

Test Group Summary Report

C02C Metals in Water – Total

March 2021 PT Round (Shipped May 17)

Issued: July 15, 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 are 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.

$$RSZ = \frac{\sum z}{\sqrt{N}}$$

where z = the z -score
 N = the number of samples

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.

ALUMINUM

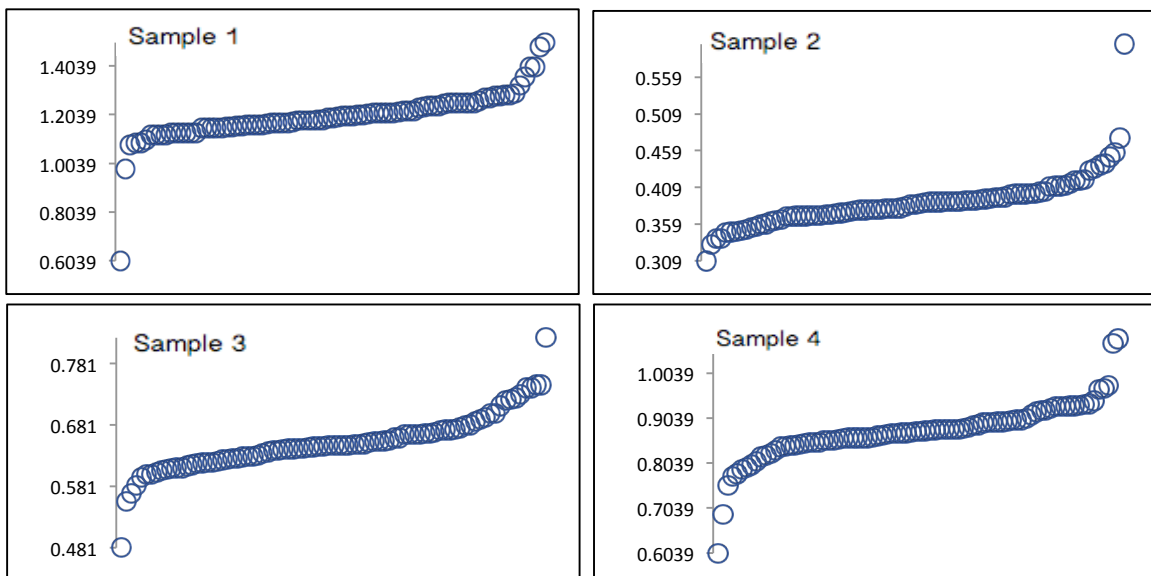
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	85	85	85	84
Median	1.19	0.386	0.647	0.874
Robust Mean	1.20	0.385	0.650	0.876
U	0.0089	0.0034	0.0051	0.0062
Robust Standard Deviation	0.0654	0.0249	0.0373	0.0452
Regression Standard Deviation	0.0896	0.0289	0.0487	0.0657
Stability Flag				
Homogeneity Flag		Homogeneity		
Standard Deviation Used (SDPA)	0.0896	0.0343	0.0487	0.0657
Outliers	0	0	0	1
z >3.0	3	1	2	2
2< z <3	3	3	0	2

Methods Used

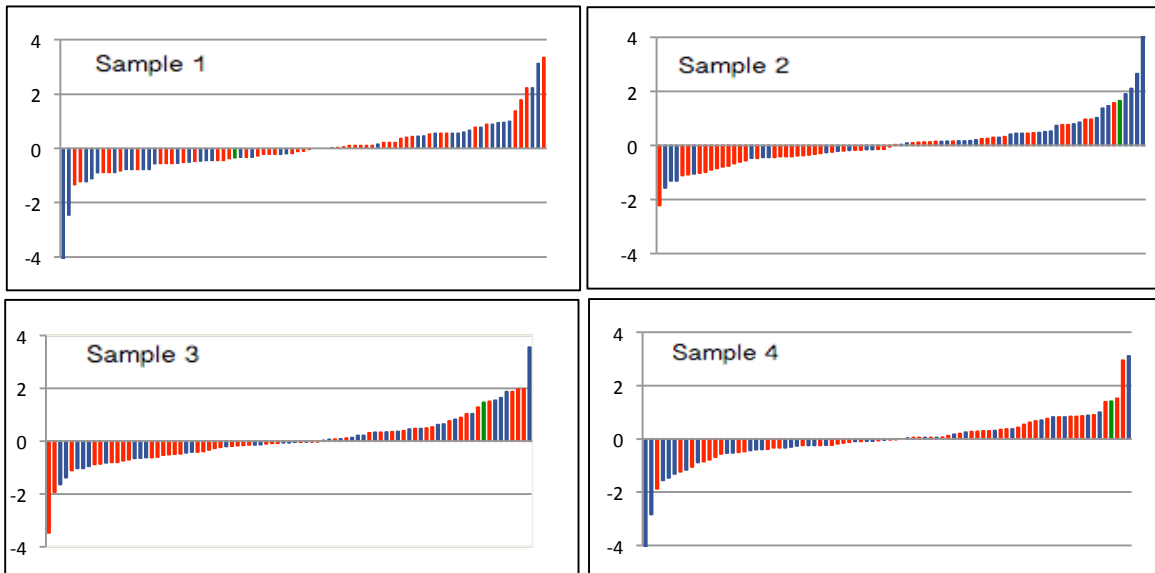
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES	37	37	37	36
ICP/MS	47	47	47	47
AA	1	1	1	1

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

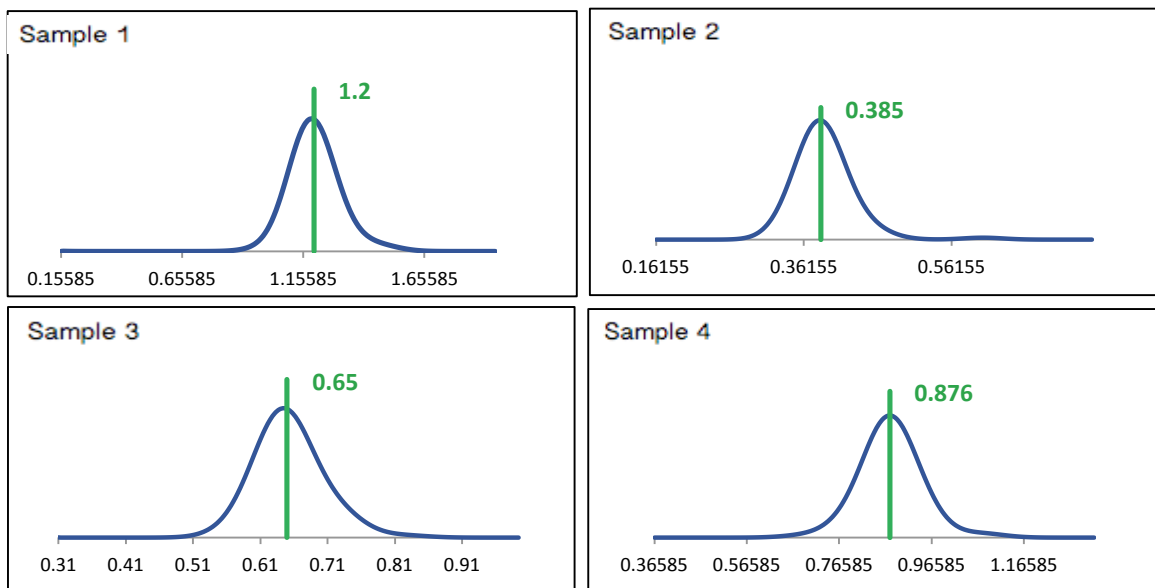


ALUMINUM

z-Score Plots

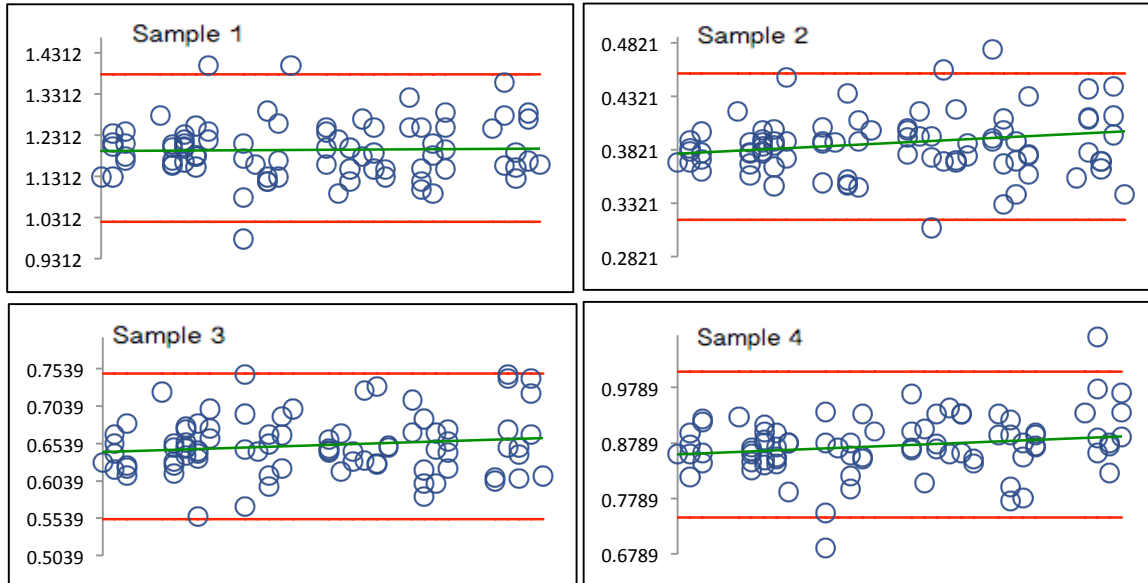


Kernel Density Plots



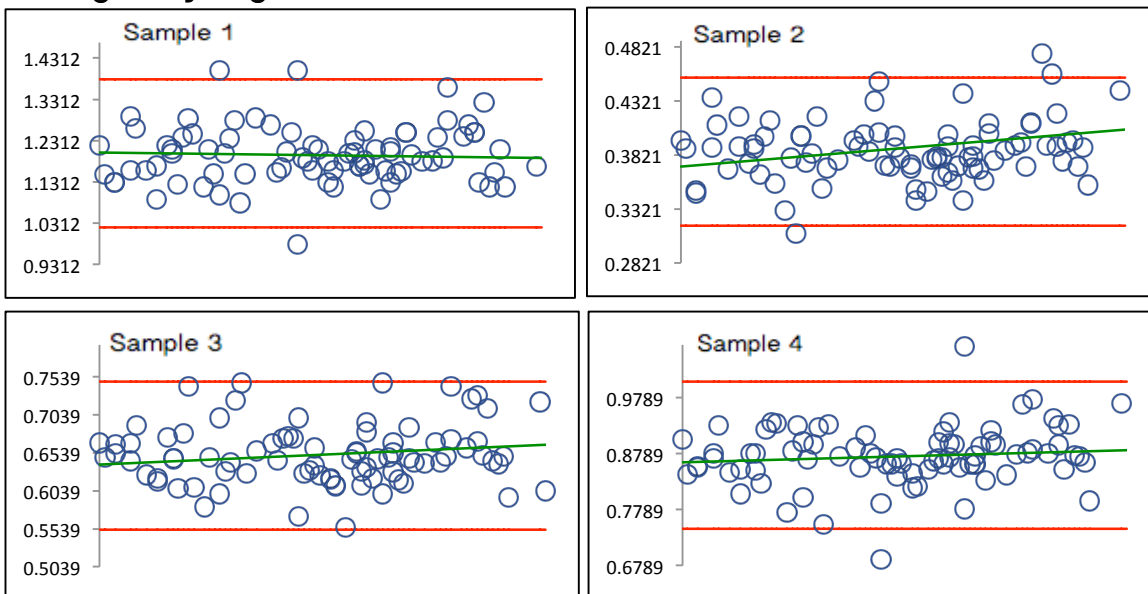
ALUMINUM

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).

ANTIMONY

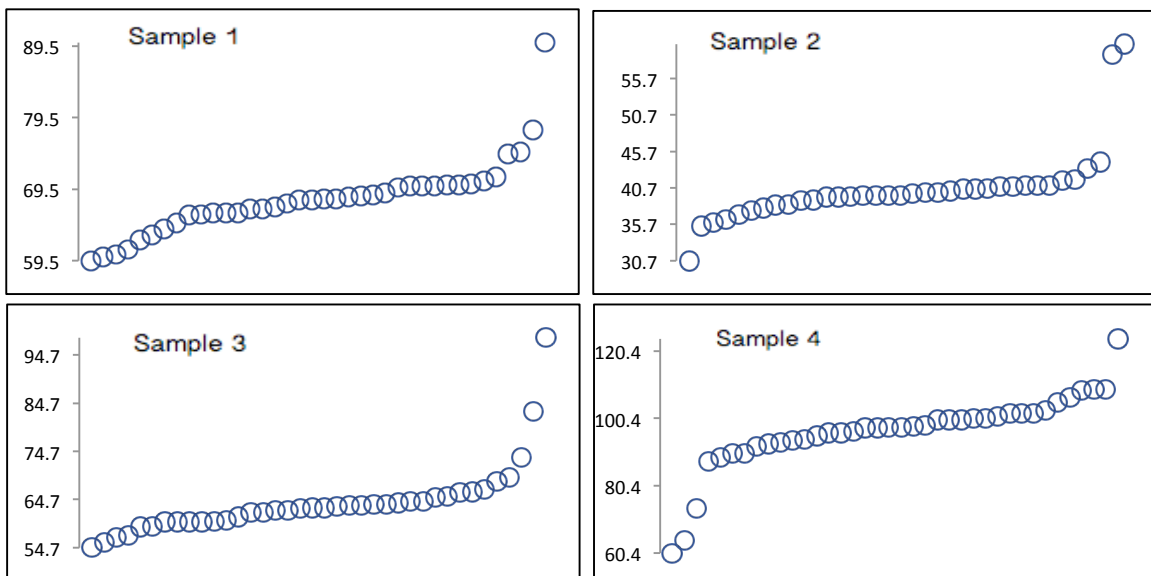
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	38	36	38	38
Median	68.1	39.8	63.0	97.8
Robust Mean	67.7	39.8	62.9	97.6
U	0.756	0.425	0.808	1.480
Robust Standard Deviation	3.73	2.01	3.93	7.18
Regression Standard Deviation	6.77	3.98	6.29	9.76
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	6.77	3.98	6.29	9.76
Outliers	1	1	1	1
$ z > 3.0$	1	2	2	2
$2 < z < 3$	0	1	0	2

Methods Used

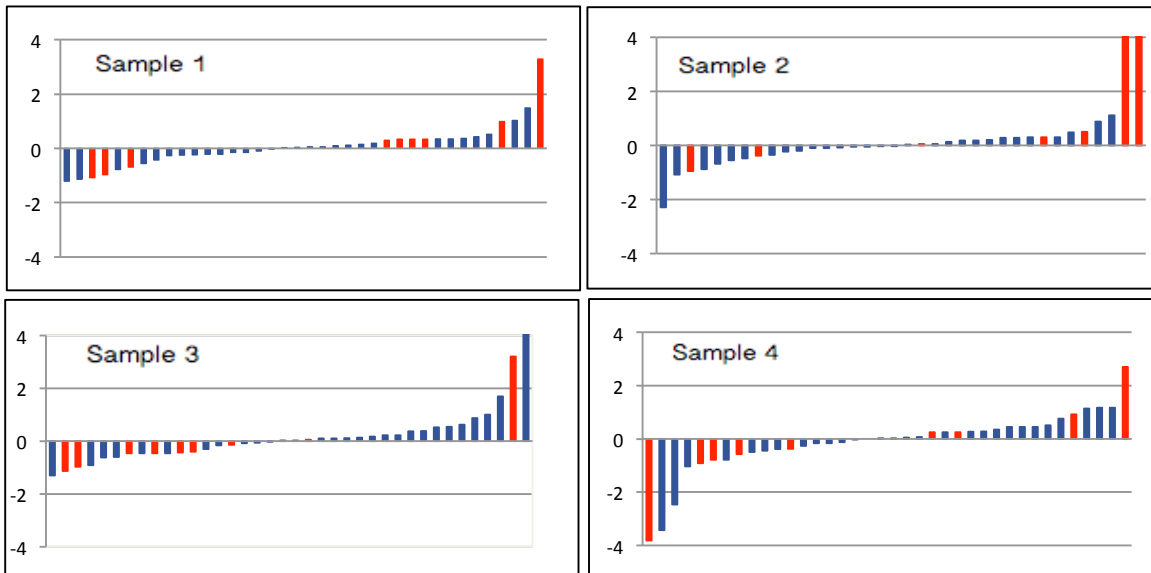
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	29	29	29	29
ICP/OES	9	7	9	9

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

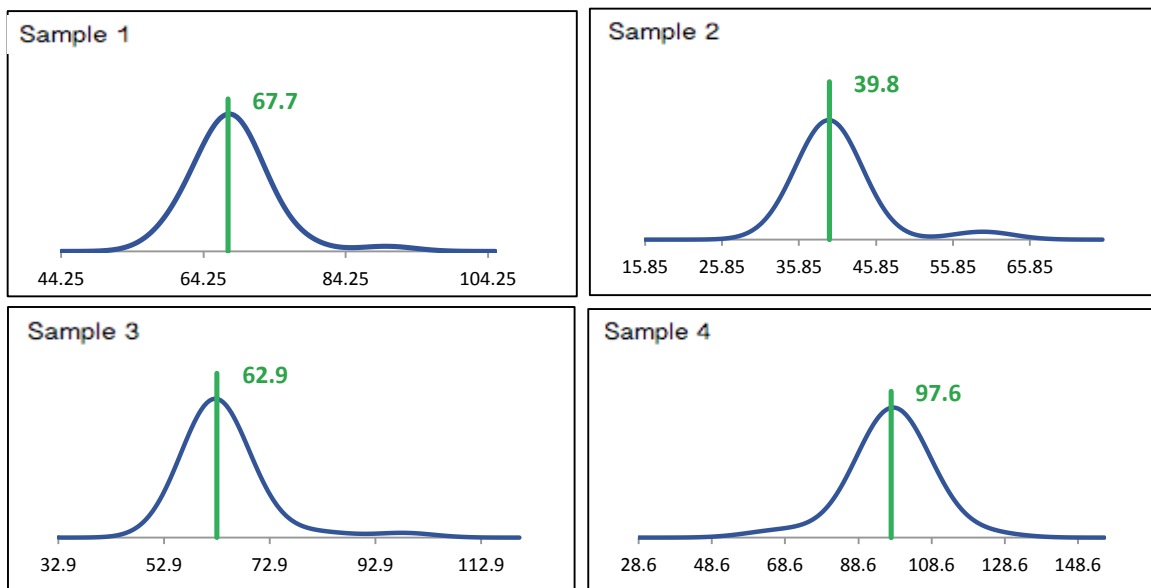


ANTIMONY

z-Score Plots

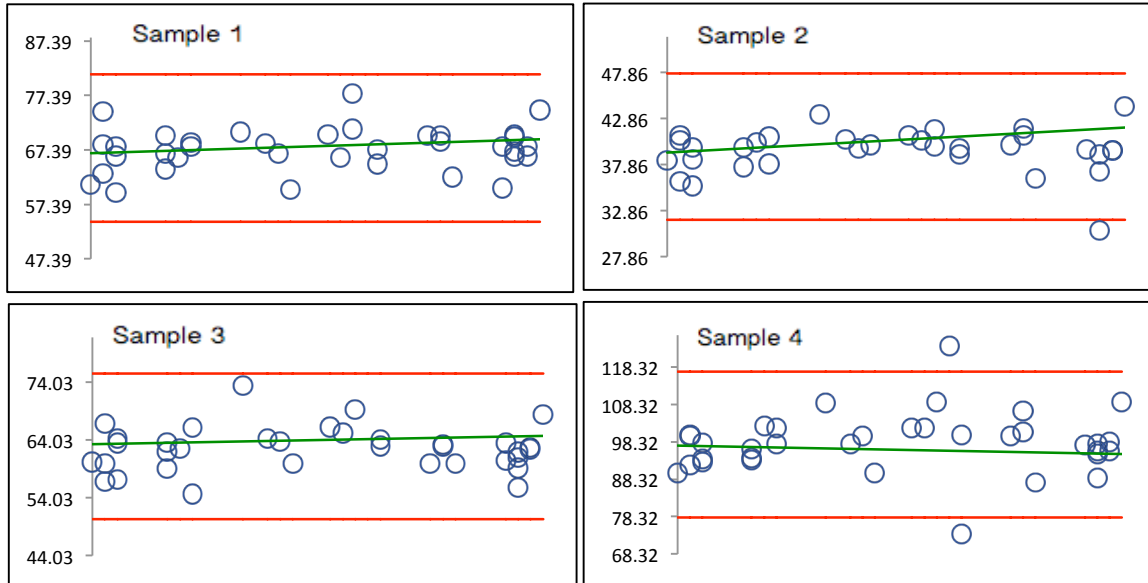


Kernel Density Plots



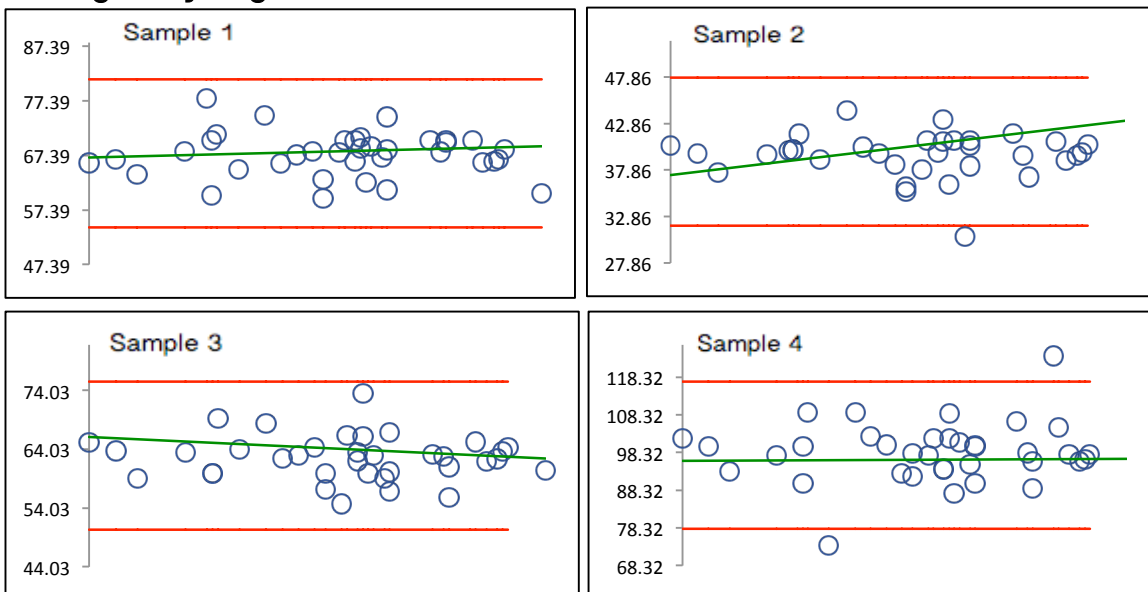
ANTIMONY

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).

