

### z-Score Plots

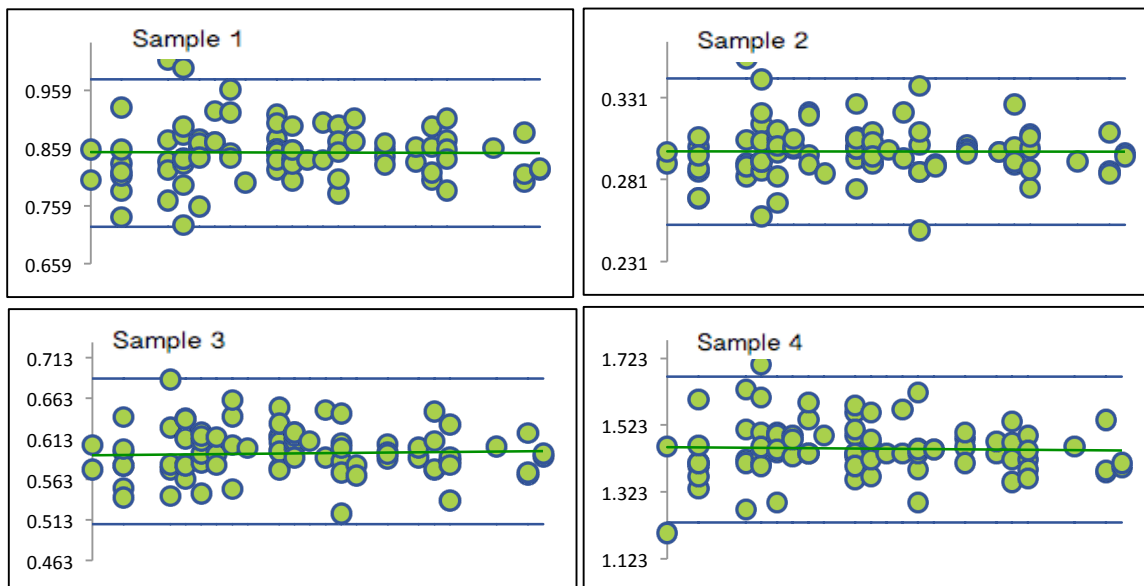


### Kernel Density Plots



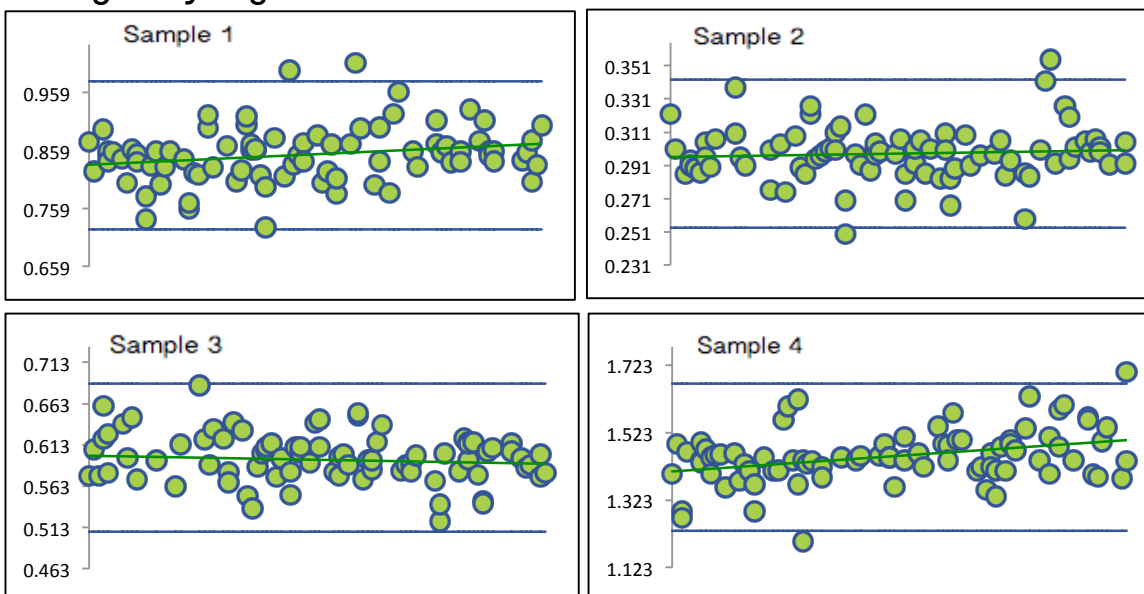
## COBALT

### Stability Regression



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

### Homogeneity Regression

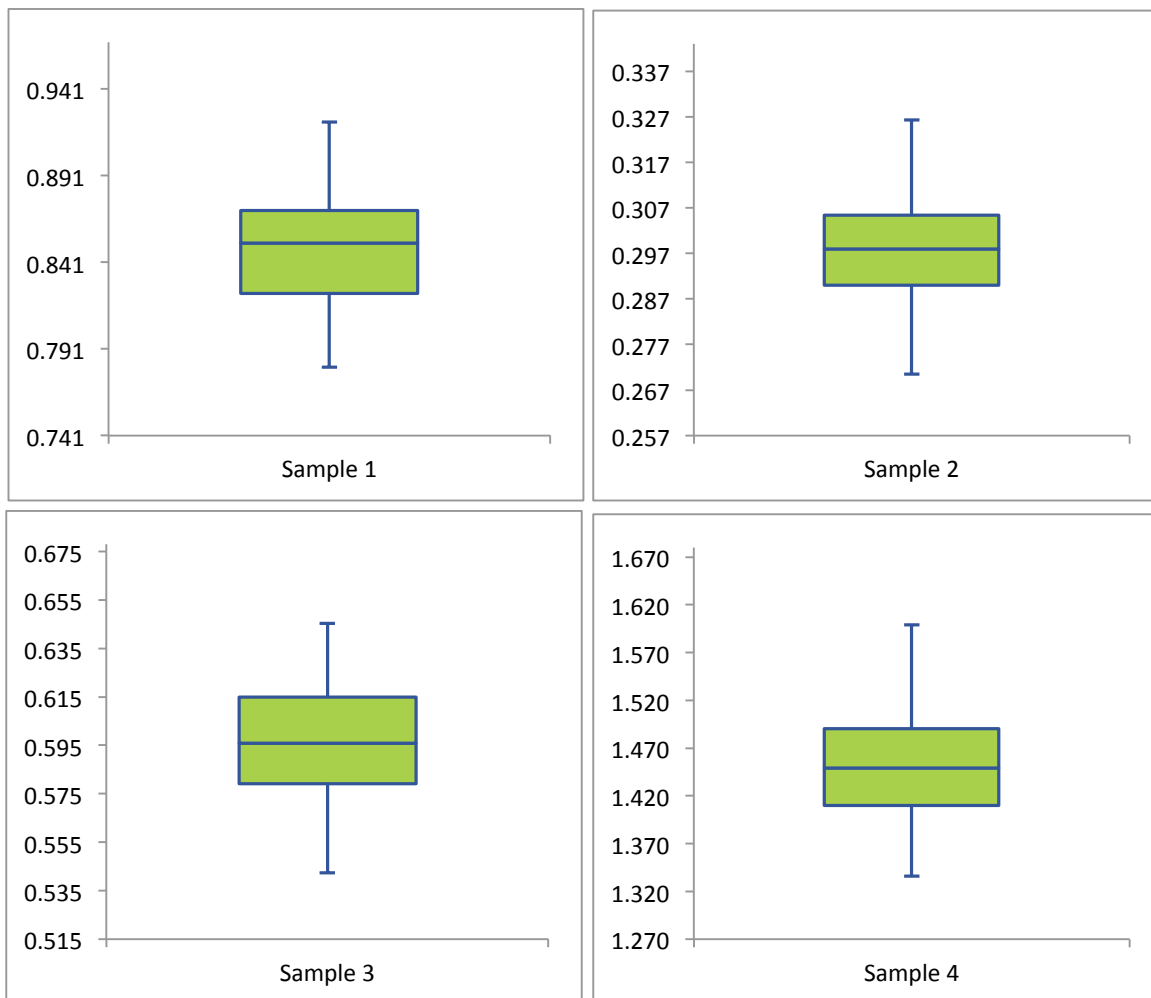


Reported results (Y-axis) plotted against bottling order (X-axis).

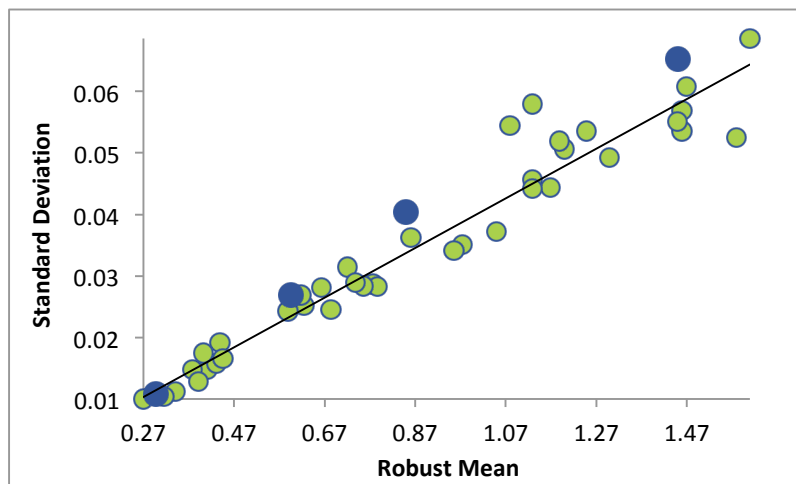


## COBALT

### Box and Whisker Plots



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



## COPPER

## Summary Statistics

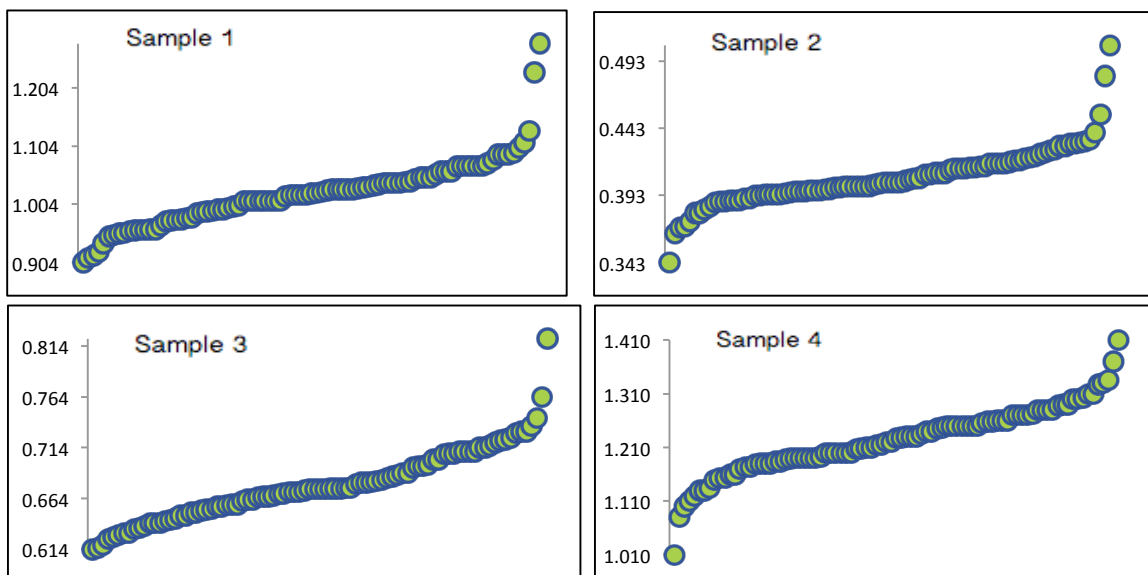
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	89	89	89	89
Median	1.02	0.403	0.673	1.23
Robust Mean	1.02	0.406	0.676	1.22
U	0.00664	0.00236	0.0046	0.0079
Robust Standard Deviation	0.0501	0.0178	0.0347	0.0596
Regression Standard Deviation	0.0765	0.0304	0.0507	0.0918
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0765	0.0304	0.0507	0.0918
Outliers	0	0	0	0
$ z  > 3.0$	1	1	0	0
$2 <  z  < 3$	1	2	1	2

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	52	52	52	52
ICP/OES (Red)	35	35	35	35
AA (Green)	2	2	2	2

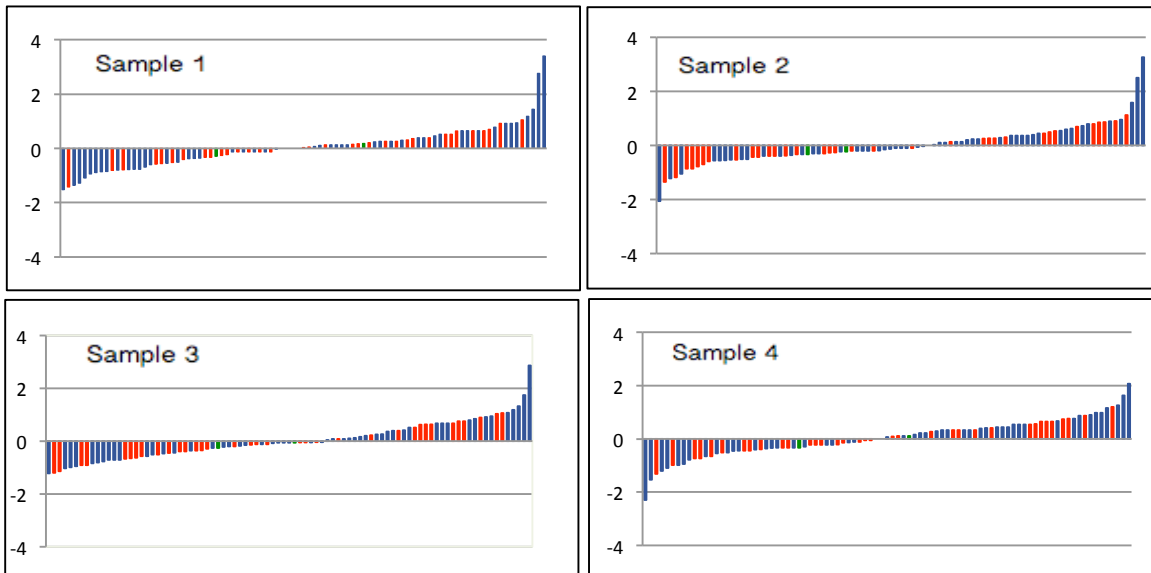
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

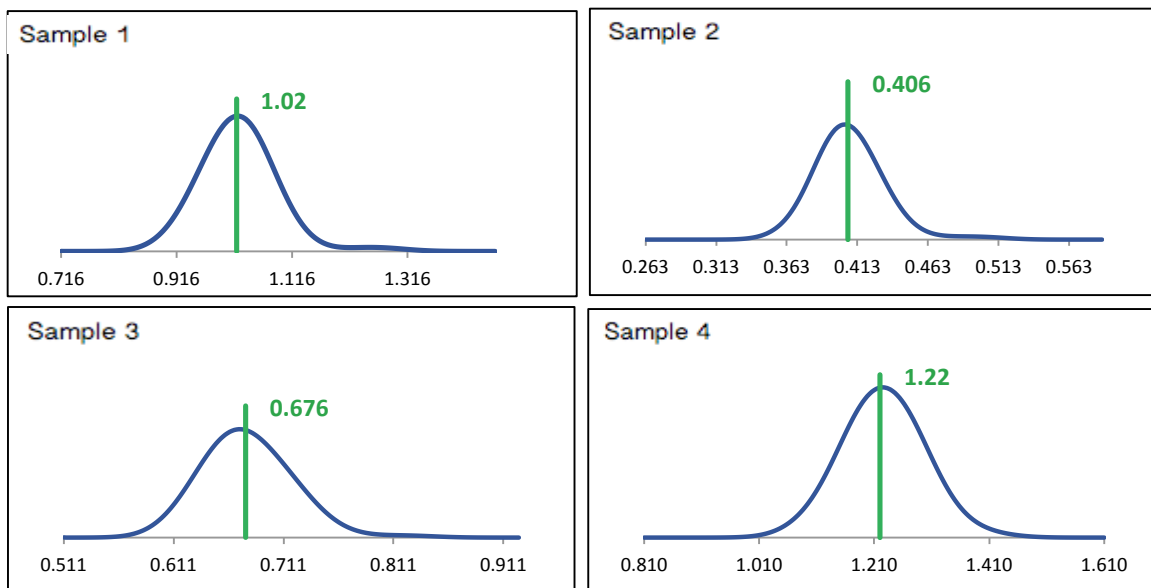


## COPPER

### z-Score Plots

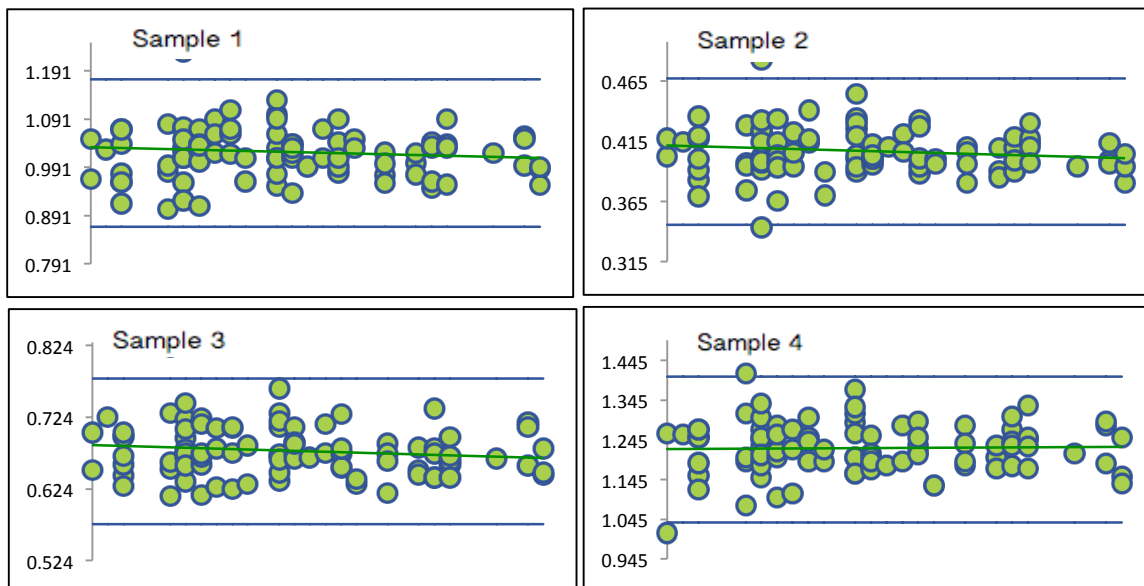


### Kernel Density Plots



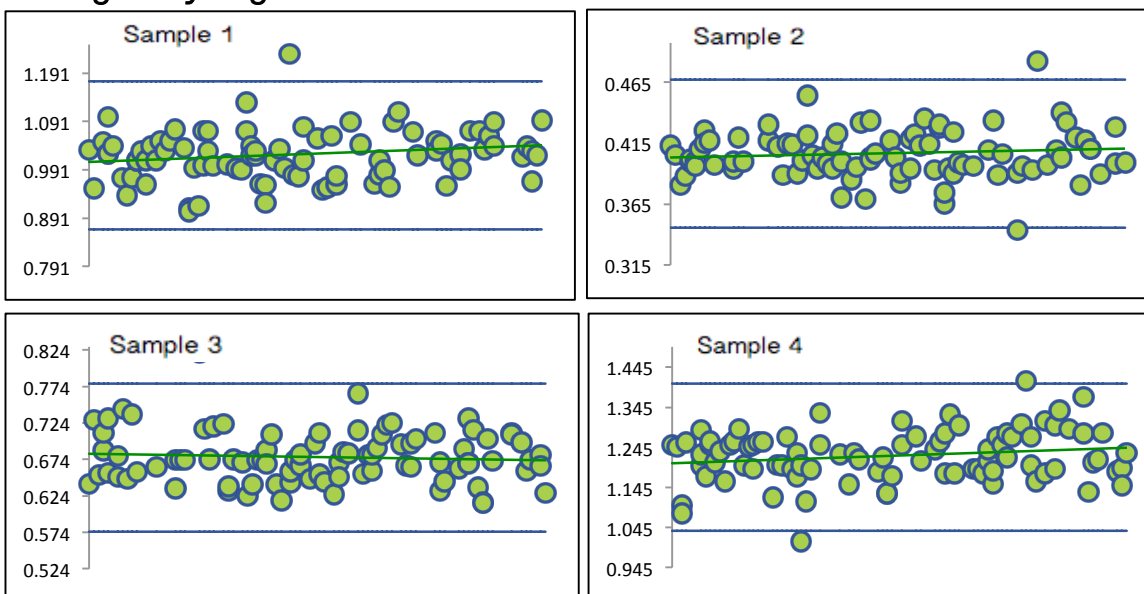
## COPPER

### Stability Regression



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

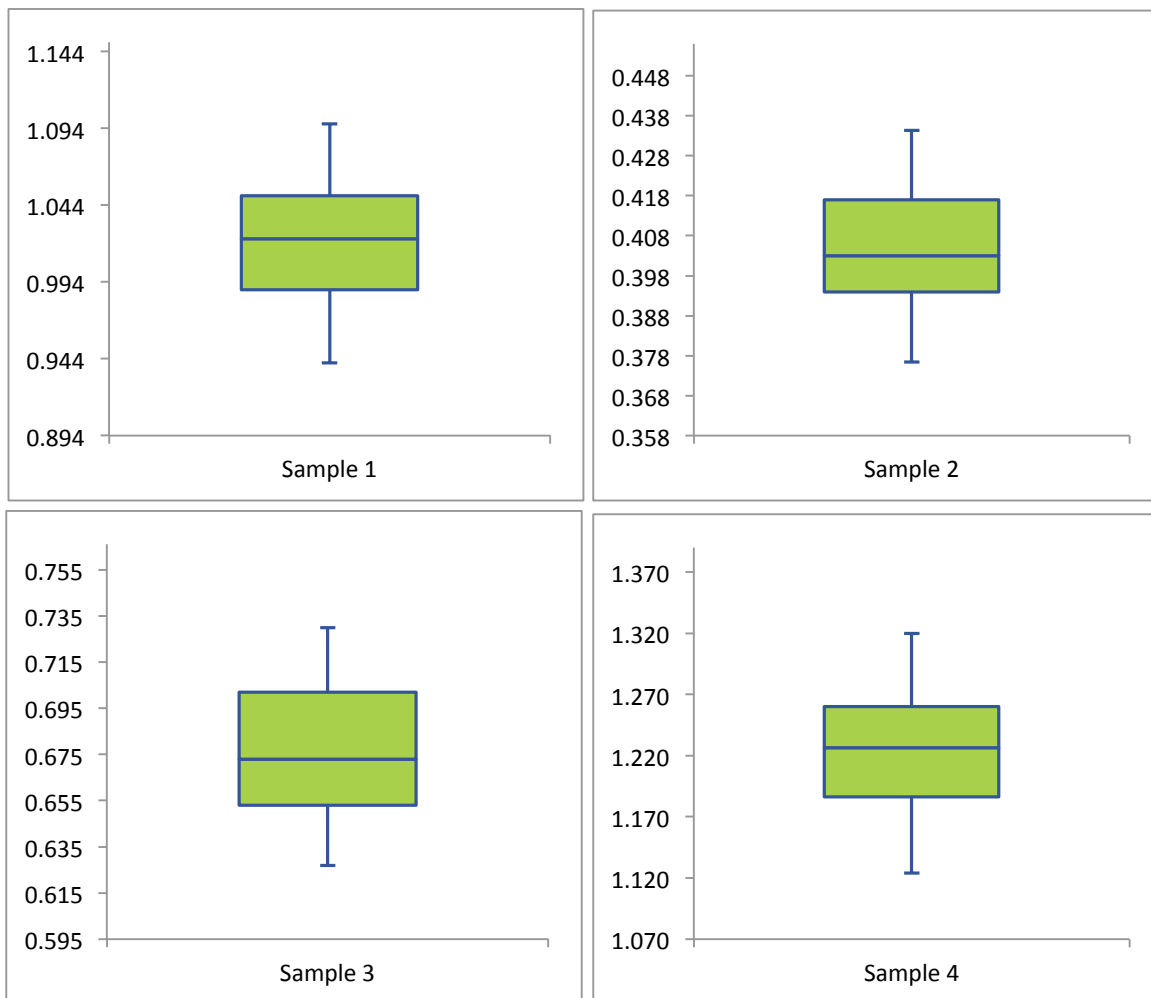
### Homogeneity Regression



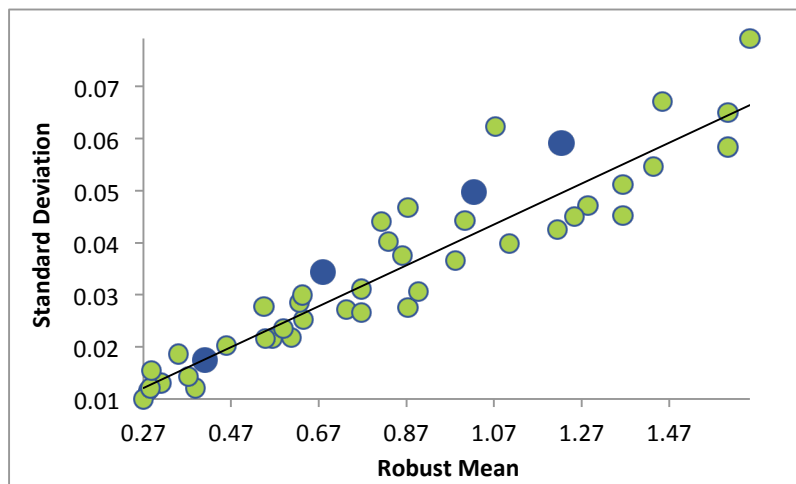
Reported results (Y-axis) plotted against bottling order (X-axis).

## COPPER

### Box and Whisker Plots



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



## IRON

## Summary Statistics

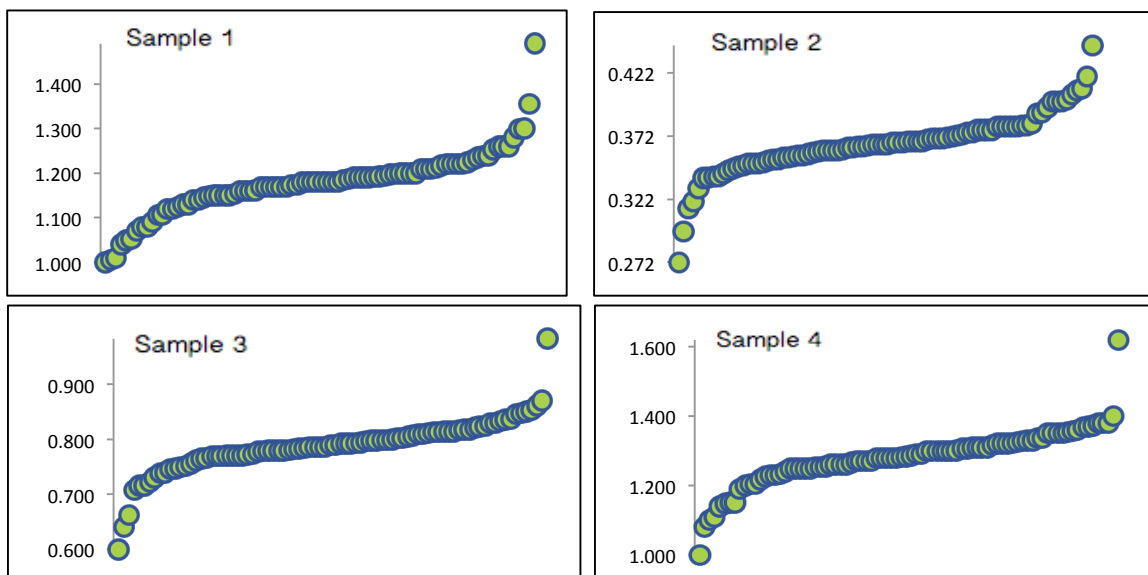
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	84	84	84	84
Median	1.18	0.366	0.790	1.29
Robust Mean	1.18	0.366	0.790	1.29
U	0.0075	0.00255	0.0049	0.00858
Robust Standard Deviation	0.0550	0.0187	0.0359	0.0629
Regression Standard Deviation	0.0883	0.0275	0.0592	0.0964
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0883	0.0275	0.0592	0.0964
Outliers	0	0	0	0
$ z  > 3.0$	1	1	2	2
$2 <  z  < 3$	1	2	2	1

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	44	44	44	44
ICP/OES (Red)	39	39	39	39
COLOR (Green)	1	1	1	1

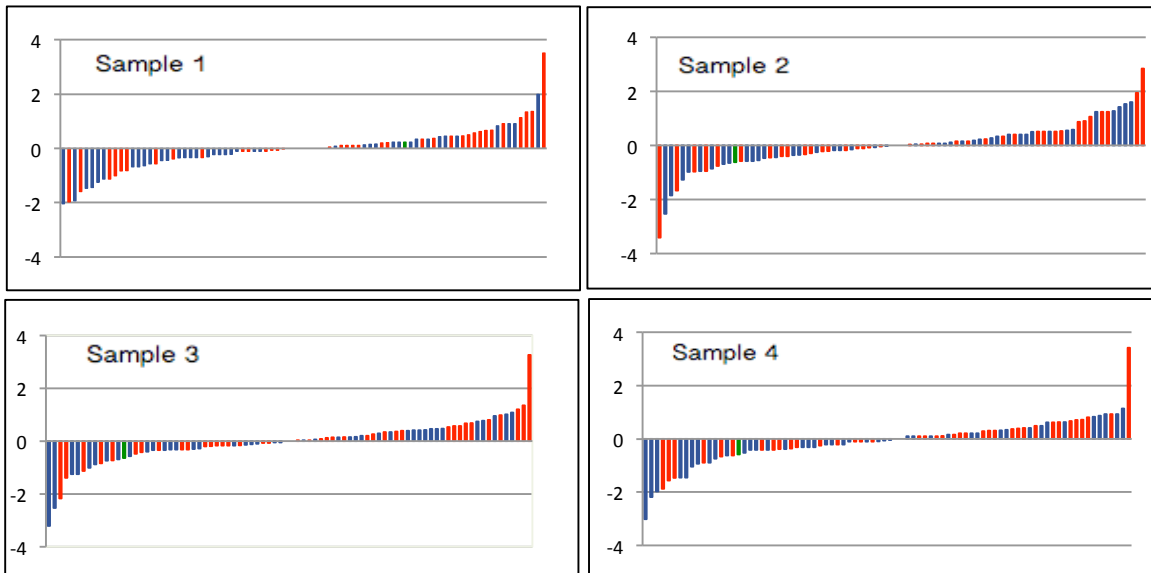
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

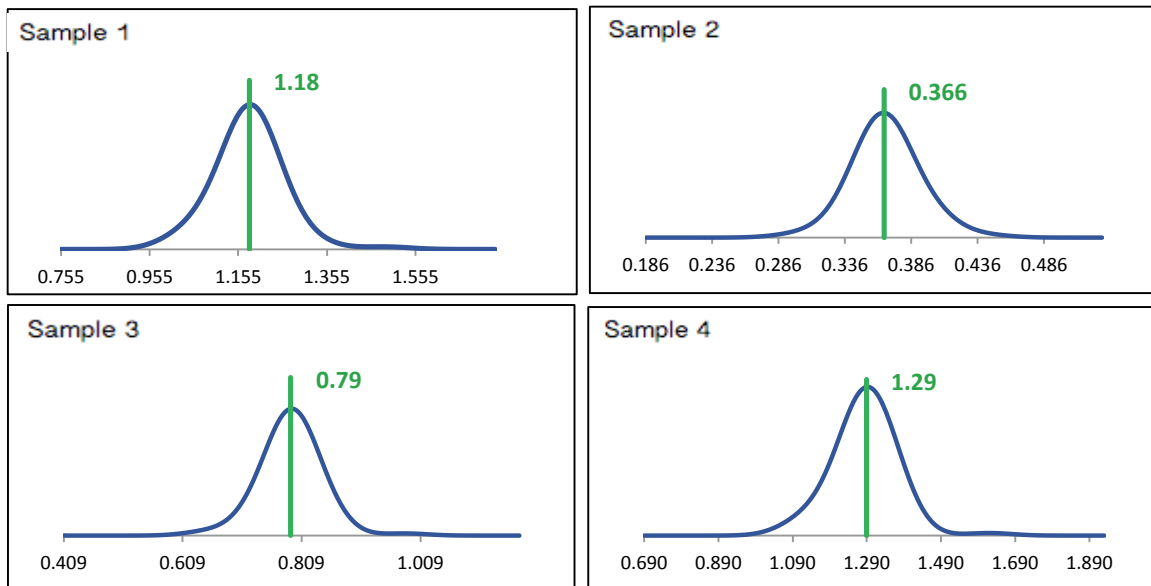


## IRON

### z-Score Plots

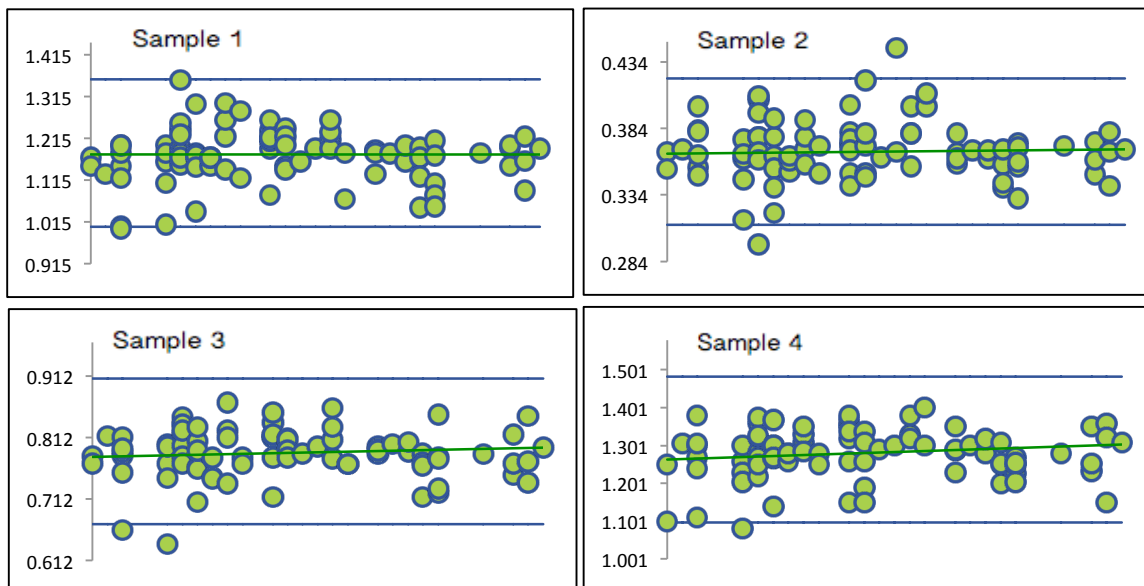


### Kernel Density Plots



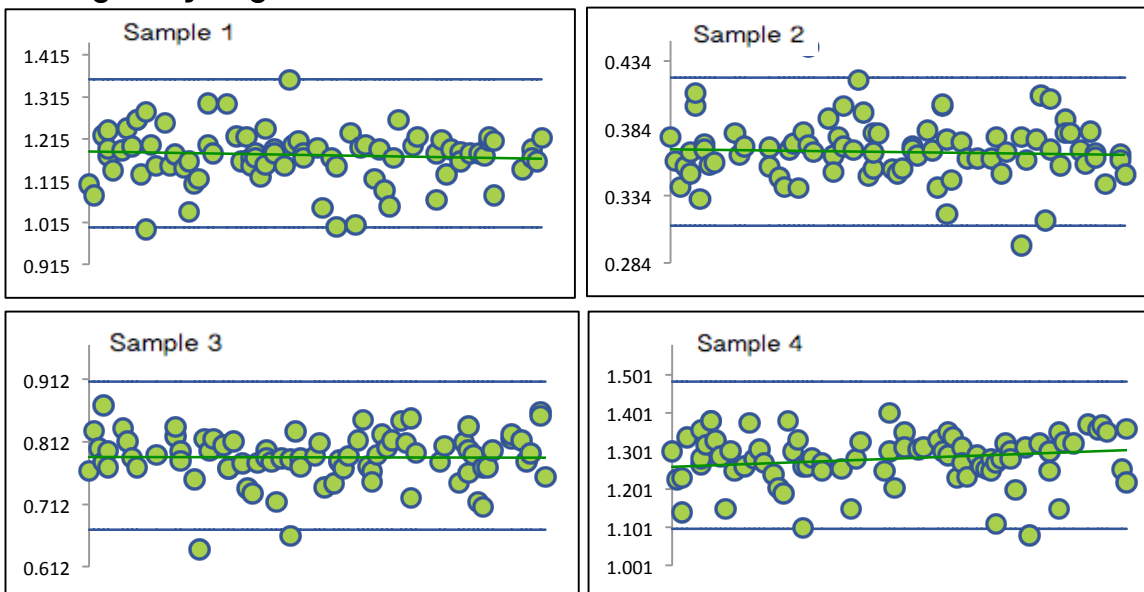
## IRON

### Stability Regression



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

### Homogeneity Regression

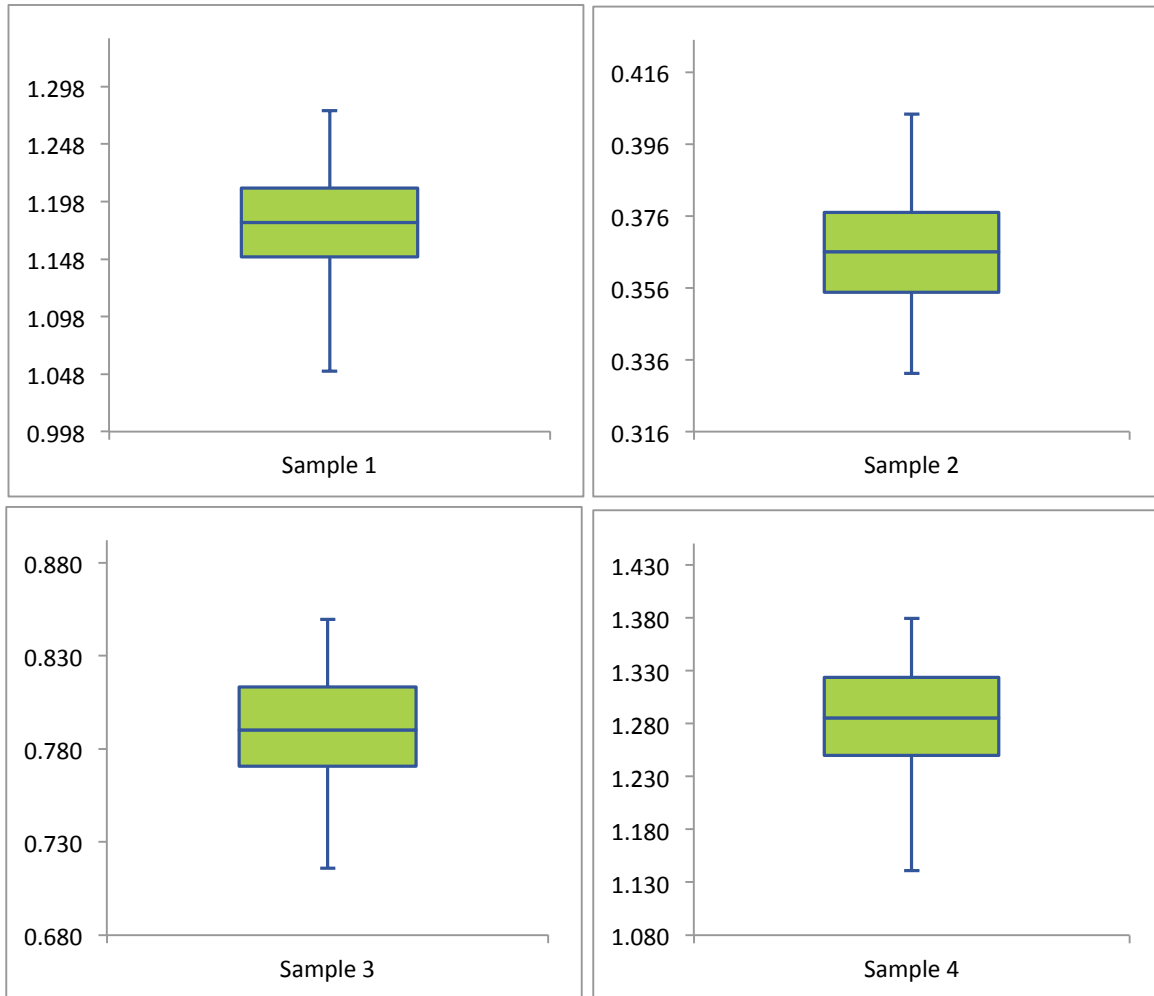


Reported results (Y-axis) plotted against bottling order (X-axis).

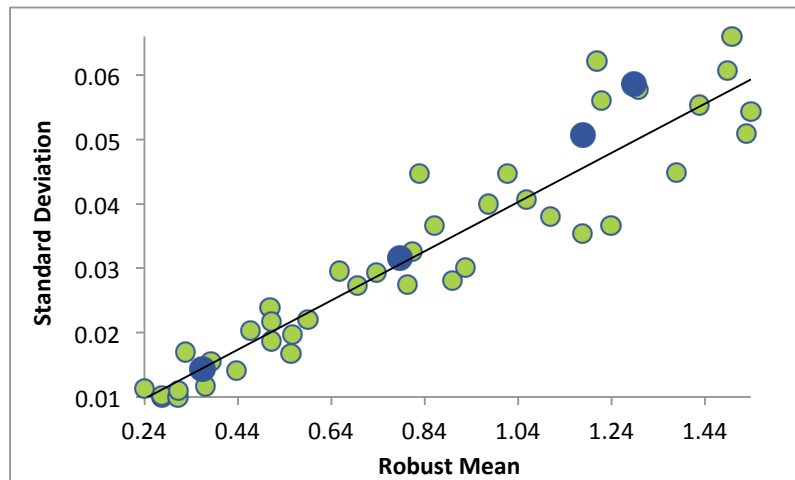


## IRON

### Box and Whisker Plots



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



## LEAD

## Summary Statistics

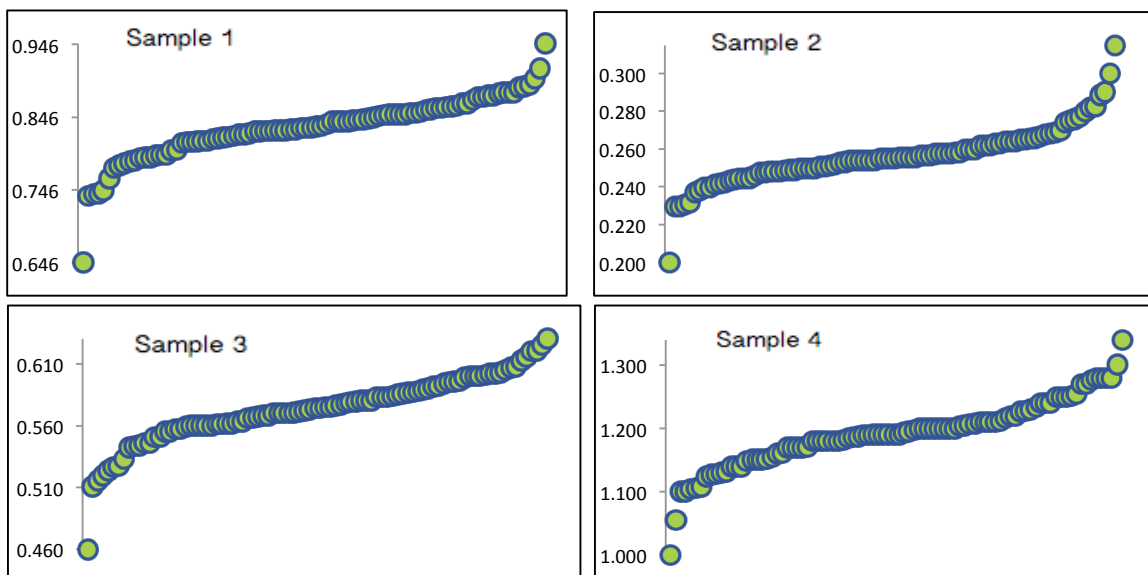
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	90	90	90	90
Median	0.832	0.255	0.574	1.19
Robust Mean	0.833	0.256	0.575	1.19
U	0.00482	0.00159	0.00321	0.00644
Robust Standard Deviation	0.0366	0.0121	0.0244	0.0489
Regression Standard Deviation	0.0625	0.0192	0.0431	0.0894
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0625	0.0192	0.0431	0.0894
Outliers	0	0	0	0
$ z  > 3.0$	0	1	0	0
$2 <  z  < 3$	1	2	1	1

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	54	54	54	54
ICP/OES (Red)	35	35	35	35
AA (Green)	1	1	1	1

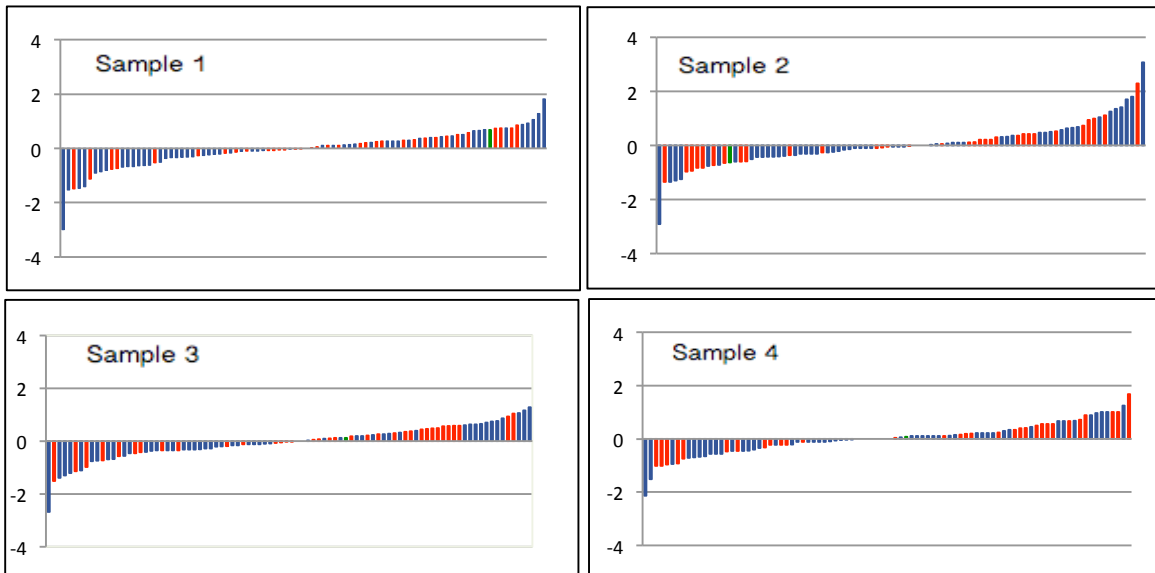
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

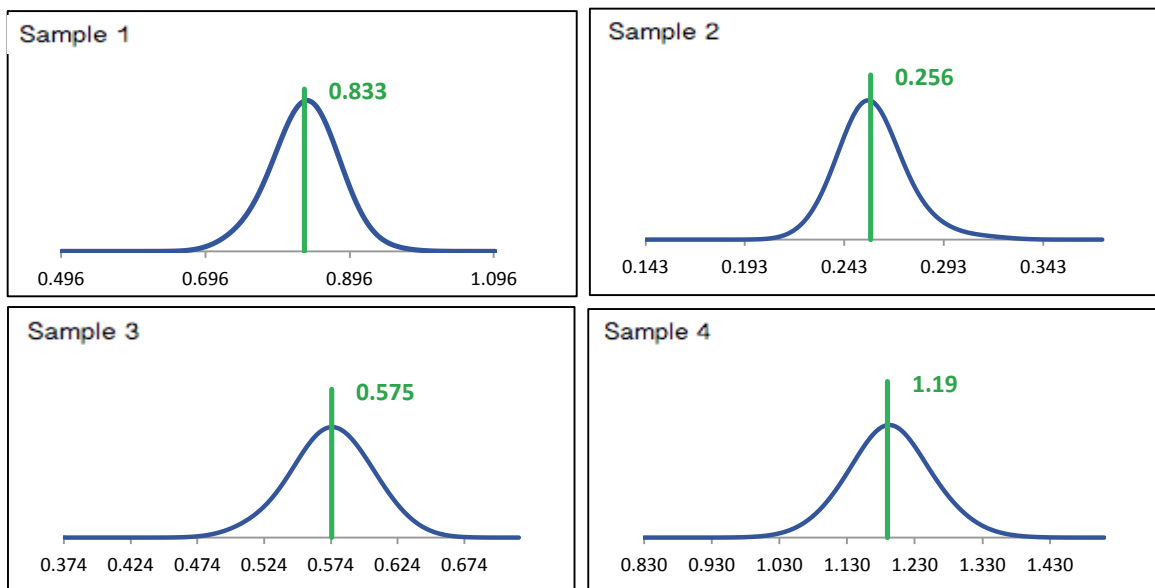


## LEAD

### z-Score Plots

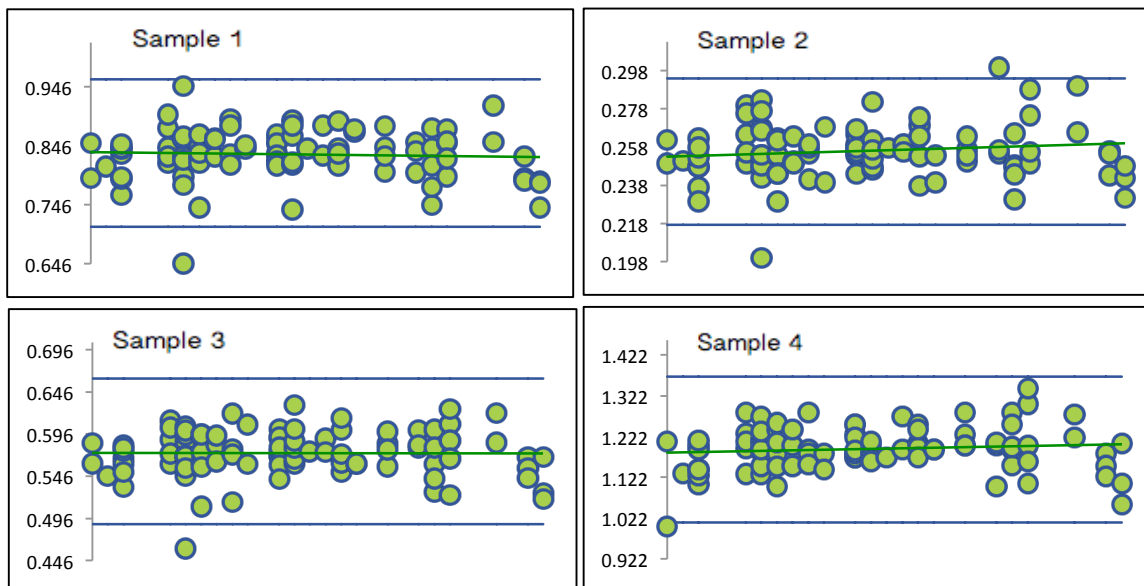


### Kernel Density Plots



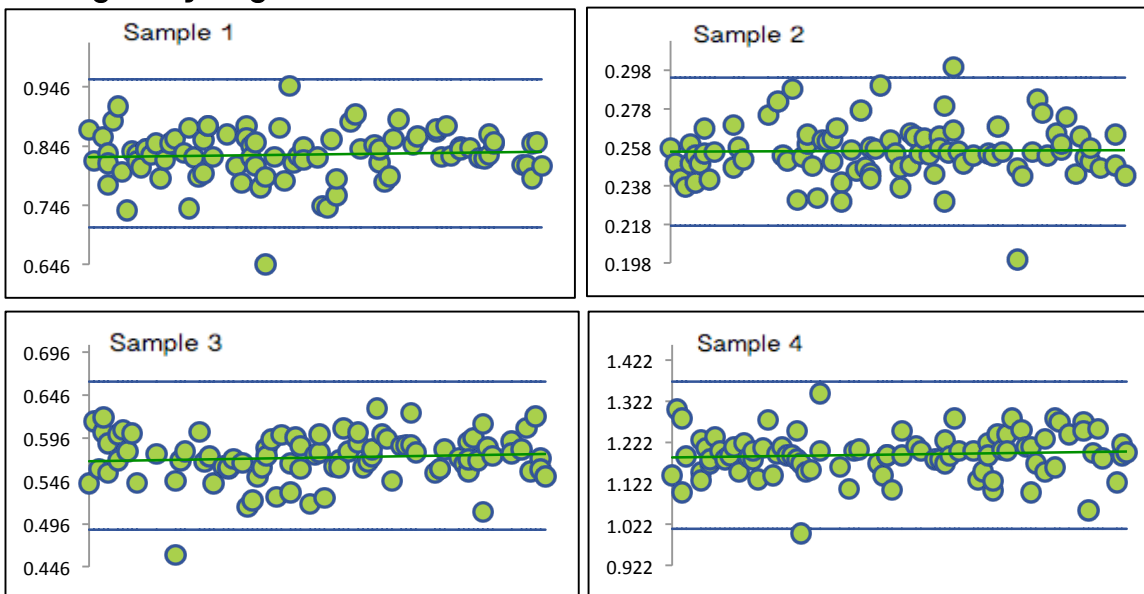
## LEAD

### Stability Regression



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

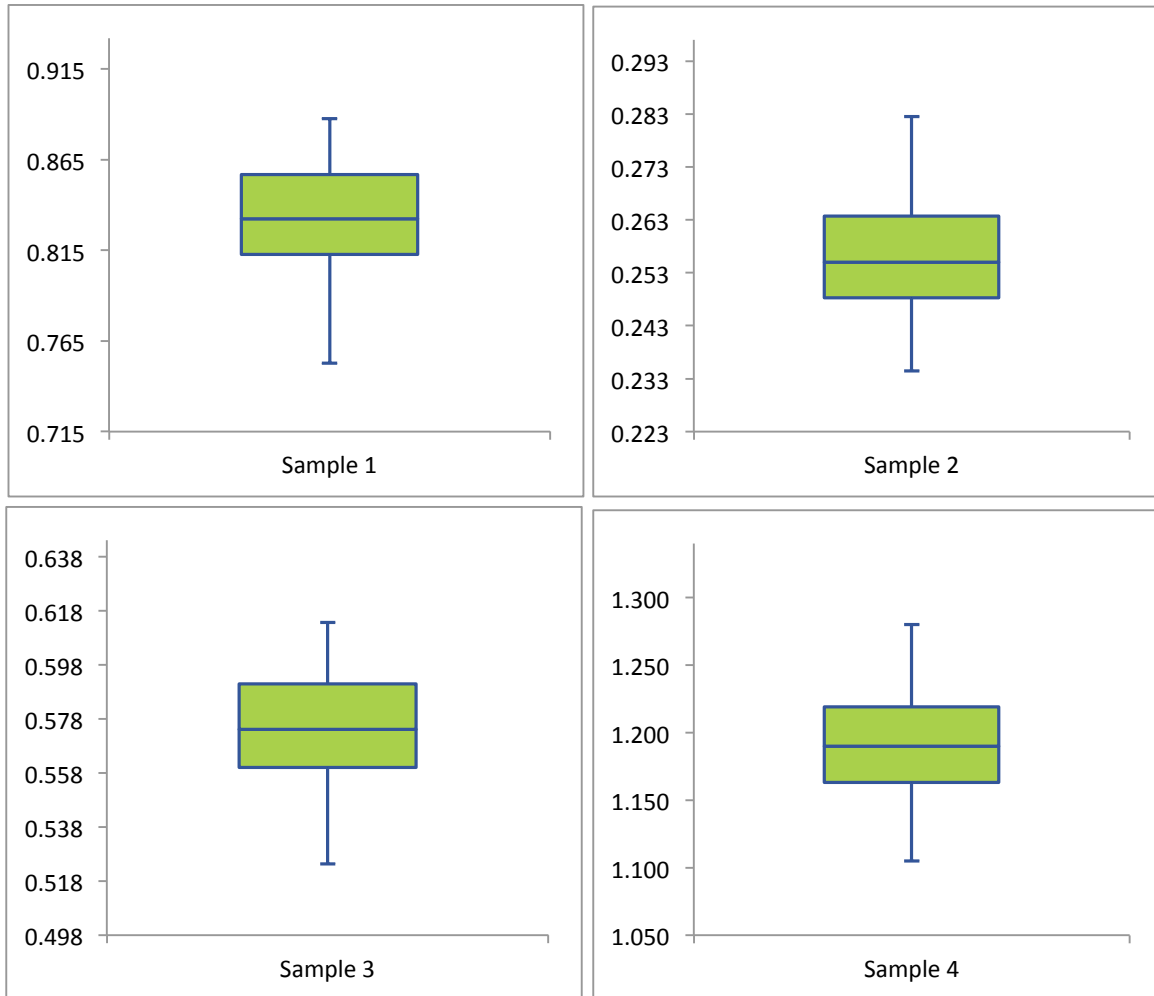
### Homogeneity Regression



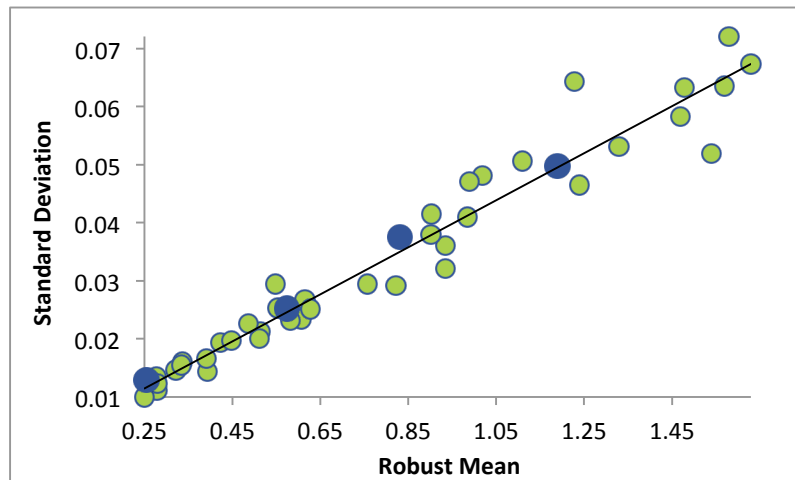
Reported results (Y-axis) plotted against bottling order (X-axis).