ARSENIC

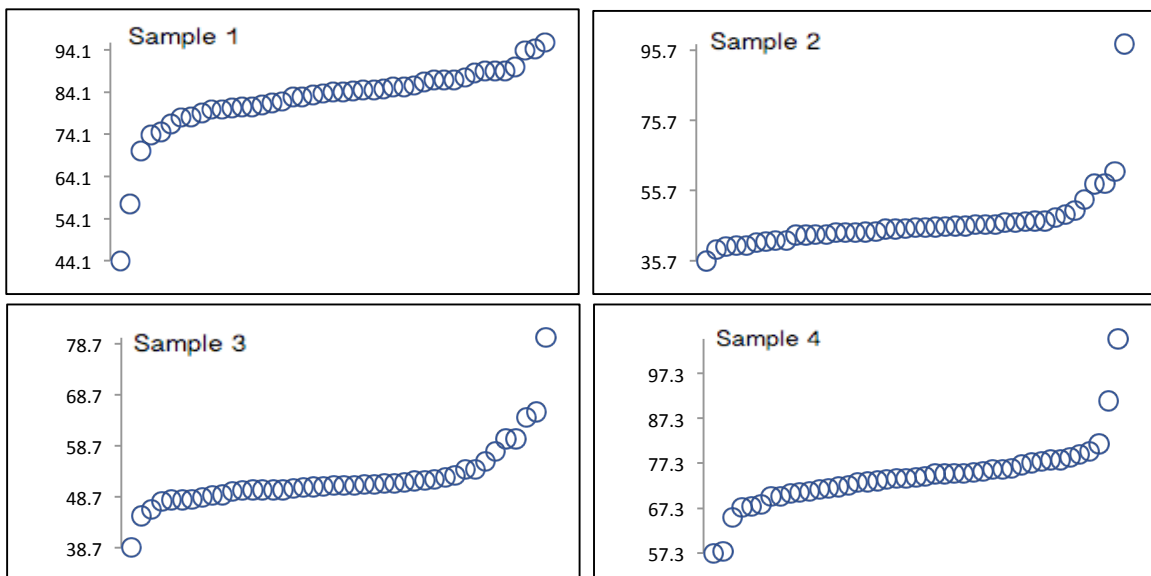
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	43	43	42	43
Median	84.0	45.0	50.9	74.2
Robust Mean	83.4	44.9	51.2	74.0
U	1.040	0.702	0.599	0.851
Robust Standard Deviation	5.44	3.64	3.07	4.41
Regression Standard Deviation	8.34	4.49	5.12	7.40
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	8.34	4.49	5.12	7.40
Outliers	1	1	1	1
$ z > 3.0$	2	2	1	1
$2 < z < 3$	0	3	3	3

Methods Used

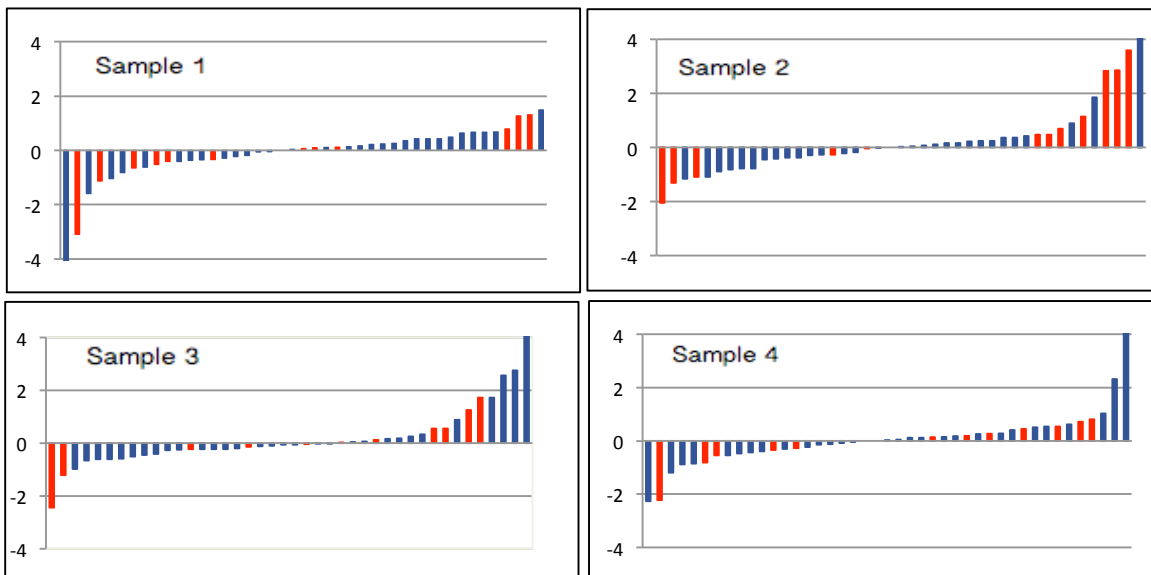
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	31	31	31	31
ICP/OES	12	12	11	12

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

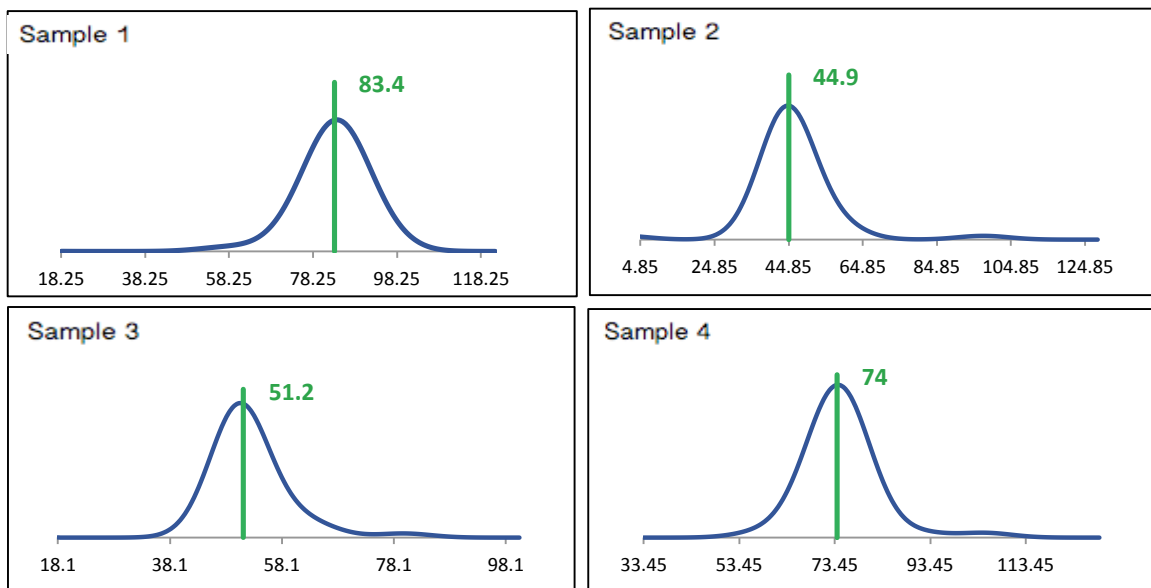


ARSENIC

z-Score Plots

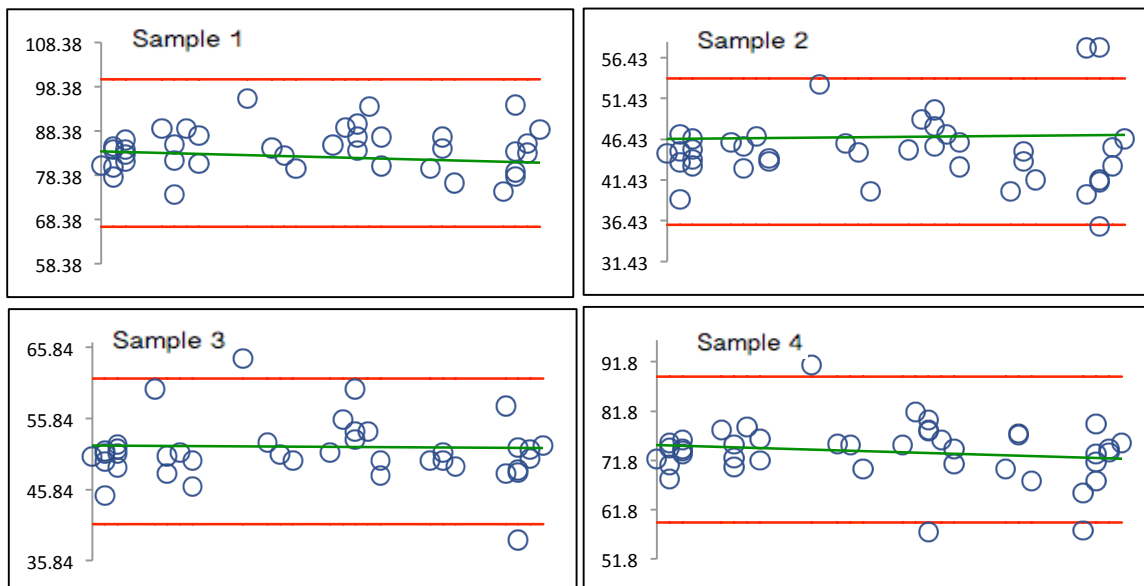


Kernel Density Plots



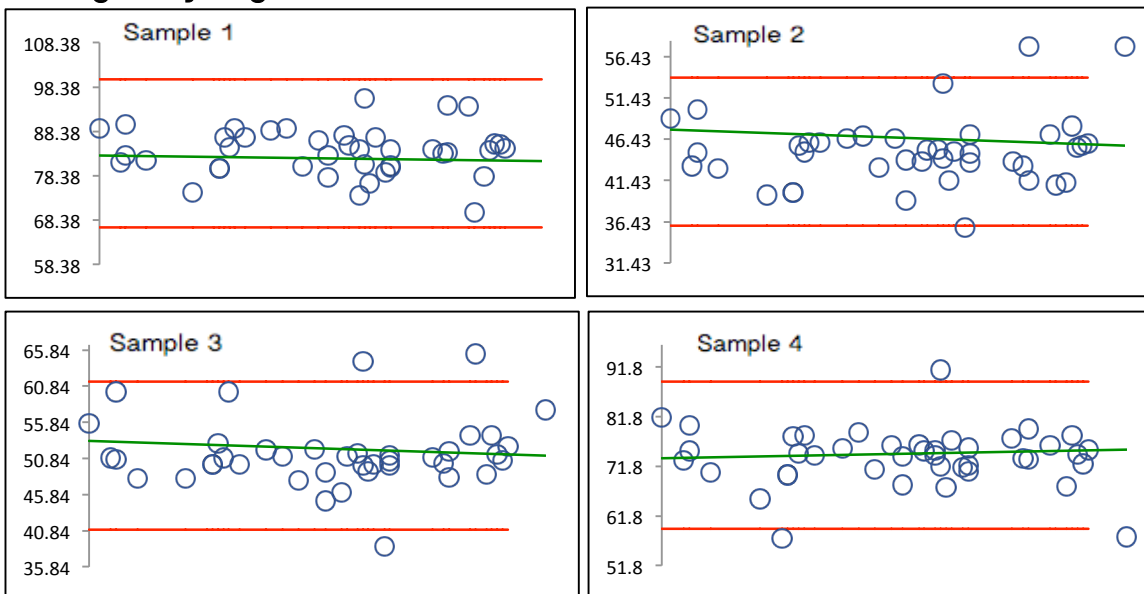
ARSENIC

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).

BARIUM

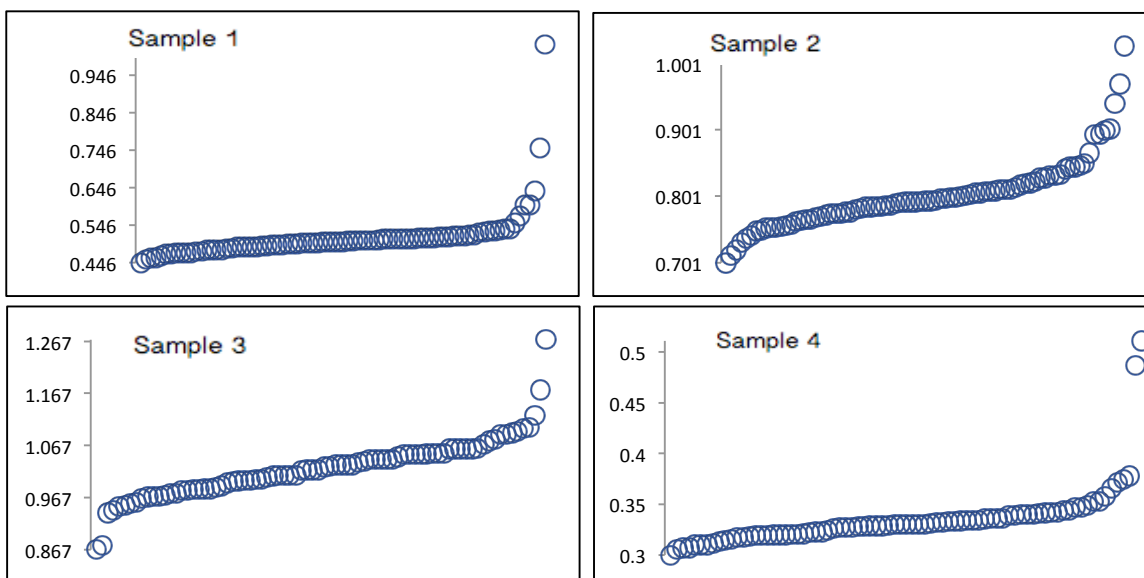
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	81	81	80	79
Median	0.501	0.794	1.02	0.330
Robust Mean	0.502	0.797	1.02	0.330
U	0.0034	0.0054	0.0069	0.0020
Robust Standard Deviation	0.0241	0.0386	0.0490	0.0144
Regression Standard Deviation	0.0376	0.0597	0.0766	0.0248
Stability Flag				
Homogeneity Flag				Homogeneity
Standard Deviation Used (SDPA)	0.0376	0.0597	0.0766	0.0333
Outliers	0	0	1	1
$ z > 3.0$	3	1	1	2
$2 < z < 3$	2	2	1	0

Methods Used

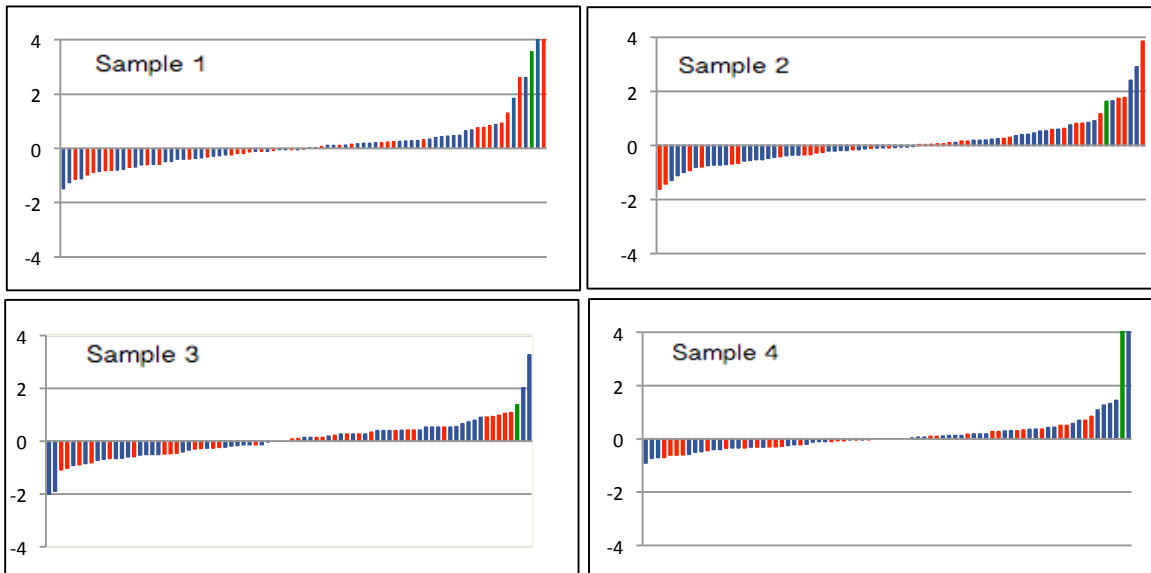
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	48	48	47	48
ICP/OES	32	32	32	30
AA	1	1	1	1

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

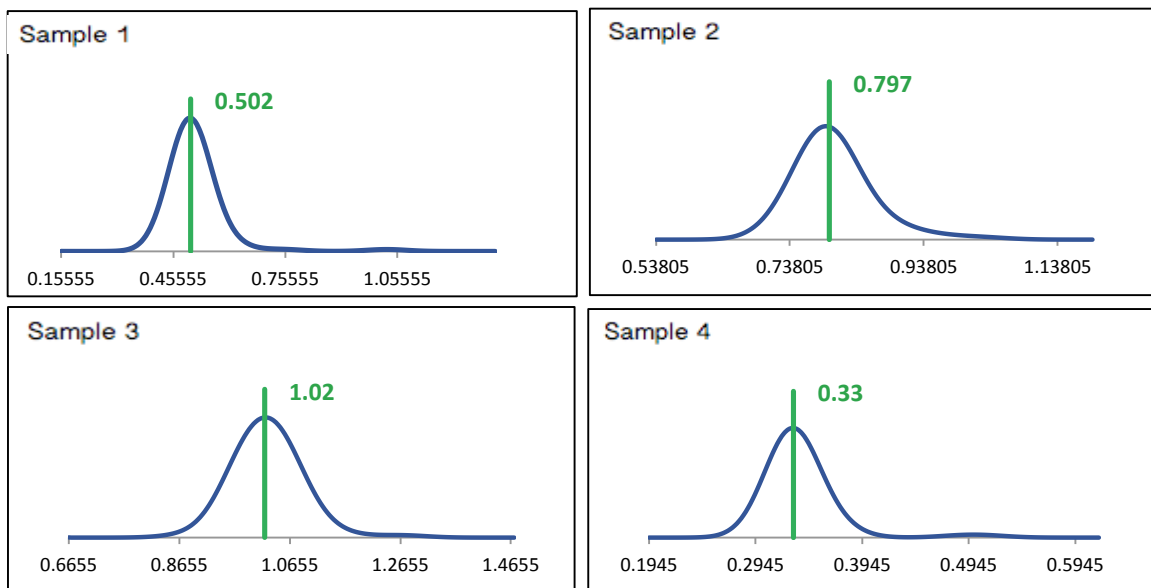


BARIUM

z-Score Plots

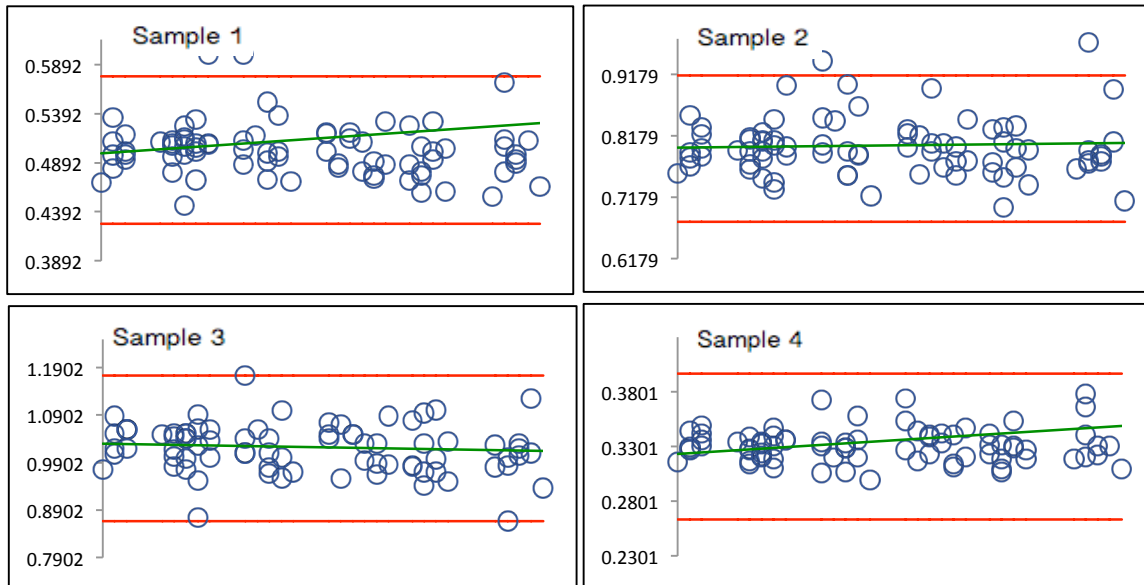


Kernel Density Plots



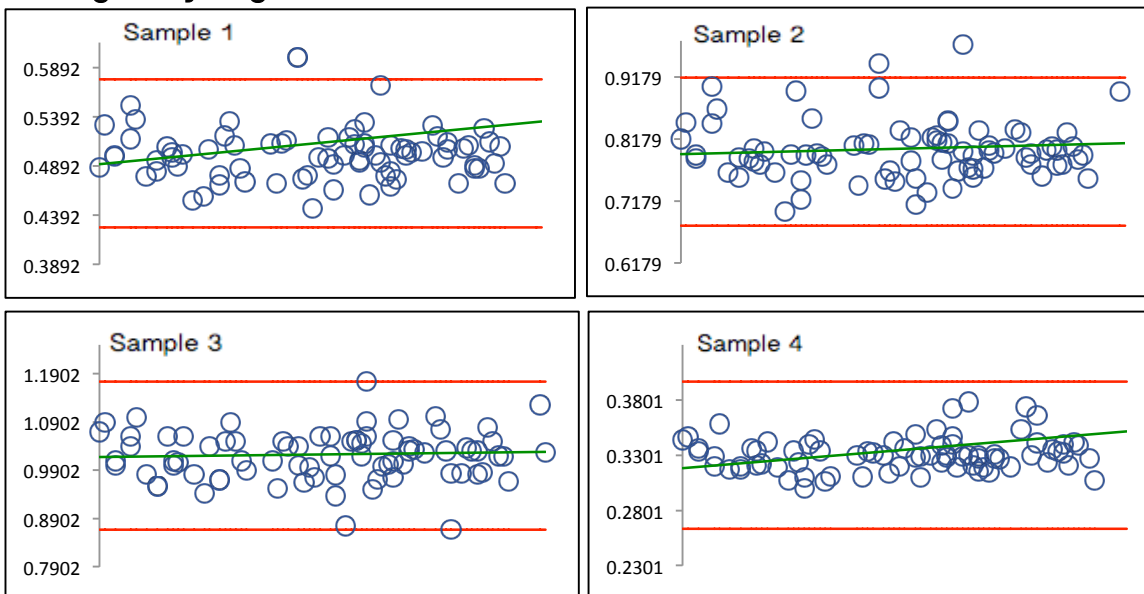
BARIUM

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).

BERYLLIUM

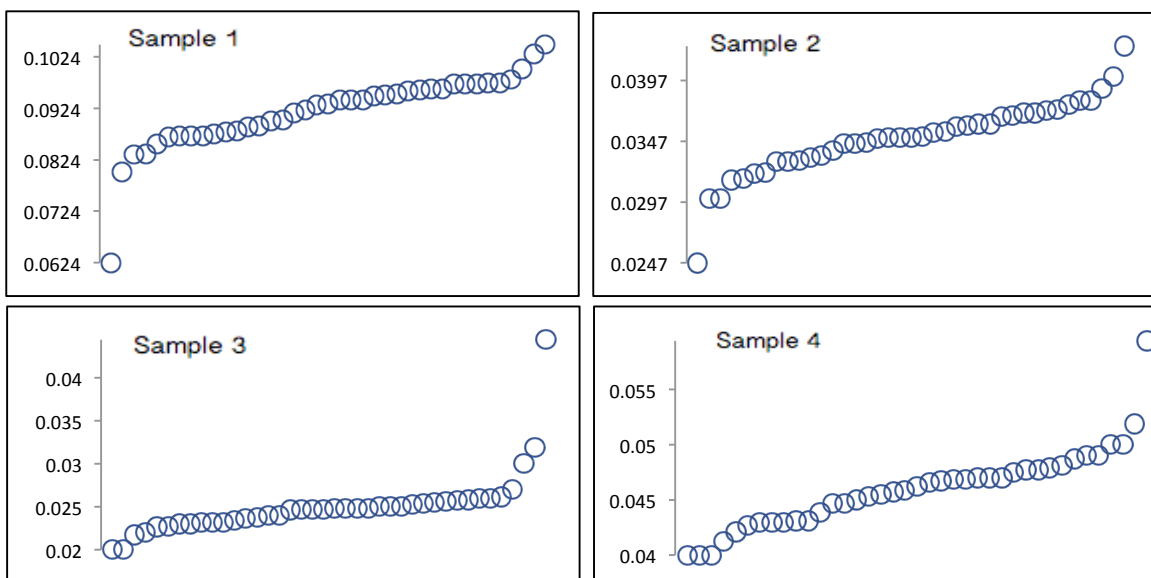
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	39	39	40	39
Median	0.0932	0.0350	0.0248	0.0462
Robust Mean	0.0922	0.0350	0.0245	0.0458
U	0.0012	0.00054	0.00033	0.00064
Robust Standard Deviation	0.00588	0.00266	0.00167	0.00315
Regression Standard Deviation	0.00691	0.00263	0.00184	0.00343
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00691	0.00266	0.00184	0.00343
Outliers	1	1	0	1
$ z > 3.0$	1	1	2	1
$2 < z < 3$	0	1	3	0

Methods Used

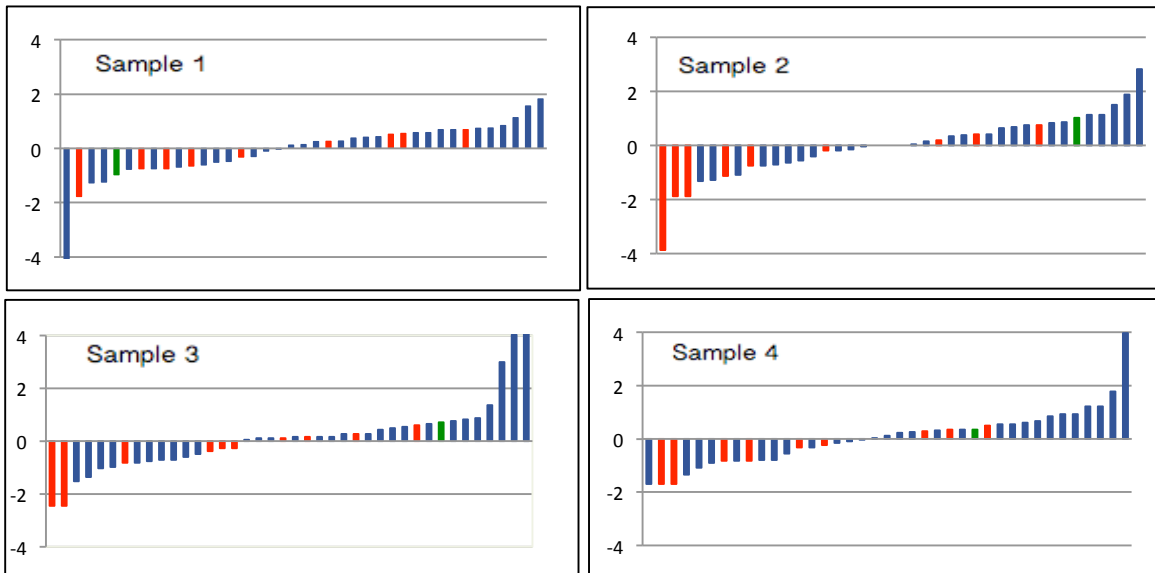
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	29	28	29	29
ICP/OES	9	10	10	9
AA	1	1	1	1