## LEAD

### Box and Whisker Plots



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



## MANGANESE

## Summary Statistics

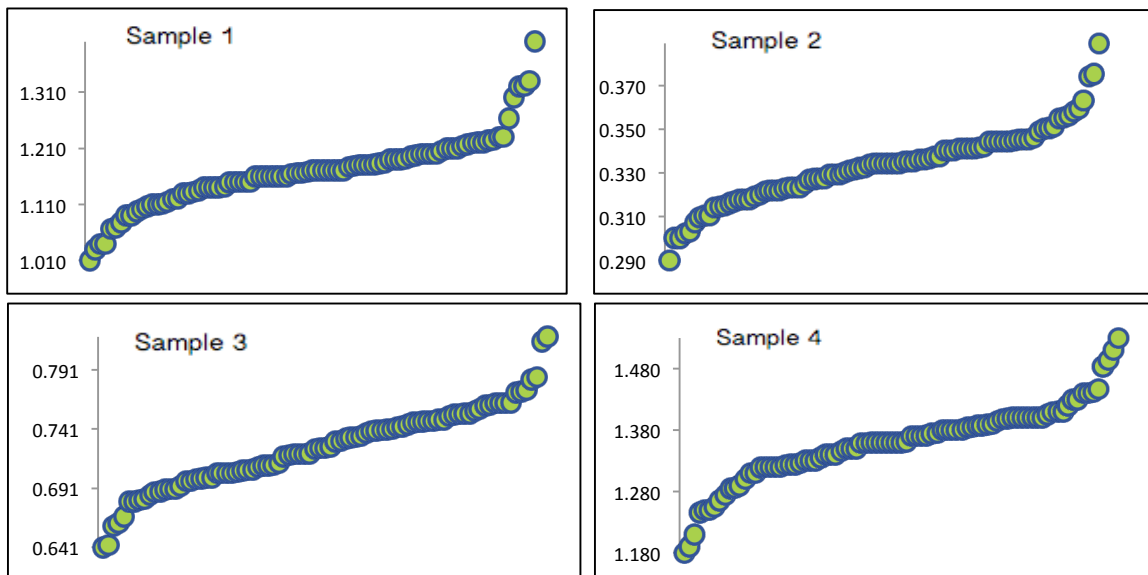
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	87	87	87	87
Median	1.17	0.334	0.725	1.36
Robust Mean	1.17	0.333	0.725	1.36
U	0.00677	0.00213	0.00453	0.00737
Robust Standard Deviation	0.0505	0.0159	0.0338	0.0550
Regression Standard Deviation	0.0874	0.0250	0.0544	0.102
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0874	0.0250	0.0544	0.102
Outliers	0	0	0	0
$ z  > 3.0$	0	0	0	0
$2 <  z  < 3$	1	1	0	0

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	48	48	48	48
ICP/OES (Red)	39	39	39	39

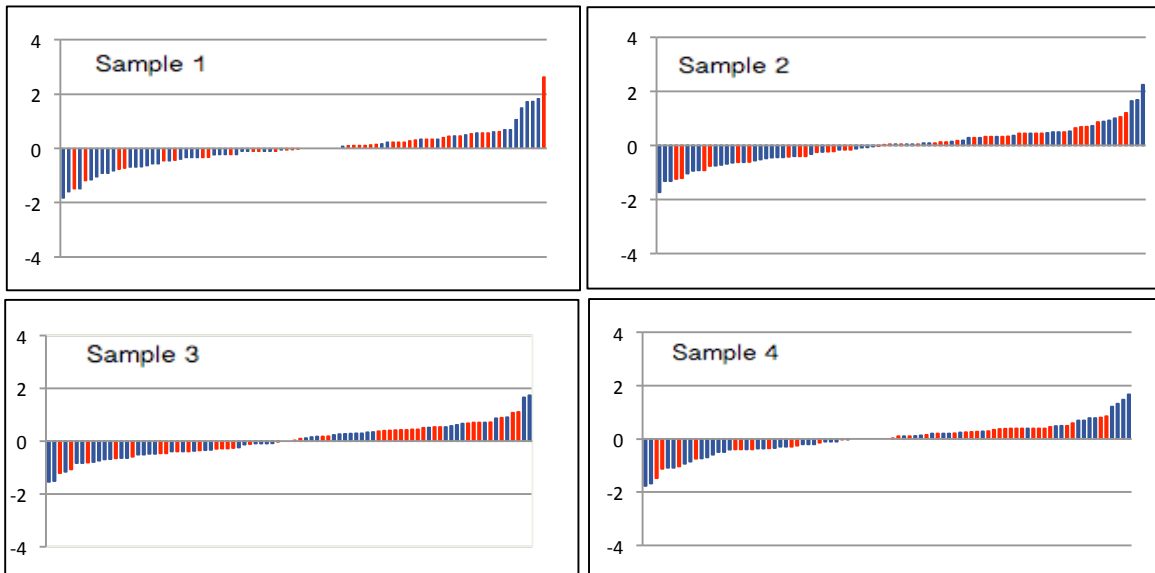
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

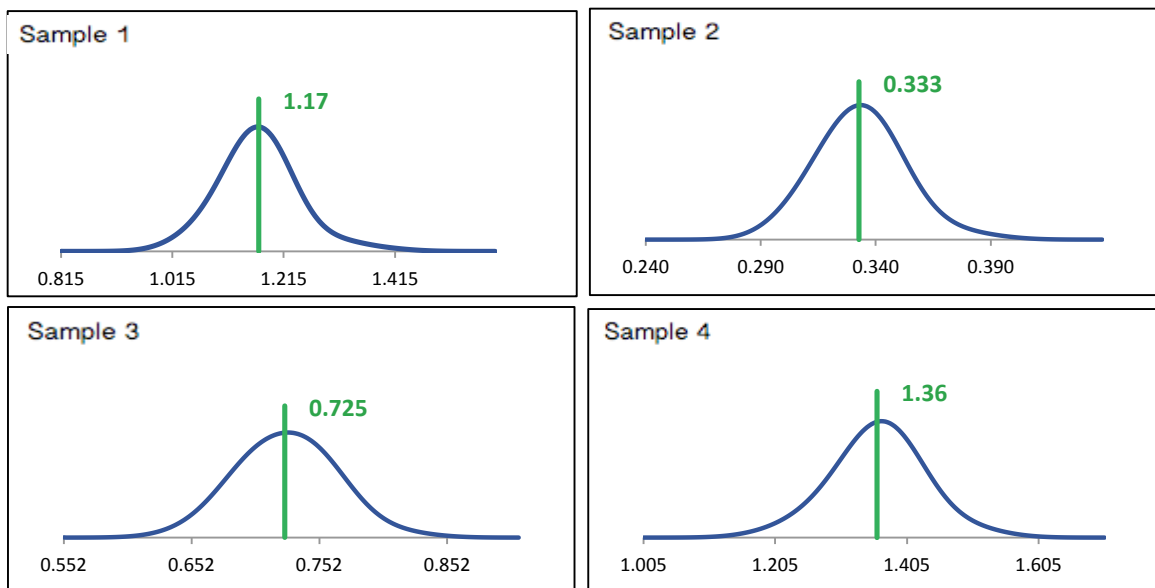


## MANGANESE

### z-Score Plots

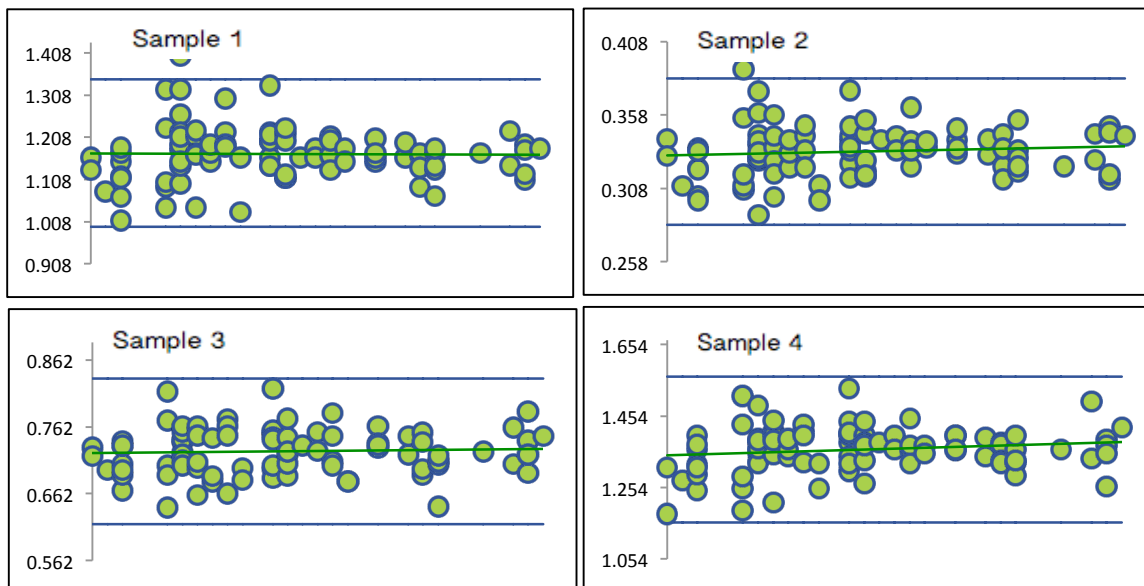


### Kernel Density Plots



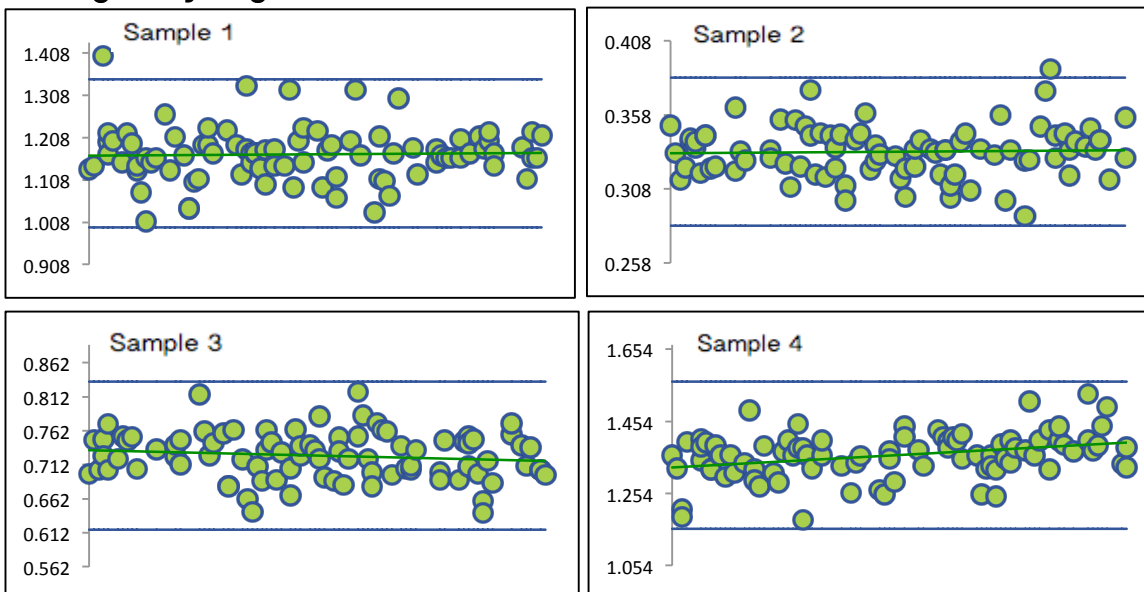
## MANGANESE

### Stability Regression



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

### Homogeneity Regression

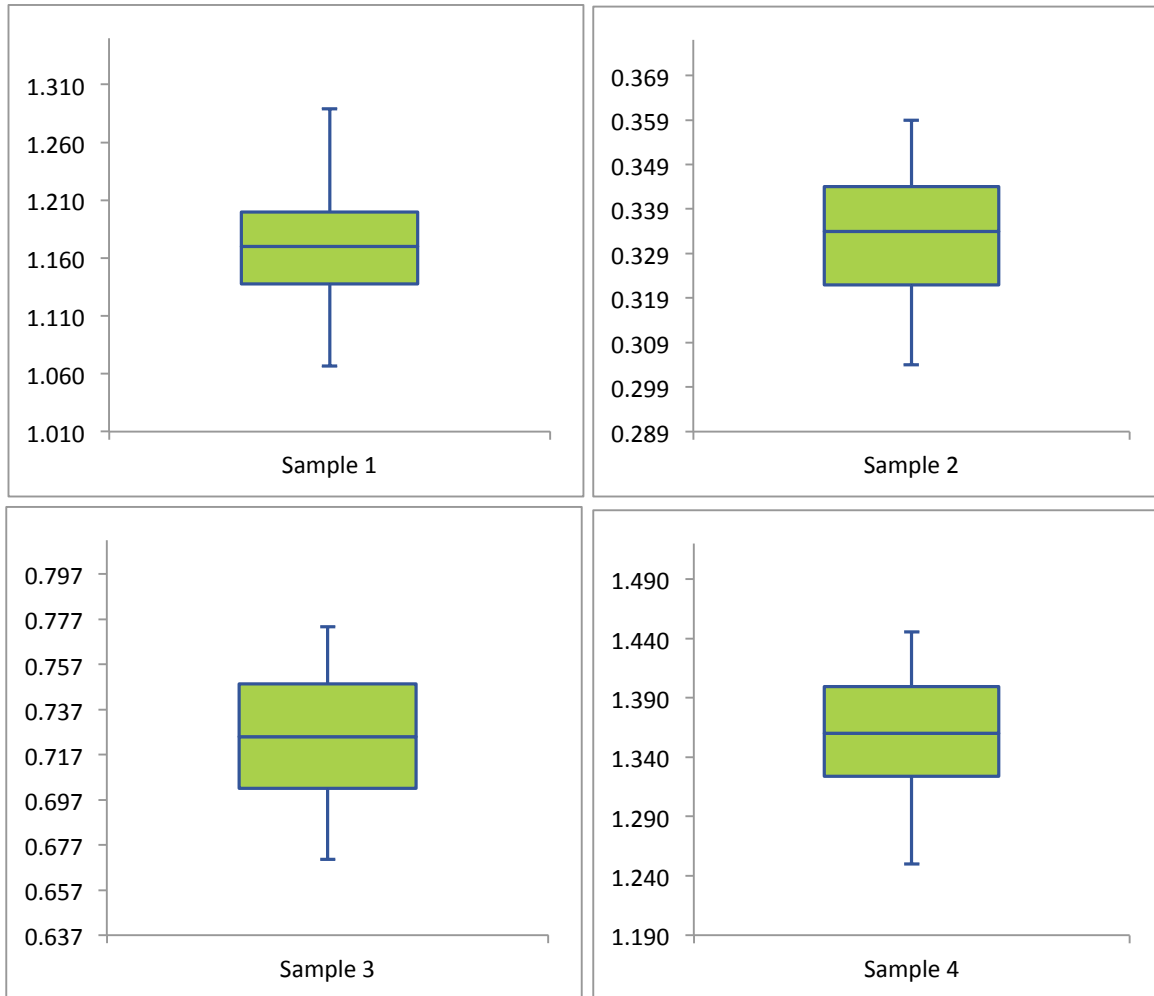


Reported results (Y-axis) plotted against bottling order (X-axis).

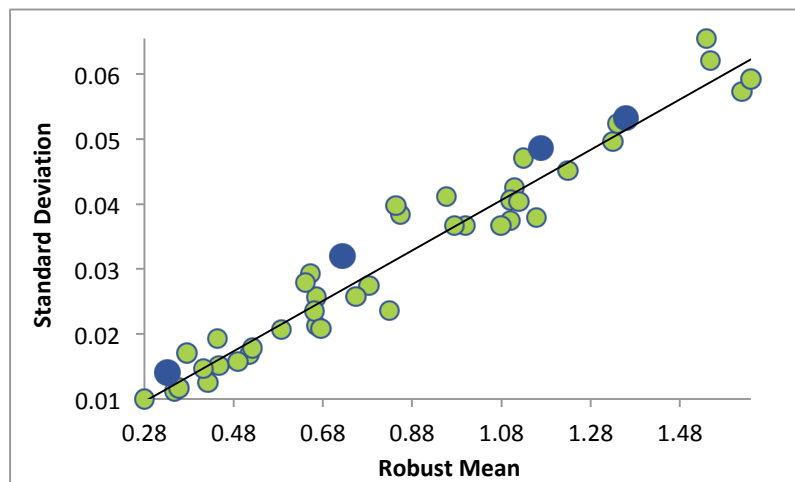


## MANGANESE

### Box and Whisker Plots



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



## MOLYBDENUM

## Summary Statistics

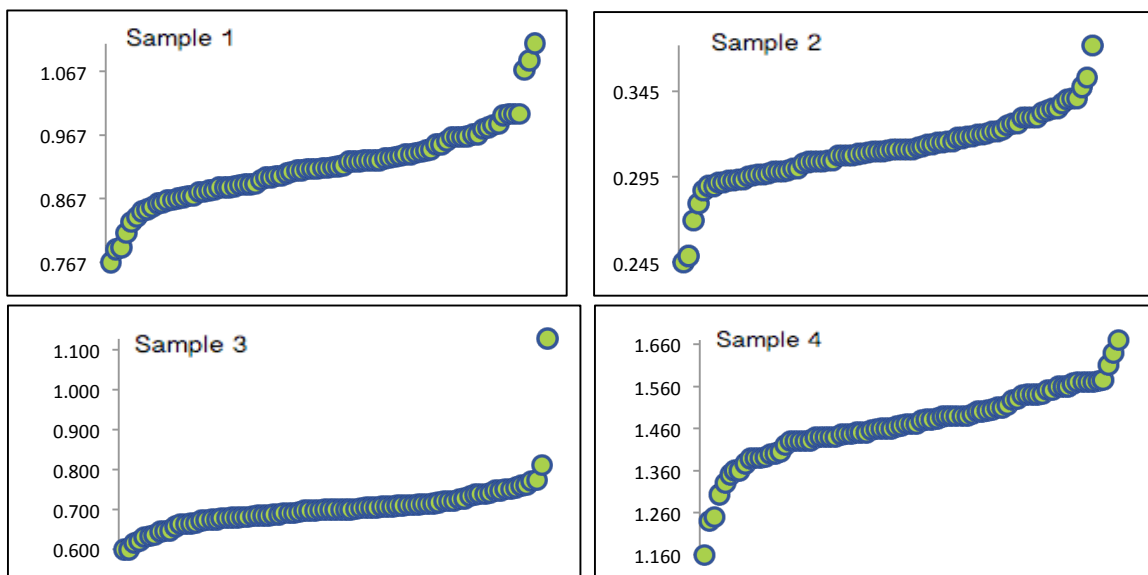
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	83	83	83	83
Median	0.915	0.310	0.700	1.47
Robust Mean	0.915	0.311	0.699	1.47
U	0.00692	0.00231	0.00506	0.0102
Robust Standard Deviation	0.0504	0.0168	0.0369	0.0741
Regression Standard Deviation	0.0686	0.0233	0.0524	0.111
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0686	0.0233	0.0524	0.111
Outliers	0	0	0	0
$ z  > 3.0$	0	0	1	0
$2 <  z  < 3$	4	3	1	2

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	50	50	50	50
ICP/OES (Red)	33	33	33	33

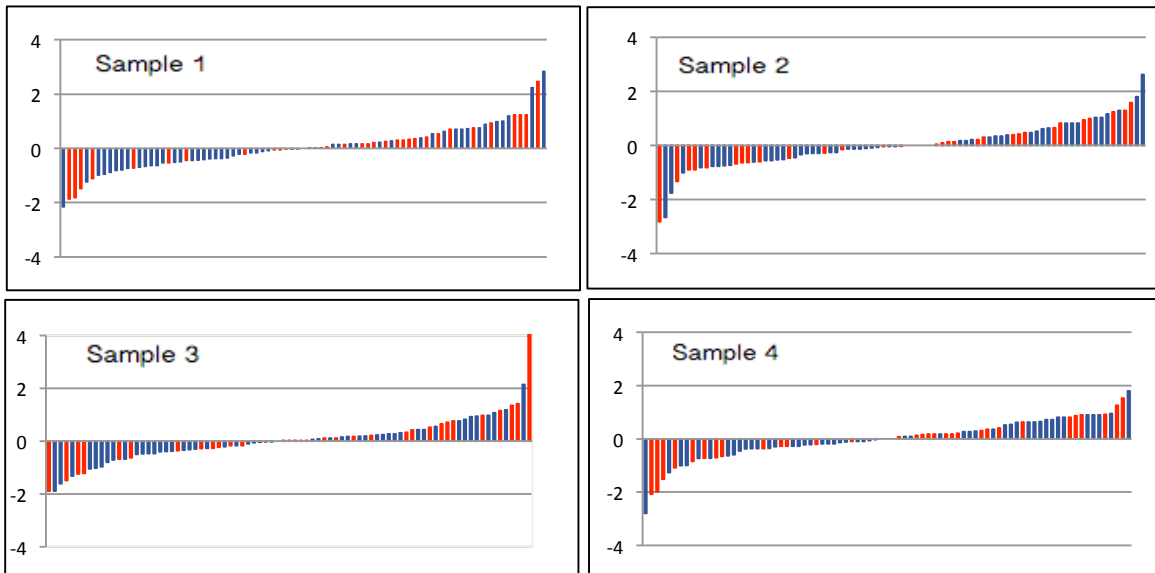
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

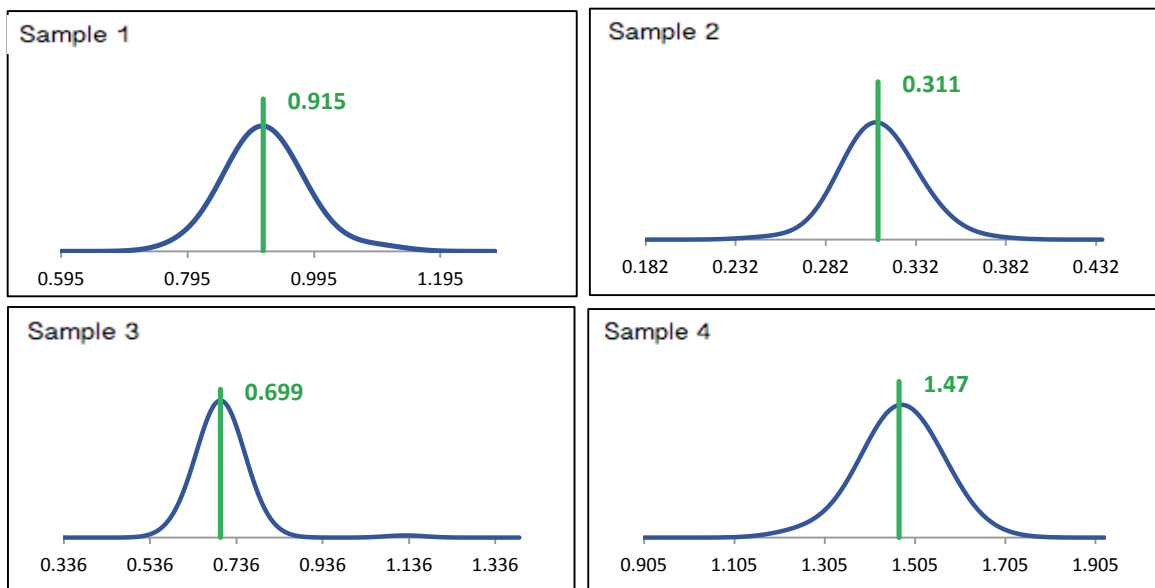


## MOLYBDENUM

### z-Score Plots

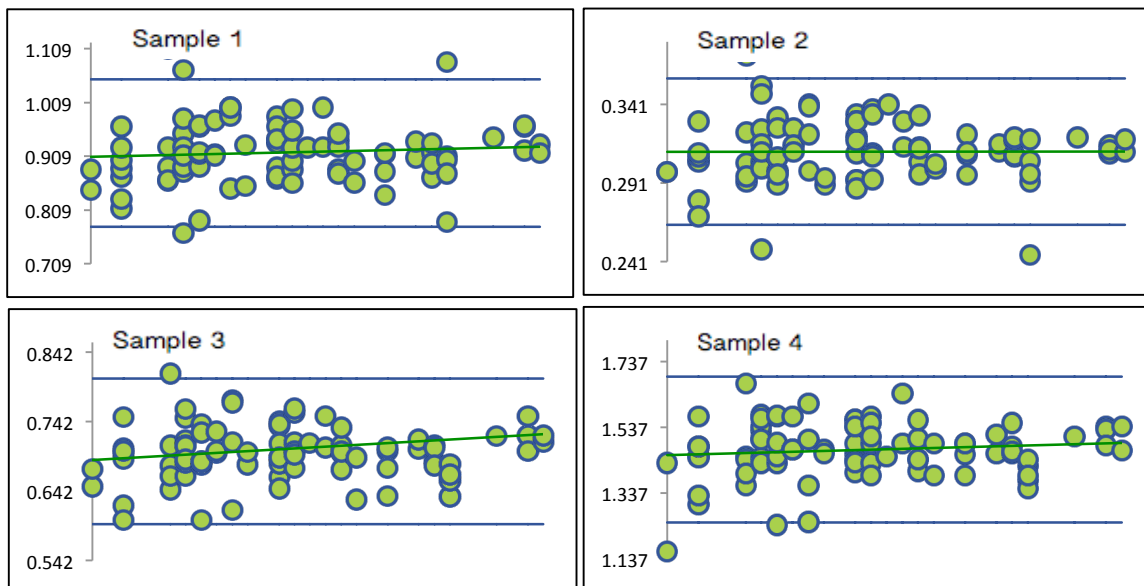


### Kernel Density Plots



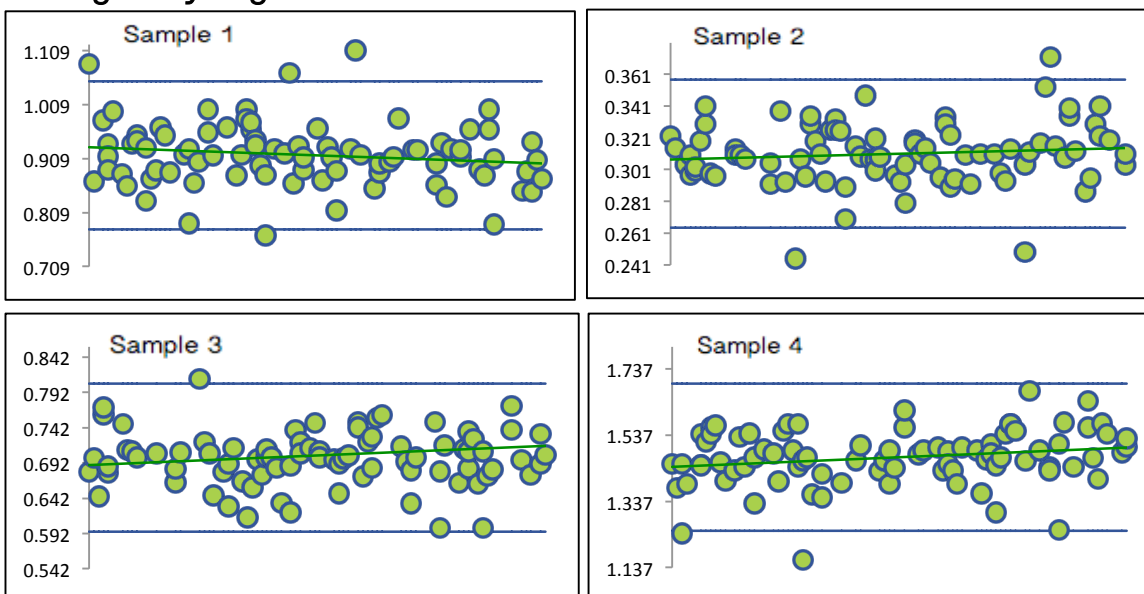
## MOLYBDENUM

### Stability Regression



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

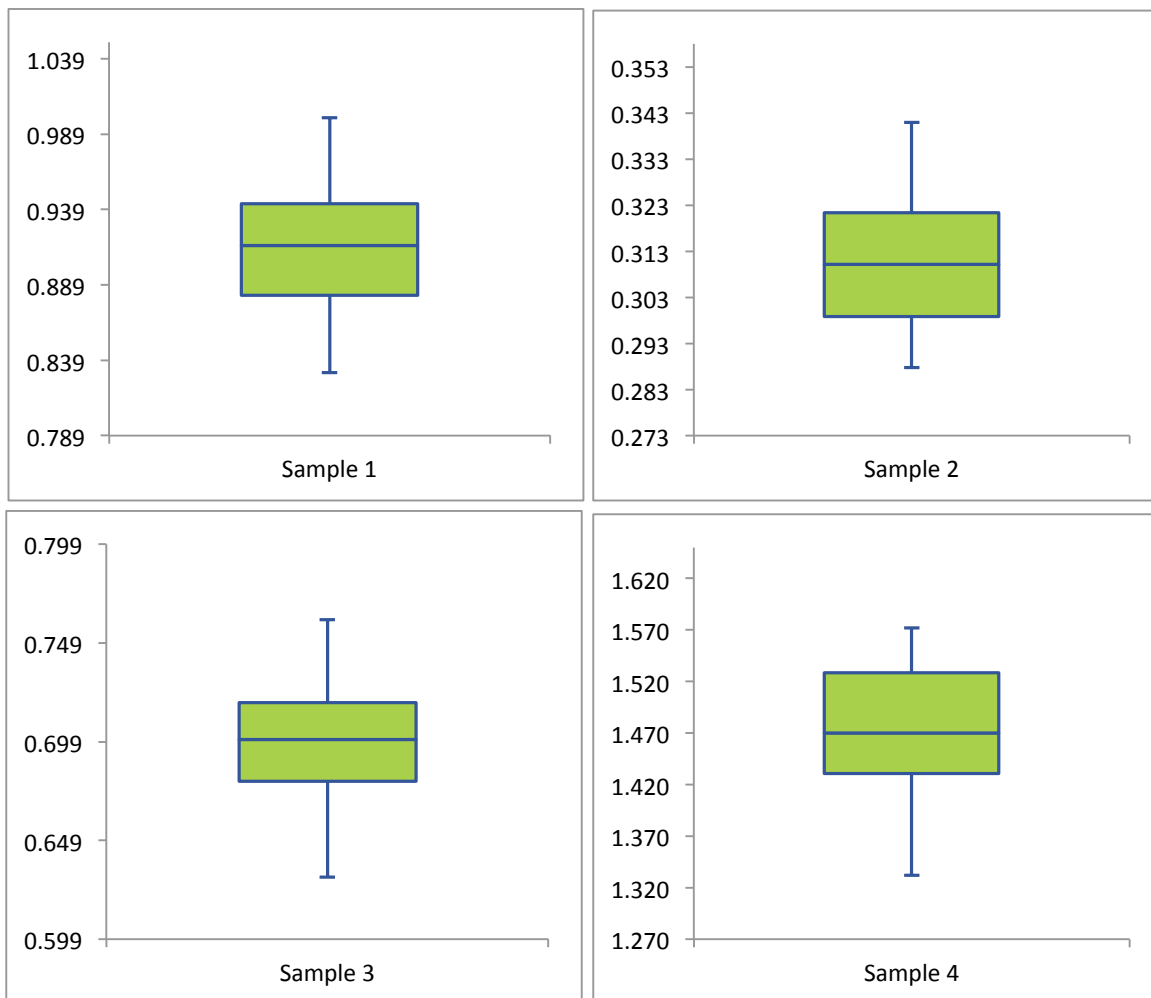
### Homogeneity Regression



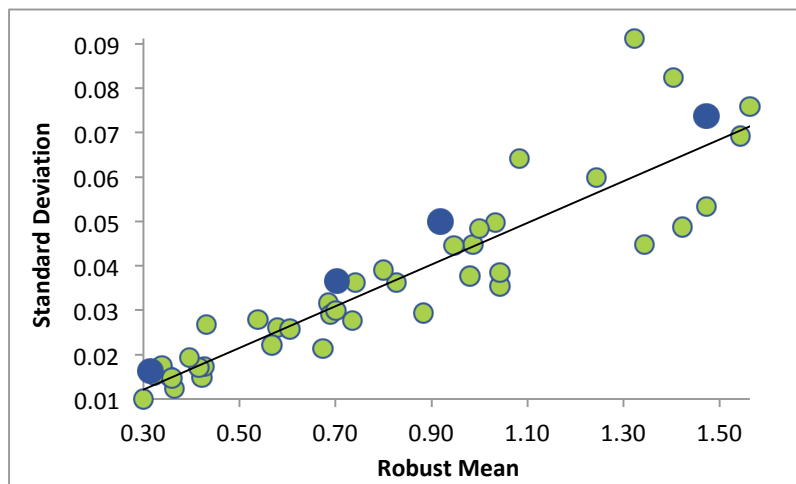
Reported results (Y-axis) plotted against bottling order (X-axis).