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

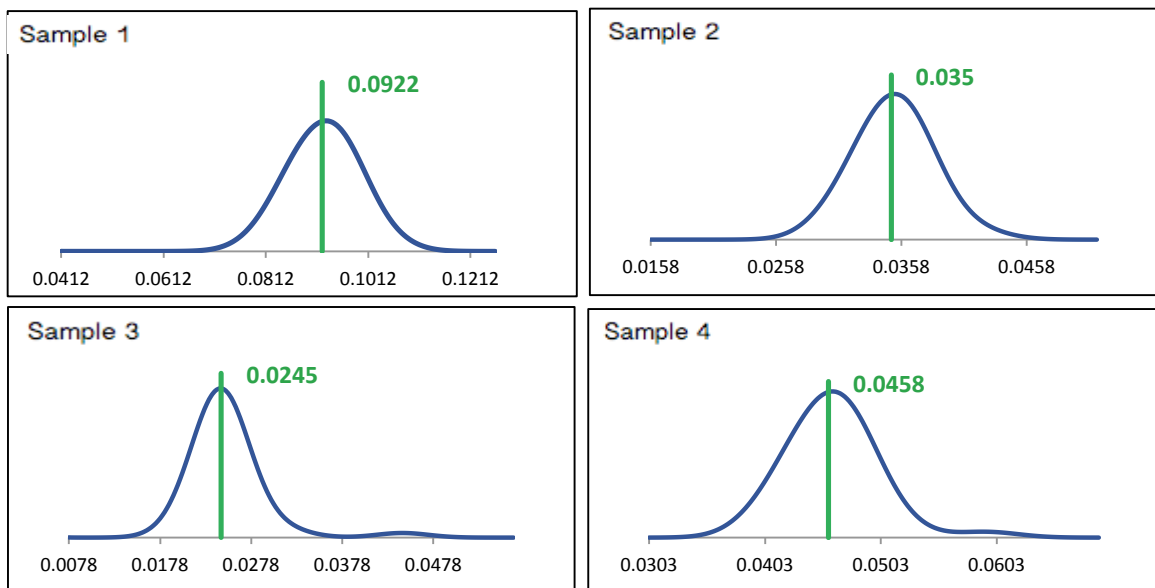


BERYLLIUM

z-Score Plots

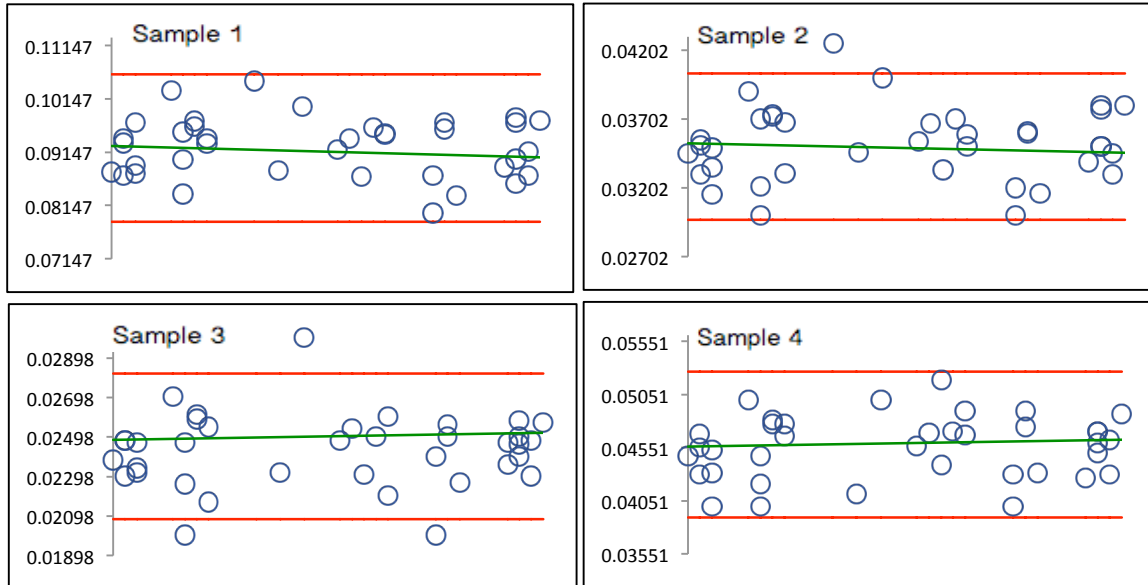


Kernel Density Plots



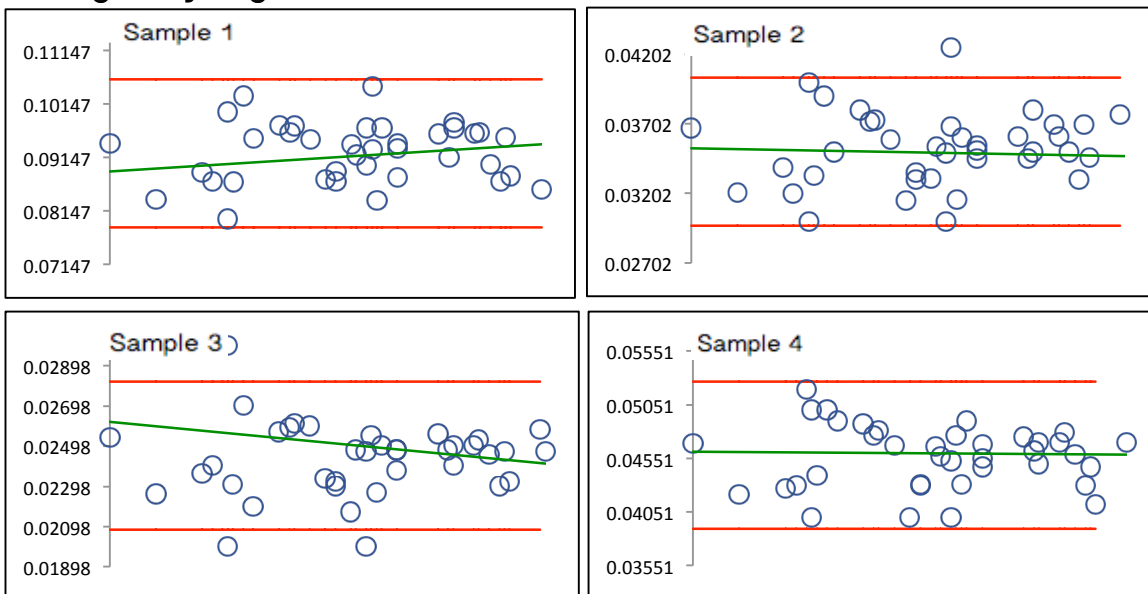
BERYLLIUM

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).

BORON

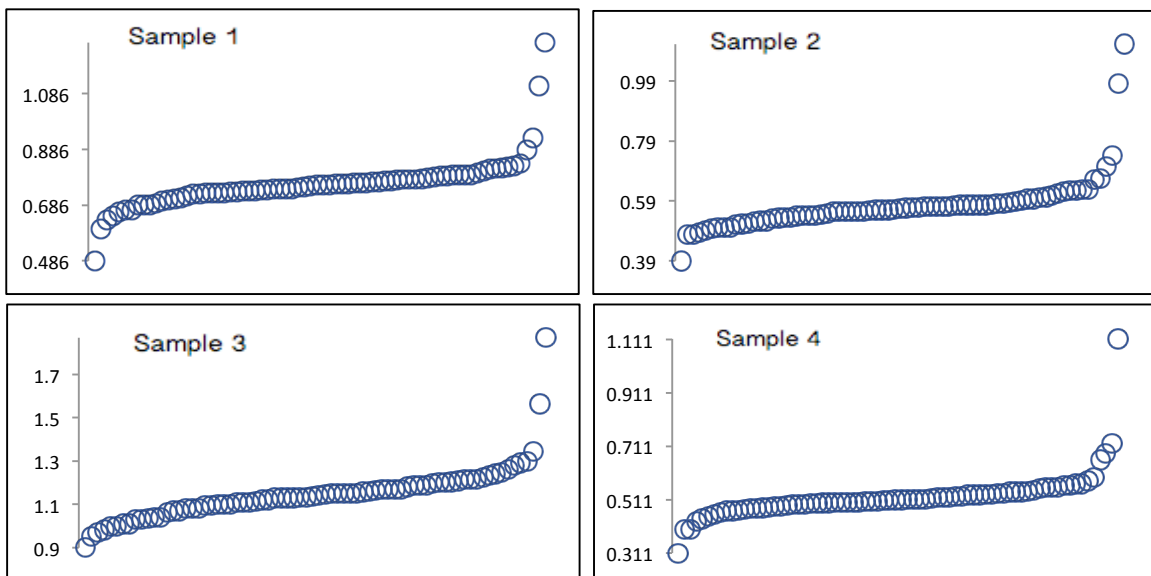
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	74	74	74	74
Median	0.758	0.564	1.14	0.511
Robust Mean	0.754	0.563	1.14	0.513
U	0.0074	0.00674	0.01280	0.00590
Robust Standard Deviation	0.0512	0.0464	0.0883	0.0406
Regression Standard Deviation	0.0566	0.0423	0.0853	0.0384
Stability Flag				
Homogeneity Flag				Homogeneity
Standard Deviation Used (SDPA)	0.0566	0.0464	0.0883	0.0963
Outliers	0	0	0	0
$ z > 3.0$	4	5	2	1
$2 < z < 3$	3	2	3	2

Methods Used

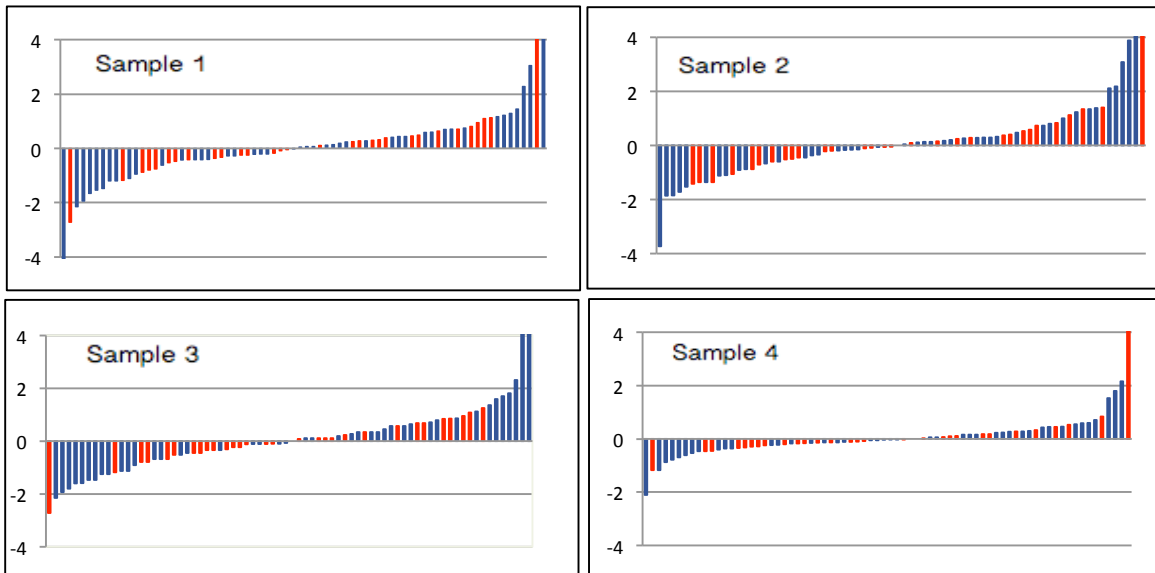
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	44	44	44	44
ICP/OES	30	30	30	30

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

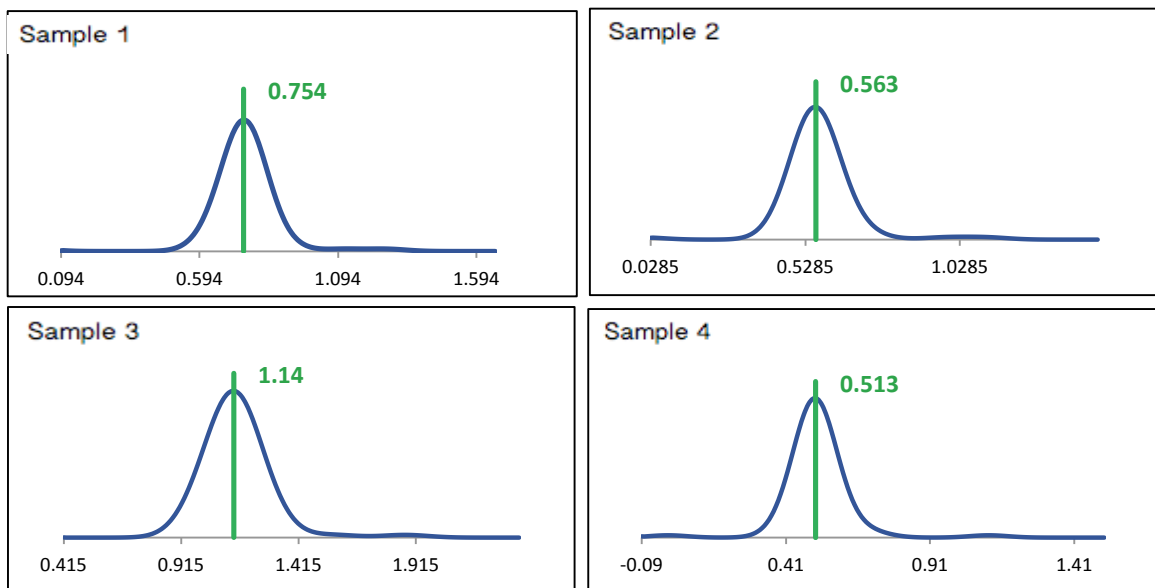


BORON

z-Score Plots

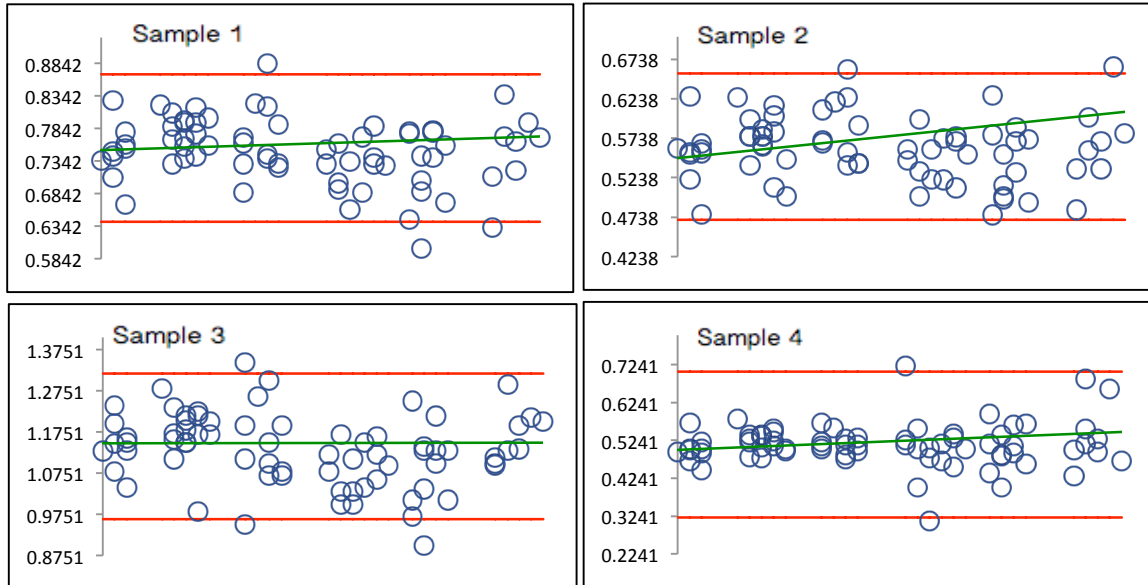


Kernel Density Plots



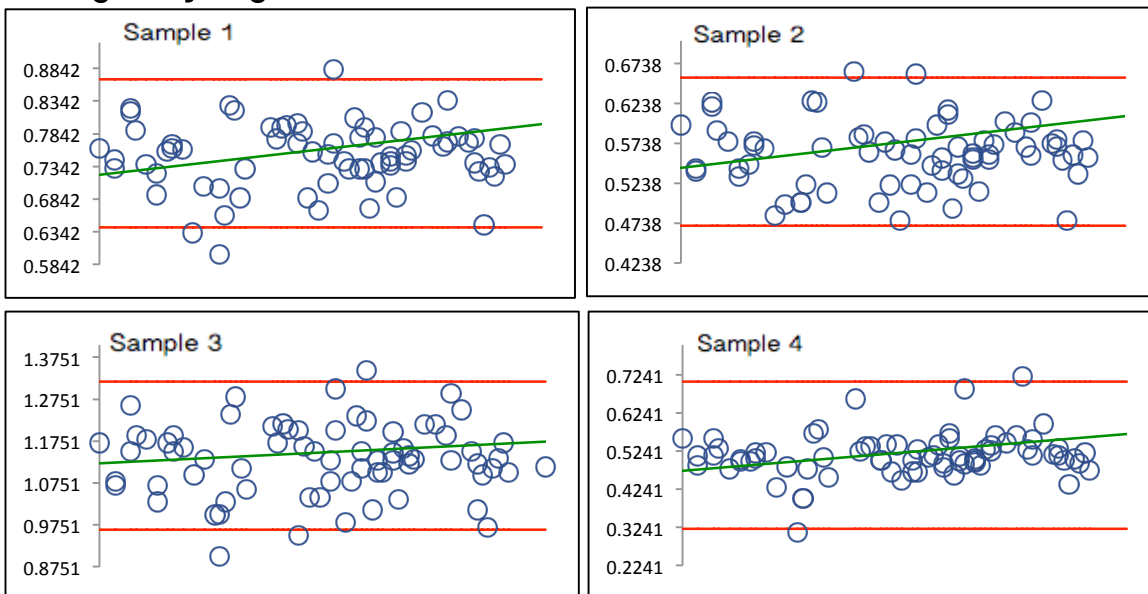
BORON

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).

CADMIUM

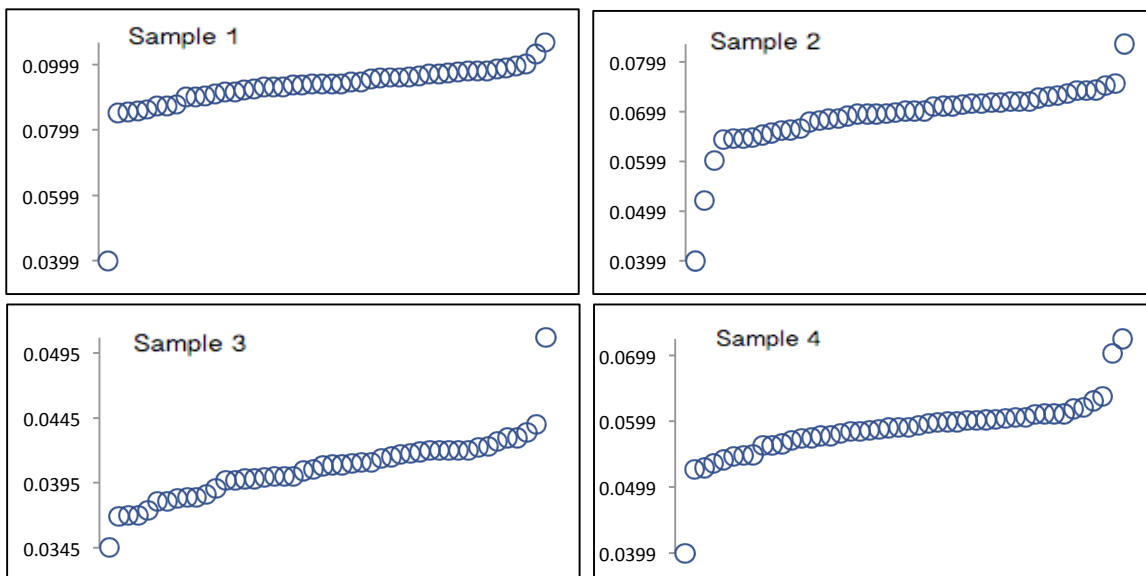
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	46	46	46	46
Median	0.0940	0.0700	0.0409	0.0590
Robust Mean	0.0937	0.0696	0.0405	0.0587
U	0.0009	0.00073	0.00039	0.00057
Robust Standard Deviation	0.00482	0.00392	0.00210	0.00303
Regression Standard Deviation	0.00703	0.00522	0.00304	0.00440
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00703	0.00522	0.00304	0.00440
Outliers	0	0	0	0
$ z > 3.0$	1	2	1	2
$2 < z < 3$	0	1	0	1

Methods Used

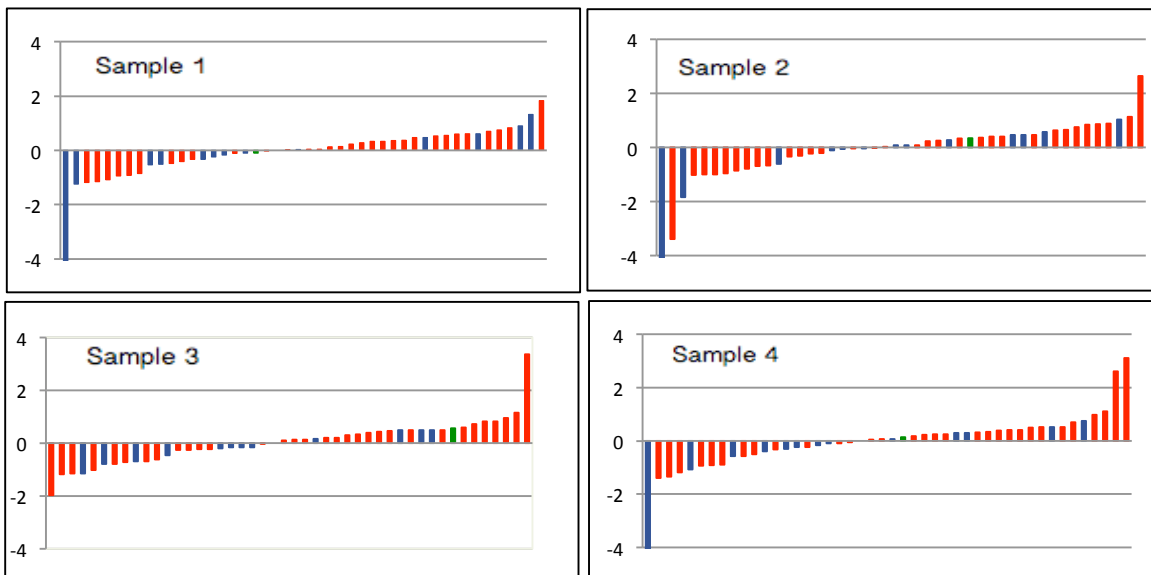
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES	13	13	13	13
ICP/MS	32	32	32	32
AA	1	1	1	1