## MOLYBDENUM

### Box and Whisker Plots



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



## NICKEL

## Summary Statistics

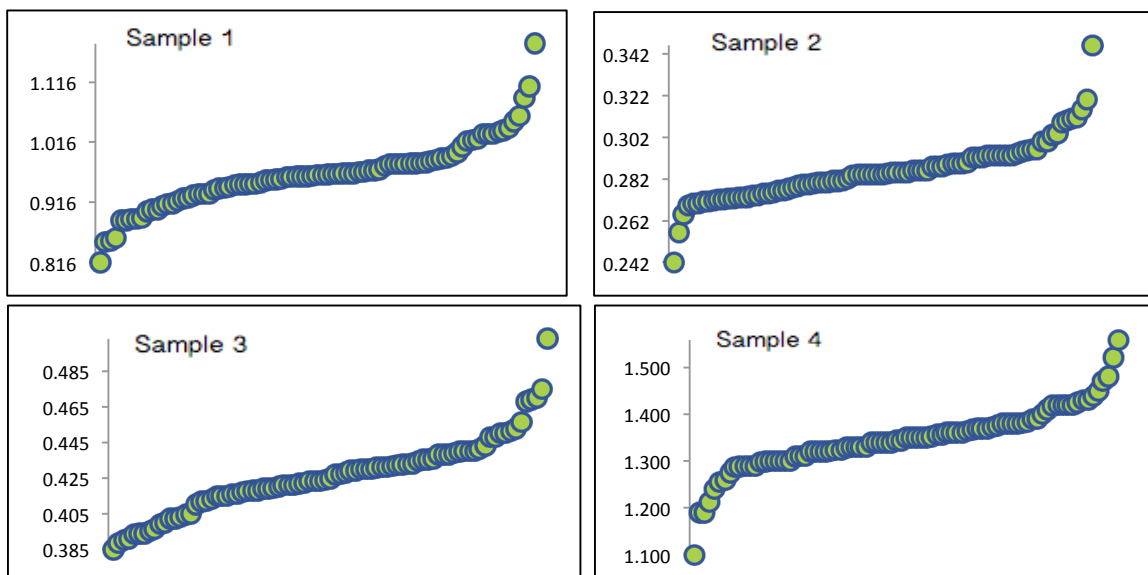
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	85	85	85	85
Median	0.961	0.284	0.425	1.35
Robust Mean	0.961	0.285	0.425	1.35
U	0.00663	0.00155	0.00266	0.0077
Robust Standard Deviation	0.0489	0.0114	0.0196	0.0568
Regression Standard Deviation	0.0721	0.0213	0.0319	0.101
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0721	0.0213	0.0319	0.101
Outliers	0	0	0	0
$ z  > 3.0$	1	0	0	0
$2 <  z  < 3$	2	2	1	2

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	51	51	51	51
ICP/OES (Red)	32	32	32	32
AA (Green)	2	2	2	2

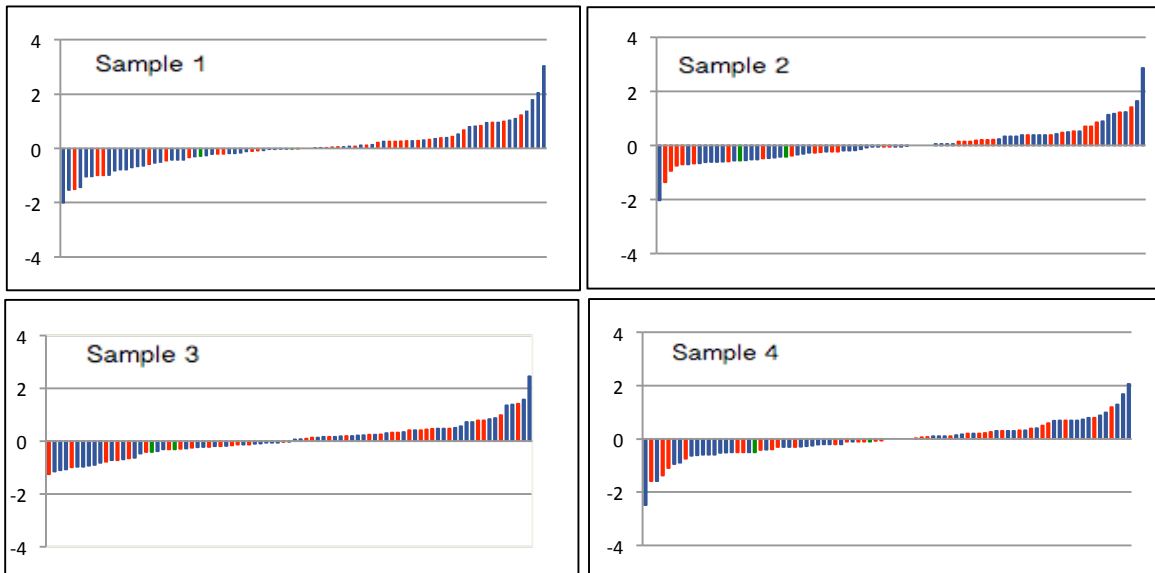
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

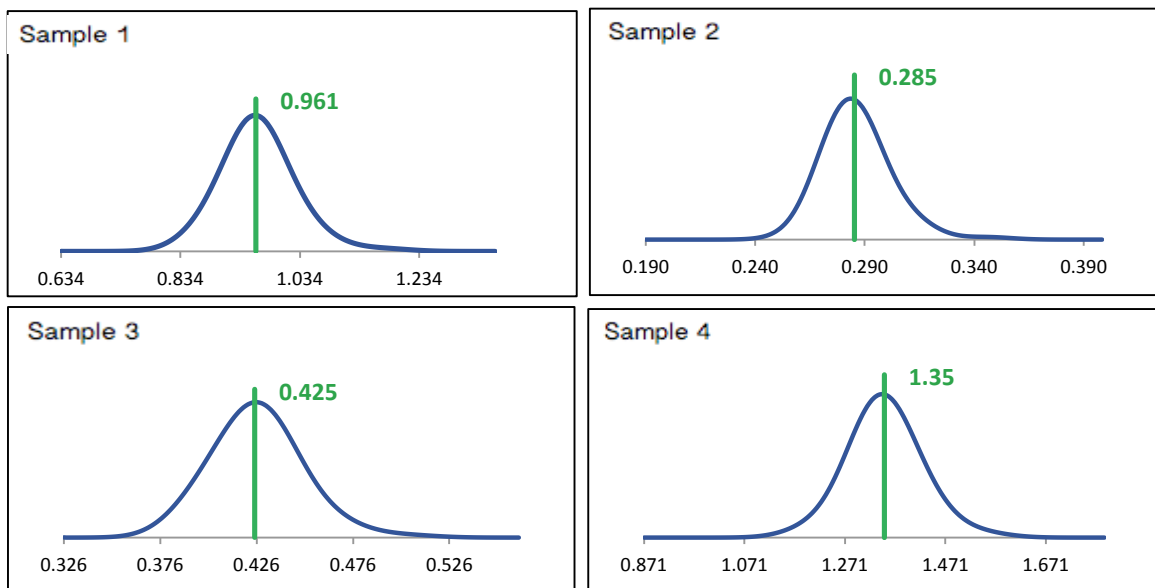


## NICKEL

### z-Score Plots

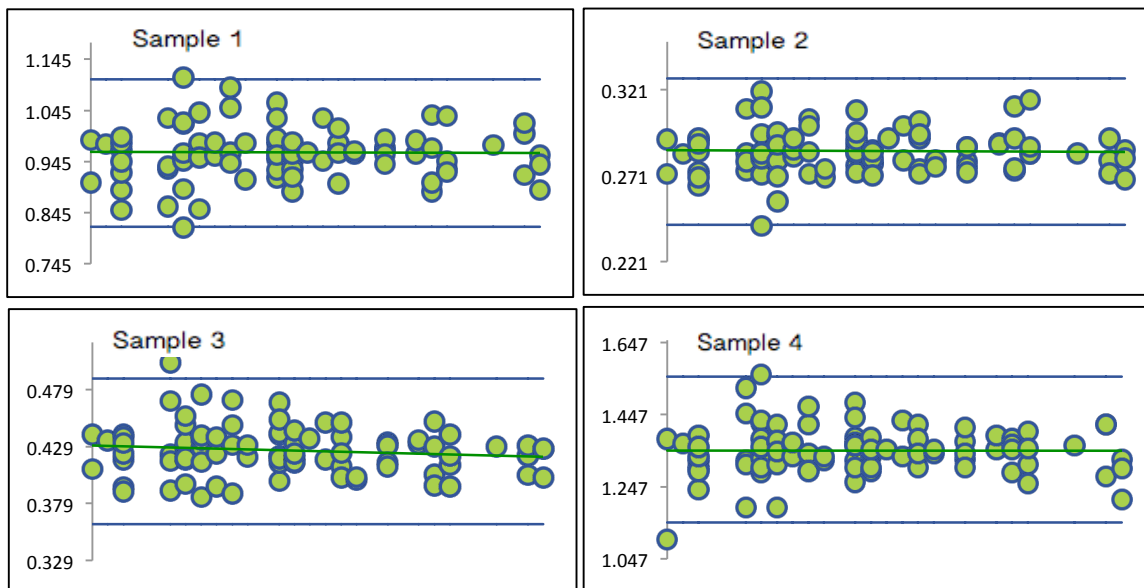


### Kernel Density Plots



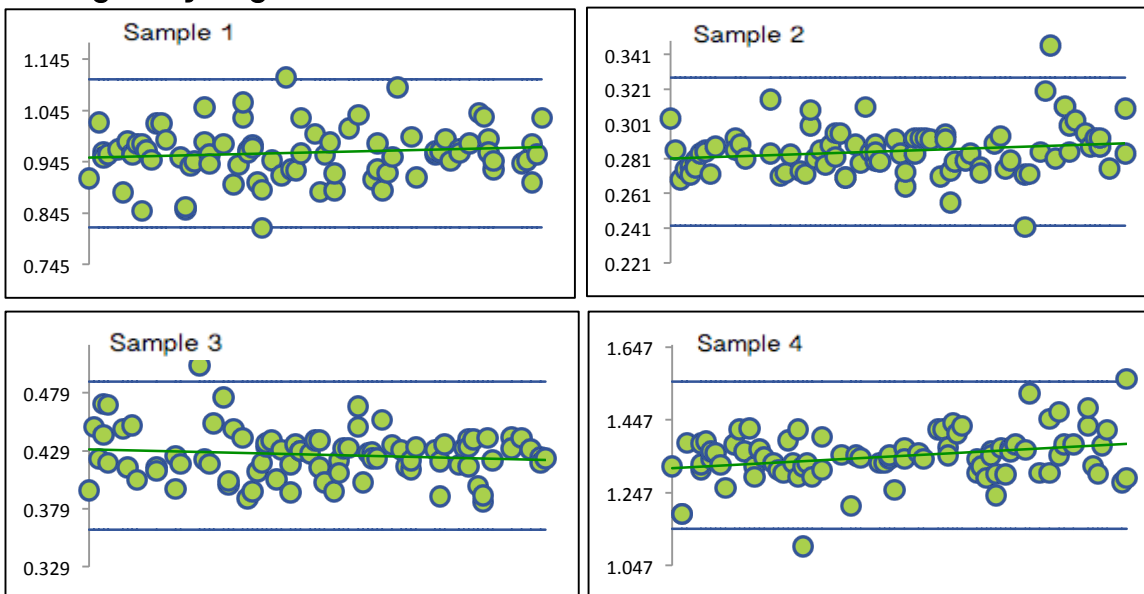
## NICKEL

### Stability Regression



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

### Homogeneity Regression

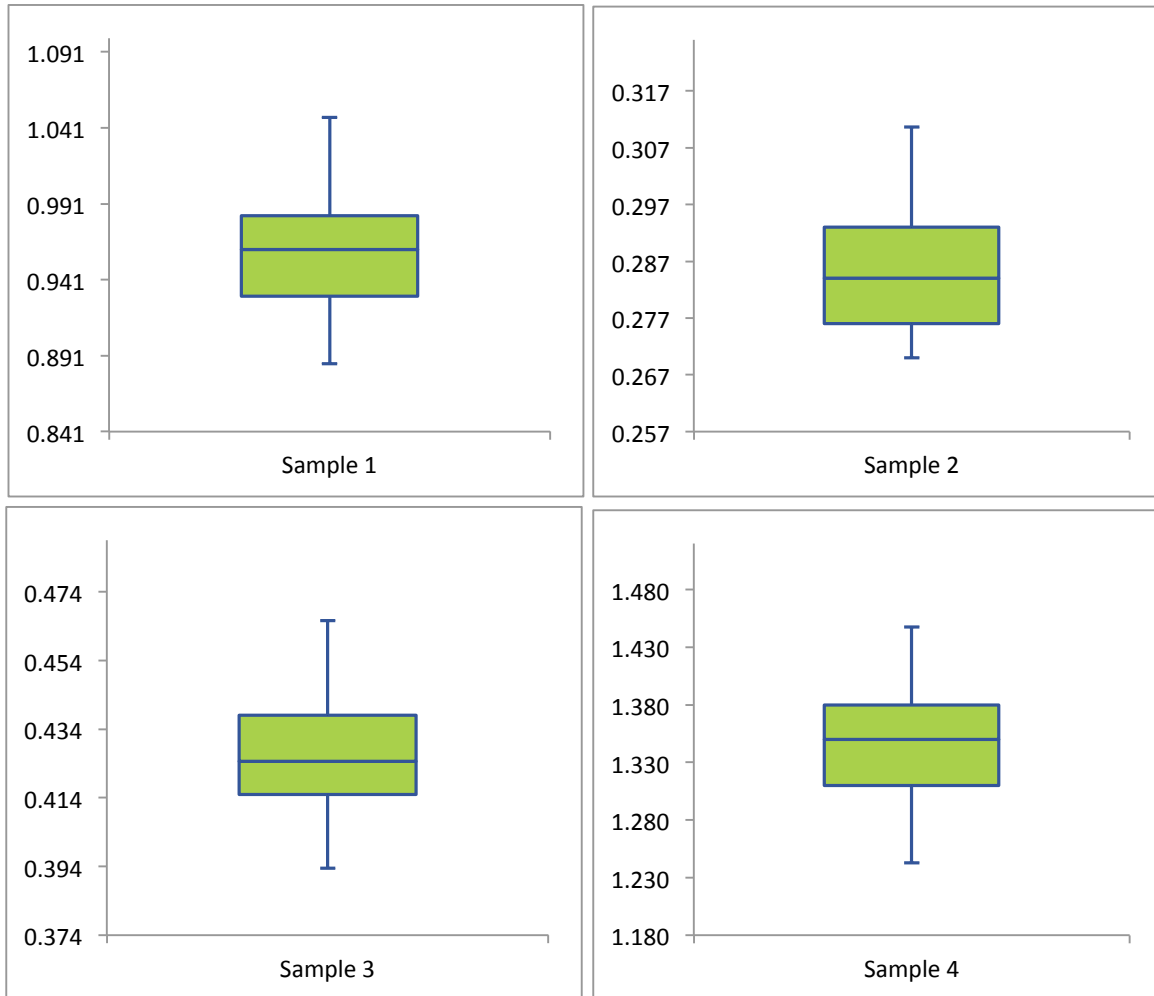


Reported results (Y-axis) plotted against bottling order (X-axis).

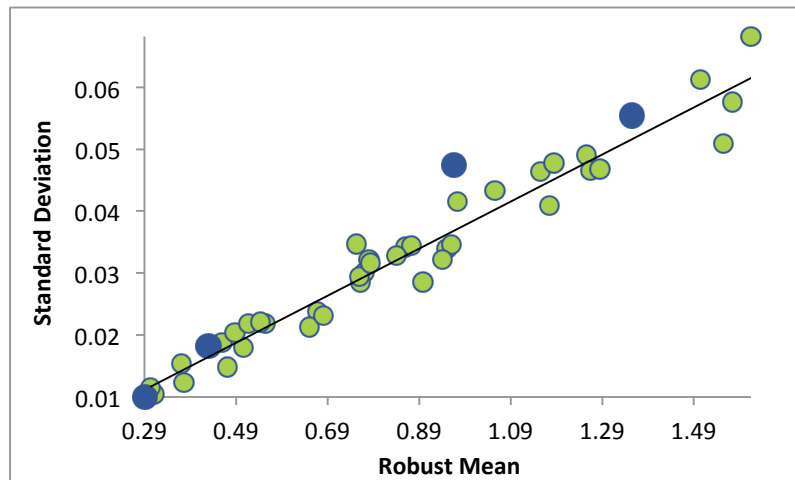


## NICKEL

### Box and Whisker Plots



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



## SELENIUM

## Summary Statistics

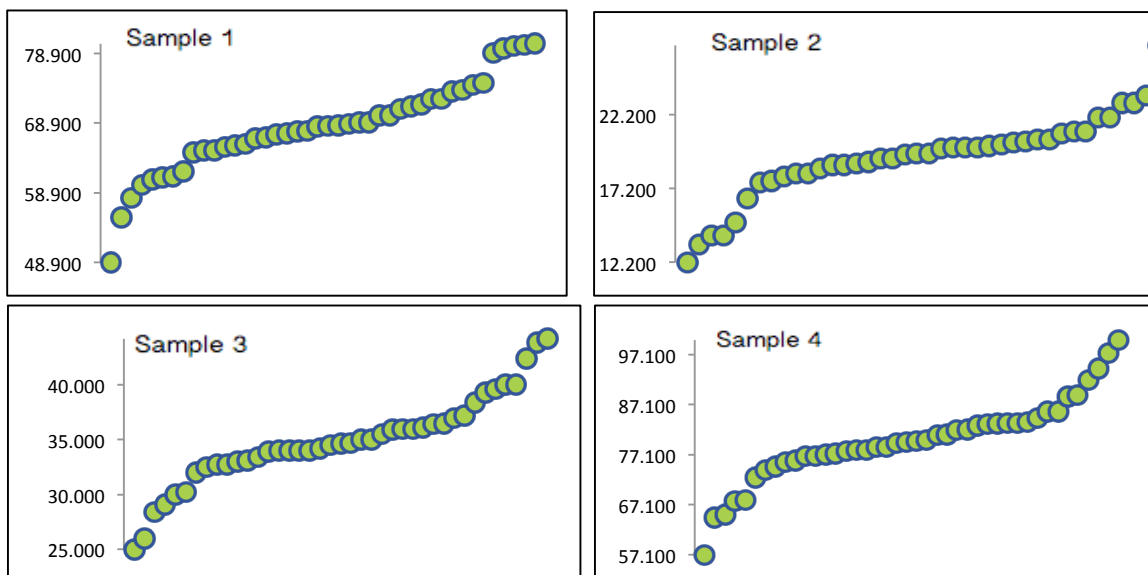
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	42	40	41	42
Median	68.5	19.6	34.6	79.7
Robust Mean	68.4	19.5	34.9	80.0
U	1.2	0.437	0.722	1.3
Robust Standard Deviation	6.20	2.21	3.70	6.73
Regression Standard Deviation	6.84	1.95	3.49	8.00
Stability Flag				
Homogeneity Flag			Homogeneity	
Standard Deviation Used (SDPA)	6.84	2.21	4.47	8.00
Outliers	0	0	0	0
$ z  > 3.0$	0	2	0	0
$2 <  z  < 3$	1	4	3	3

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	31	30	31	31
ICP/OES (Red)	10	9	9	10
CVAFS (Green)	1	1	1	1

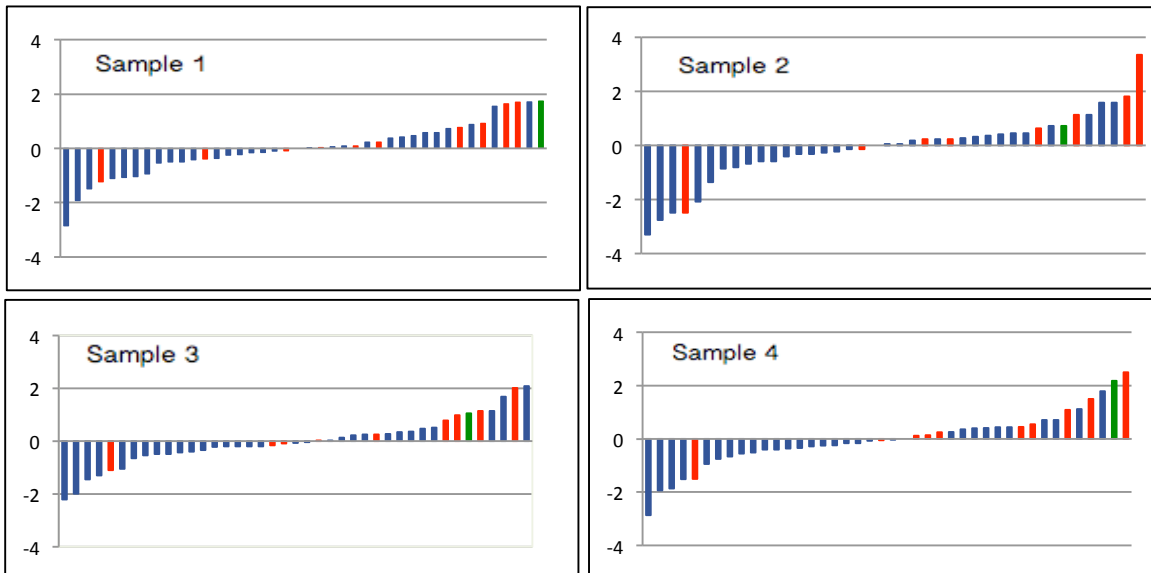
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

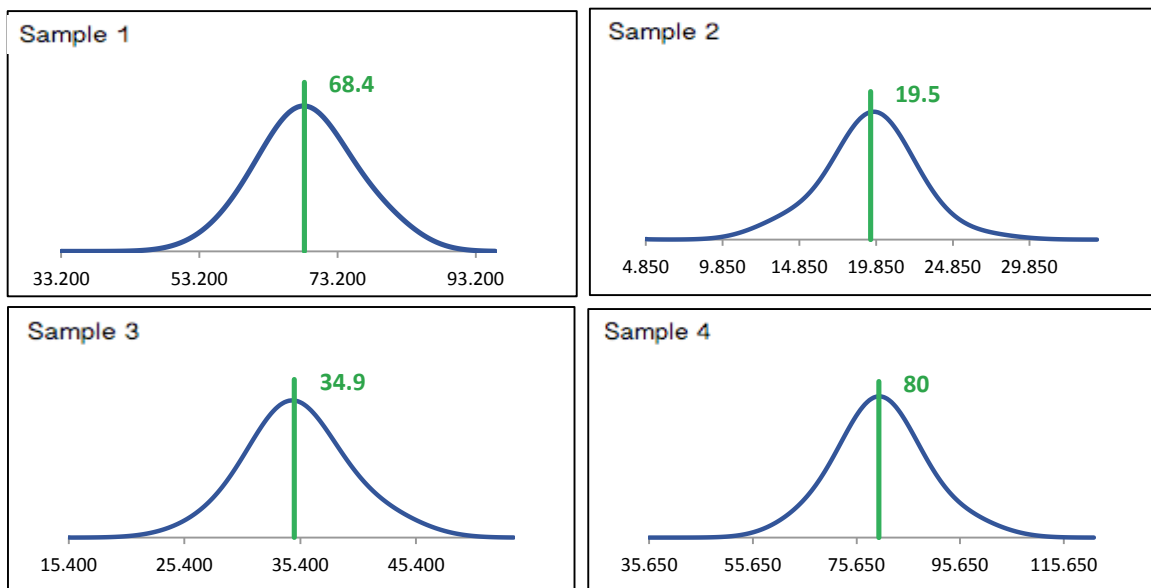


## SELENIUM

### z-Score Plots

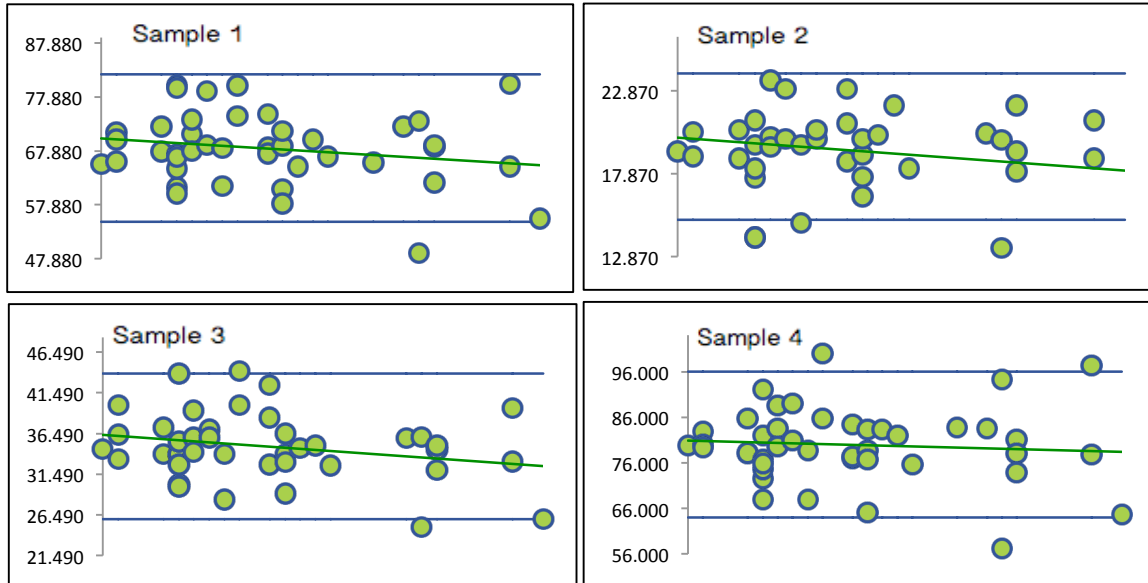


### Kernel Density Plots



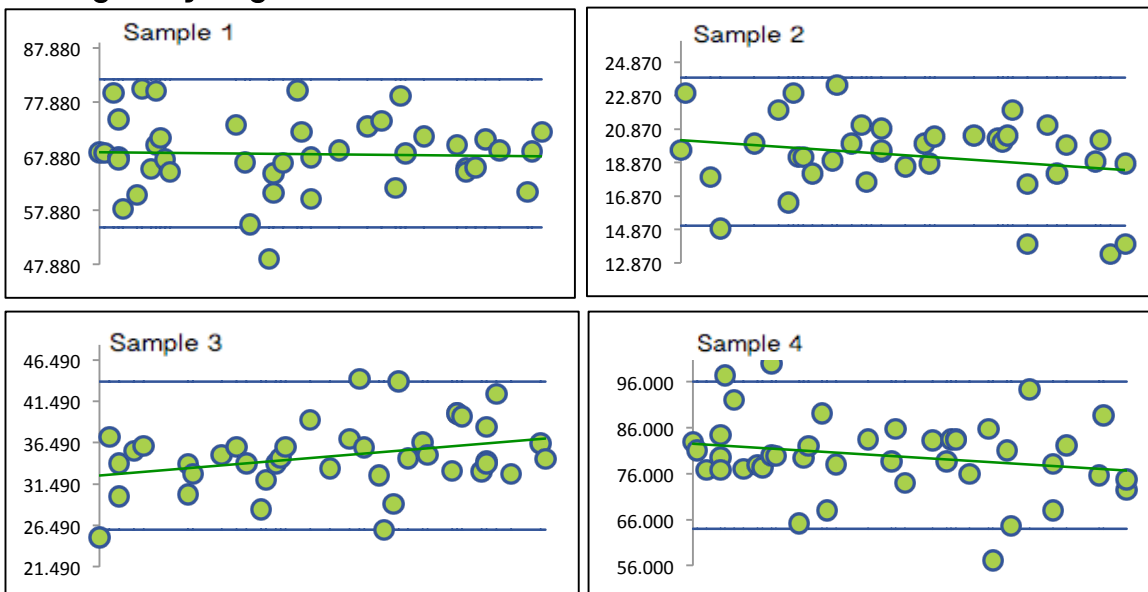
## SELENIUM

### Stability Regression



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

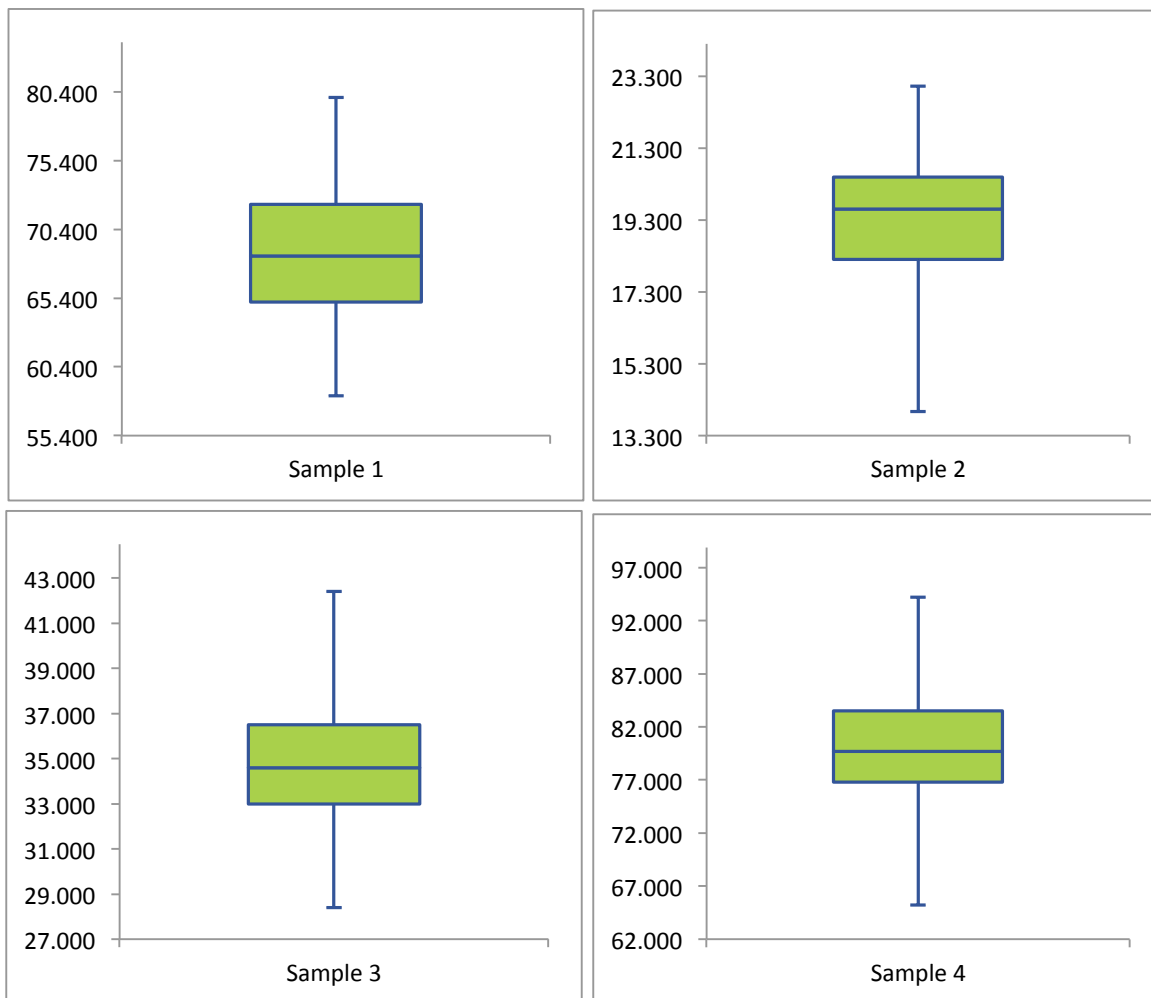
### Homogeneity Regression



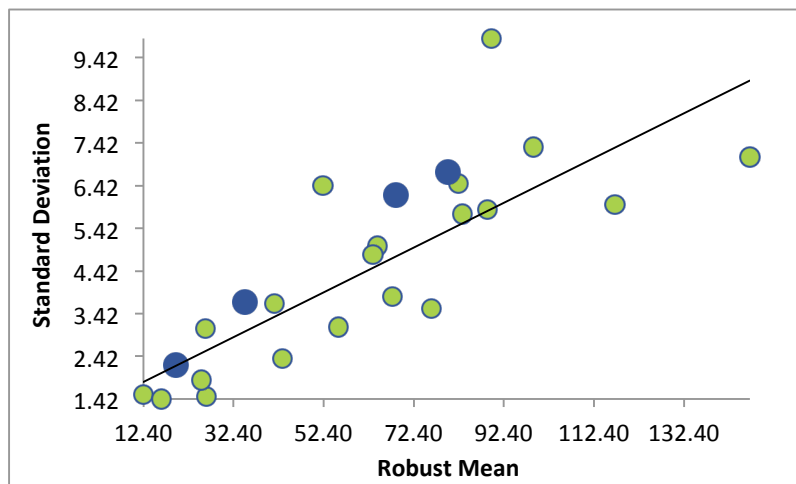
Reported results (Y-axis) plotted against bottling order (X-axis).

## SELENIUM

### Box and Whisker Plots



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



## SILVER

## Summary Statistics

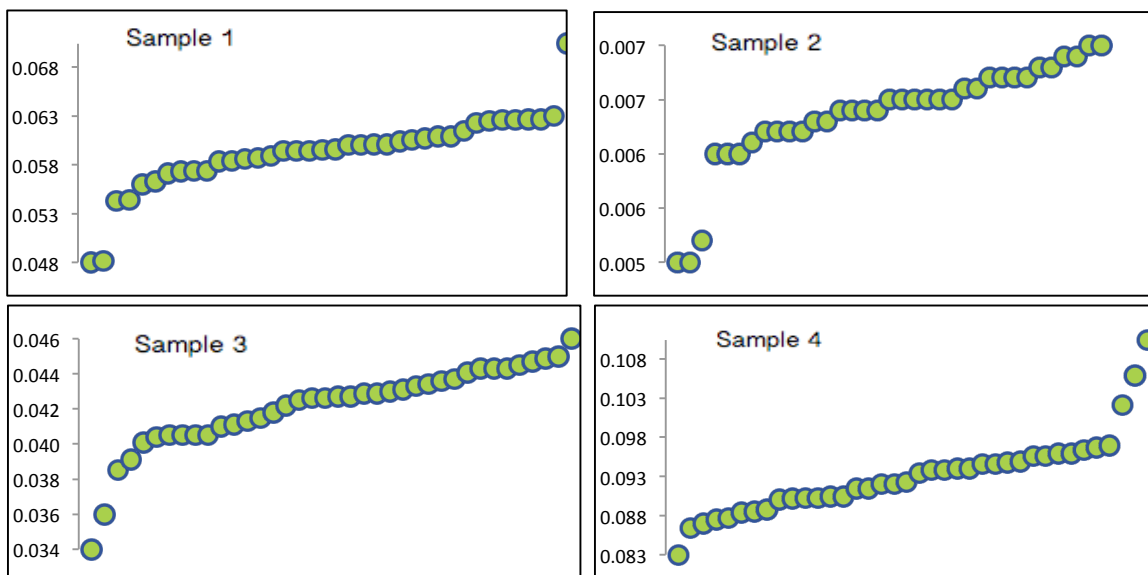
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	38	35	38	38
Median	0.0592	0.00650	0.0422	0.0925
Robust Mean	0.0591	0.00643	0.0418	0.0922
U	0.000547	0.0000767	0.000416	0.000813
Robust Standard Deviation	0.00270	0.000363	0.00205	0.00401
Regression Standard Deviation	0.00443	0.000482	0.00314	0.00691
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00443	0.000482	0.00314	0.00691
Outliers	0	0	0	0
$ z  > 3.0$	0	0	0	0
$2 <  z  < 3$	3	3	2	1

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	29	26	29	29
ICP/OES (Red)	9	9	9	9

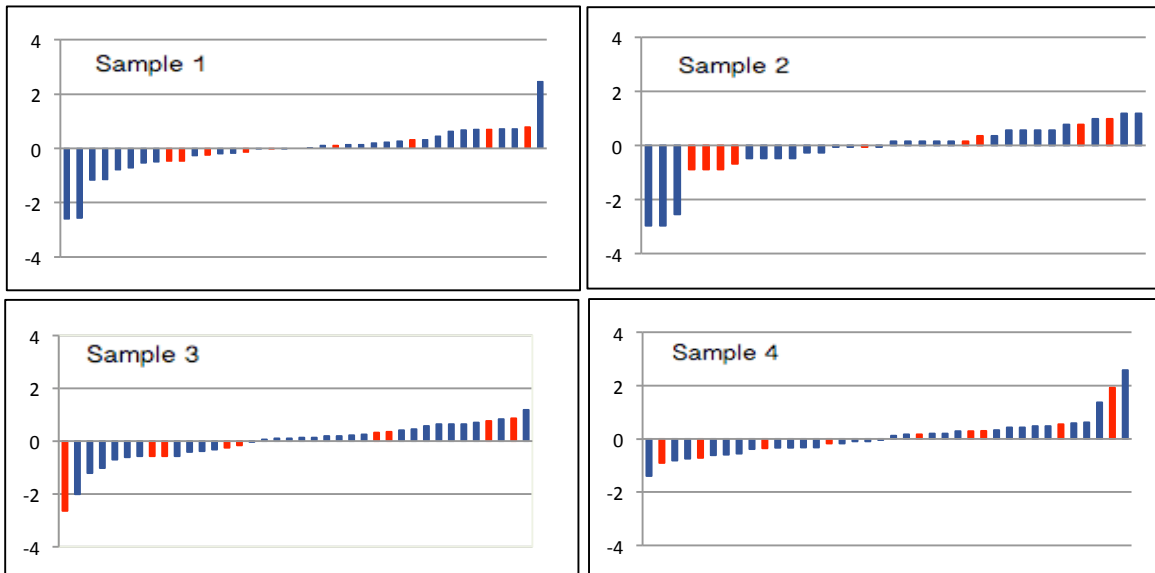
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

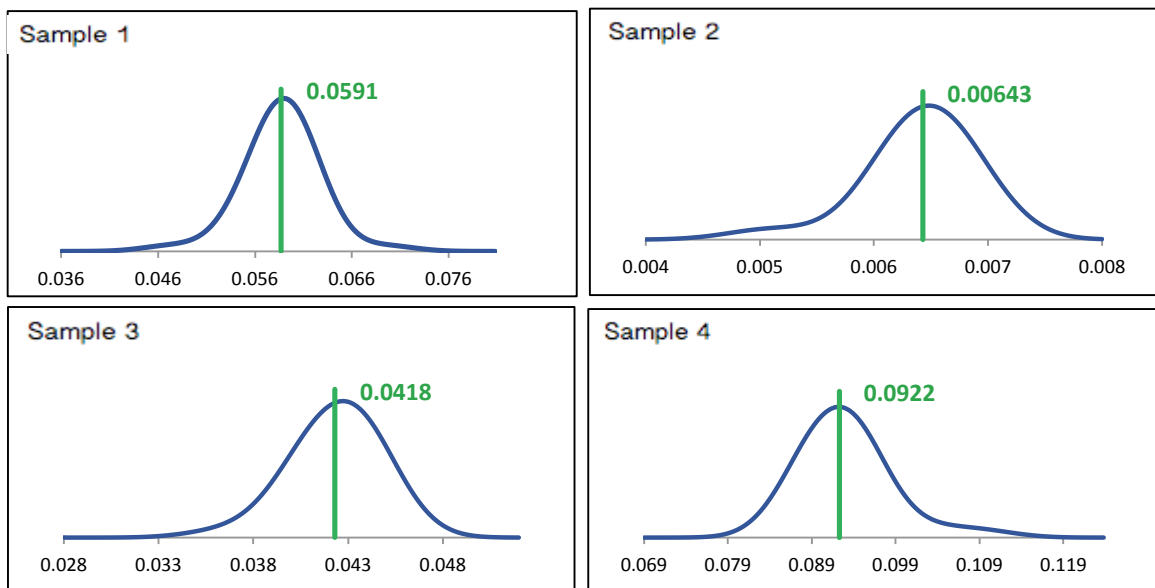


## SILVER

### z-Score Plots

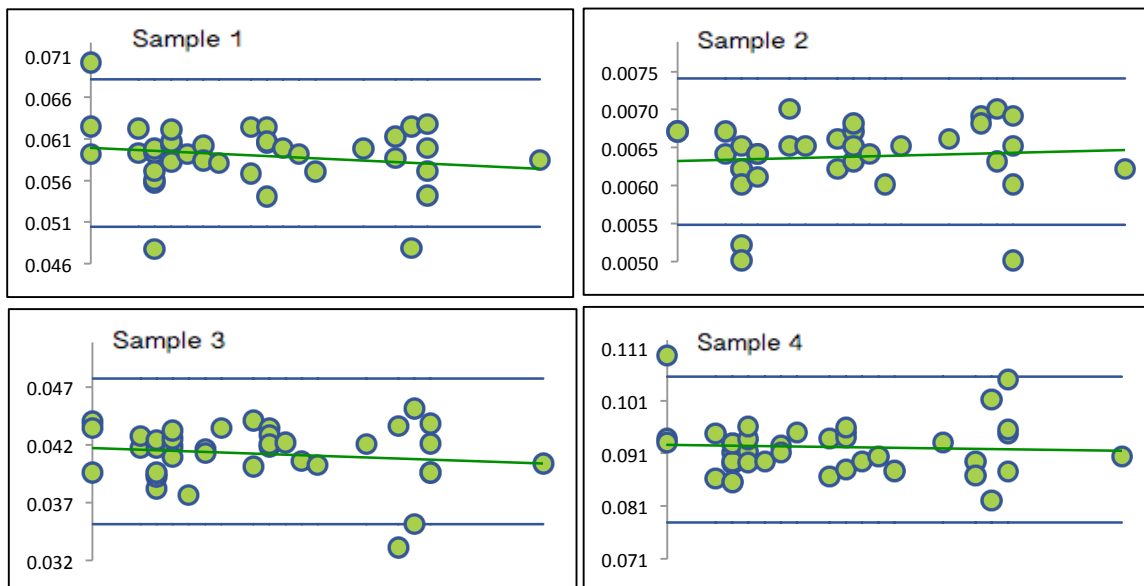


### Kernel Density Plots



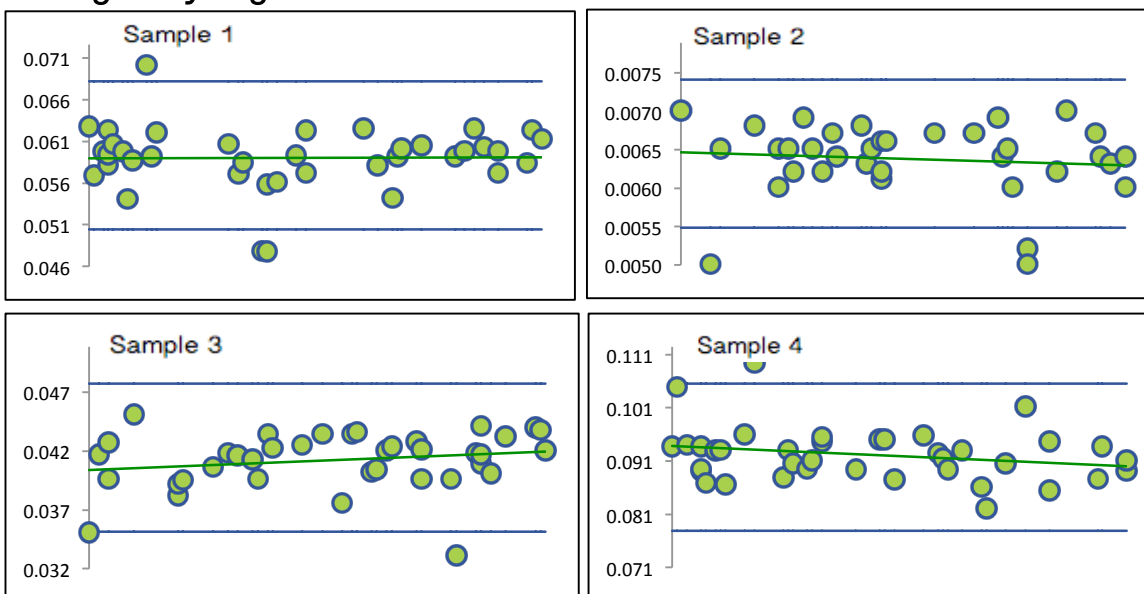
## SILVER

### 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).





## STRONTIUM

## Summary Statistics

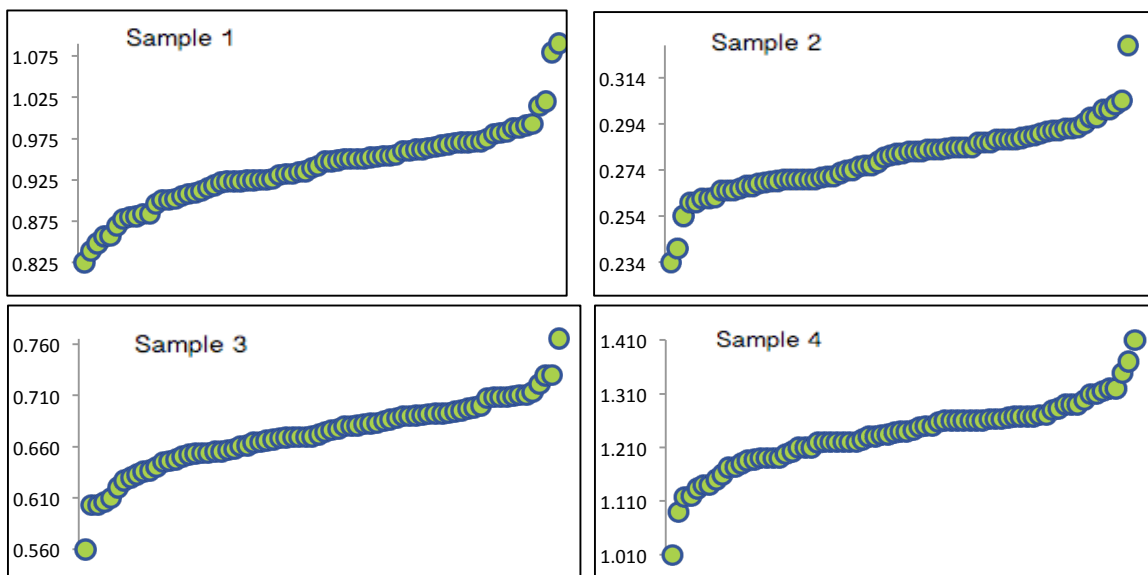
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	74	74	74	74
Median	0.945	0.281	0.673	1.24
Robust Mean	0.938	0.279	0.673	1.24
U	0.00602	0.0019	0.00448	0.00808
Robust Standard Deviation	0.0414	0.0131	0.0308	0.0556
Regression Standard Deviation	0.0704	0.0209	0.0505	0.0927
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0704	0.0209	0.0505	0.0927
Outliers	0	0	0	0
$ z  > 3.0$	0	0	0	0
$2 <  z  < 3$	2	2	1	1

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	44	44	44	44
ICP/OES (Red)	30	30	30	30

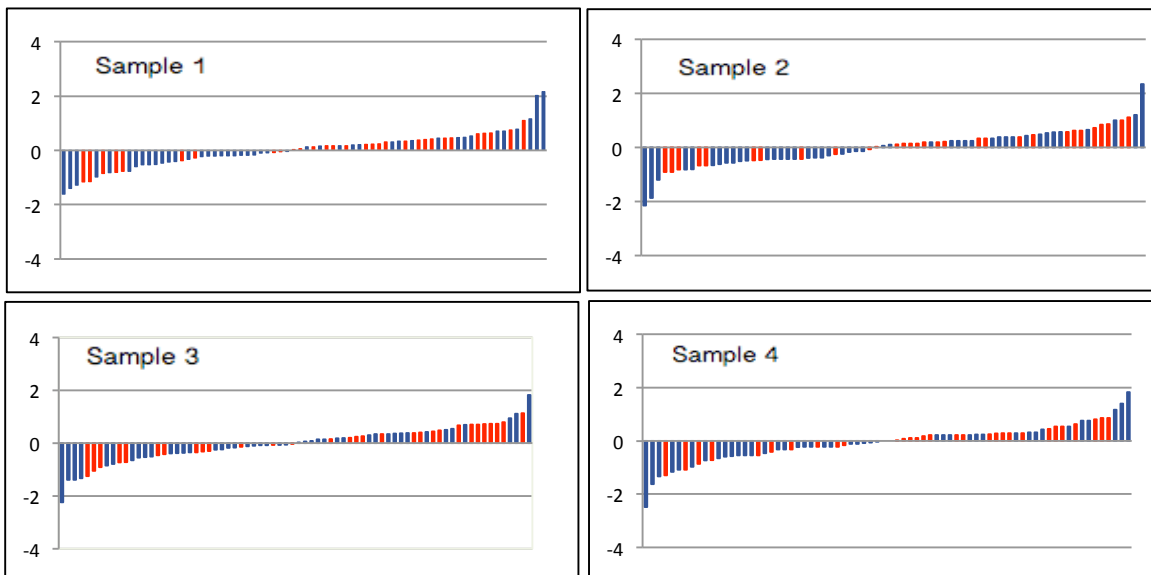
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

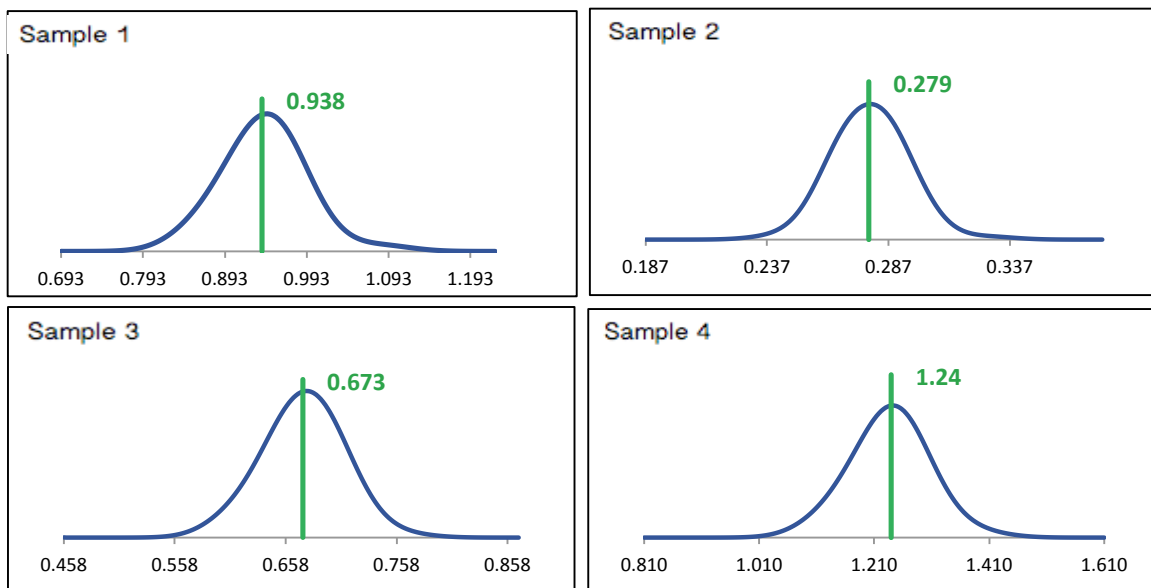


## STRONTIUM

### z-Score Plots

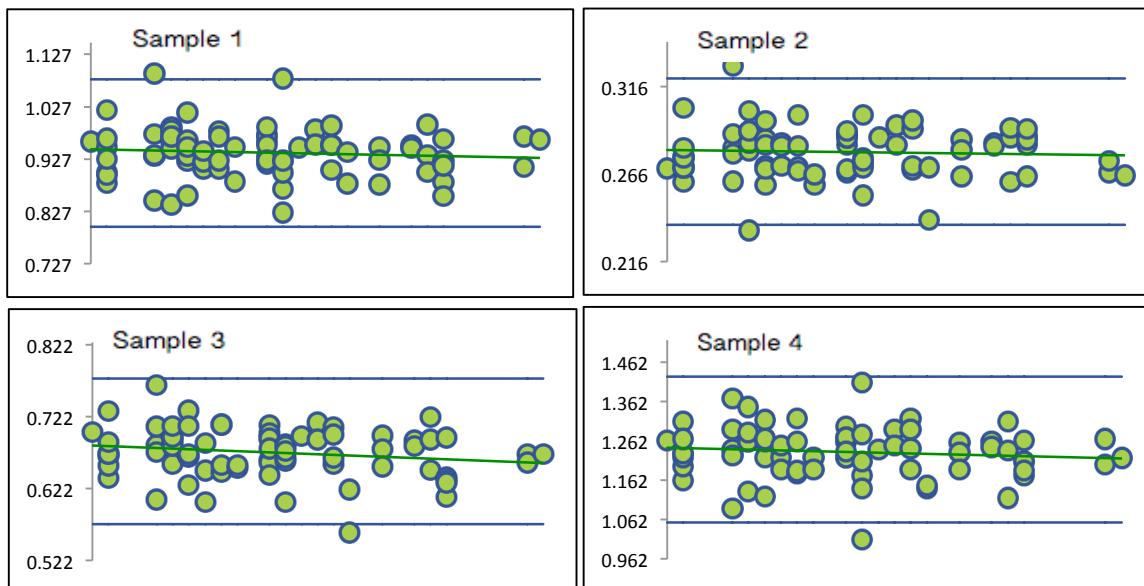


### Kernel Density Plots



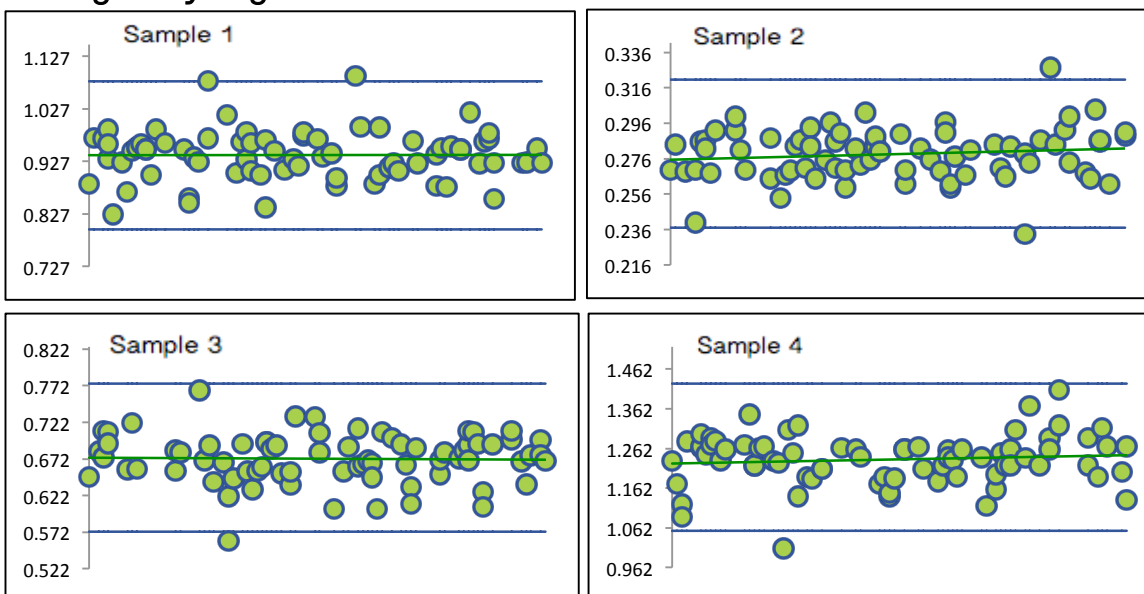
## STRONTIUM

### Stability Regression



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

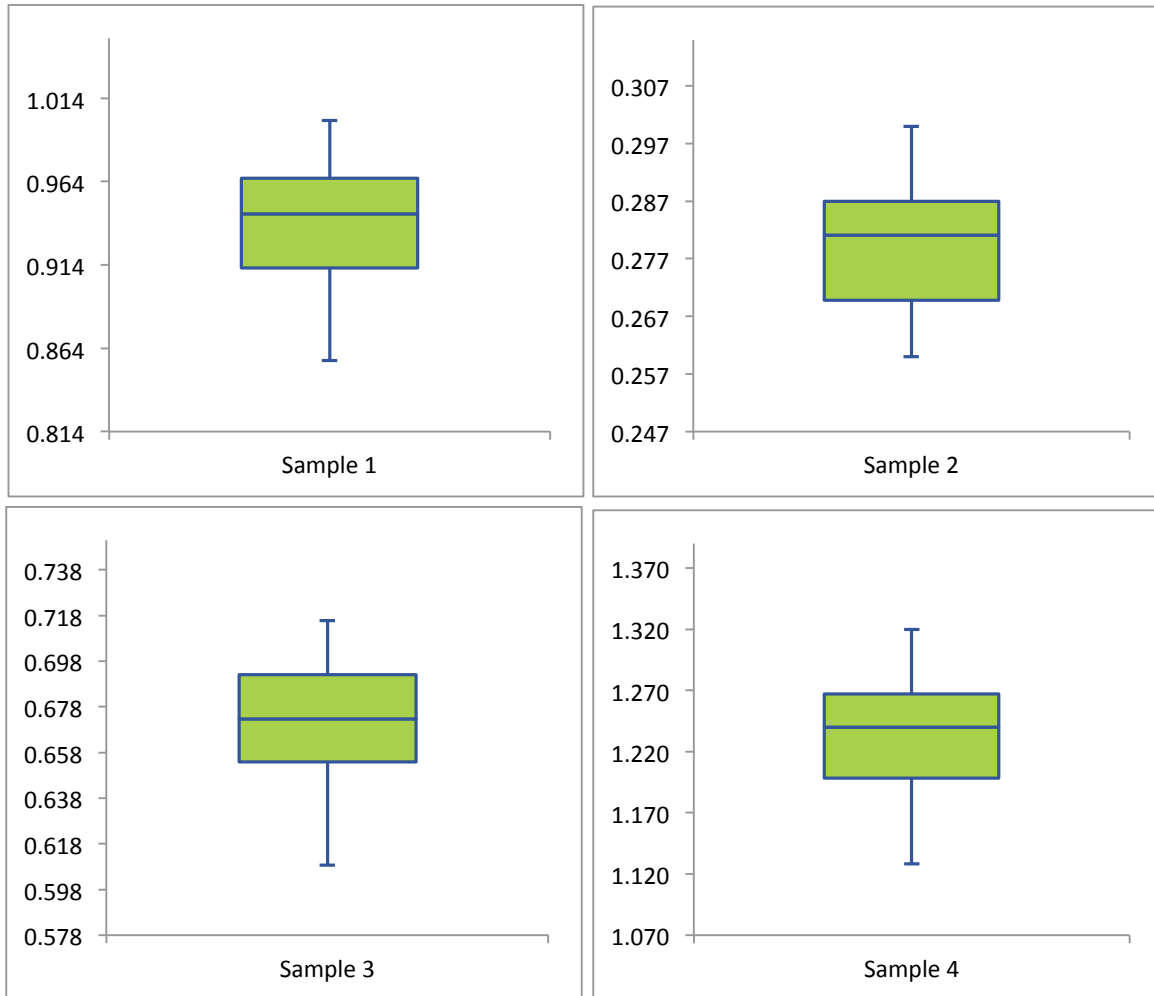
### Homogeneity Regression



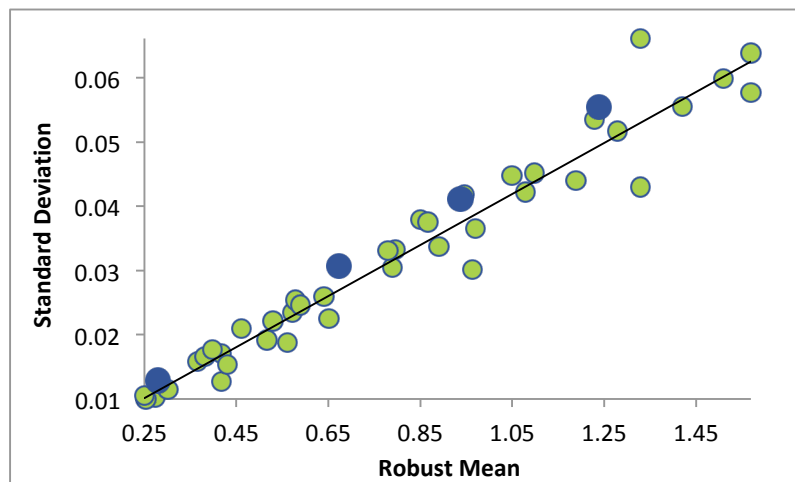
Reported results (Y-axis) plotted against bottling order (X-axis).