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

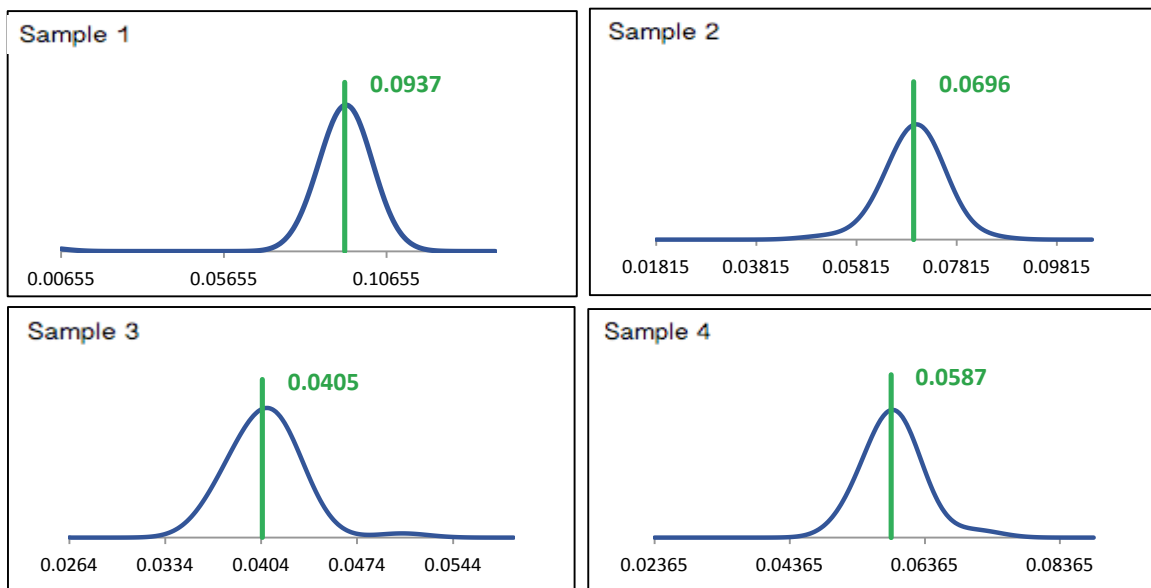


CADMIUM

z-Score Plots

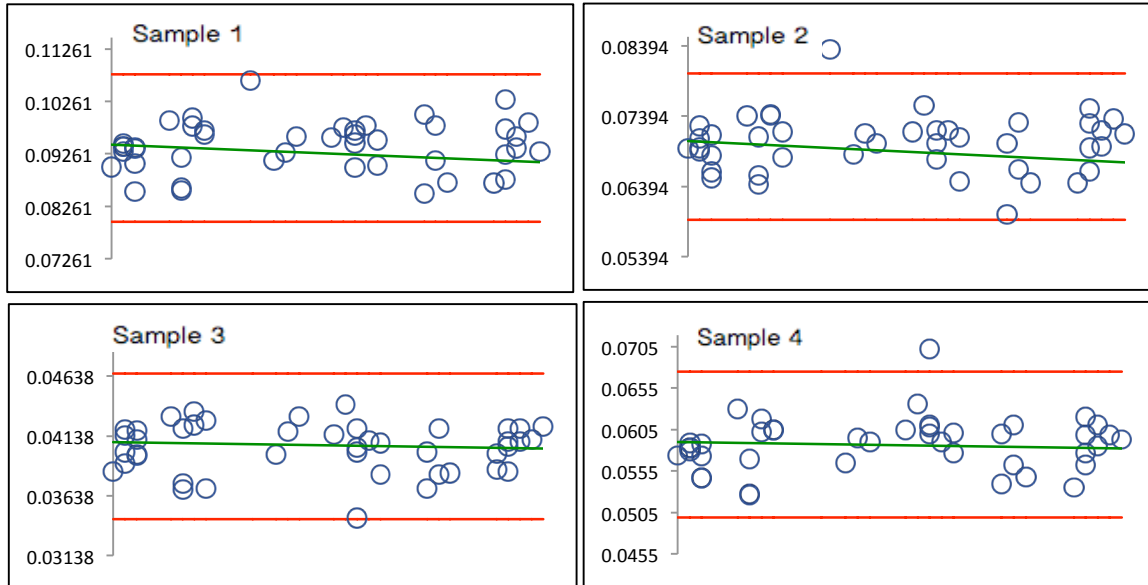


Kernel Density Plots



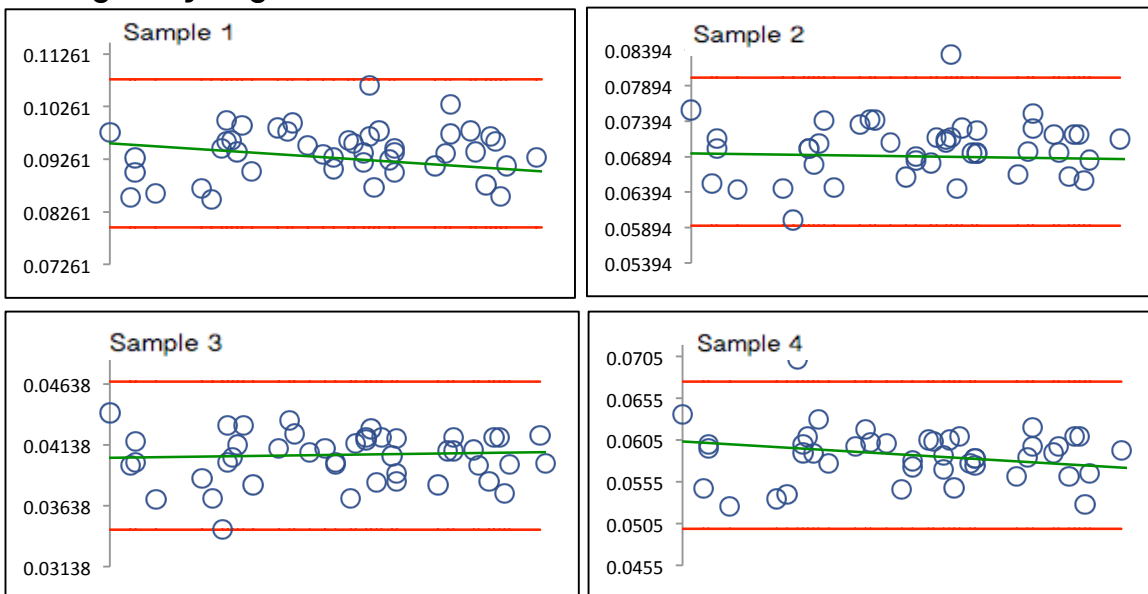
CADMIUM

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).

CHROMIUM

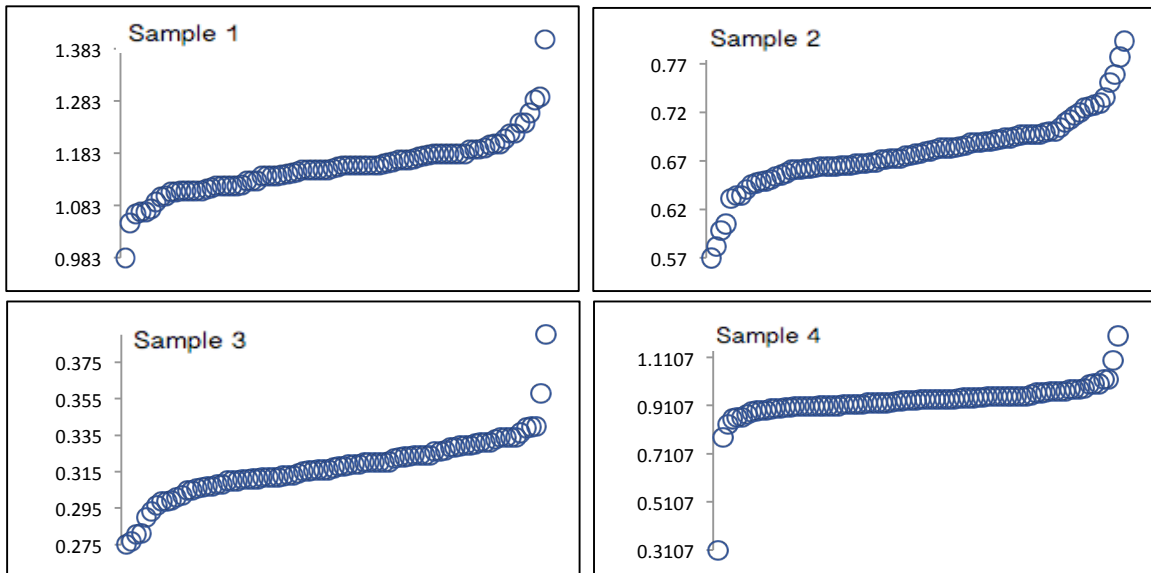
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	84	84	84	84
Median	1.15	0.677	0.318	0.934
Robust Mean	1.15	0.679	0.317	0.932
U	0.0058	0.00383	0.00181	0.00480
Robust Standard Deviation	0.0422	0.0281	0.0133	0.0352
Regression Standard Deviation	0.0865	0.0509	0.0238	0.0699
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0865	0.0509	0.0238	0.0699
Outliers	1	1	1	1
$ z > 3.0$	0	0	1	2
$2 < z < 3$	1	2	0	2

Methods Used

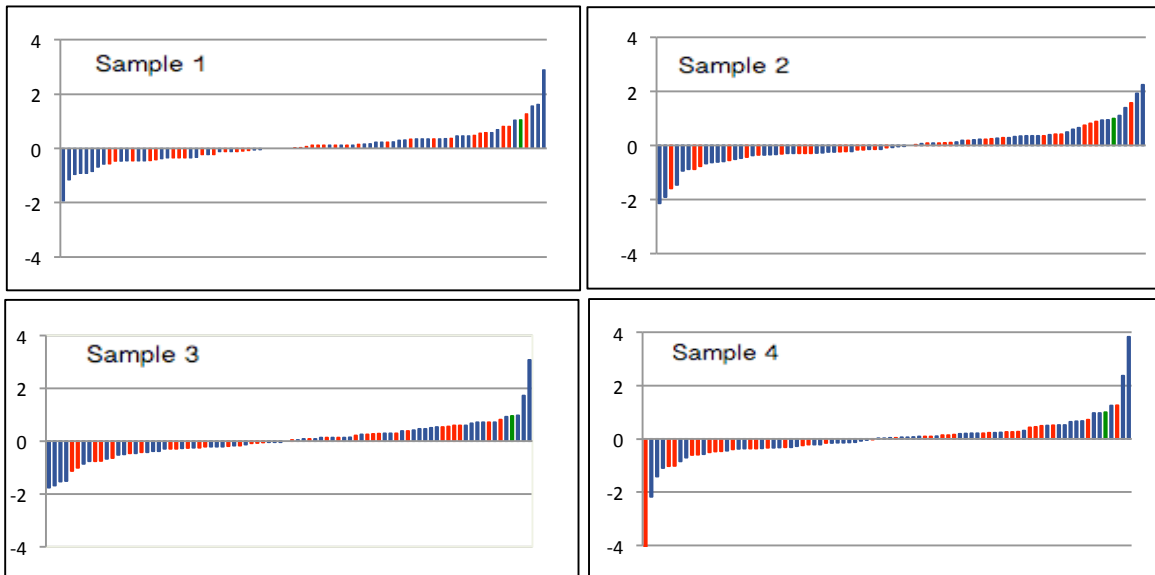
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	50	50	49	49
ICP/OES	33	33	34	34
AA	1	1	1	1

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

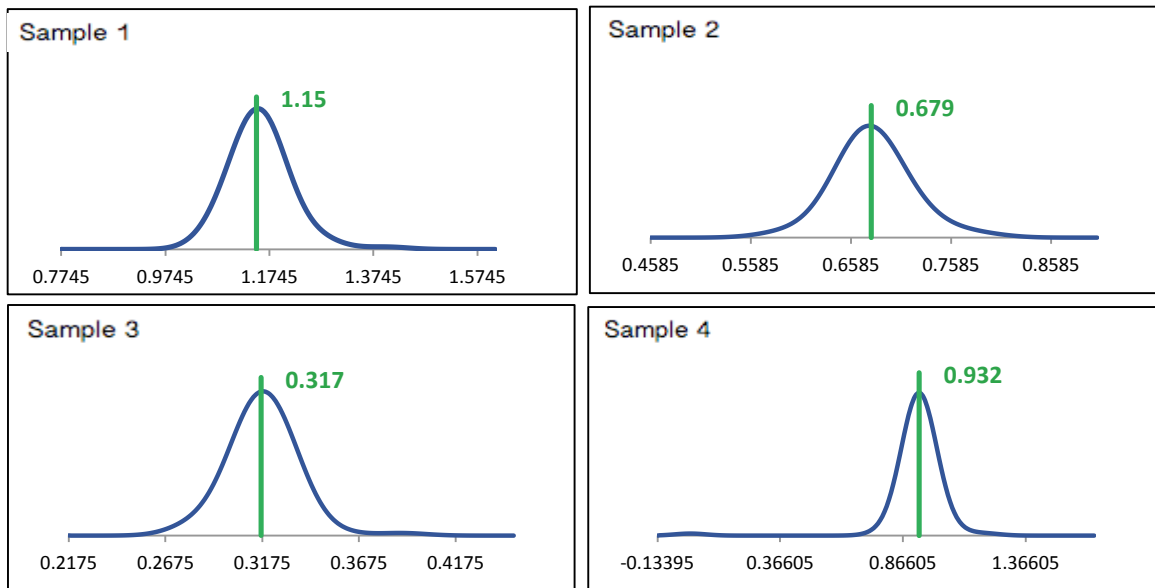


CHROMIUM

z-Score Plots

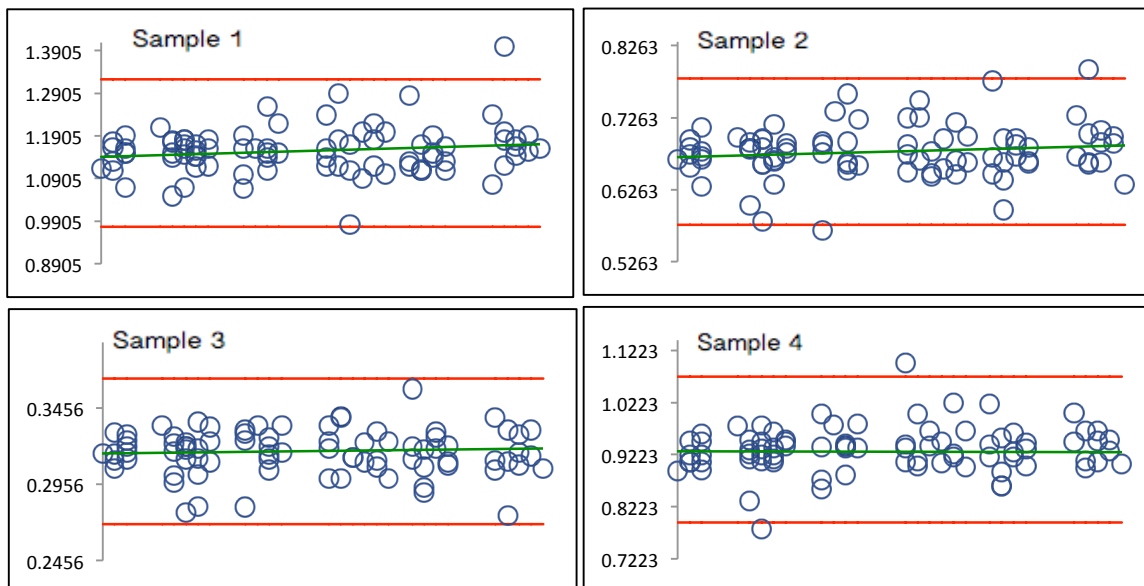


Kernel Density Plots



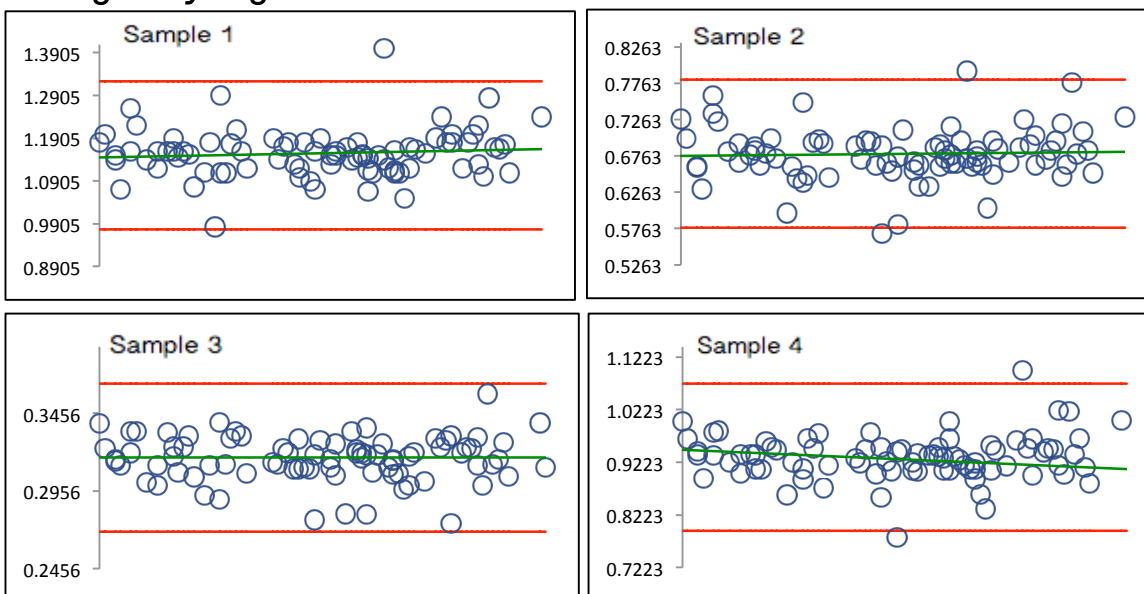
CHROMIUM

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).

COBALT

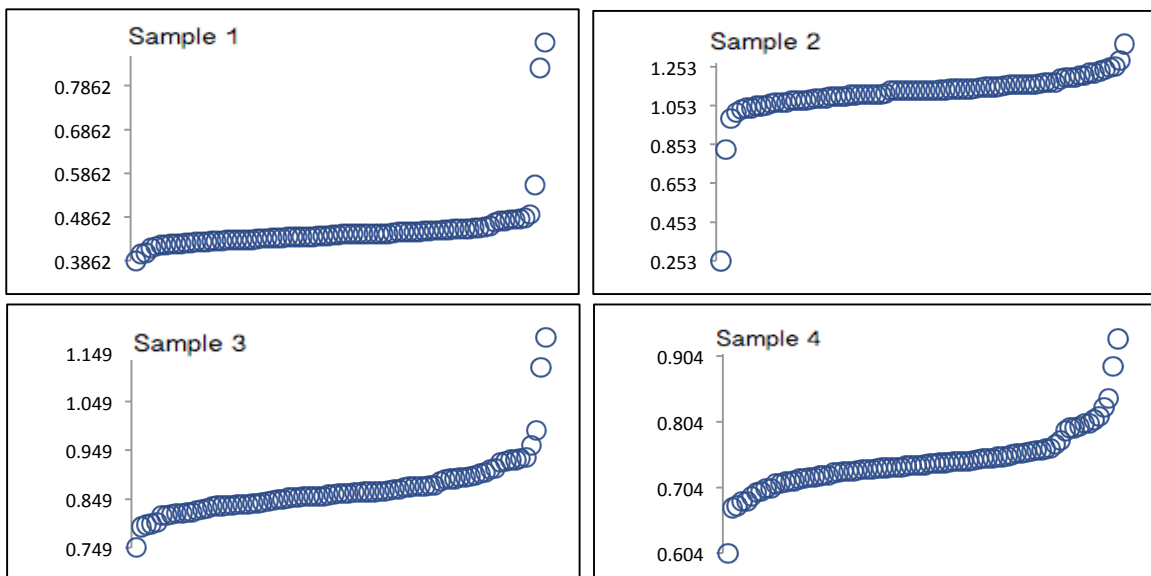
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	82	82	82	82
Median	0.446	1.13	0.860	0.738
Robust Mean	0.446	1.13	0.862	0.740
U	0.0025	0.00819	0.00520	0.00420
Robust Standard Deviation	0.0180	0.0593	0.0377	0.0304
Regression Standard Deviation	0.0334	0.0847	0.0646	0.0555
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0334	0.0847	0.0646	0.0555
Outliers	0	0	0	0
$ z > 3.0$	3	2	2	1
$2 < z < 3$	0	1	0	2

Methods Used

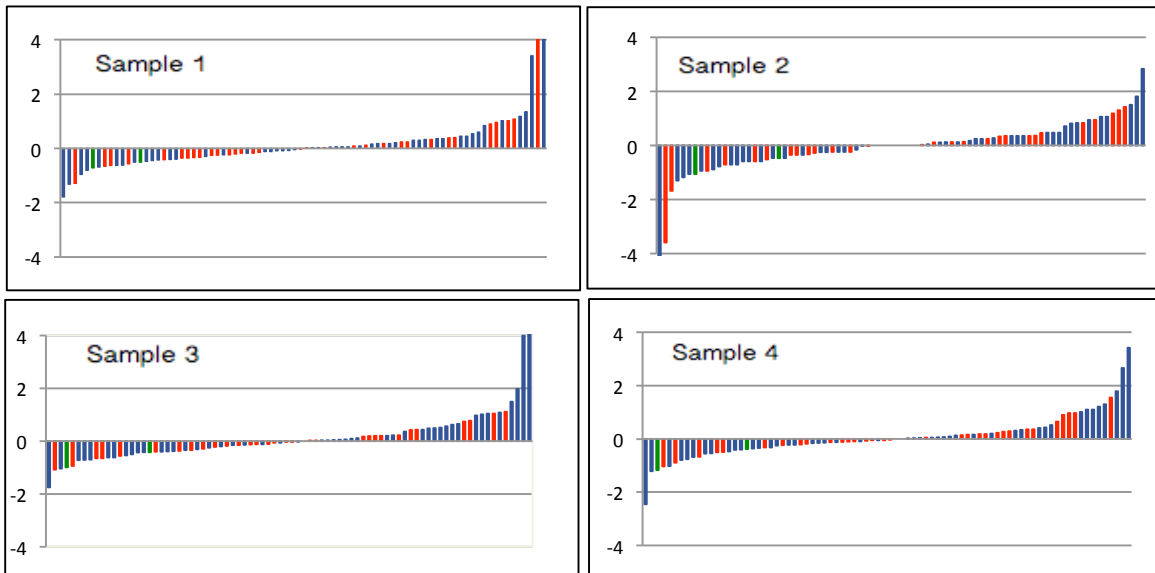
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	48	48	48	48
ICP/OES	32	32	32	32
AA	2	2	2	2

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

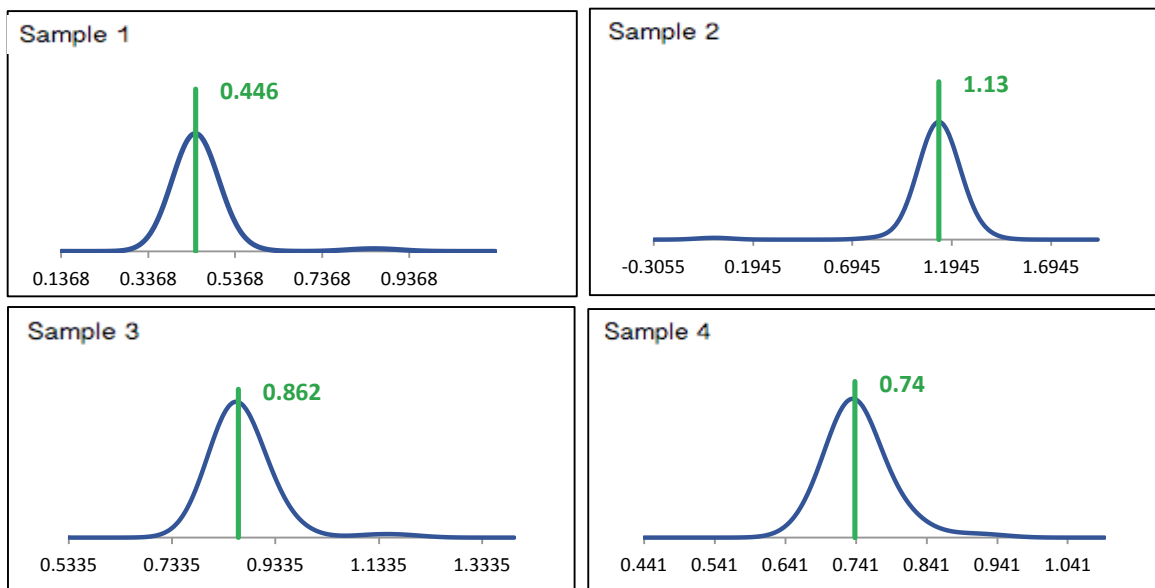


COBALT

z-Score Plots

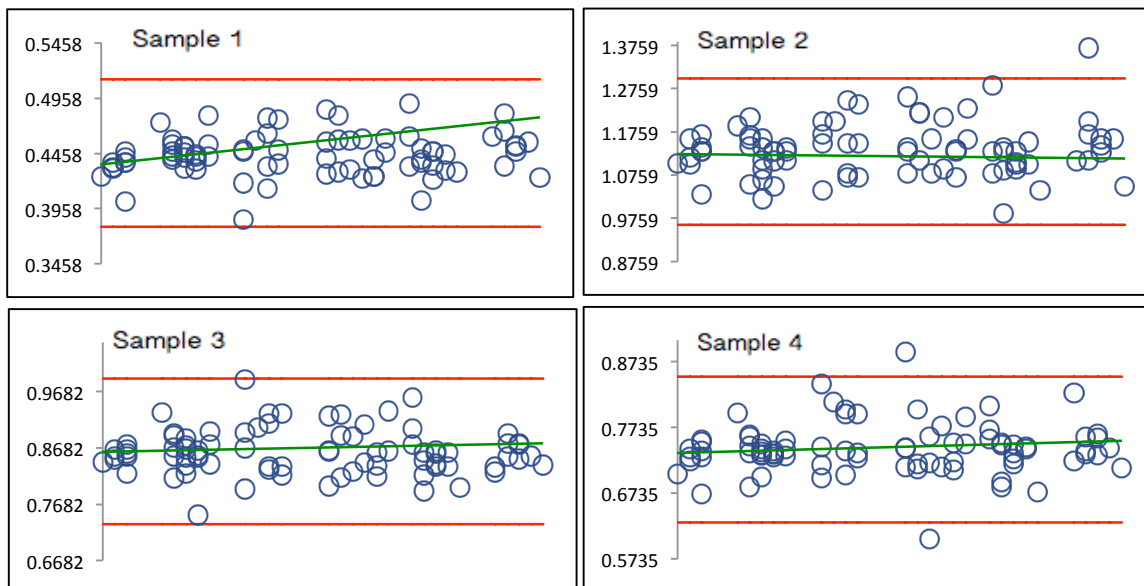


Kernel Density Plots



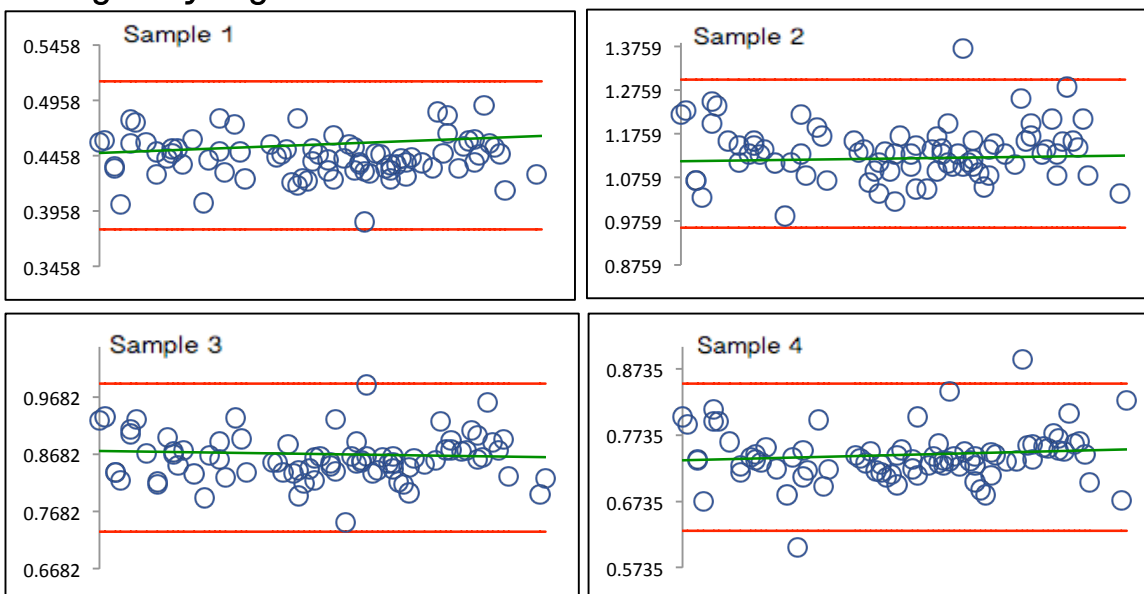
COBALT

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).