## STRONTIUM

### Box and Whisker Plots



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



## THALLIUM

## Summary Statistics

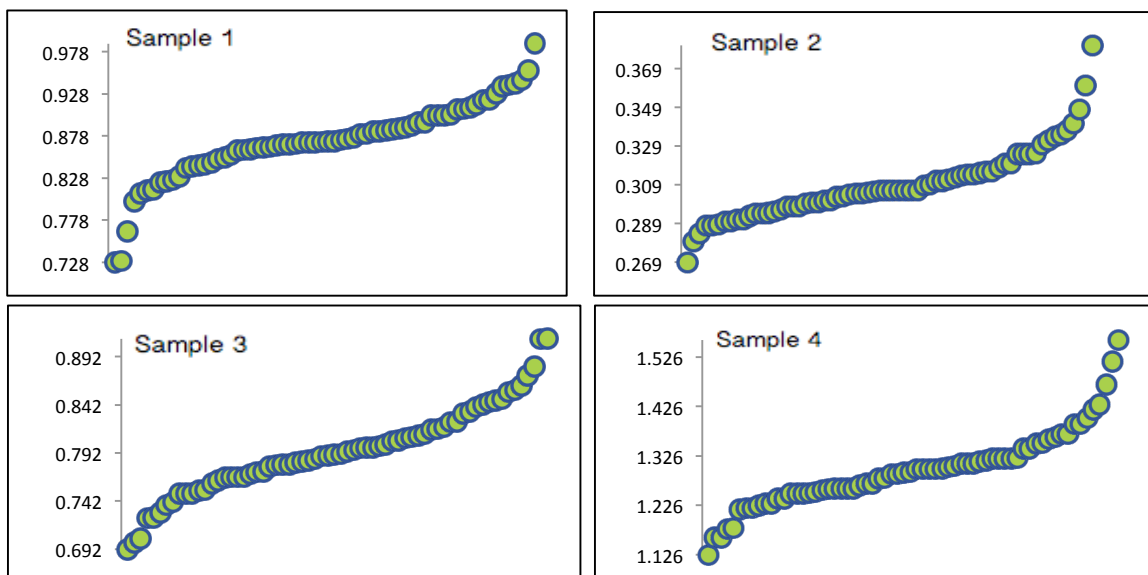
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	66	66	66	66
Median	0.871	0.306	0.790	1.30
Robust Mean	0.873	0.308	0.793	1.29
U	0.00617	0.00245	0.00683	0.01
Robust Standard Deviation	0.0401	0.0159	0.0444	0.0653
Regression Standard Deviation	0.0873	0.0308	0.0793	0.129
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0873	0.0308	0.0793	0.129
Outliers	0	0	0	0
$ z  > 3.0$	0	0	0	0
$2 <  z  < 3$	0	1	0	1

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	46	46	46	46
ICP/OES (Red)	20	20	20	20

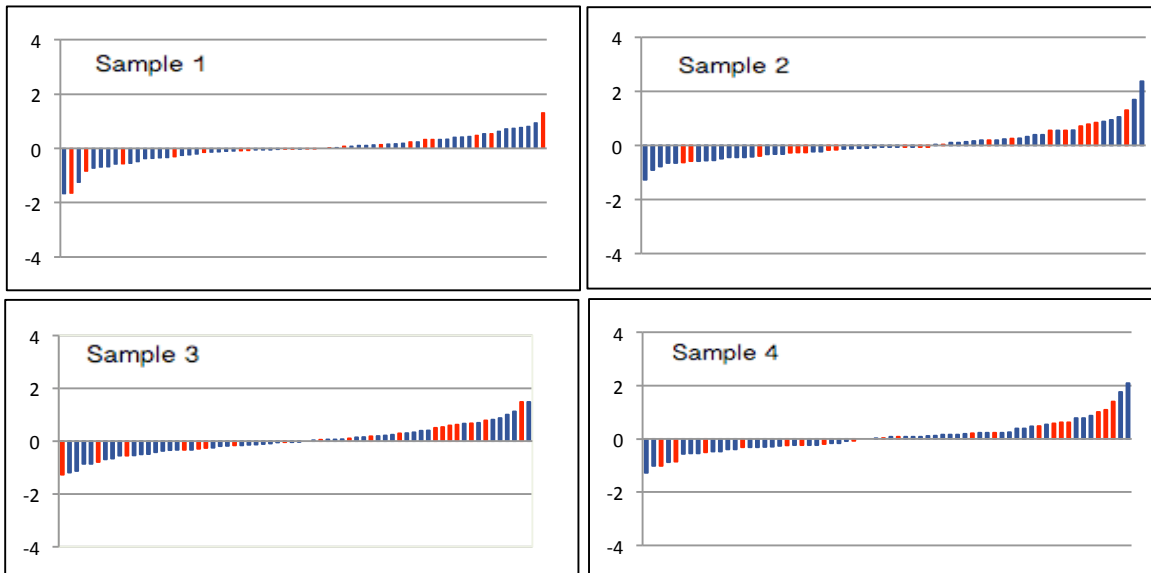
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

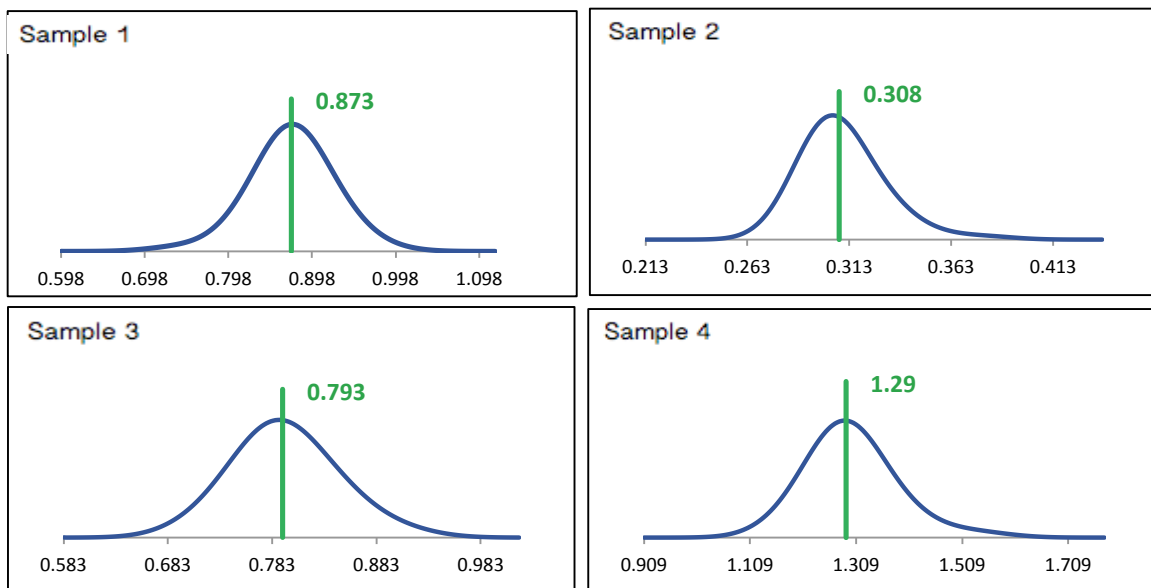


# THALLIUM

## z-Score Plots

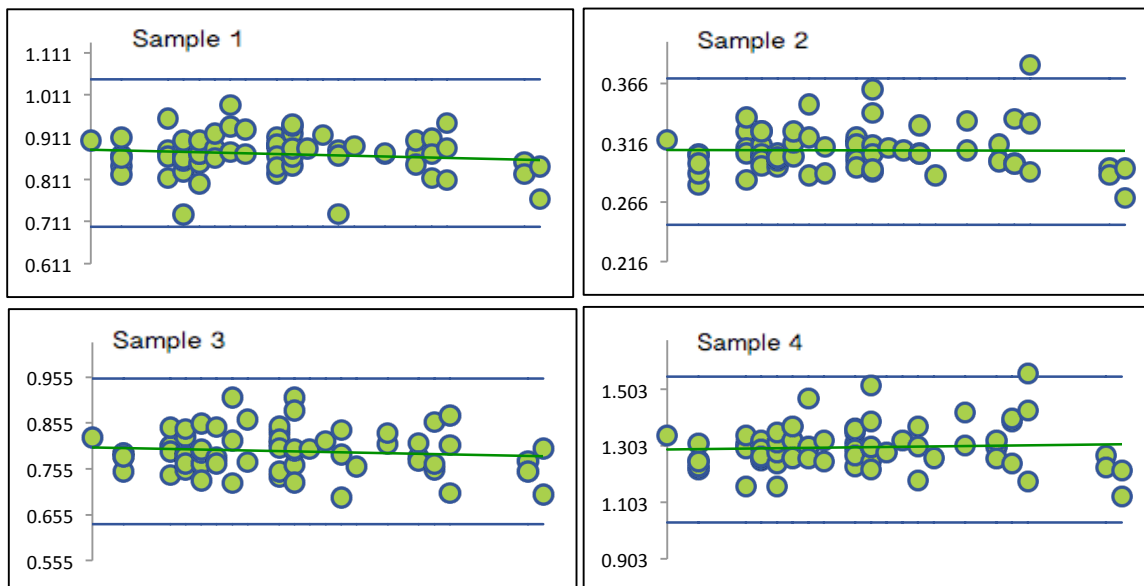


## Kernel Density Plots



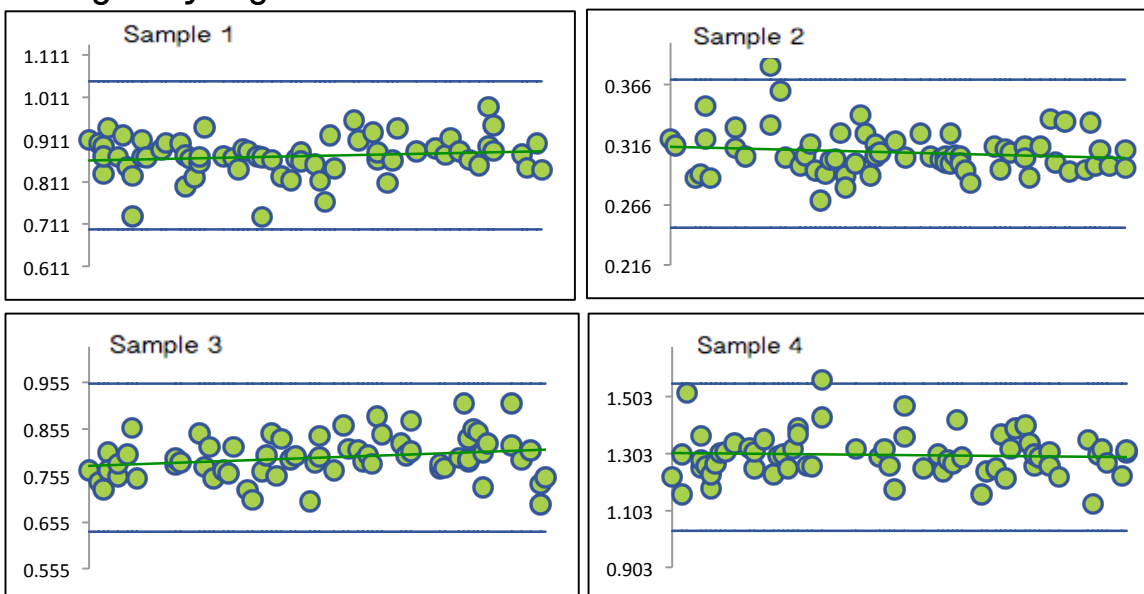
## THALLIUM

### Stability Regression



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

### Homogeneity Regression

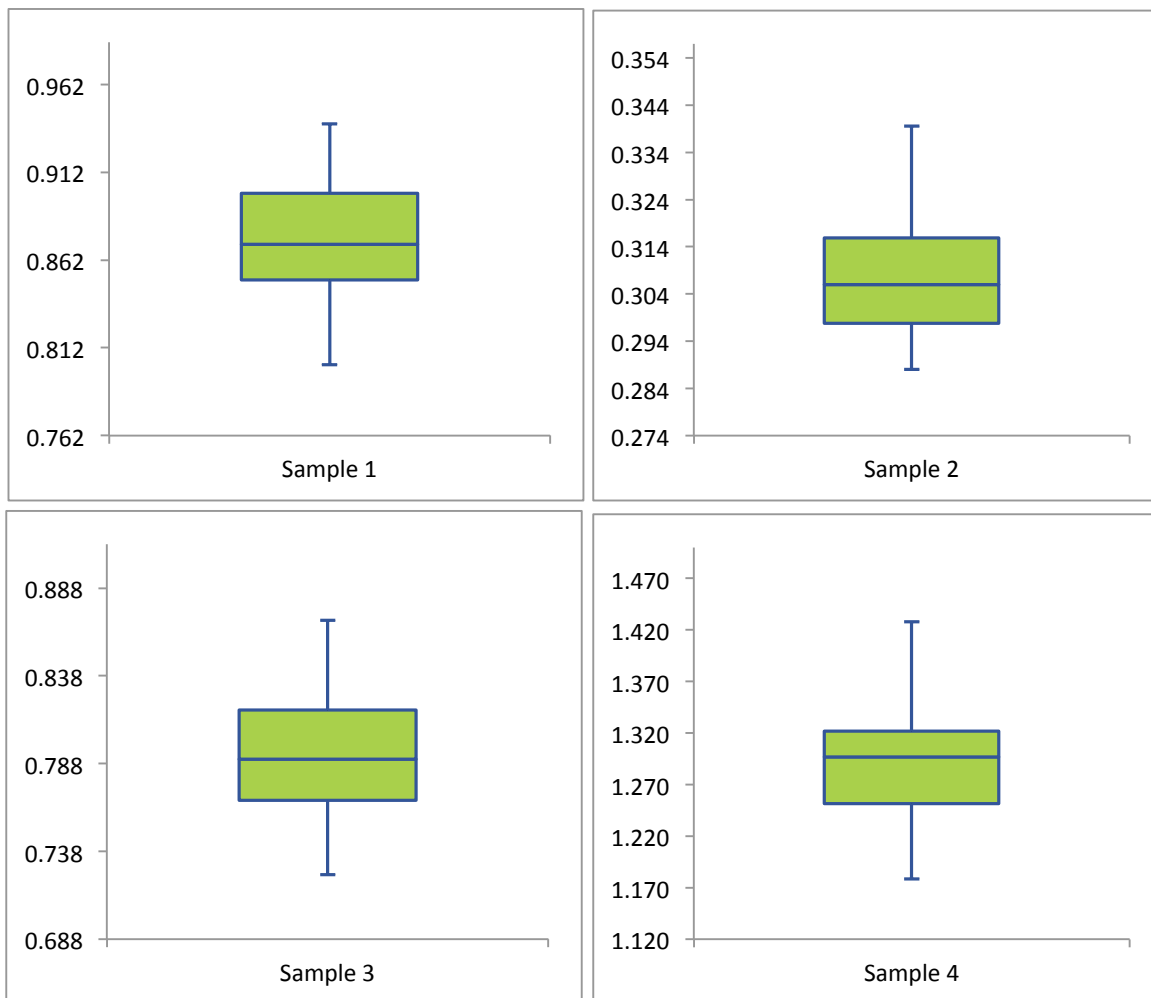


Reported results (Y-axis) plotted against bottling order (X-axis).

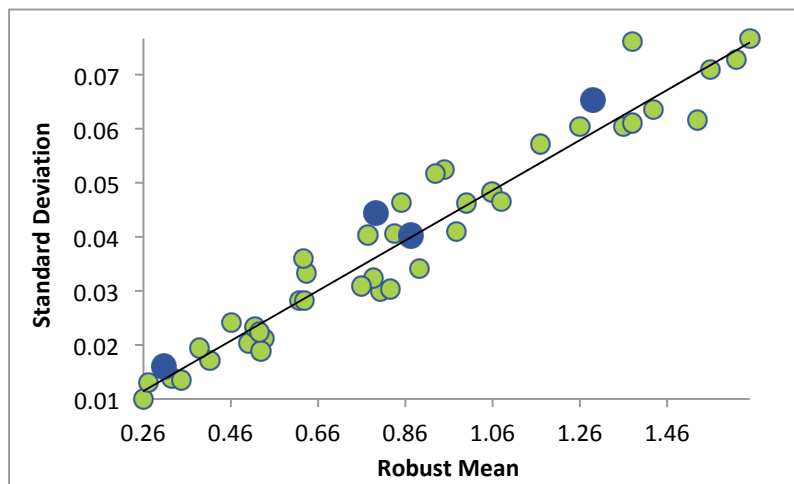


# THALLIUM

## Box and Whisker Plots



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



## TIN

## Summary Statistics

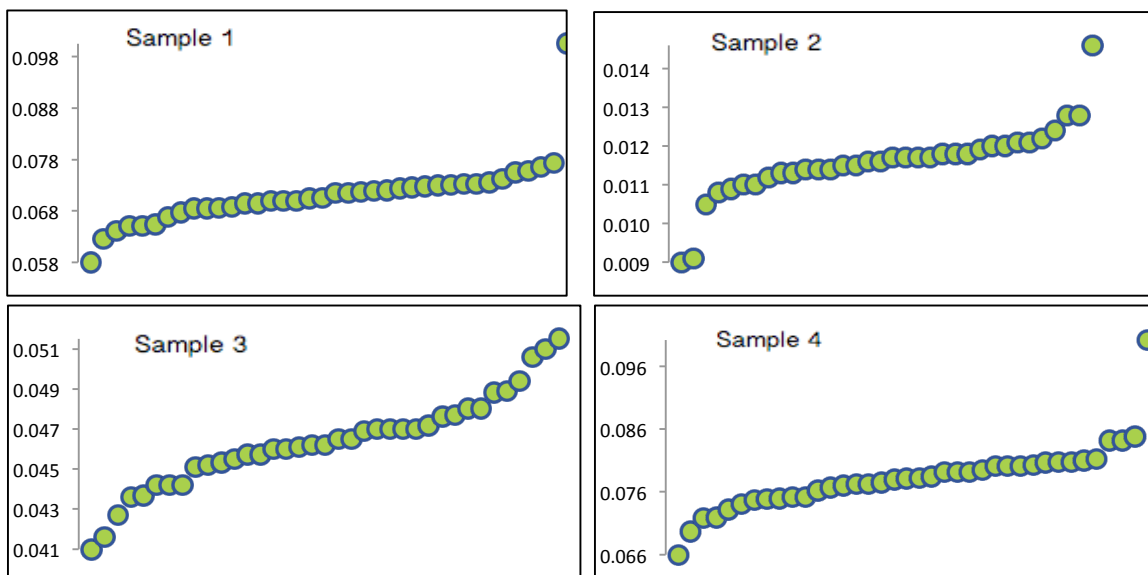
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	38	34	37	38
Median	0.0705	0.0119	0.0462	0.0780
Robust Mean	0.0702	0.0118	0.0463	0.0778
U	0.000813	0.000129	0.000444	0.000775
Robust Standard Deviation	0.00401	0.000600	0.00216	0.00382
Regression Standard Deviation	0.00702	0.00118	0.00463	0.00778
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00702	0.00118	0.00463	0.00778
Outliers	0	0	0	0
$ z  > 3.0$	1	0	0	0
$2 <  z  < 3$	0	3	0	1

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	28	27	28	28
ICP/OES (Red)	10	7	9	10

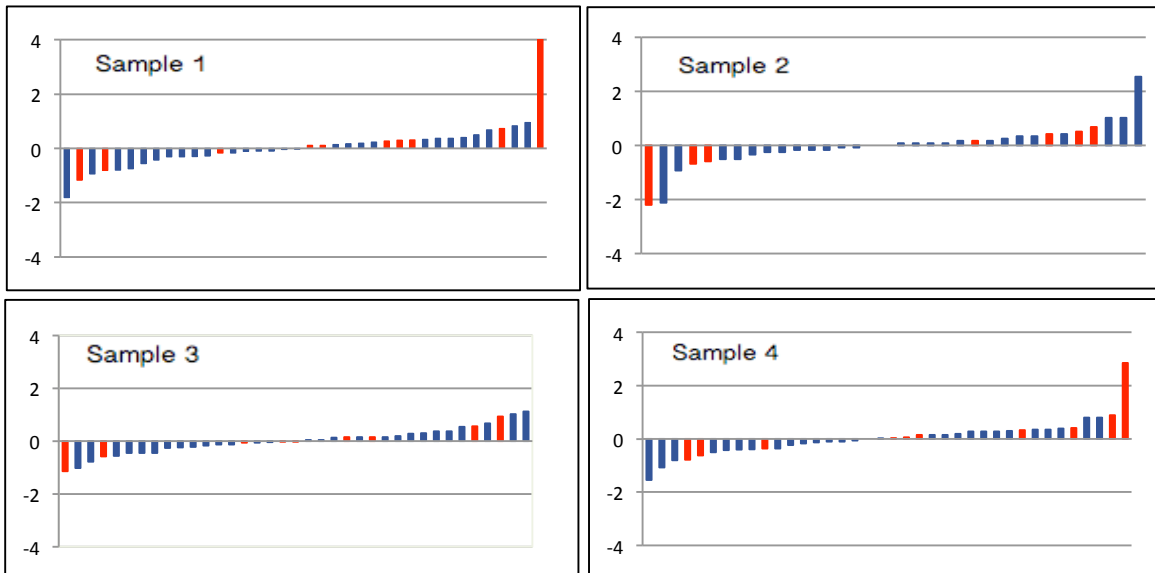
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

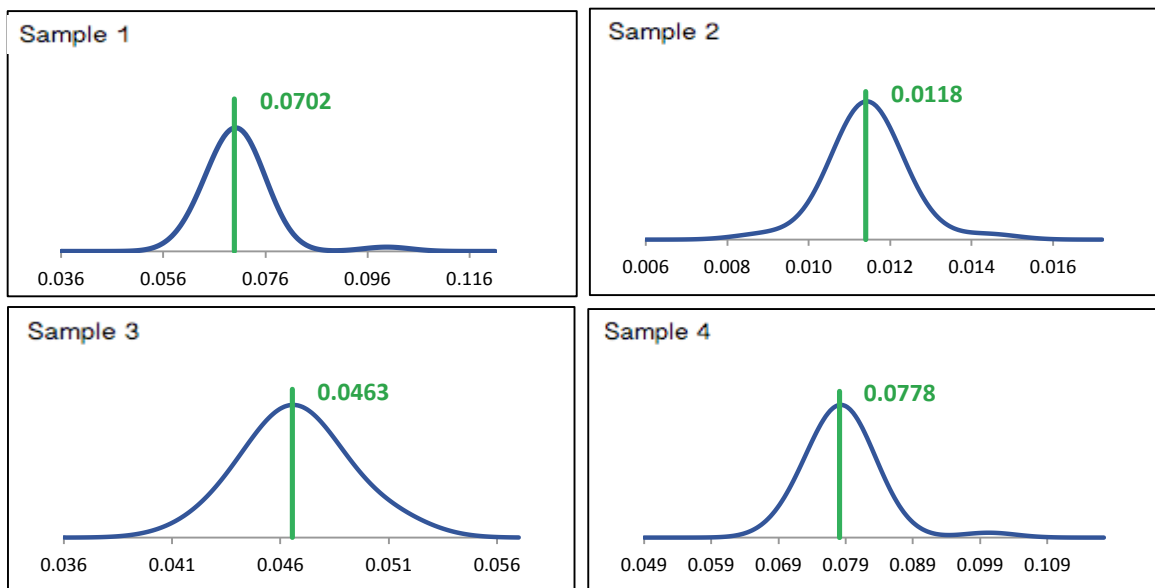


## TIN

### z-Score Plots

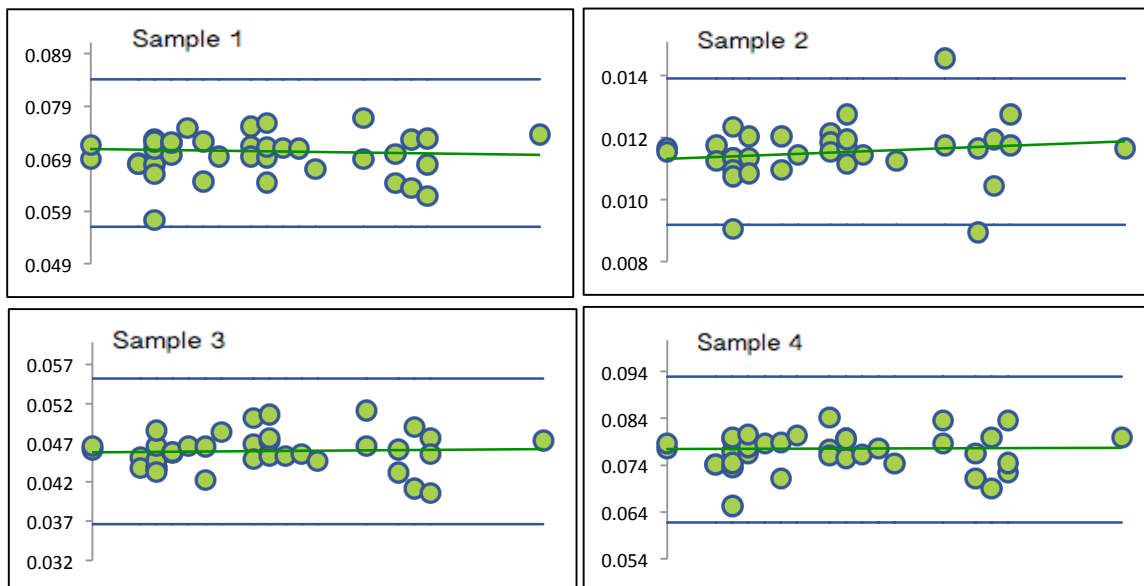


### Kernel Density Plots



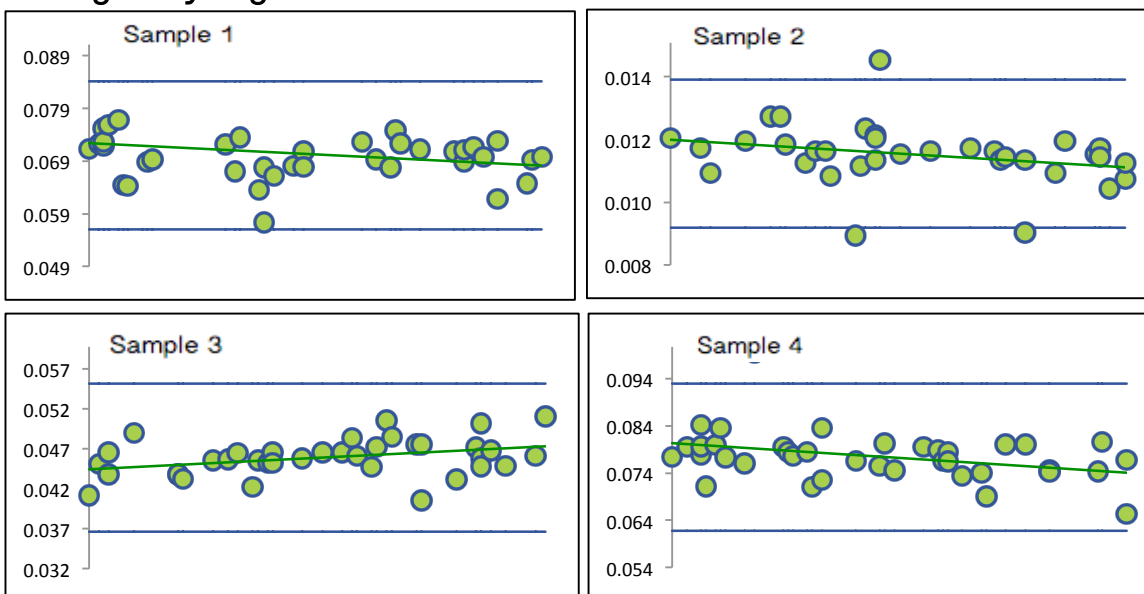
## TIN

### Stability Regression



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

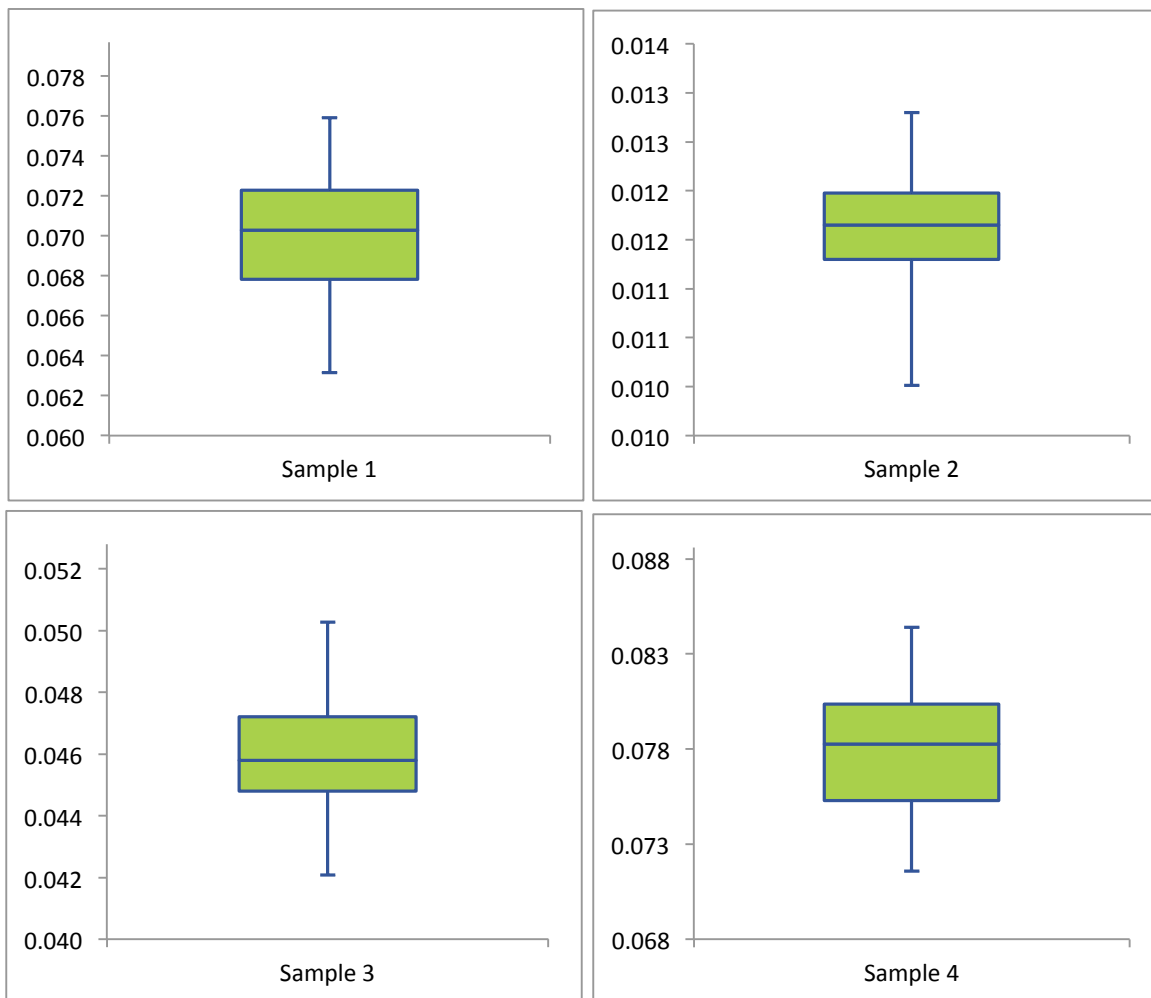
### Homogeneity Regression



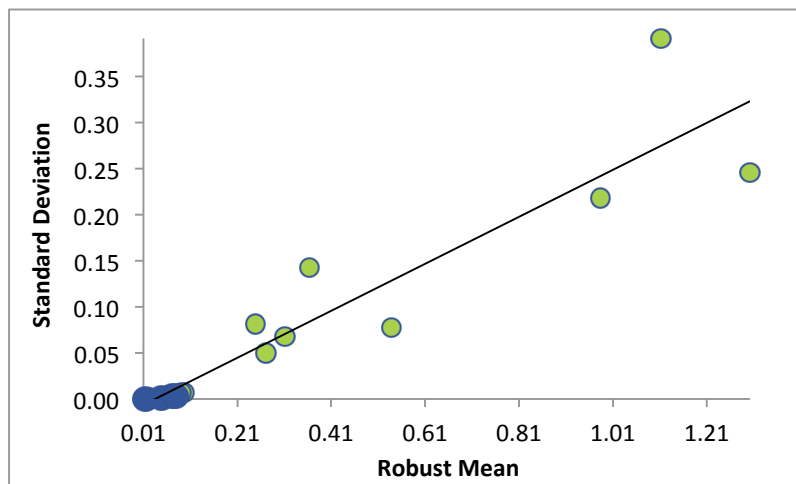
Reported results (Y-axis) plotted against bottling order (X-axis).

## TIN

### Box and Whisker Plots



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



## TITANIUM

## Summary Statistics

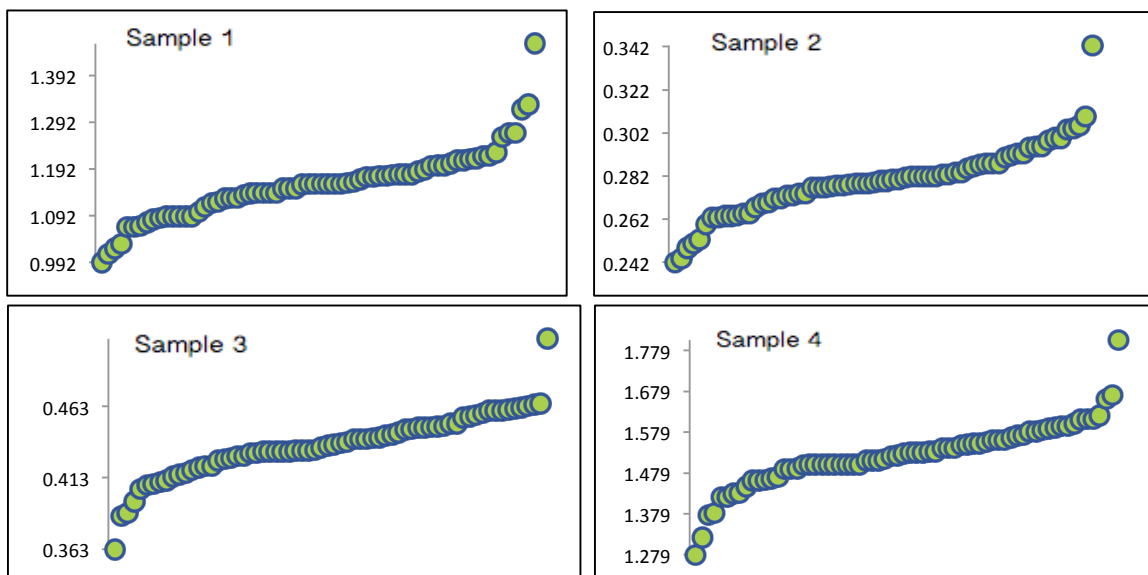
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	68	68	68	68
Median	1.16	0.280	0.436	1.53
Robust Mean	1.15	0.280	0.436	1.53
U	0.00932	0.00212	0.003	0.00975
Robust Standard Deviation	0.0615	0.0140	0.0198	0.0643
Regression Standard Deviation	0.0866	0.0210	0.0327	0.114
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0866	0.0210	0.0327	0.114
Outliers	0	0	0	0
$ z  > 3.0$	1	0	0	0
$2 <  z  < 3$	1	1	2	2

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	42	42	42	42
ICP/OES (Red)	26	26	26	26

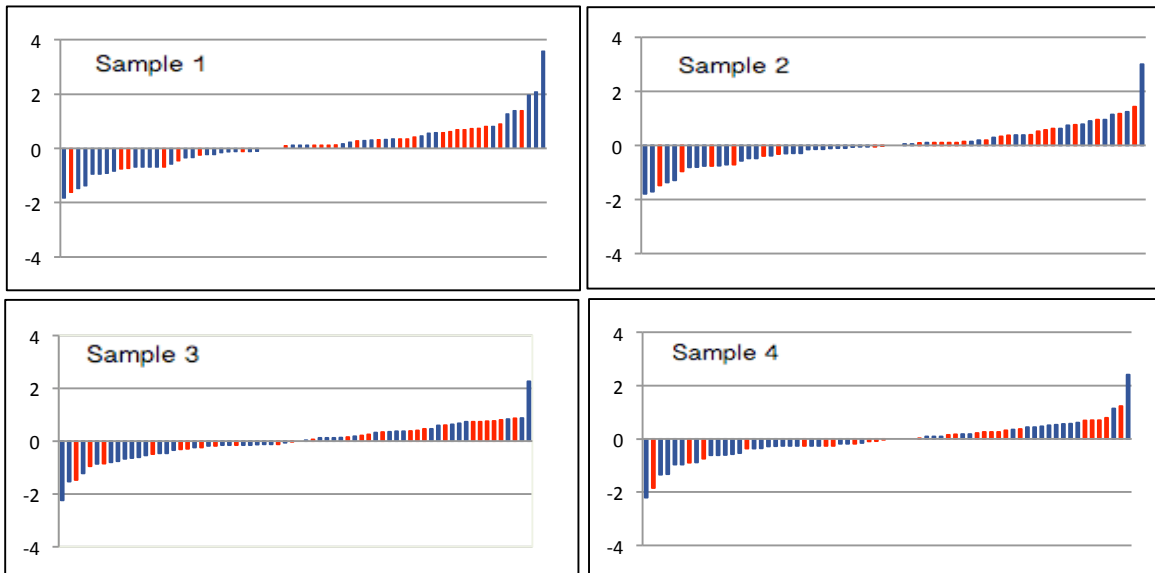
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

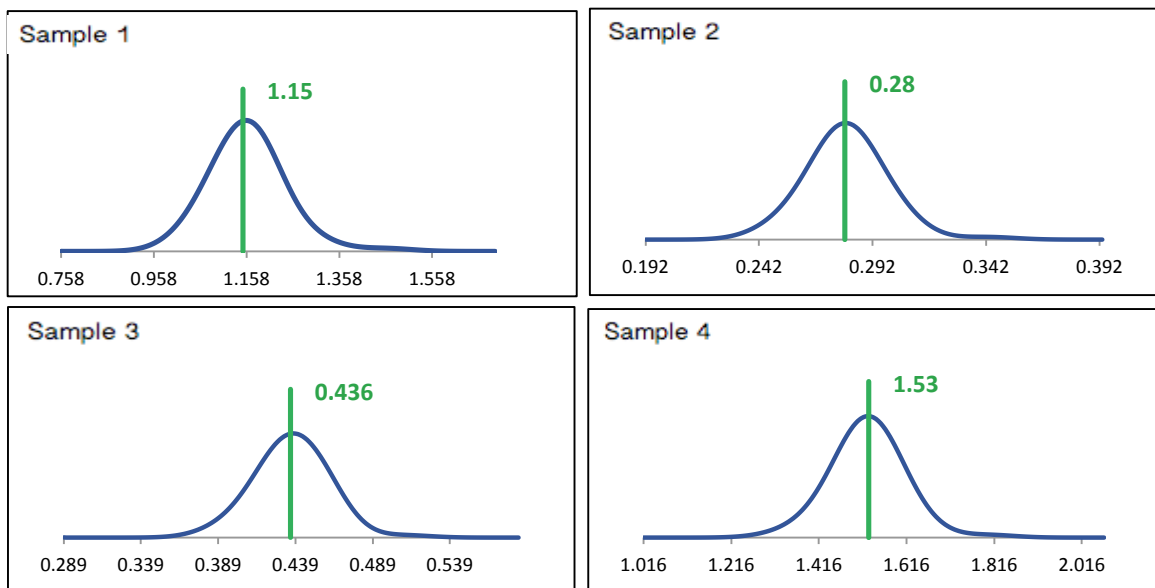


## TITANIUM

### z-Score Plots

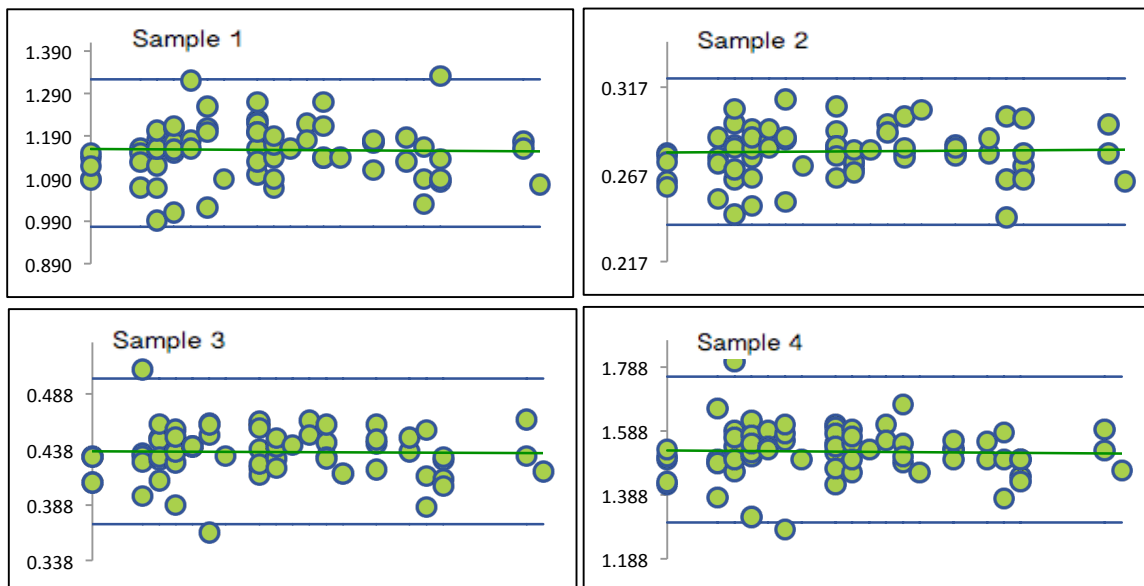


### Kernel Density Plots



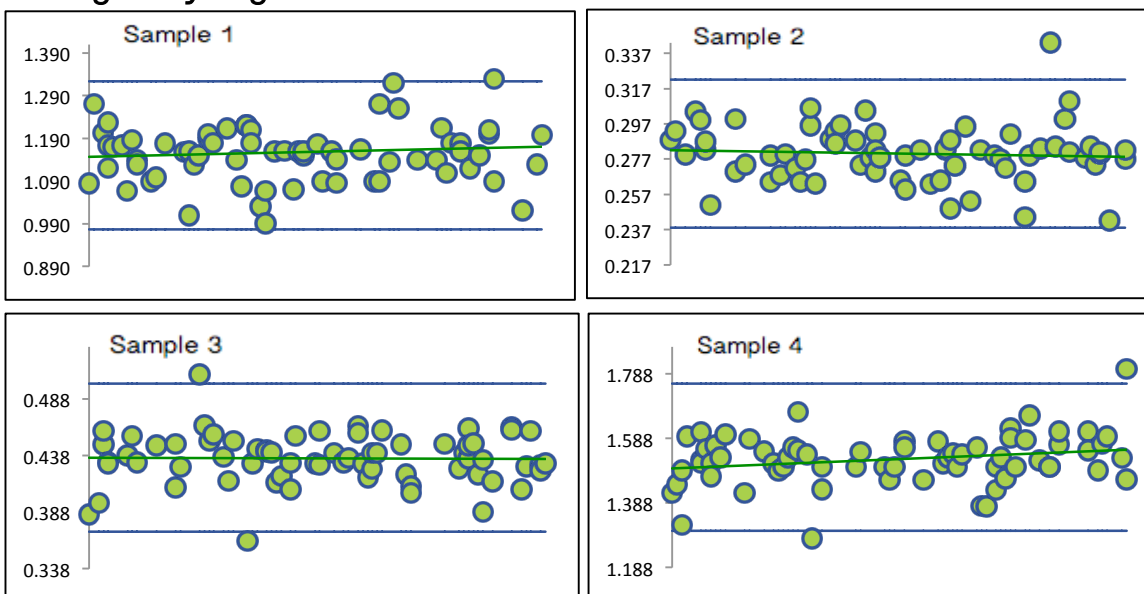
# TITANIUM

## Stability Regression



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

## Homogeneity Regression

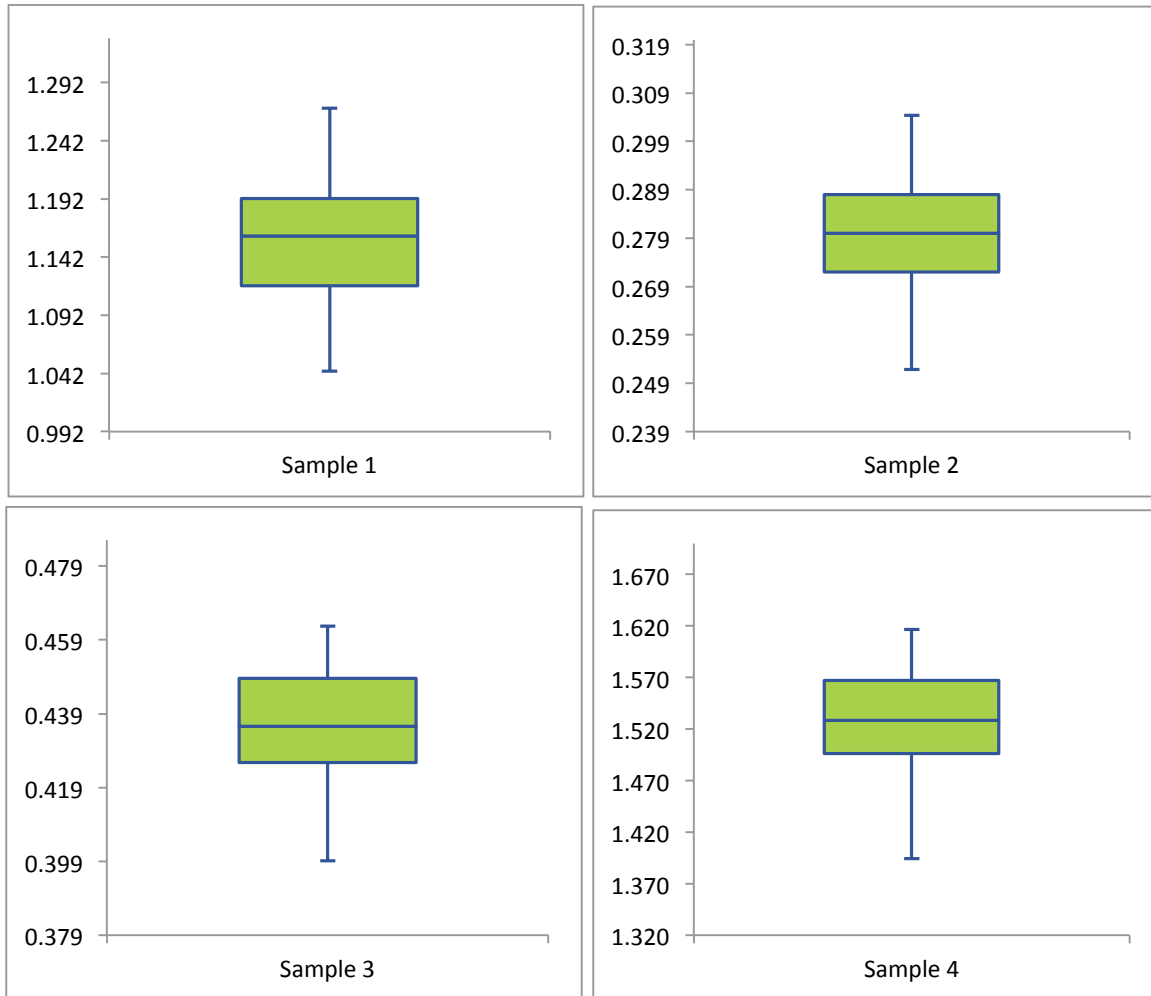


Reported results (Y-axis) plotted against bottling order (X-axis).

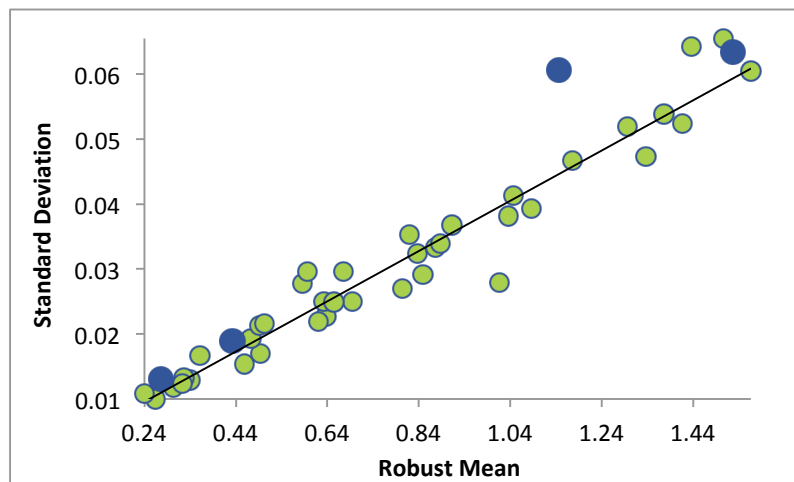


## TITANIUM

### Box and Whisker Plots



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



## URANIUM

## Summary Statistics

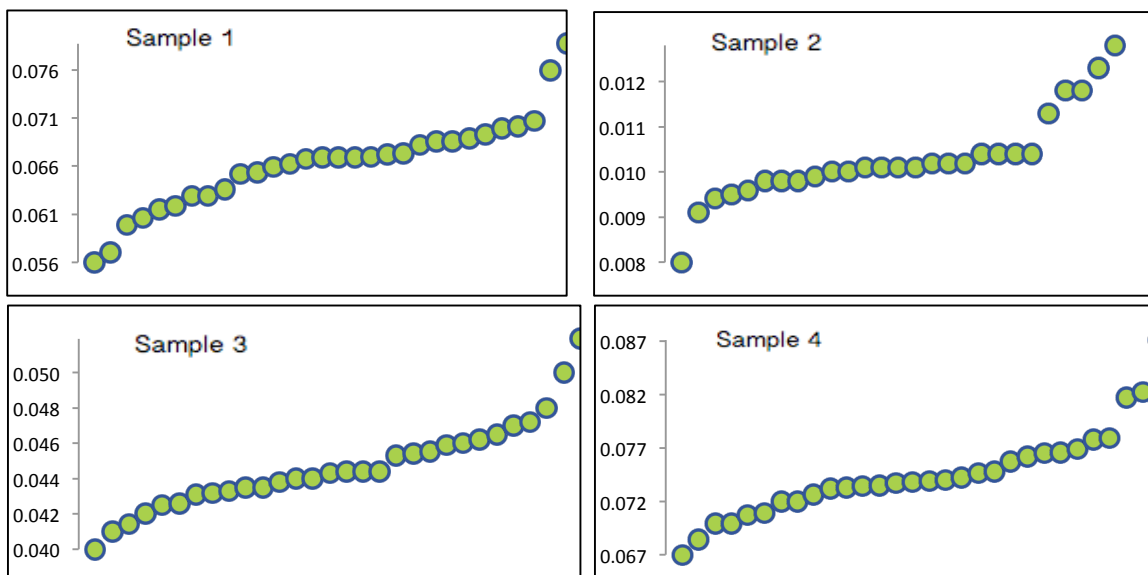
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	30	27	30	30
Median	0.0670	0.0103	0.0444	0.0740
Robust Mean	0.0662	0.0104	0.0445	0.0742
U	0.000933	0.000168	0.00052	0.000765
Robust Standard Deviation	0.00409	0.000700	0.00228	0.00335
Regression Standard Deviation	0.00497	0.000778	0.00334	0.00557
Stability Flag				Stability
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00497	0.000778	0.00334	0.00792
Outliers	0	0	0	0
$ z  > 3.0$	0	1	0	0
$2 <  z  < 3$	2	4	1	0

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES (Blue)	2	1	2	2
ICP/MS (Red)	28	26	28	28

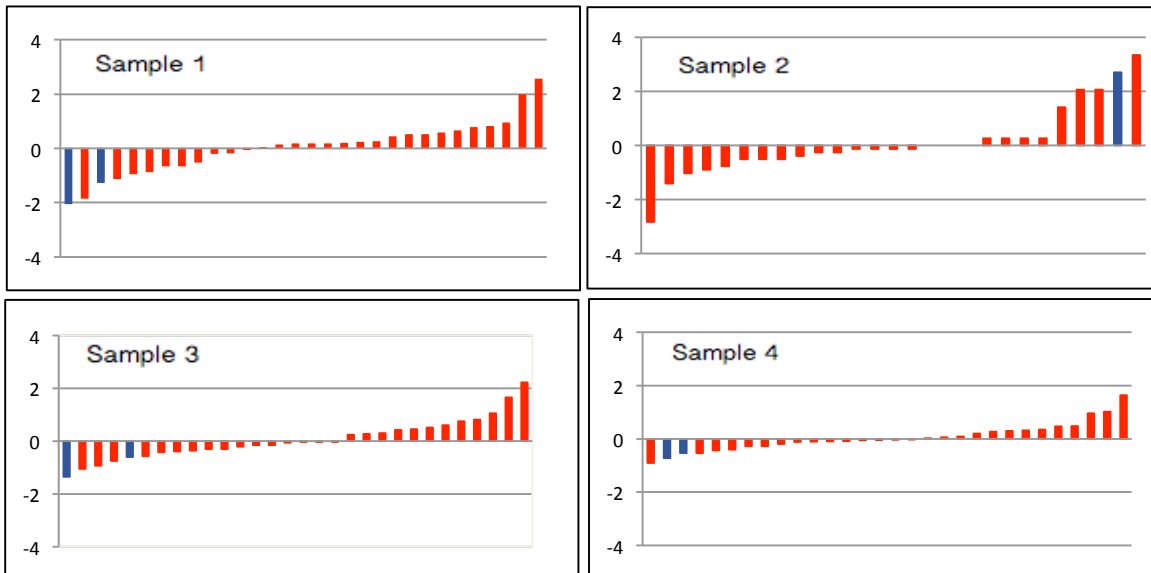
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

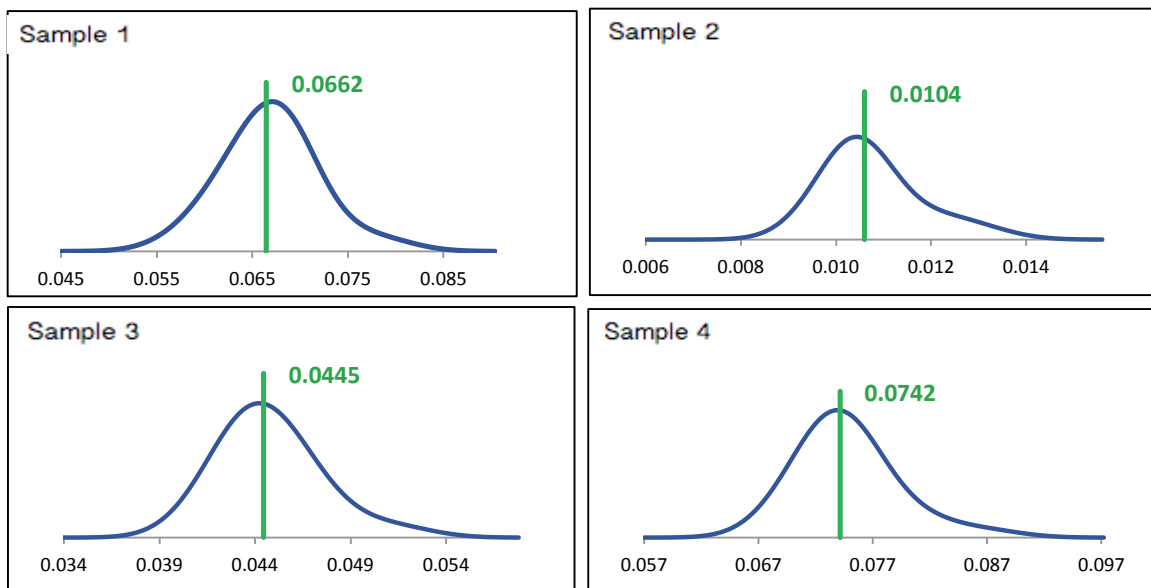


## URANIUM

### z-Score Plots

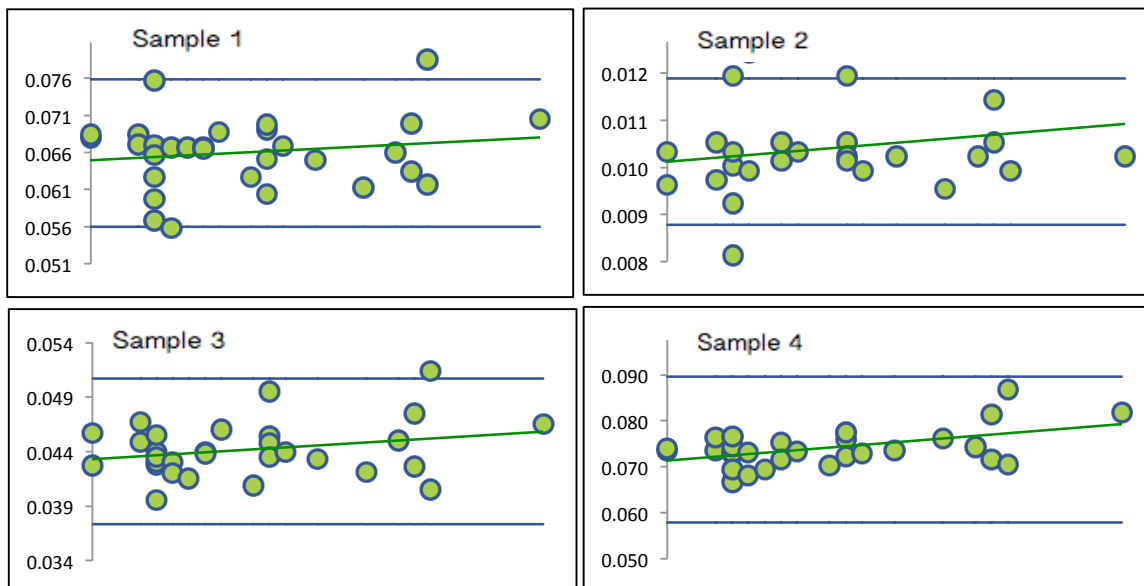


### Kernel Density Plots



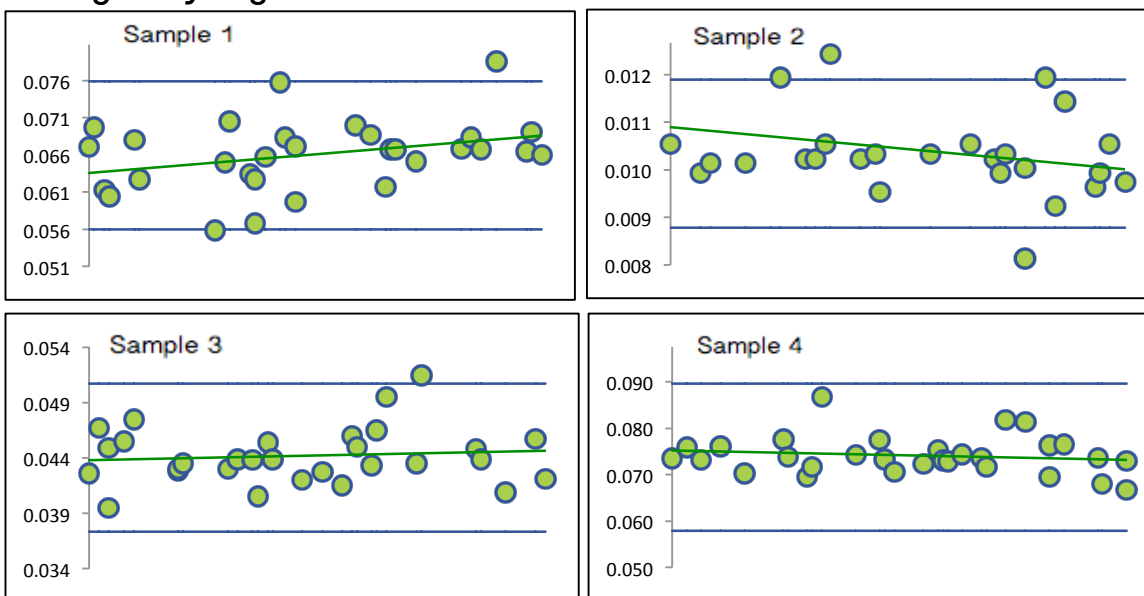
## URANIUM

### Stability Regression



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

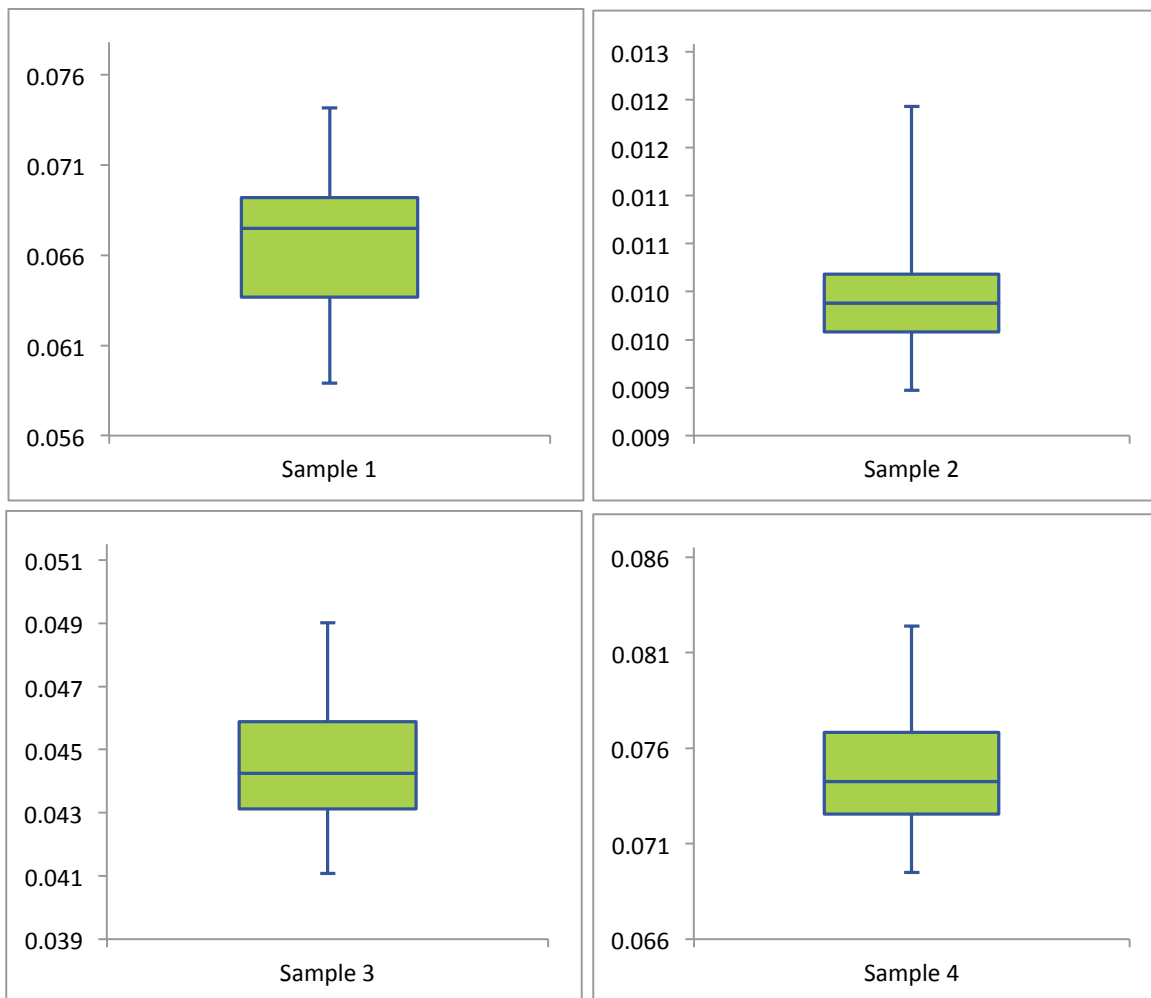
### Homogeneity Regression



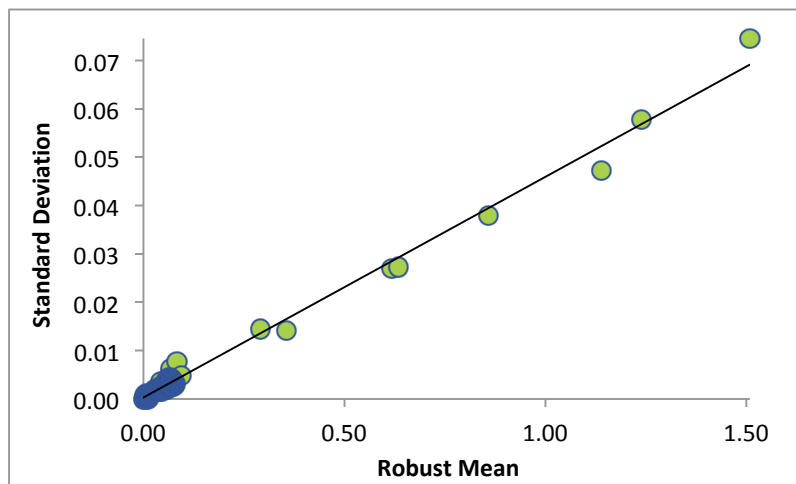
Reported results (Y-axis) plotted against bottling order (X-axis).