COPPER

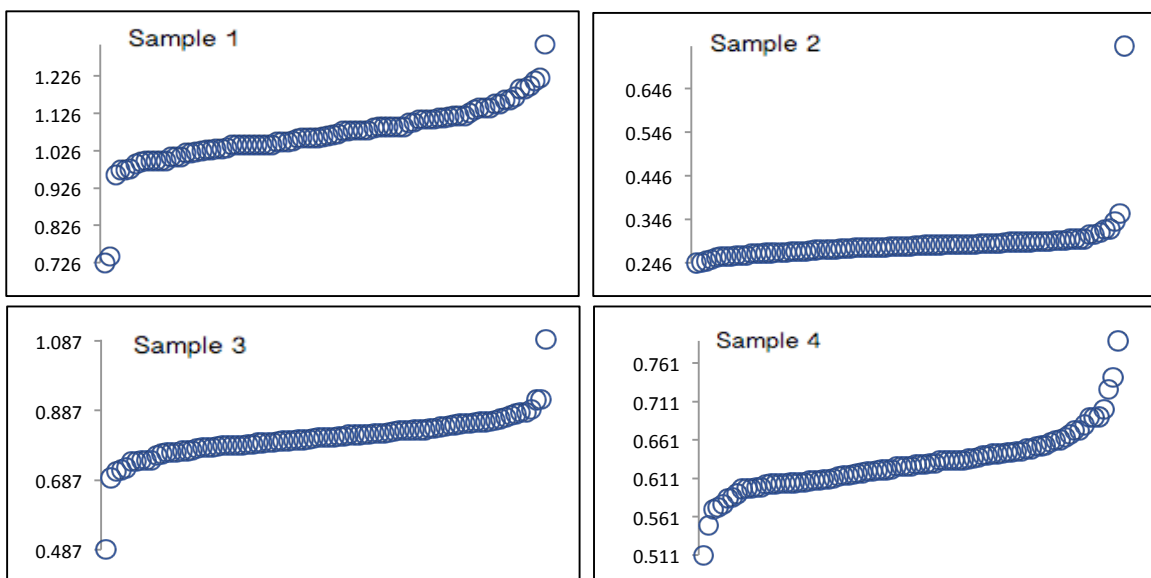
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	88	87	88	87
Median	1.07	0.284	0.810	0.627
Robust Mean	1.07	0.283	0.809	0.628
U	0.0083	0.00206	0.00593	0.00398
Robust Standard Deviation	0.0626	0.0154	0.0445	0.0297
Regression Standard Deviation	0.0802	0.0212	0.0607	0.0471
Stability Flag				
Homogeneity Flag		Homogeneity		
Standard Deviation Used (SDPA)	0.0802	0.0410	0.0607	0.0471
Outliers	0	1	0	1
z >3.0	2	1	2	1
2< z <3	1	0	0	3

Methods Used

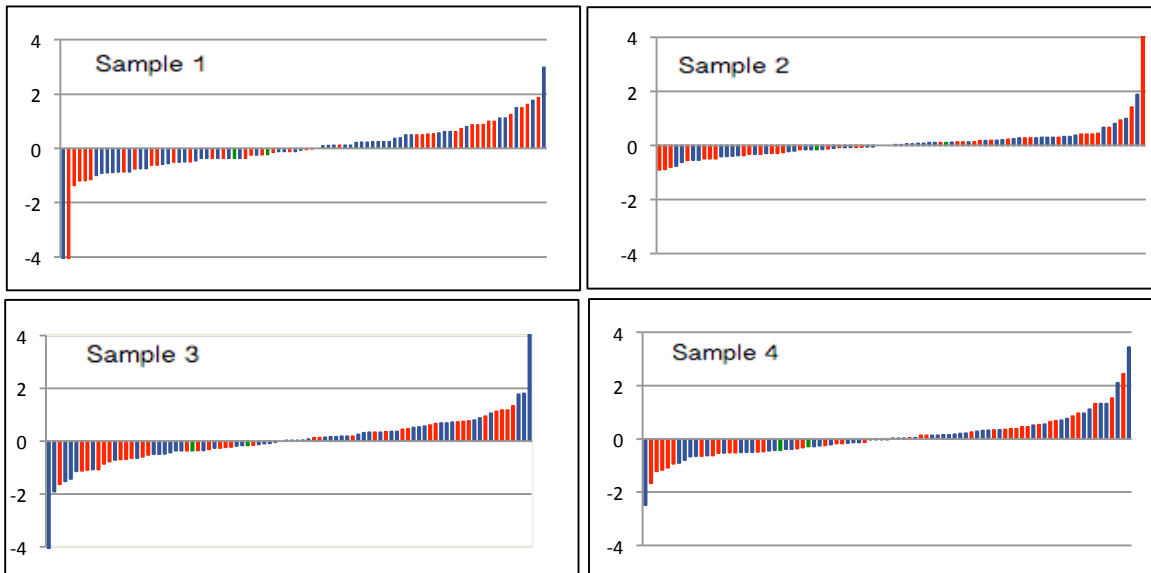
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	50	49	50	49
ICP/OES	36	36	36	36
AA	2	2	2	2

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

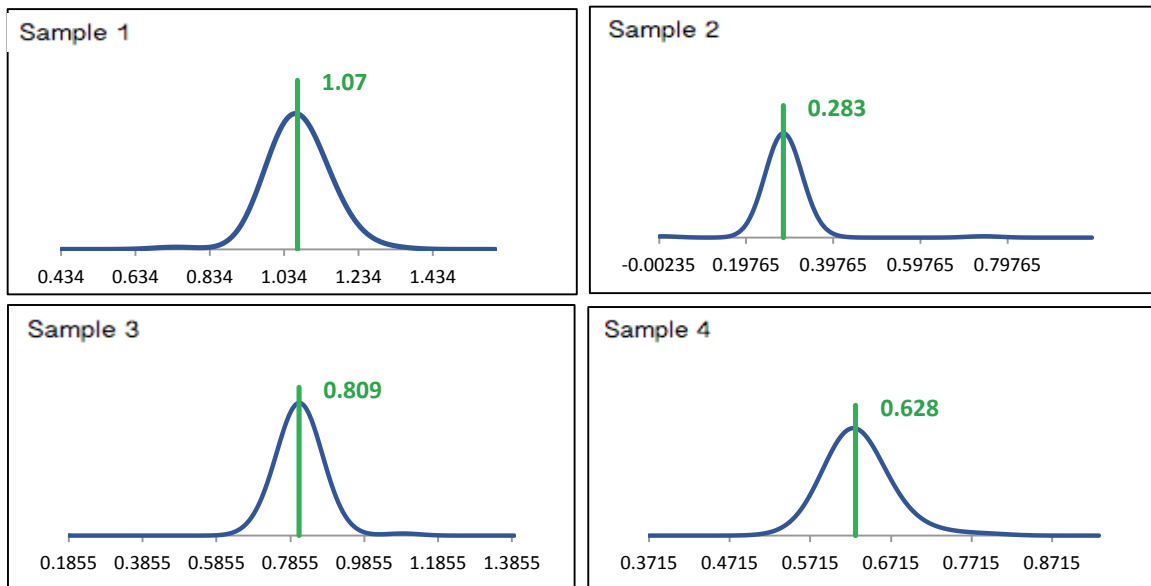


COPPER

z-Score Plots

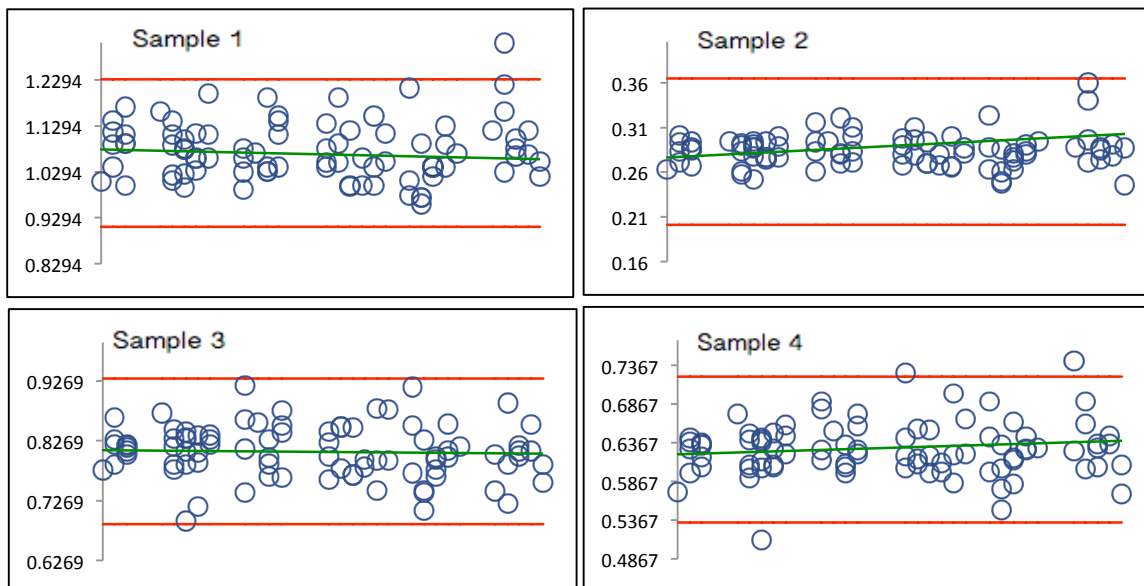


Kernel Density Plots



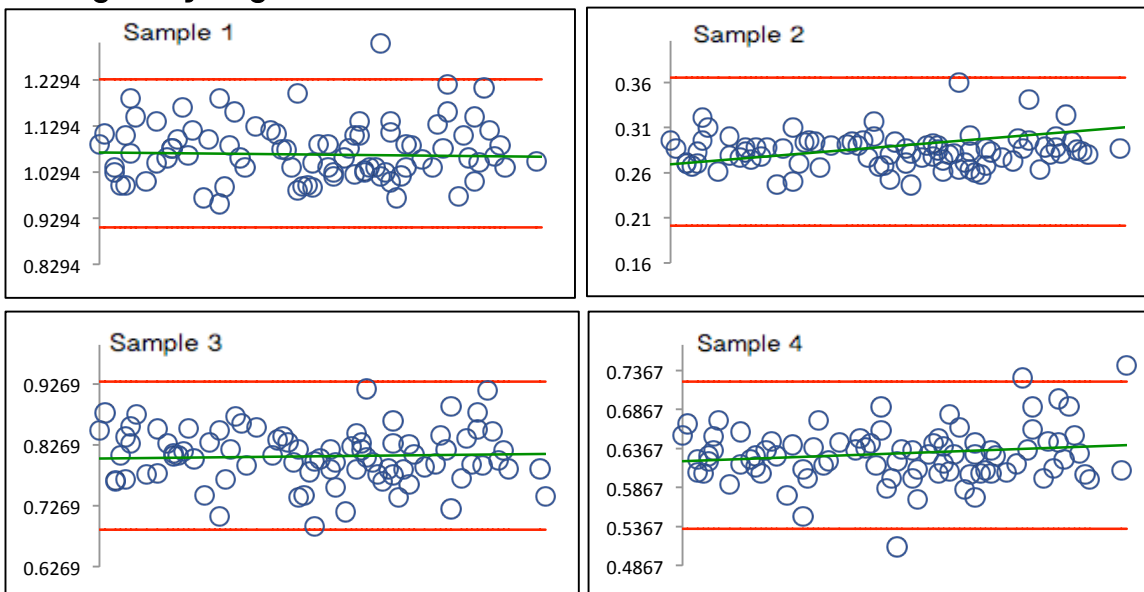
COPPER

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).

IRON

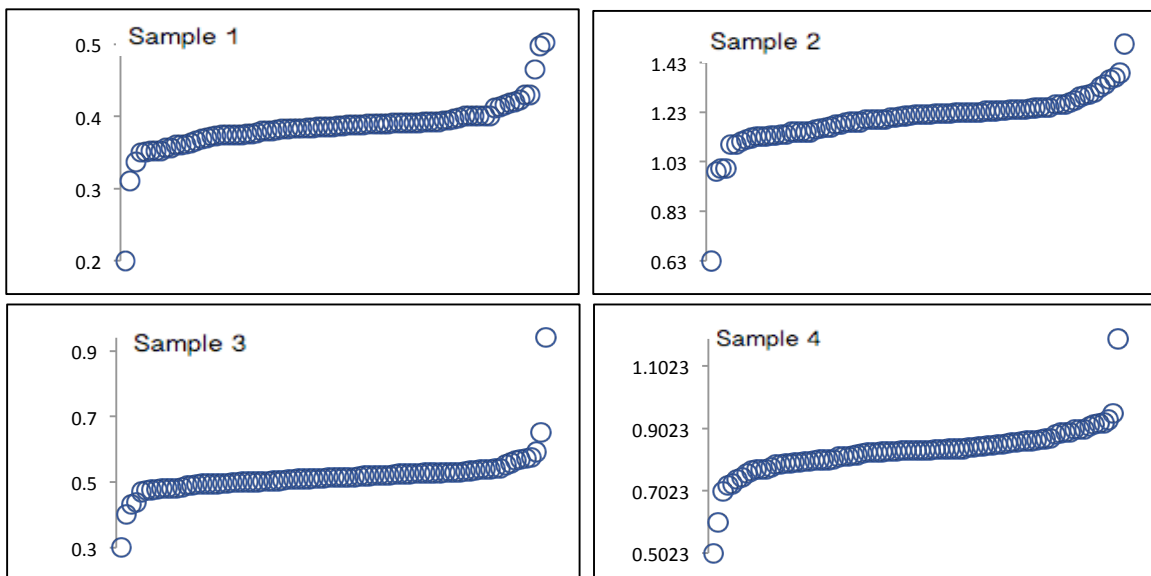
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	84	84	85	85
Median	0.386	1.22	0.514	0.832
Robust Mean	0.385	1.21	0.513	0.830
U	0.0026	0.00888	0.00353	0.00664
Robust Standard Deviation	0.0193	0.0651	0.0260	0.0490
Regression Standard Deviation	0.0289	0.0906	0.0385	0.0623
Stability Flag				
Homogeneity Flag	Homogeneity			
Standard Deviation Used (SDPA)	0.0386	0.0906	0.0385	0.0623
Outliers	1	1	0	0
$ z > 3.0$	2	2	3	3
$2 < z < 3$	2	3	3	1

Methods Used

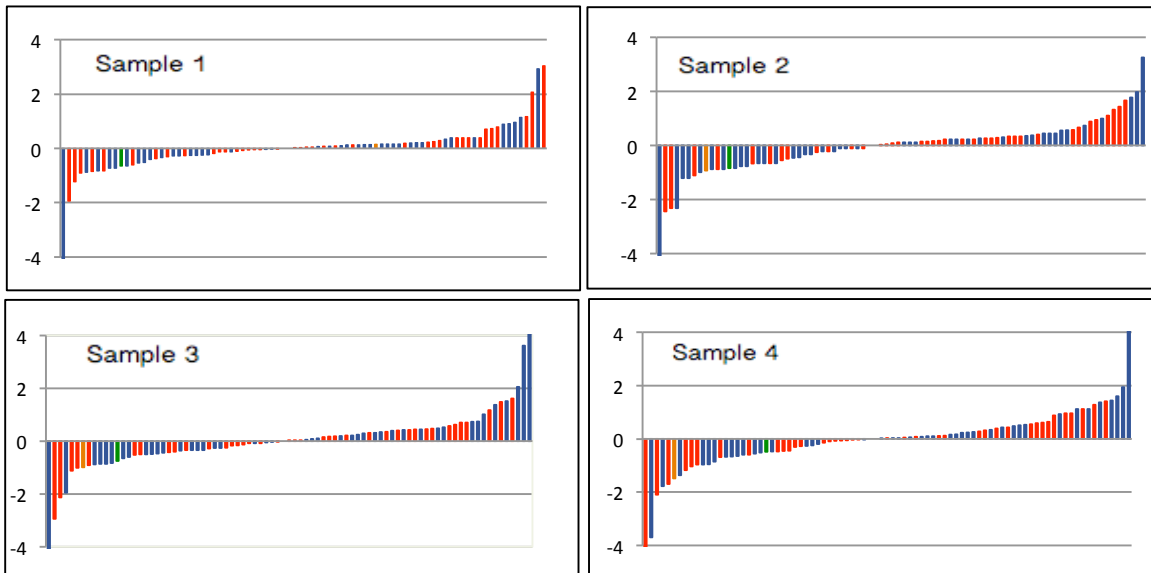
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	42	43	43	43
ICP/OES	40	39	40	40
COLOR	1	1	1	1
AA	1	1	1	1

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

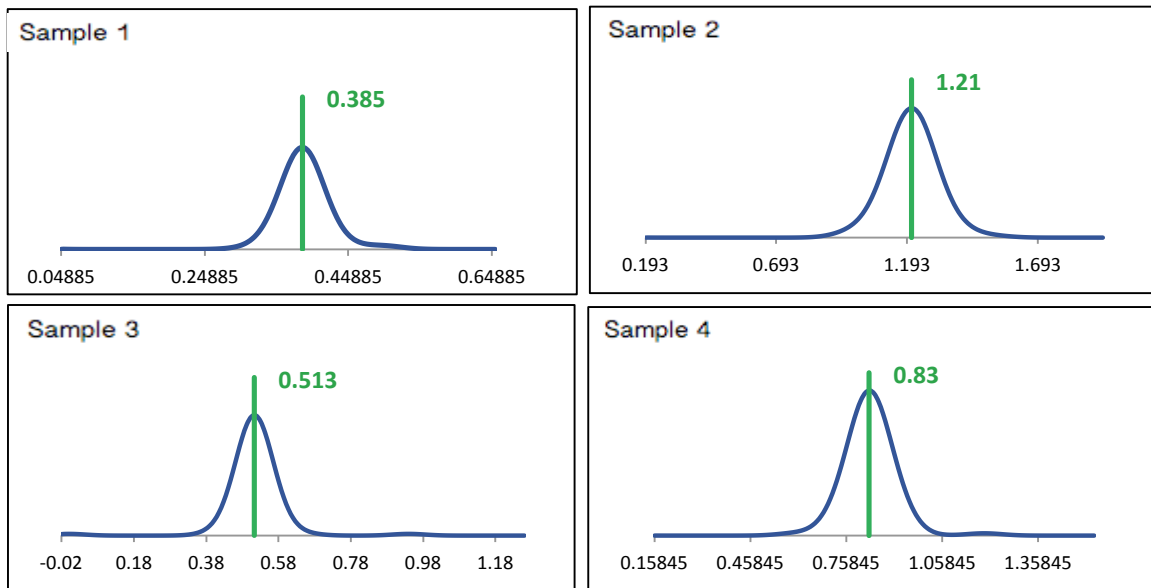


IRON

z-Score Plots

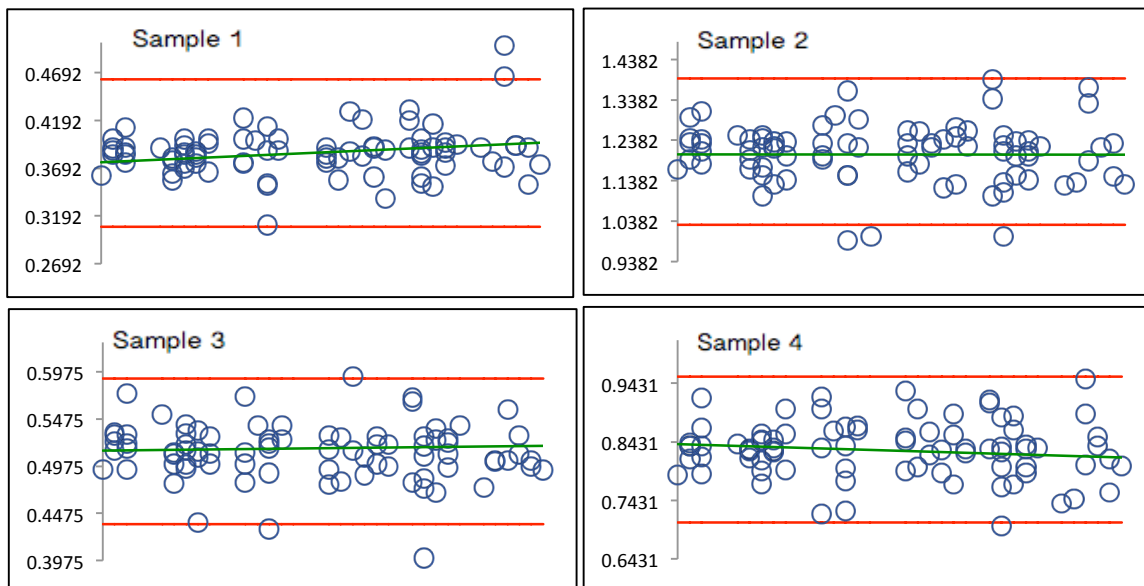


Kernel Density Plots



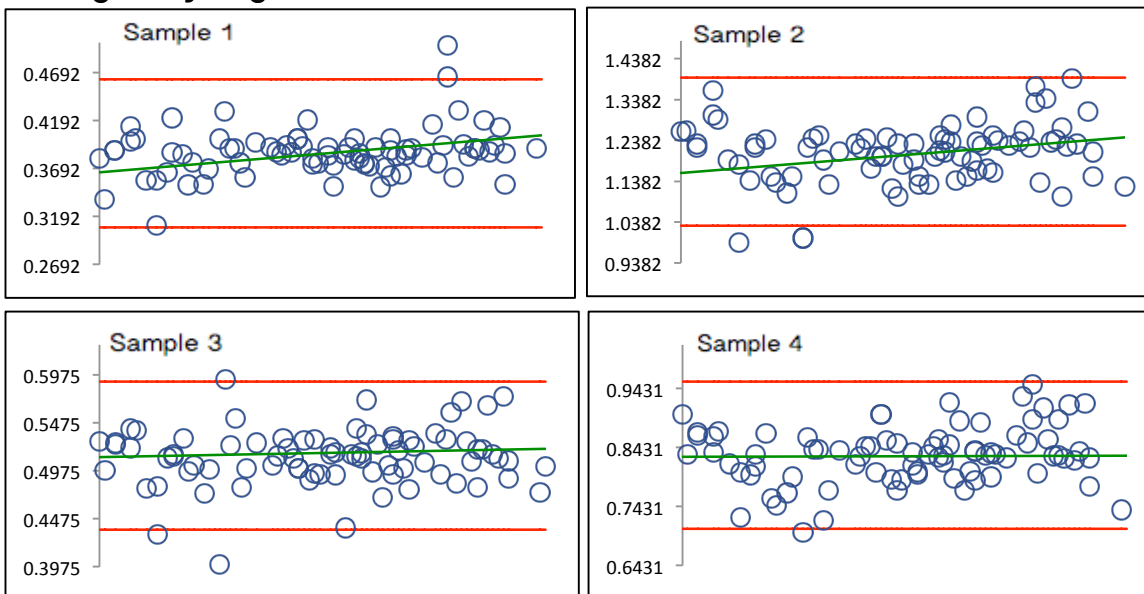
IRON

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).

LEAD

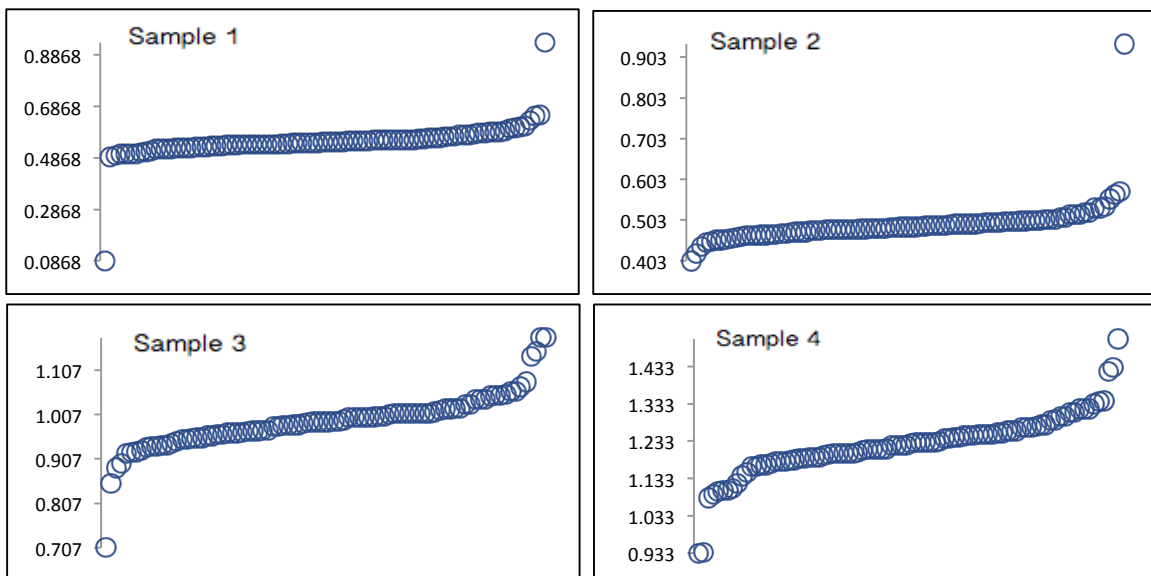
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	88	88	88	88
Median	0.547	0.486	0.991	1.22
Robust Mean	0.549	0.487	0.990	1.23
U	0.0038	0.00289	0.00617	0.00845
Robust Standard Deviation	0.0286	0.0217	0.0463	0.0634
Regression Standard Deviation	0.0412	0.0365	0.0743	0.0919
Stability Flag				
Homogeneity Flag		Homogeneity		
Standard Deviation Used (SDPA)	0.0412	0.0433	0.0743	0.0919
Outliers	0	0	0	0
$ z > 3.0$	2	1	1	3
$2 < z < 3$	2	0	4	2

Methods Used

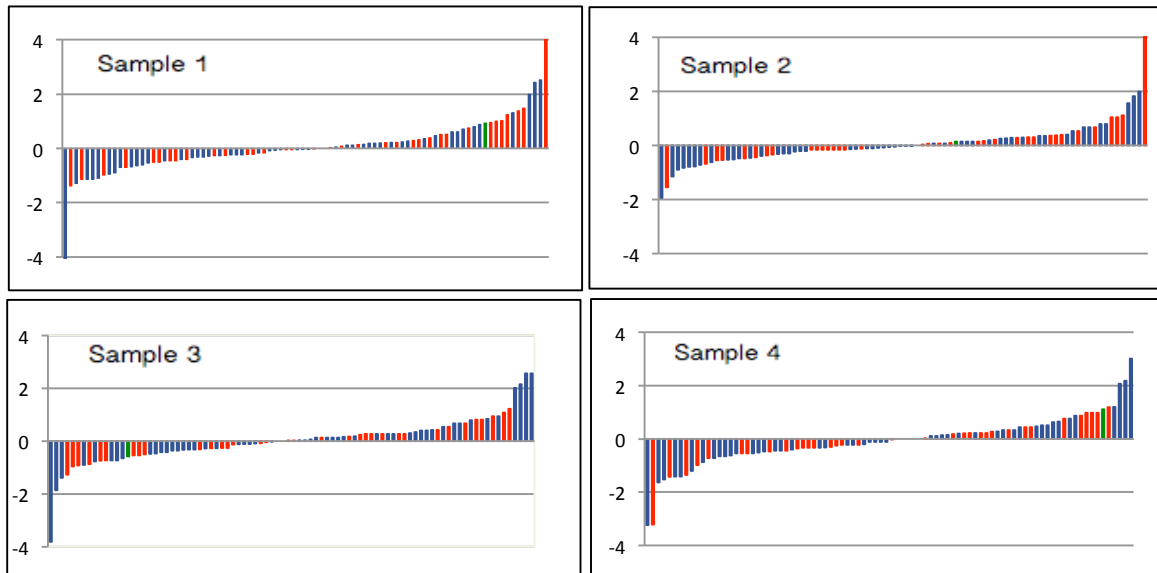
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	52	52	52	52
ICP/OES	35	35	35	35
AA	1	1	1	1

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

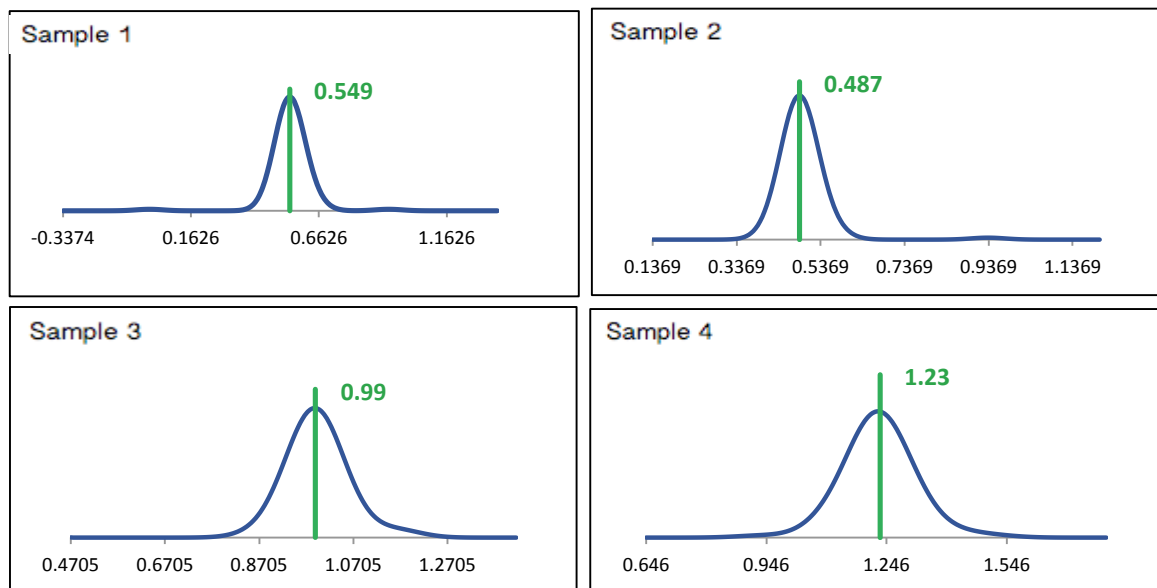


LEAD

z-Score Plots

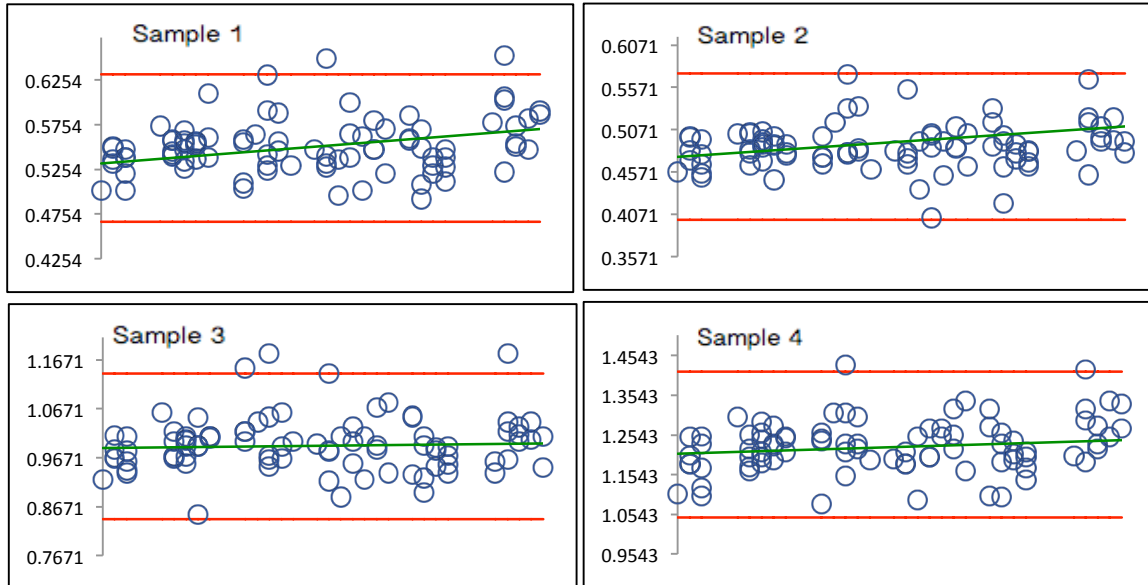


Kernel Density Plots



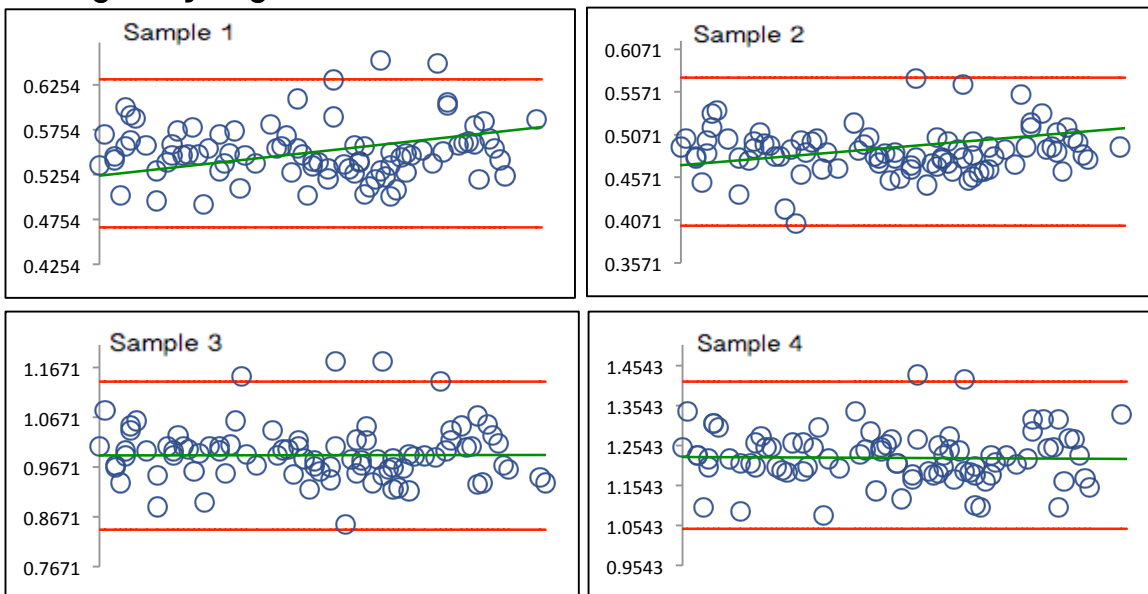
LEAD

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).

MANGANESE

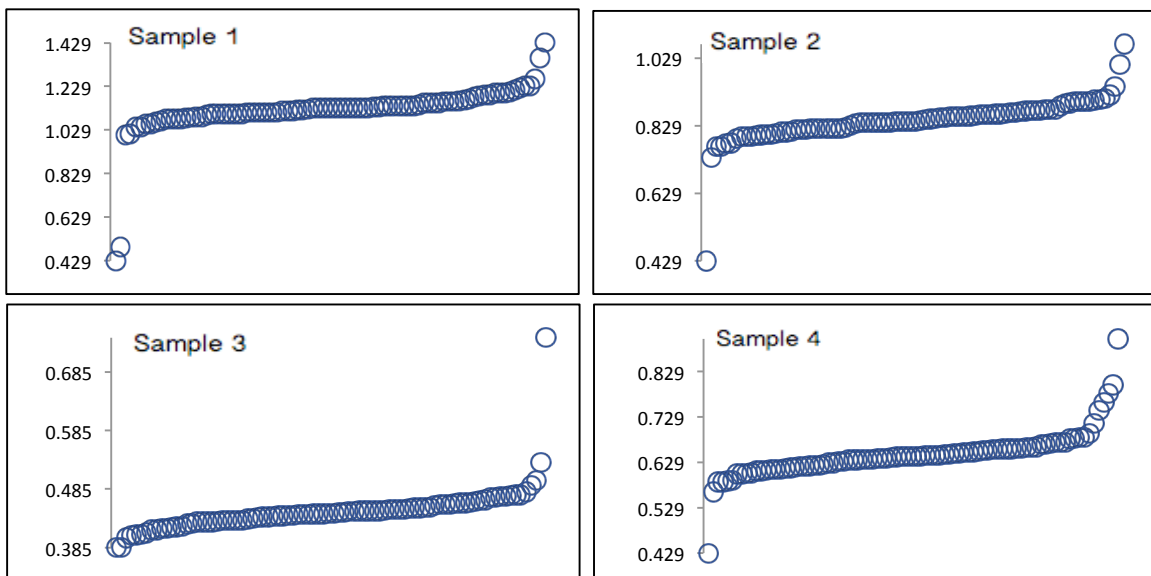
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	86	85	86	86
Median	1.13	0.842	0.444	0.643
Robust Mean	1.13	0.845	0.444	0.642
U	0.0066	0.00553	0.00286	0.00400
Robust Standard Deviation	0.0489	0.0408	0.0212	0.0297
Regression Standard Deviation	0.0846	0.0634	0.0333	0.0481
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0846	0.0634	0.0333	0.0481
Outliers	0	1	0	0
$ z > 3.0$	3	2	1	3
$2 < z < 3$	1	1	1	3

Methods Used

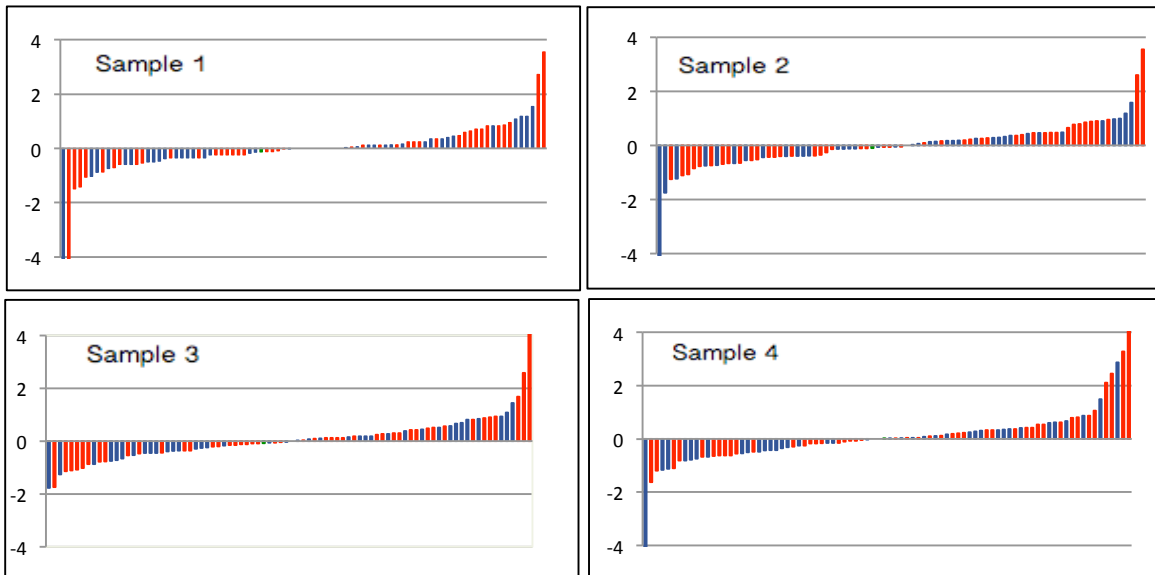
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES	39	39	39	39
ICP/MS	46	45	46	46
AA	1	1	1	1

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

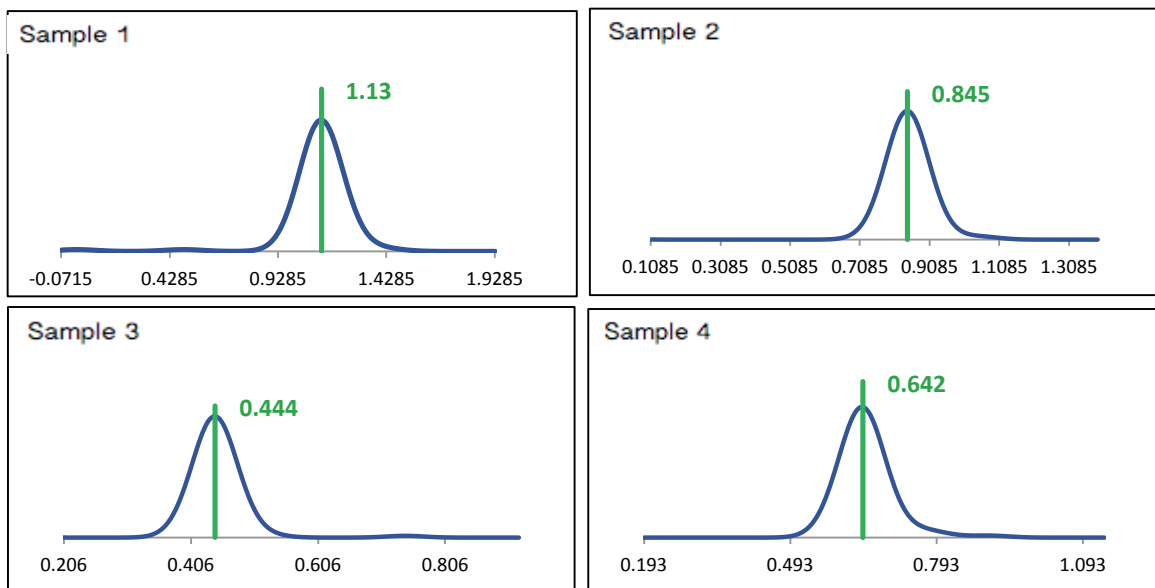


MANGANESE

z-Score Plots

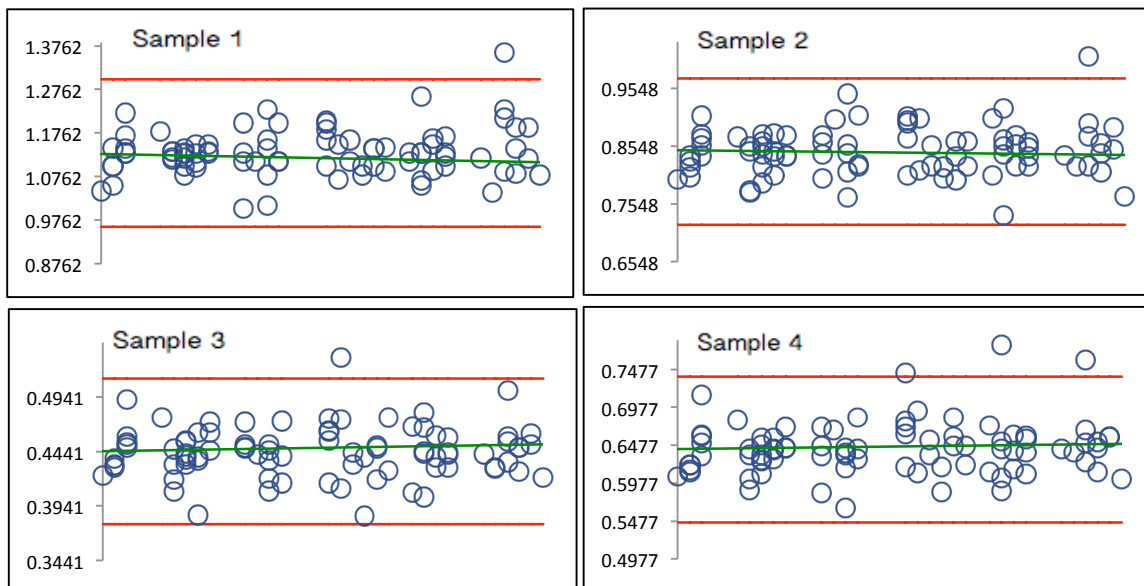


Kernel Density Plots



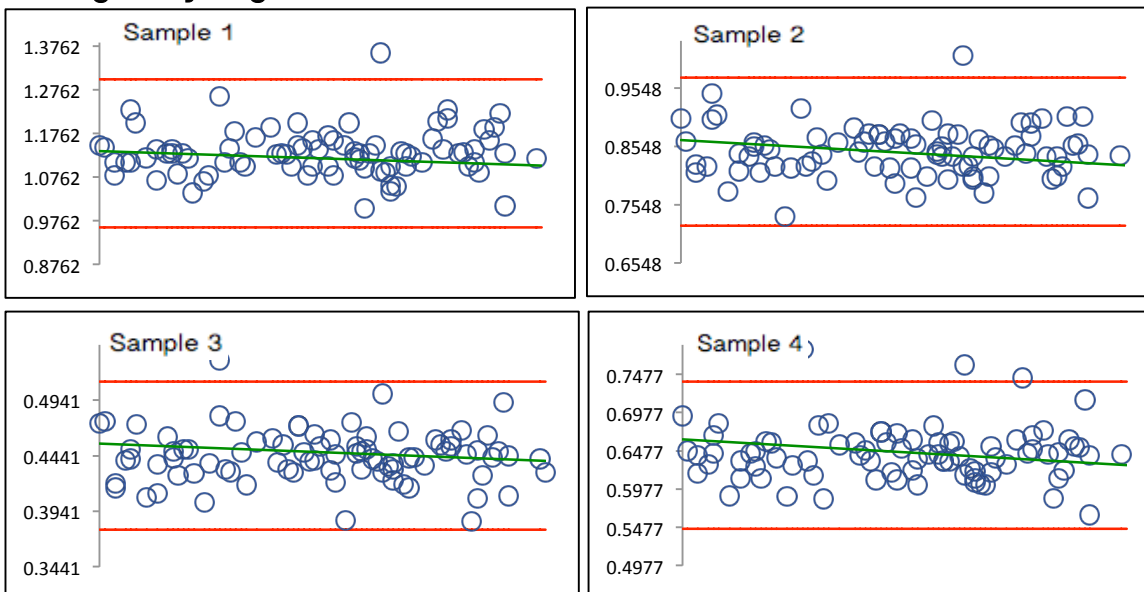
MANGANESE

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).