## URANIUM

### Box and Whisker Plots



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



## VANADIUM

## Summary Statistics

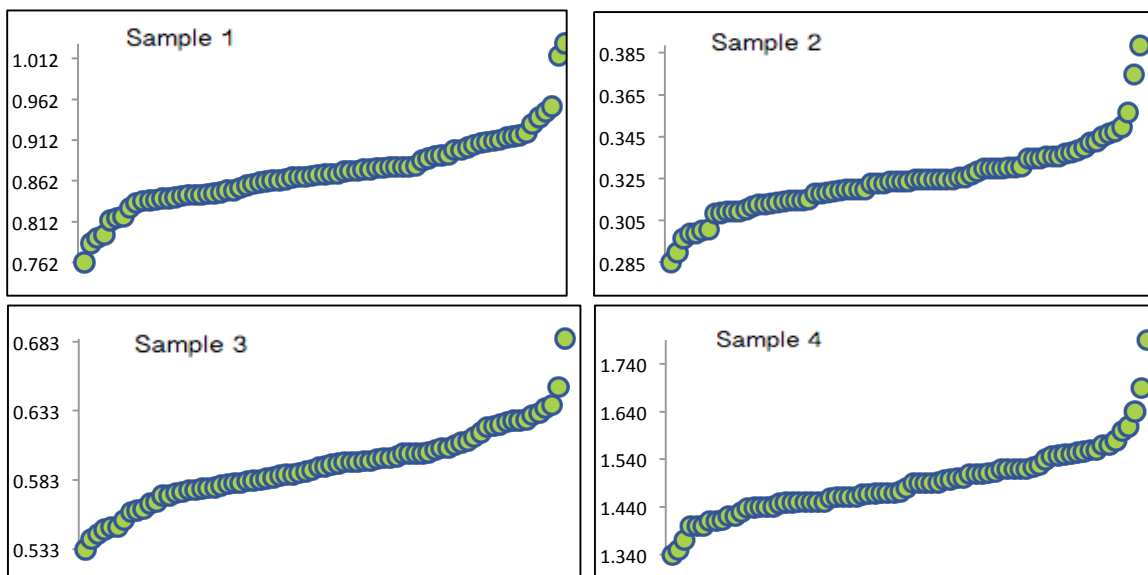
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	75	76	75	76
Median	0.870	0.324	0.593	1.49
Robust Mean	0.871	0.324	0.592	1.49
U	0.00521	0.00198	0.0037	0.00882
Robust Standard Deviation	0.0361	0.0138	0.0256	0.0615
Regression Standard Deviation	0.0653	0.0243	0.0444	0.111
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0653	0.0243	0.0444	0.111
Outliers	1	0	1	0
$ z  > 3.0$	0	0	0	0
$2 <  z  < 3$	2	2	1	1

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	46	47	46	47
ICP/OES (Red)	29	29	29	29

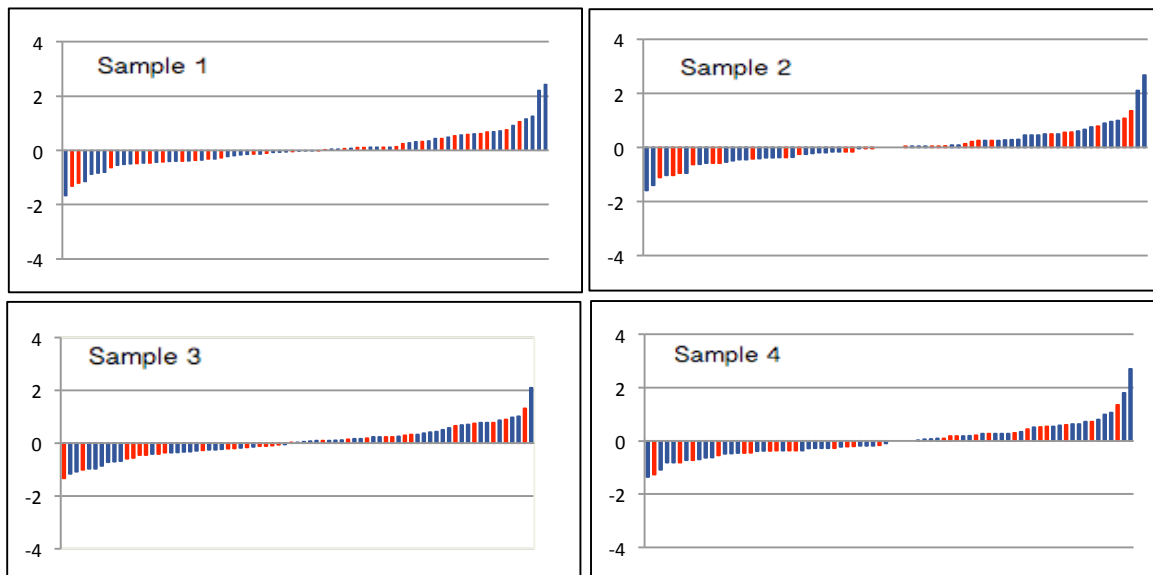
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

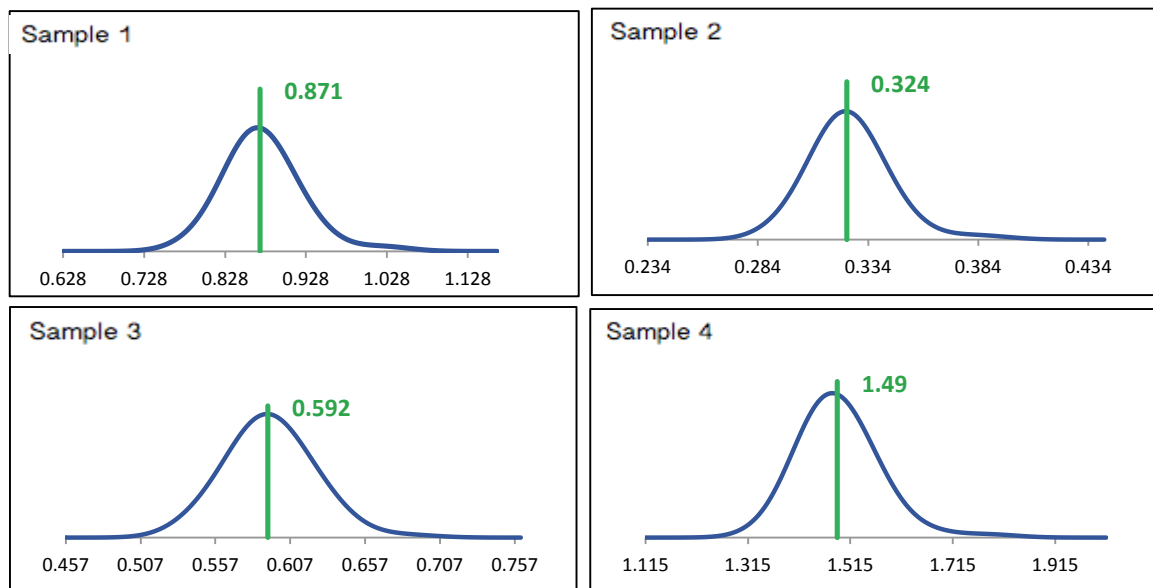


## VANADIUM

### z-Score Plots

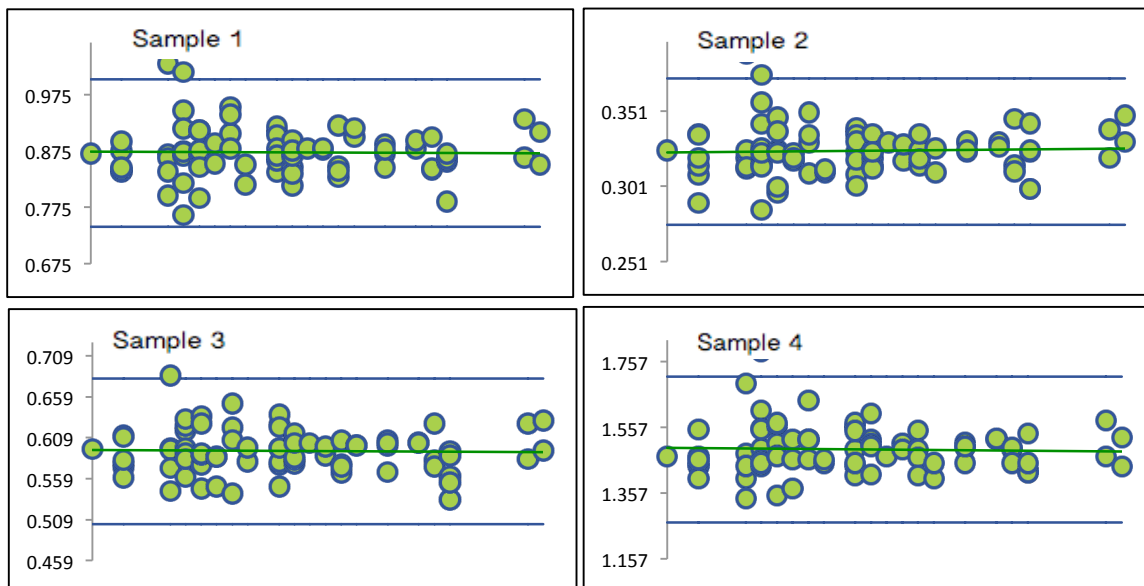


### Kernel Density Plots



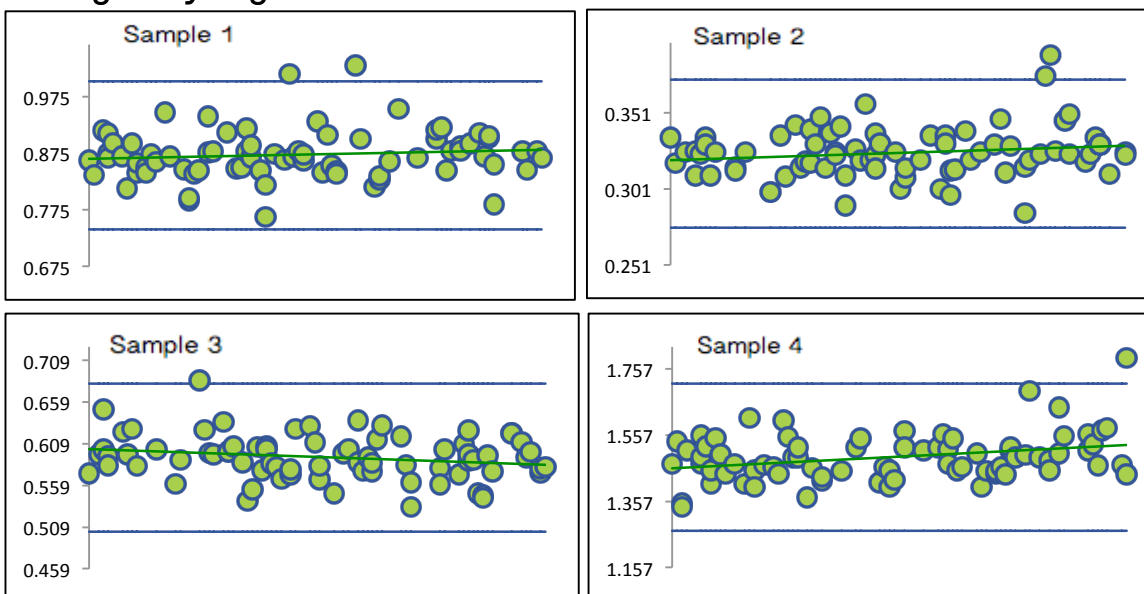
## VANADIUM

### Stability Regression



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

### Homogeneity Regression

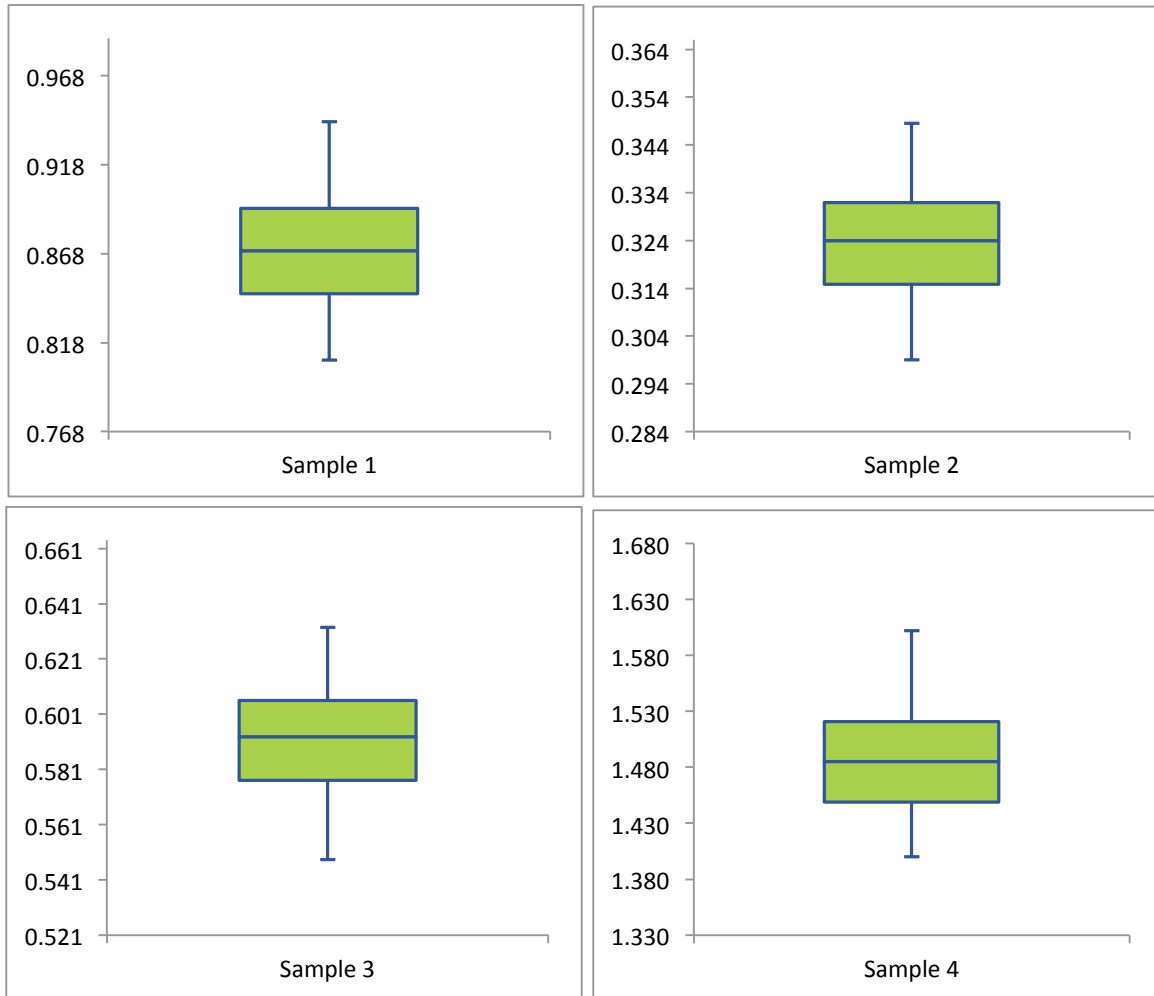


Reported results (Y-axis) plotted against bottling order (X-axis).

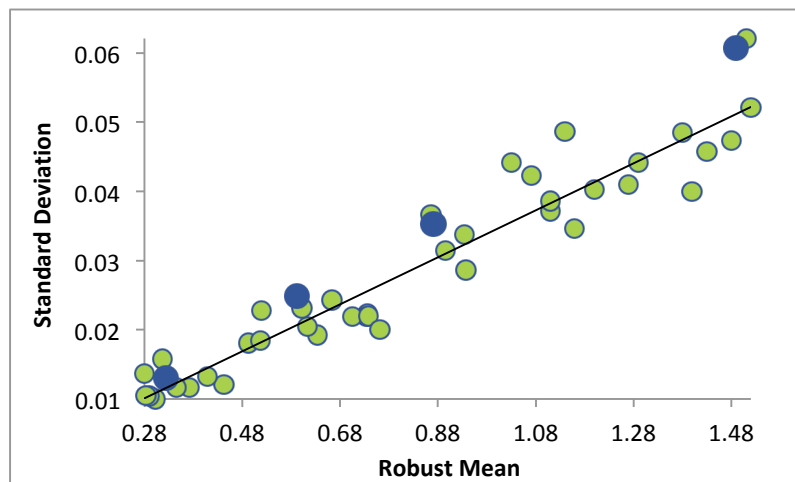


## VANADIUM

### Box and Whisker Plots



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



## ZINC

## Summary Statistics

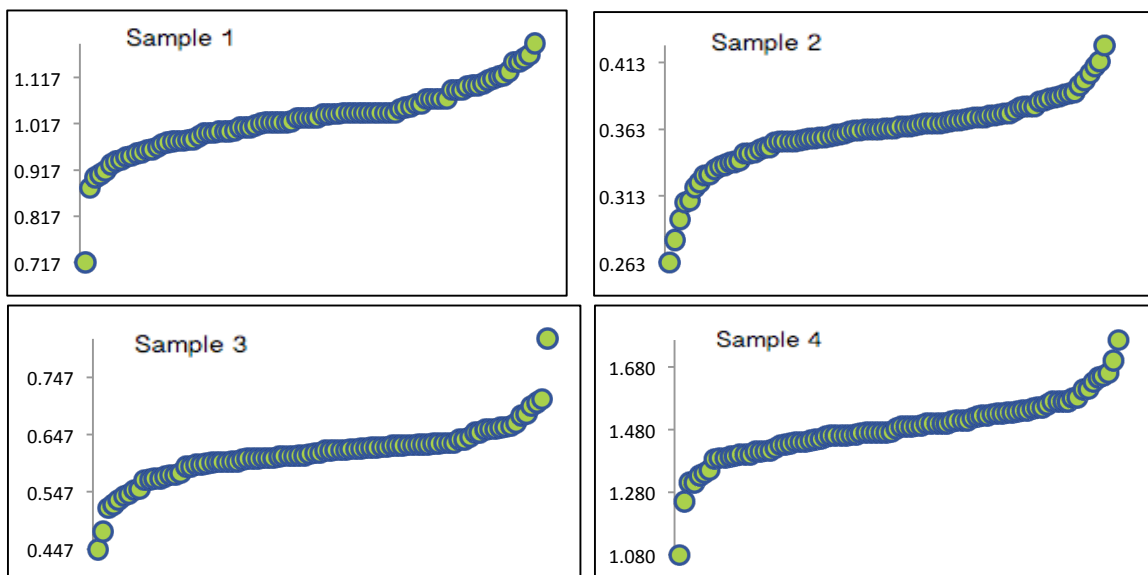
Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	88	88	88	88
Median	1.03	0.364	0.617	1.49
Robust Mean	1.03	0.363	0.614	1.48
U	0.00829	0.0027	0.00465	0.0105
Robust Standard Deviation	0.0622	0.0203	0.0349	0.0788
Regression Standard Deviation	0.0771	0.0272	0.0461	0.111
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0771	0.0272	0.0461	0.111
Outliers	0	0	0	0
$ z  > 3.0$	1	2	2	1
$2 <  z  < 3$	1	3	3	2

## Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	53	53	53	53
ICP/OES (Red)	34	34	34	34
AA (Green)	1	1	1	1

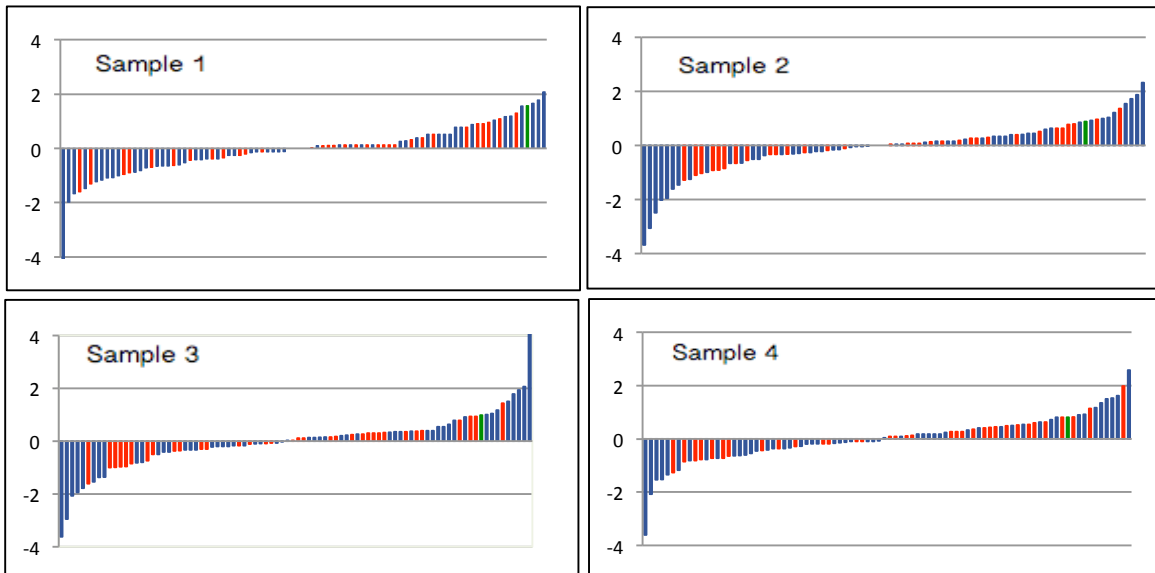
All summary stats and the plots below are based on the data excluding any flagged outliers

## Sorted Scatter Plots

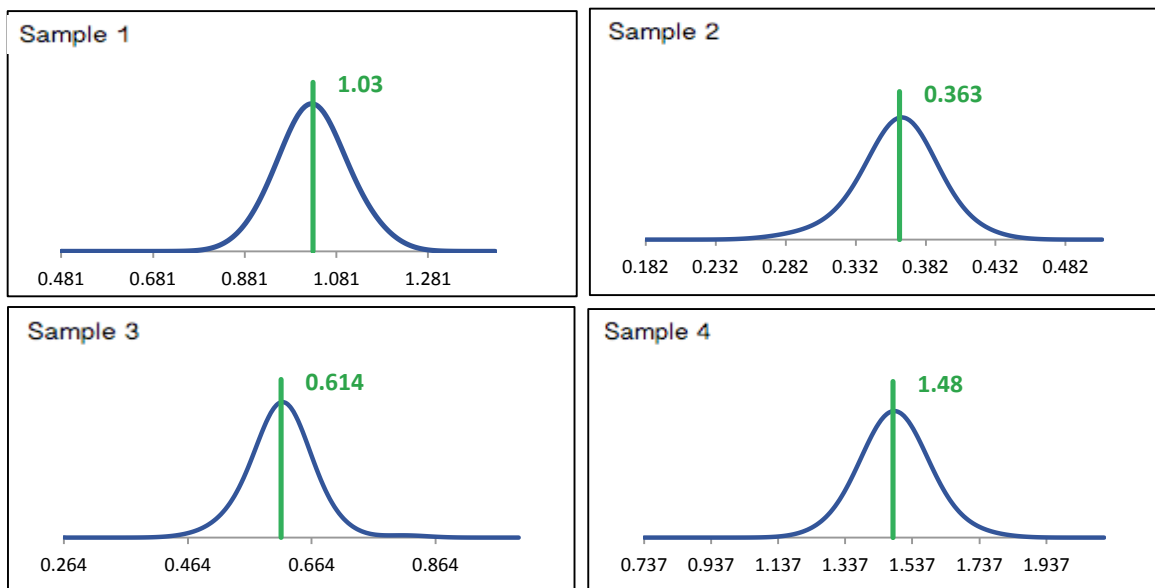


## ZINC

### z-Score Plots

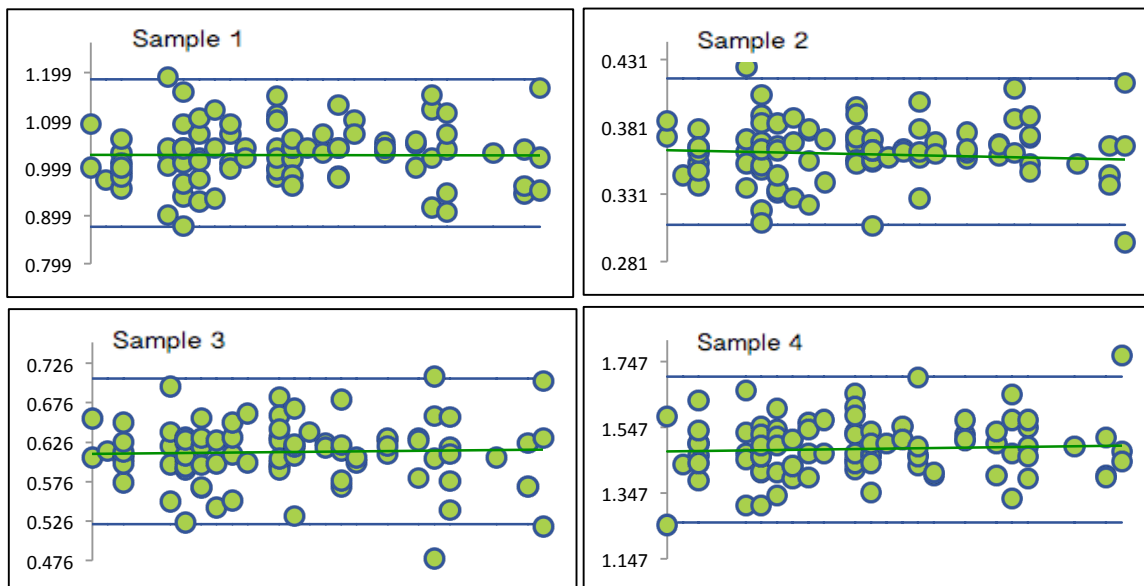


### Kernel Density Plots



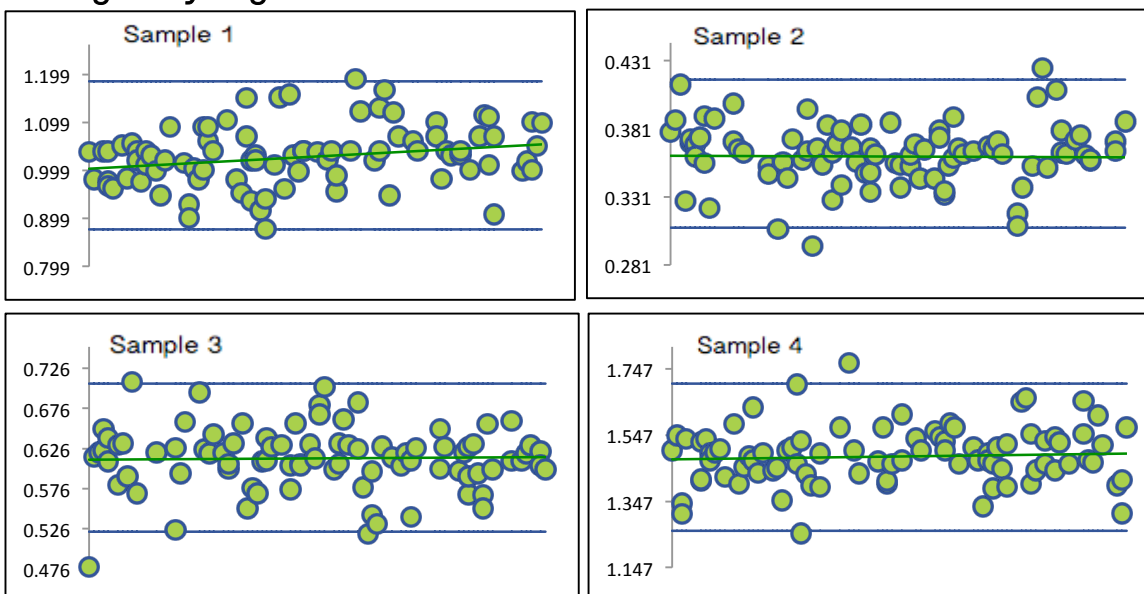
## ZINC

### Stability Regression



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

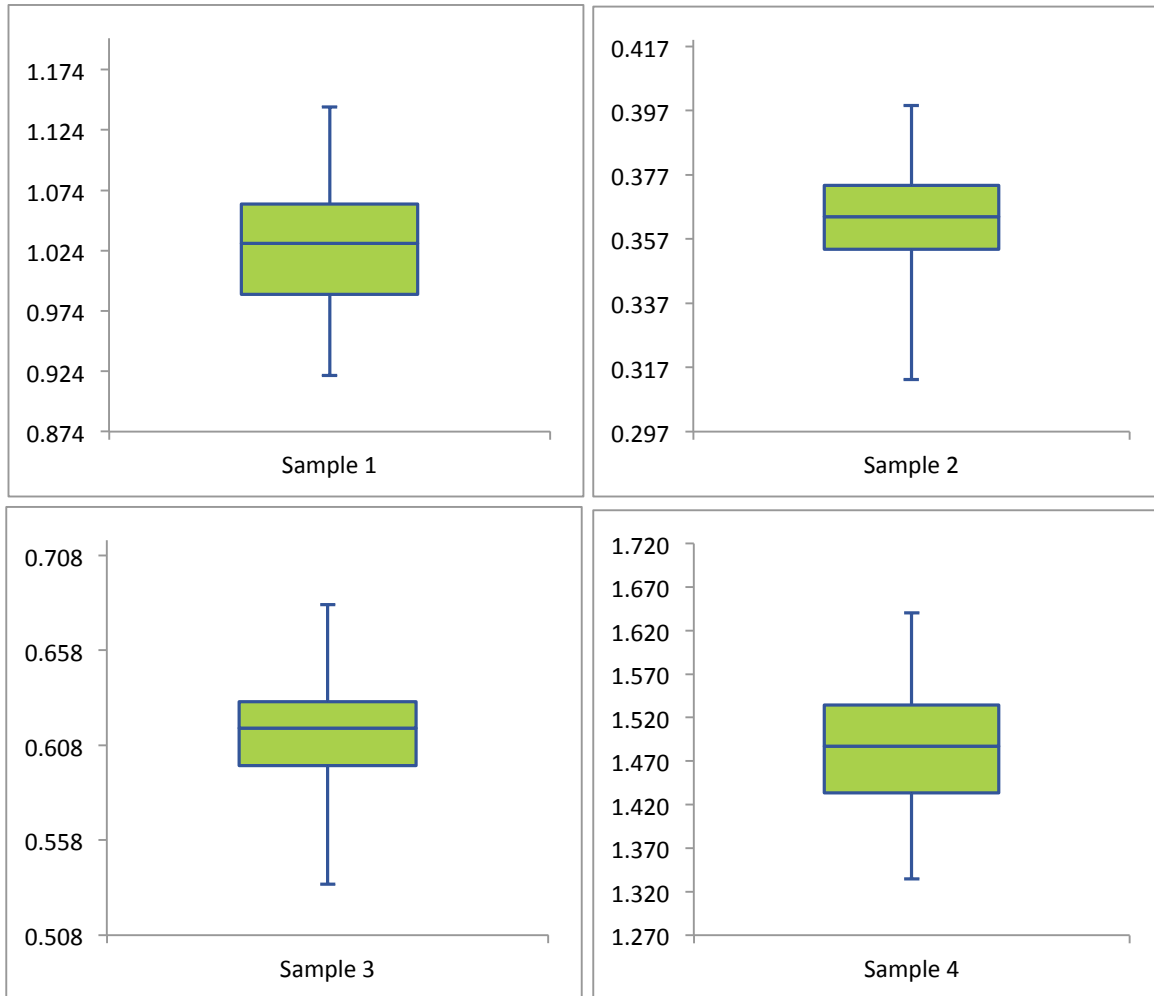
### Homogeneity Regression



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

## ZINC

### Box and Whisker Plots



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