MOLYBDENUM

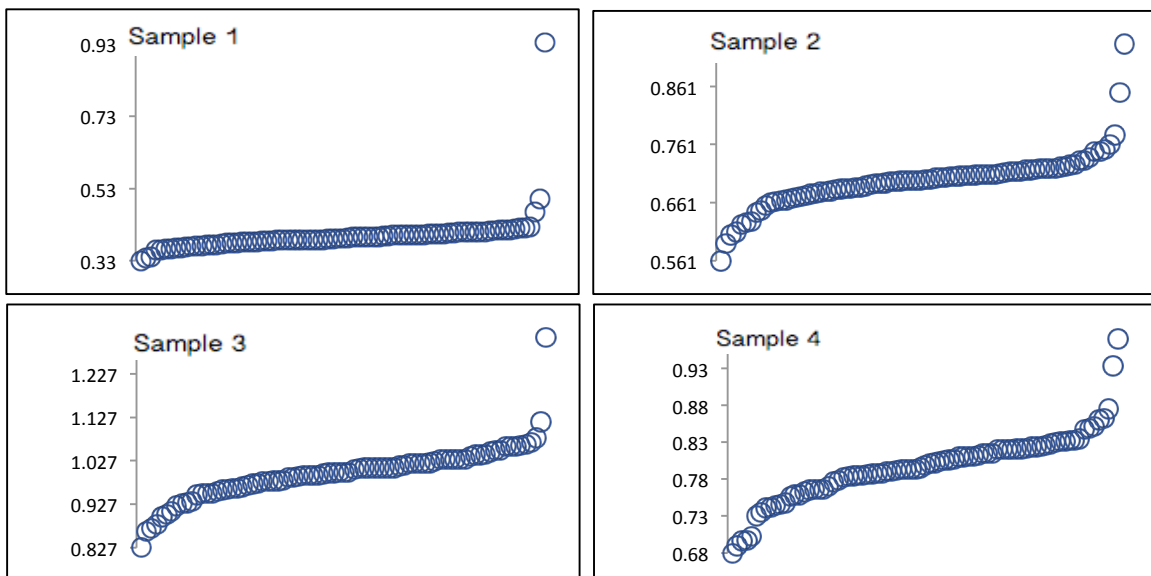
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	81	82	81	81
Median	0.392	0.700	1.00	0.799
Robust Mean	0.392	0.698	0.998	0.797
U	0.0027	0.00418	0.00661	0.00536
Robust Standard Deviation	0.0194	0.0303	0.0476	0.0386
Regression Standard Deviation	0.0294	0.0523	0.0749	0.0598
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0294	0.0523	0.0749	0.0598
Outliers	1	0	1	1
z >3.0	2	1	1	0
2< z <3	2	3	1	2

Methods Used

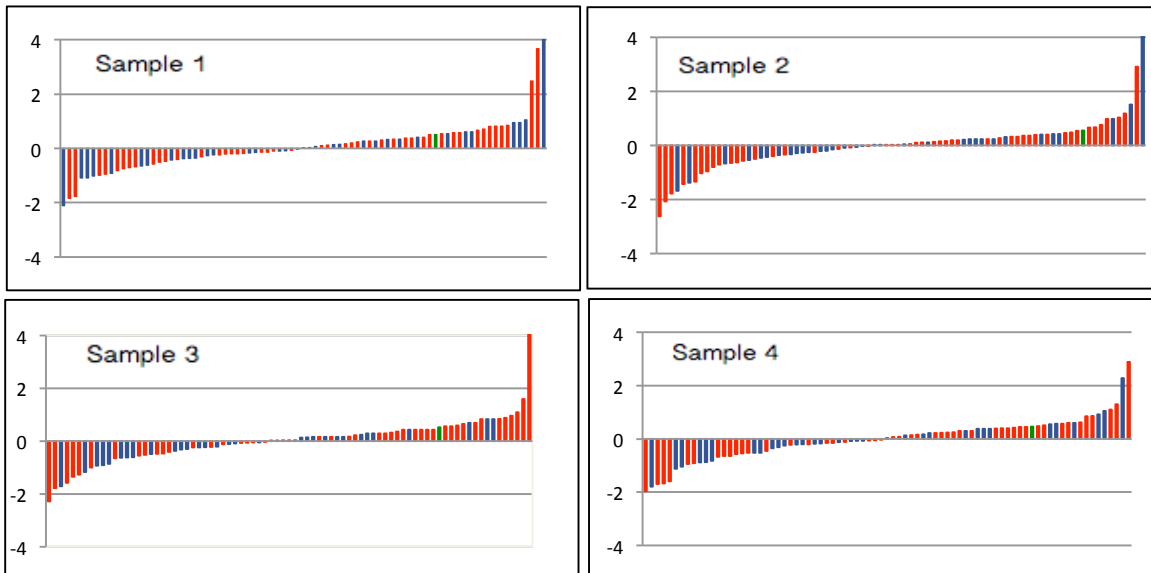
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES	33	33	33	33
ICP/MS	47	48	47	47
AA	1	1	1	1

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

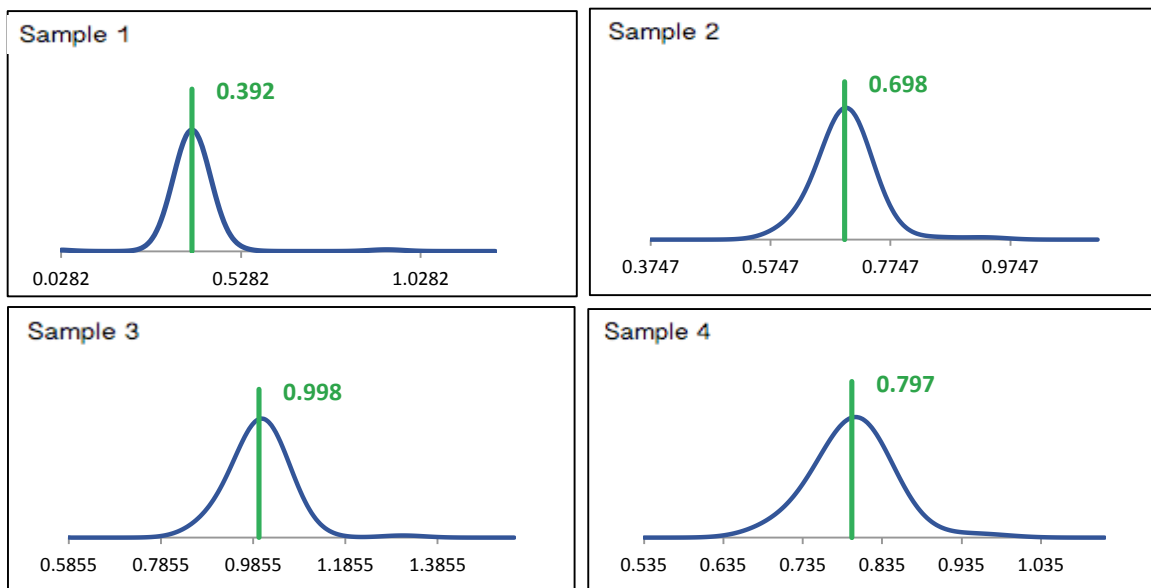


MOLYBDENUM

z-Score Plots

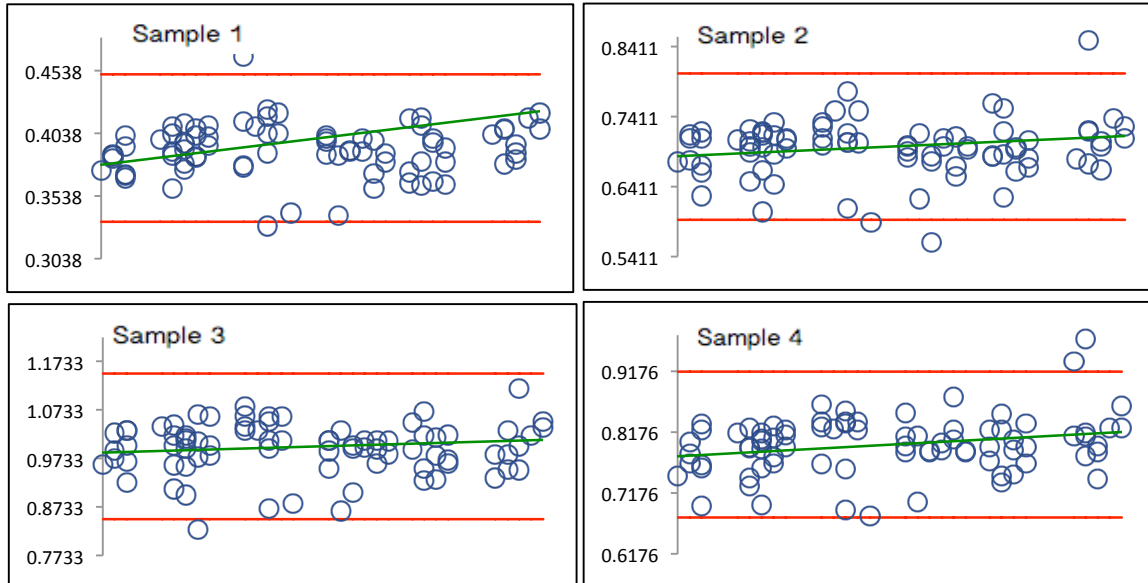


Kernel Density Plots



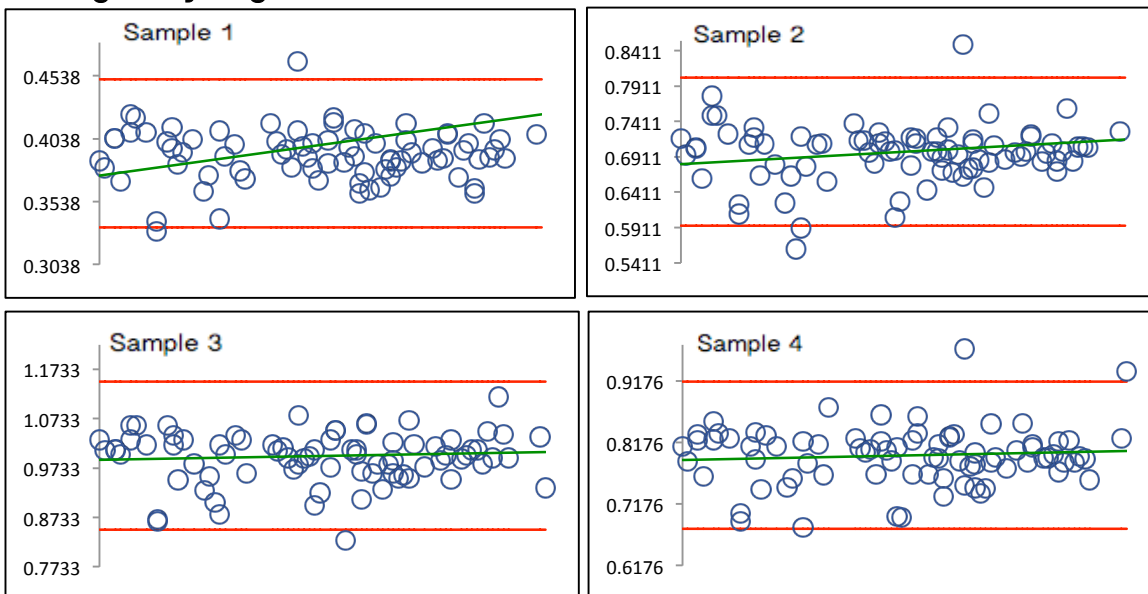
MOLYBDENUM

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).

NICKEL

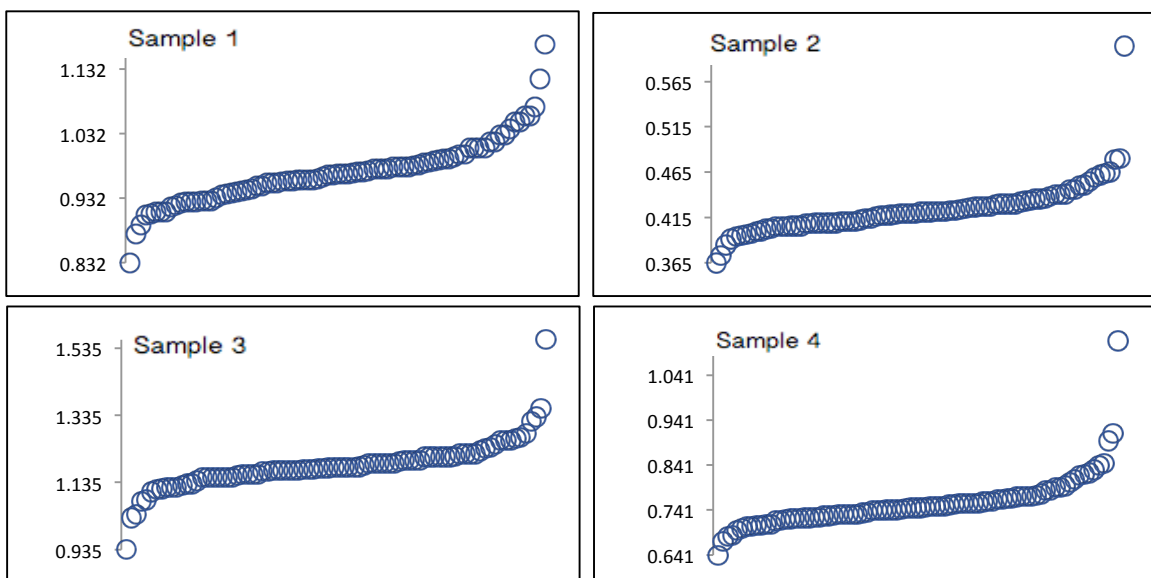
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	83	83	84	84
Median	0.969	0.421	1.18	0.746
Robust Mean	0.968	0.421	1.18	0.749
U	0.0058	0.00263	0.00671	0.00492
Robust Standard Deviation	0.0422	0.0192	0.0492	0.0361
Regression Standard Deviation	0.0726	0.0316	0.0887	0.0561
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0726	0.0316	0.0887	0.0561
Outliers	1	1	0	0
$ z > 3.0$	0	1	1	1
$2 < z < 3$	2	0	1	2

Methods Used

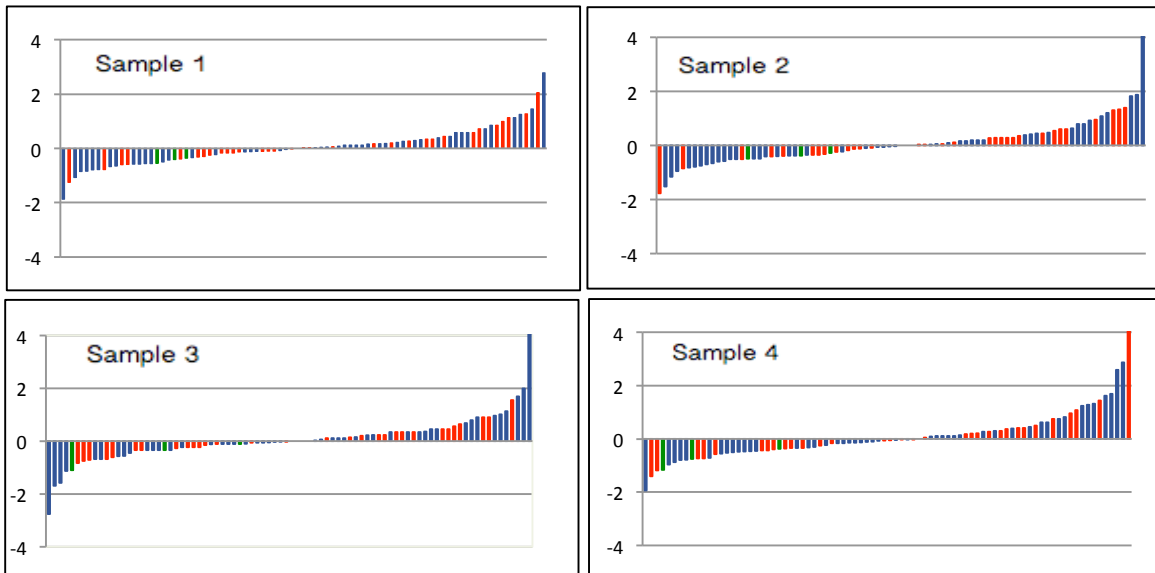
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	48	49	49	49
ICP/OES	32	31	32	32
AA	3	3	3	3

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

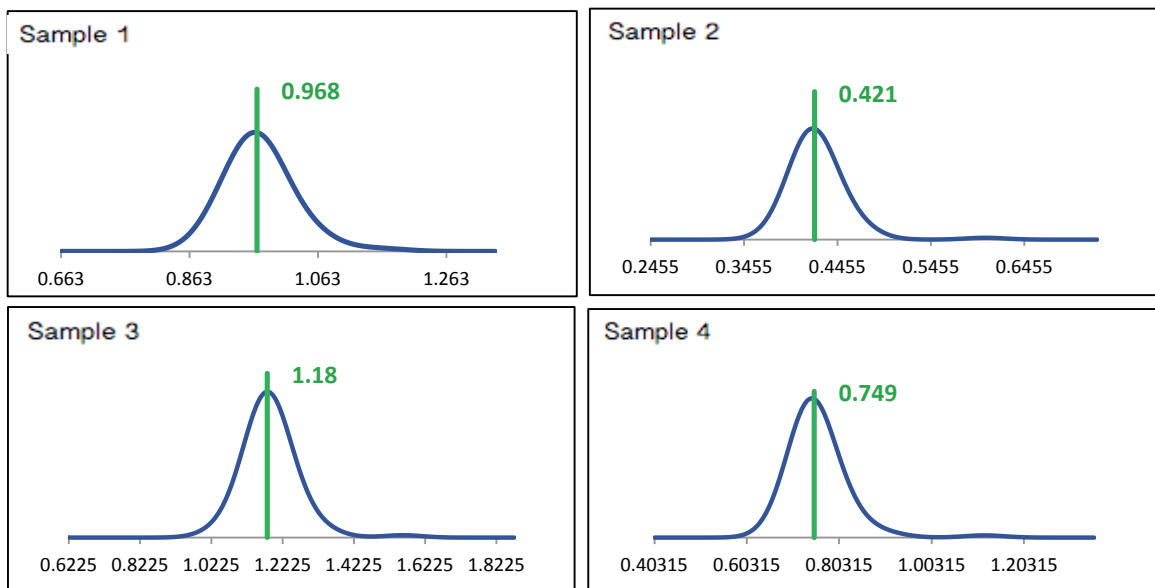


NICKEL

z-Score Plots

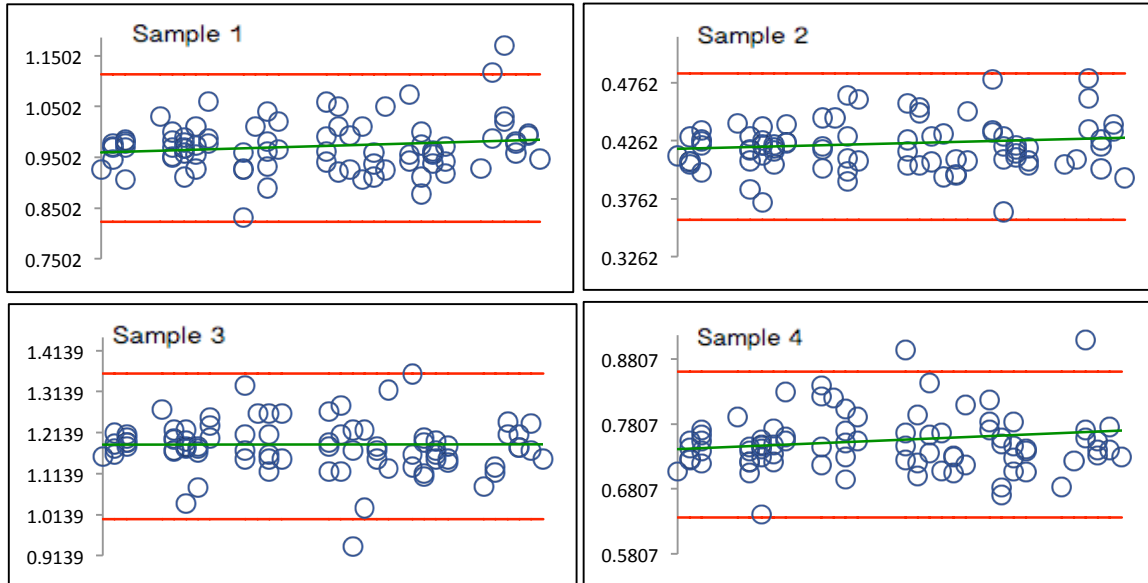


Kernel Density Plots



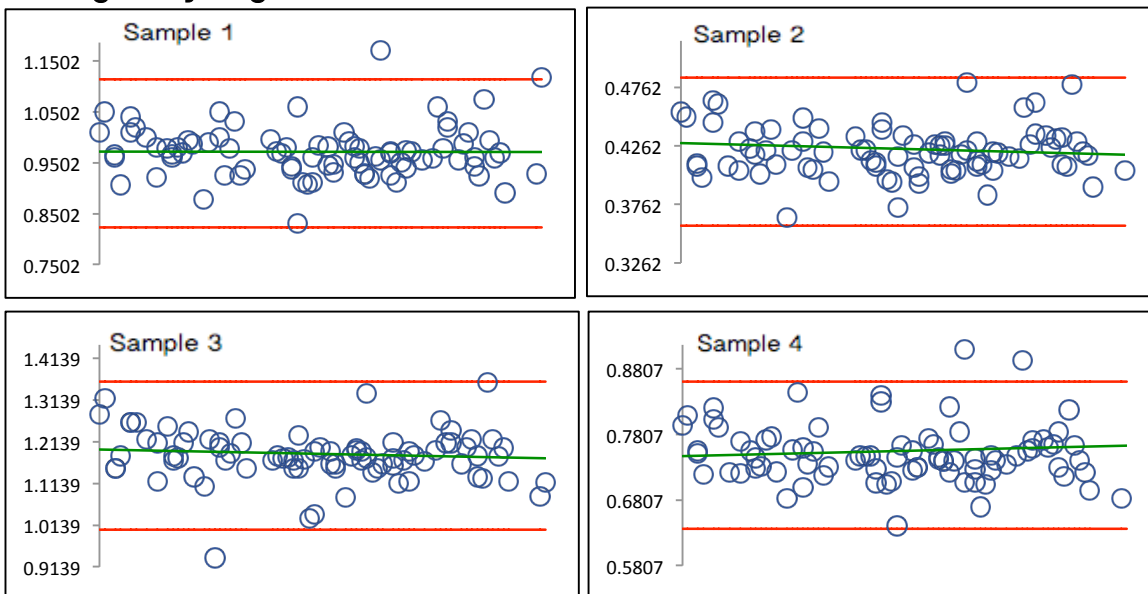
NICKEL

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).

SELENIUM

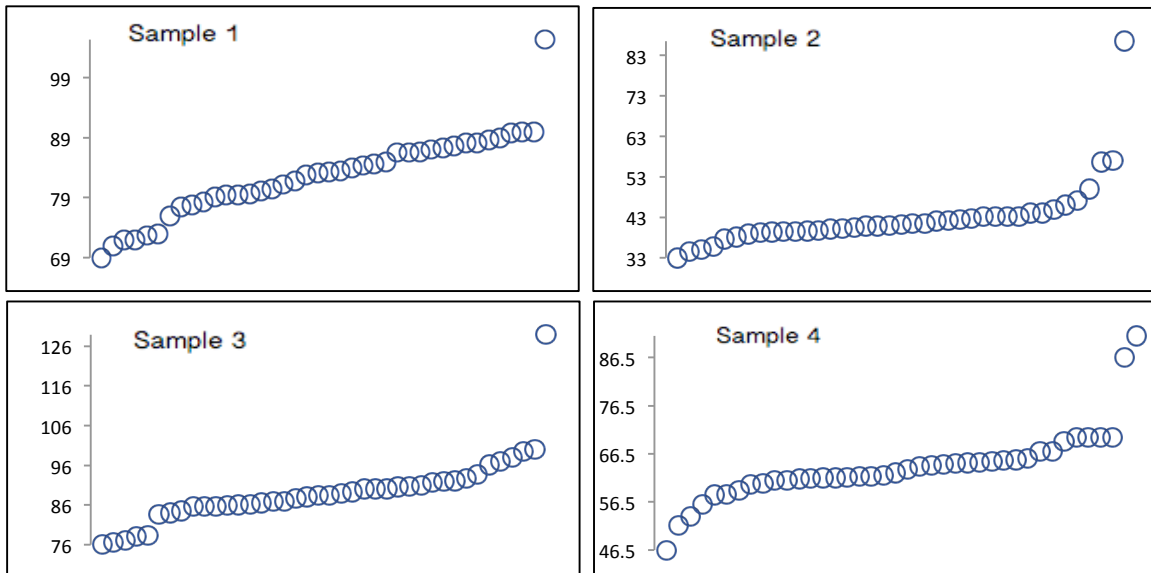
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	40	39	40	40
Median	83.2	41.2	88.3	62.9
Robust Mean	82.3	41.5	88.6	63.3
U	1.28	0.74	1.17	0.96
Robust Standard Deviation	6.47	3.65	5.85	4.80
Regression Standard Deviation	8.23	4.15	8.86	6.33
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	8.23	4.15	8.86	6.33
Outliers	1	1	1	1
$ z > 3.0$	0	3	1	2
$2 < z < 3$	1	2	0	1

Methods Used

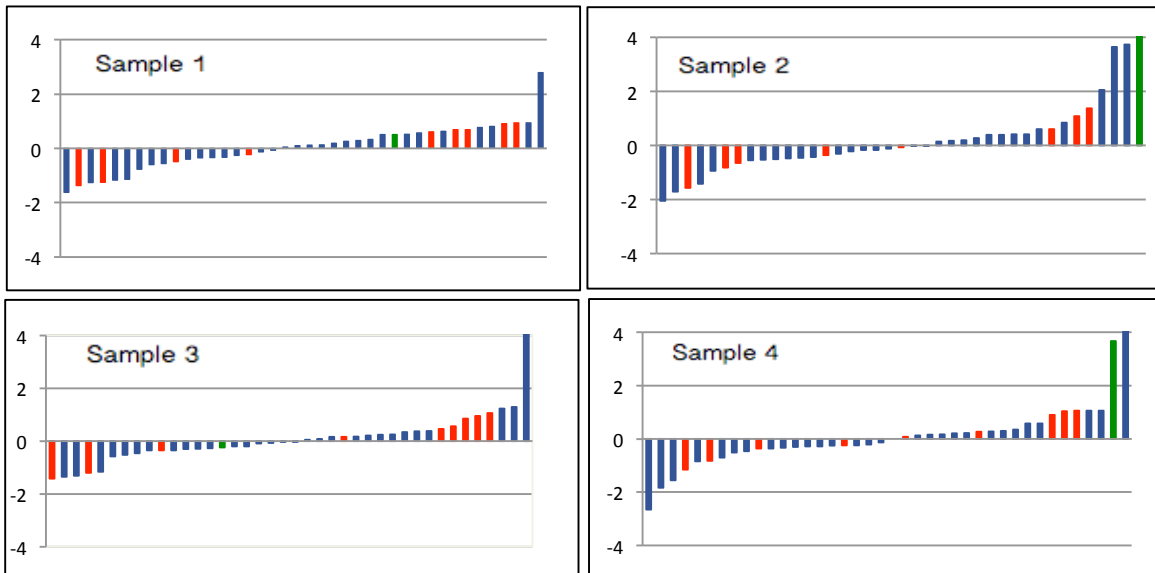
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	30	30	30	30
ICP/OES	9	8	9	9
CVAFS	1	1	1	1

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

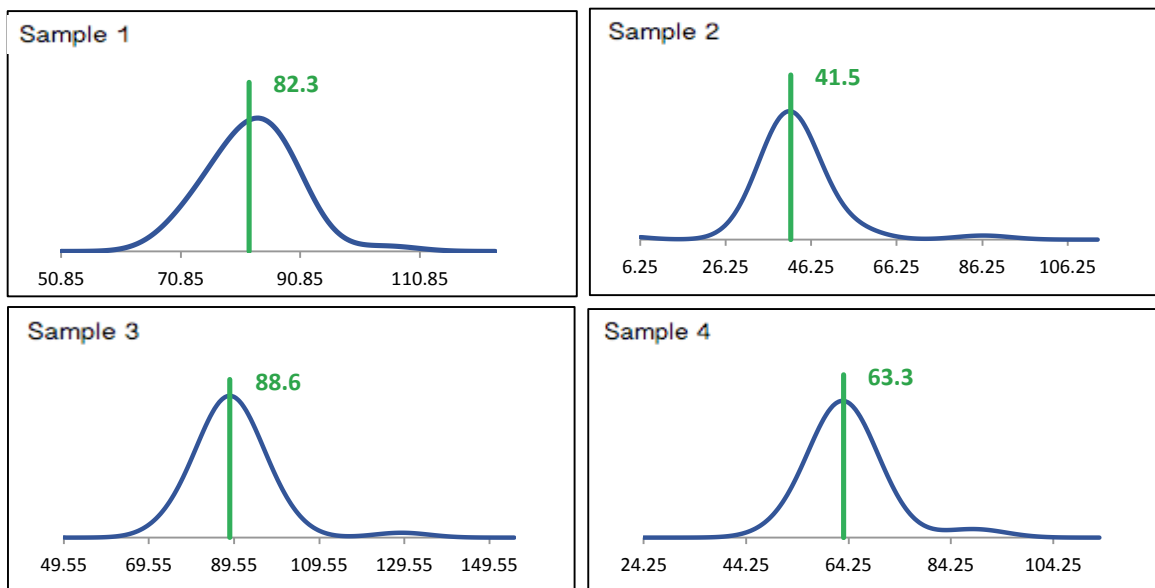


SELENIUM

z-Score Plots

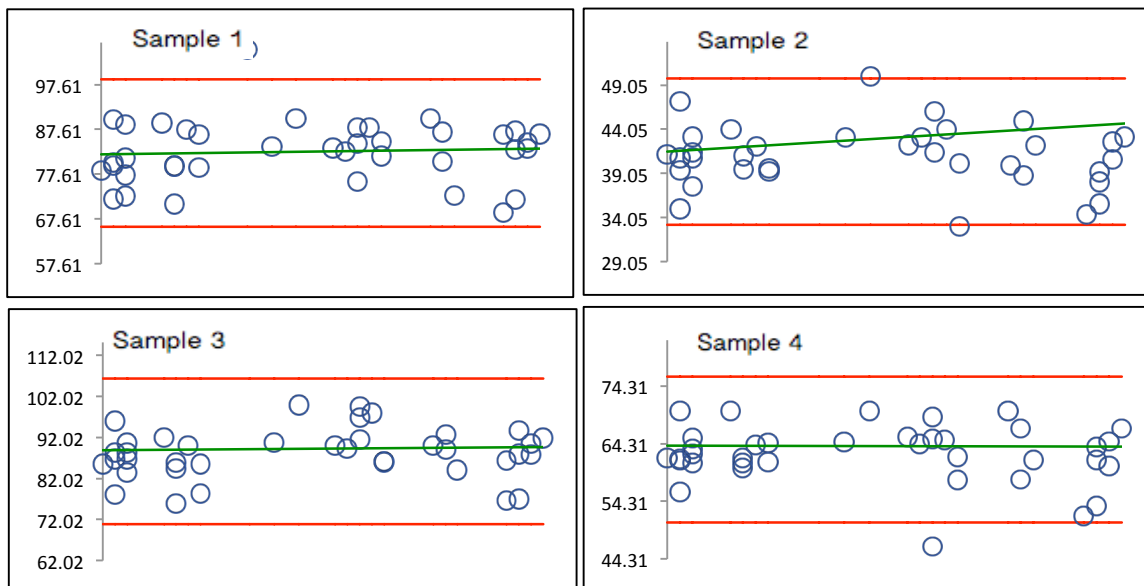


Kernel Density Plots



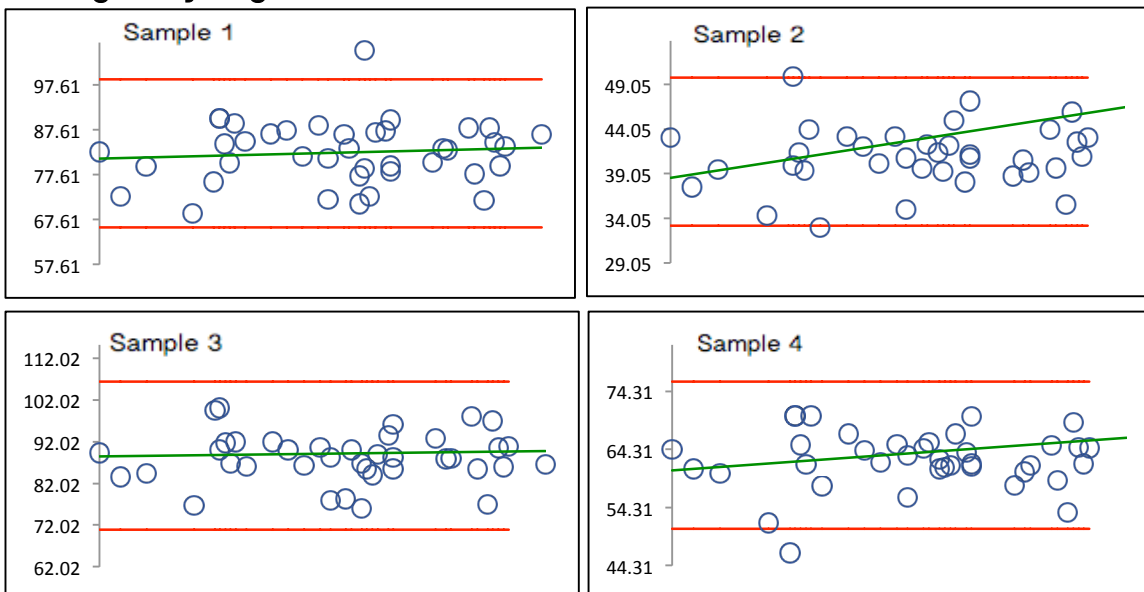
SELENIUM

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).

SILVER

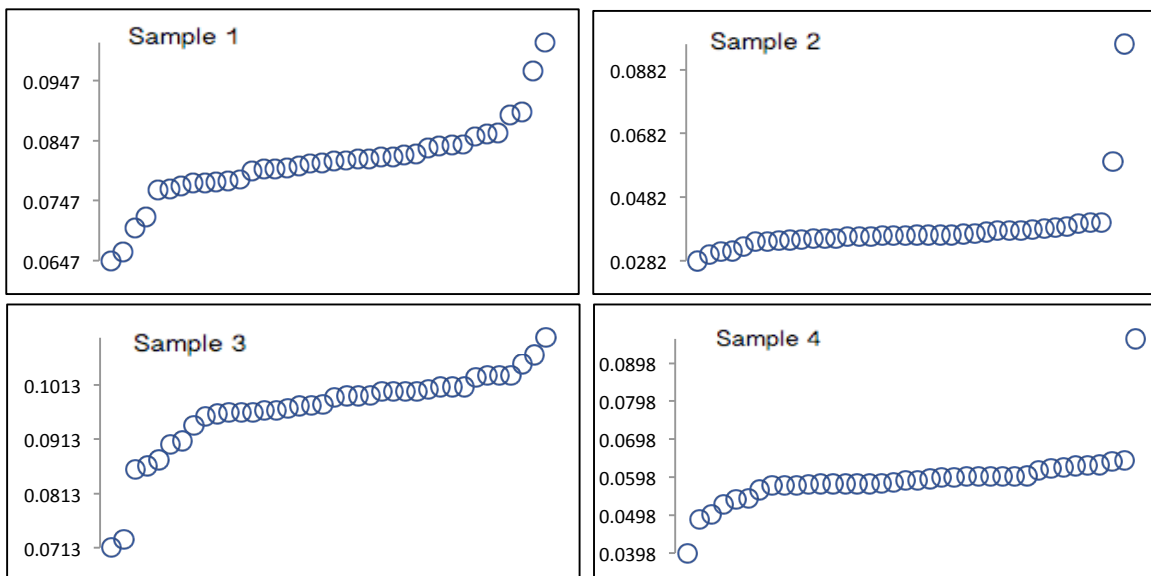
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	38	38	38	38
Median	0.0812	0.0361	0.0984	0.0590
Robust Mean	0.0810	0.0363	0.0978	0.0590
U	0.00090	0.00053	0.00109	0.00069
Robust Standard Deviation	0.00443	0.00258	0.00530	0.00335
Regression Standard Deviation	0.00607	0.00272	0.00734	0.00442
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00607	0.00272	0.00734	0.00442
Outliers	0	0	0	0
$ z > 3.0$	1	2	2	2
$2 < z < 3$	3	2	0	2

Methods Used

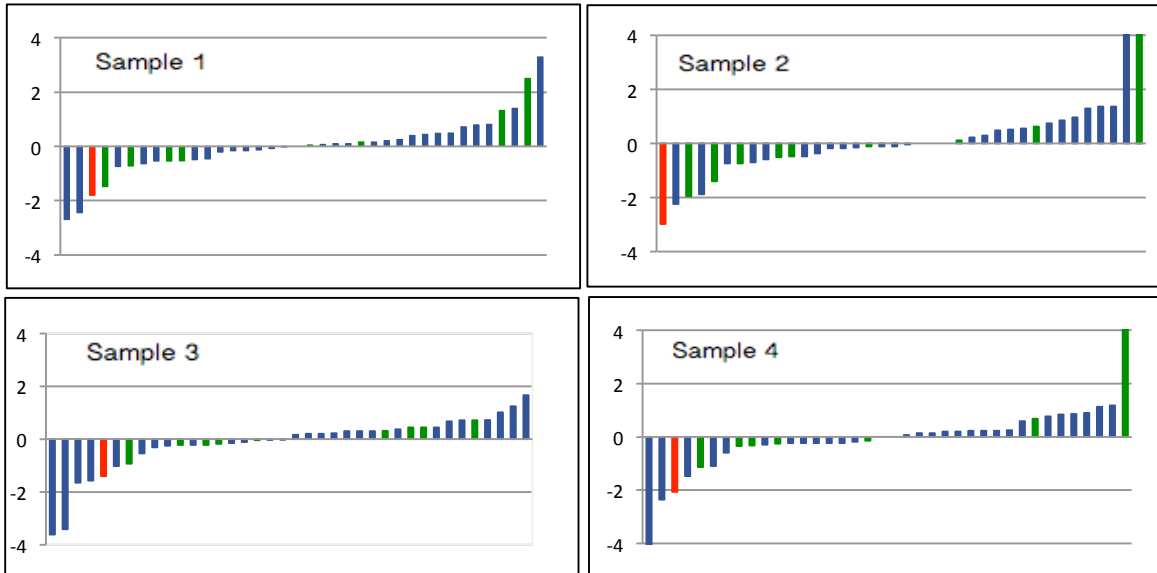
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	28	28	28	28
AA	1	1	1	1
ICP/OES	9	9	9	9

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

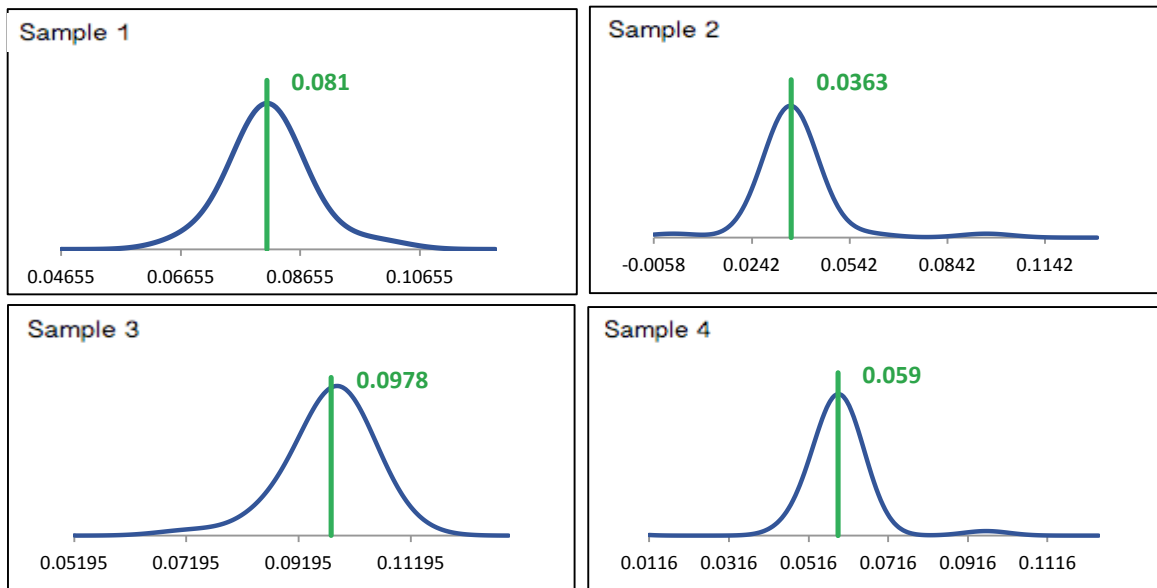


SILVER

z-Score Plots

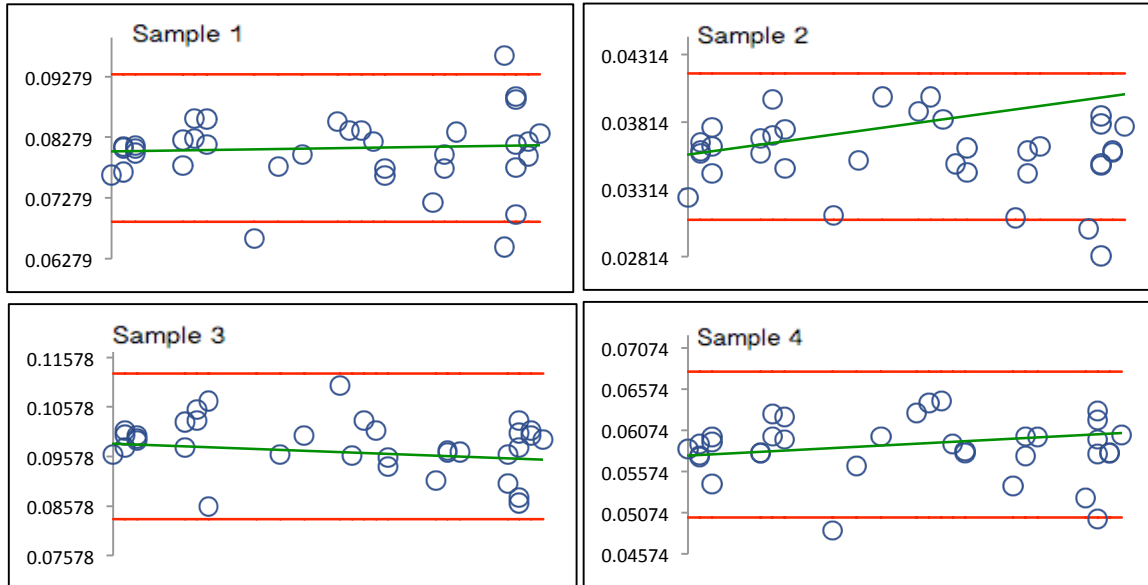


Kernel Density Plots



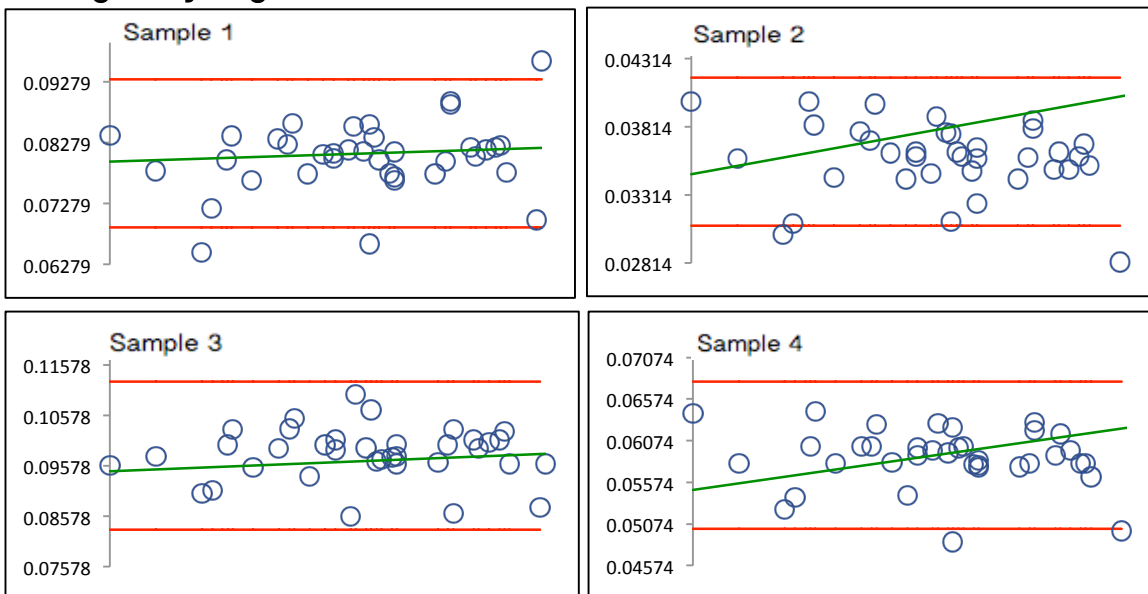
SILVER

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

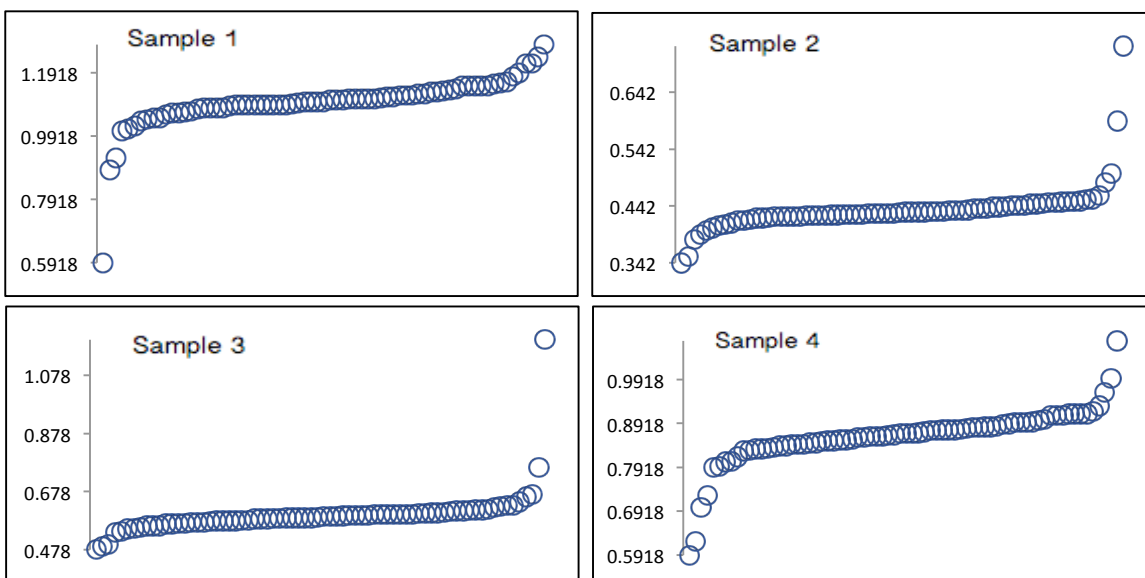
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	71	72	72	72
Median	1.10	0.431	0.590	0.868
Robust Mean	1.10	0.432	0.590	0.867
U	0.00650	0.00228	0.00365	0.00555
Robust Standard Deviation	0.0438	0.0155	0.0248	0.0377
Regression Standard Deviation	0.0828	0.0324	0.0443	0.0650
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0828	0.0324	0.0443	0.0650
Outliers	1	0	0	0
$ z > 3.0$	1	2	2	3
$2 < z < 3$	3	3	3	2

Methods Used

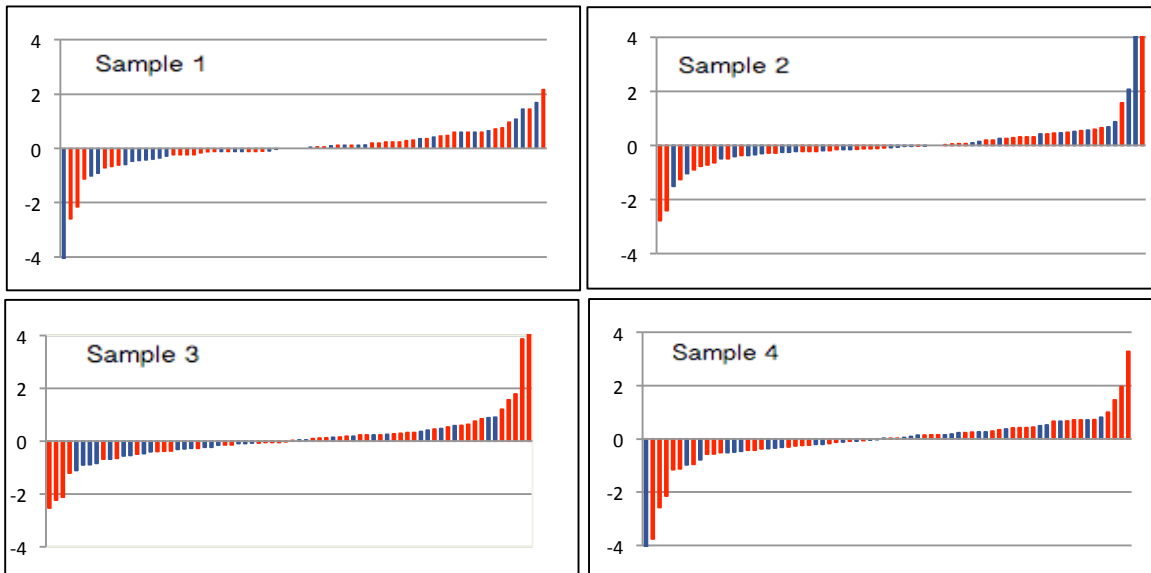
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES	30	30	30	30
ICP/MS	41	42	42	42

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

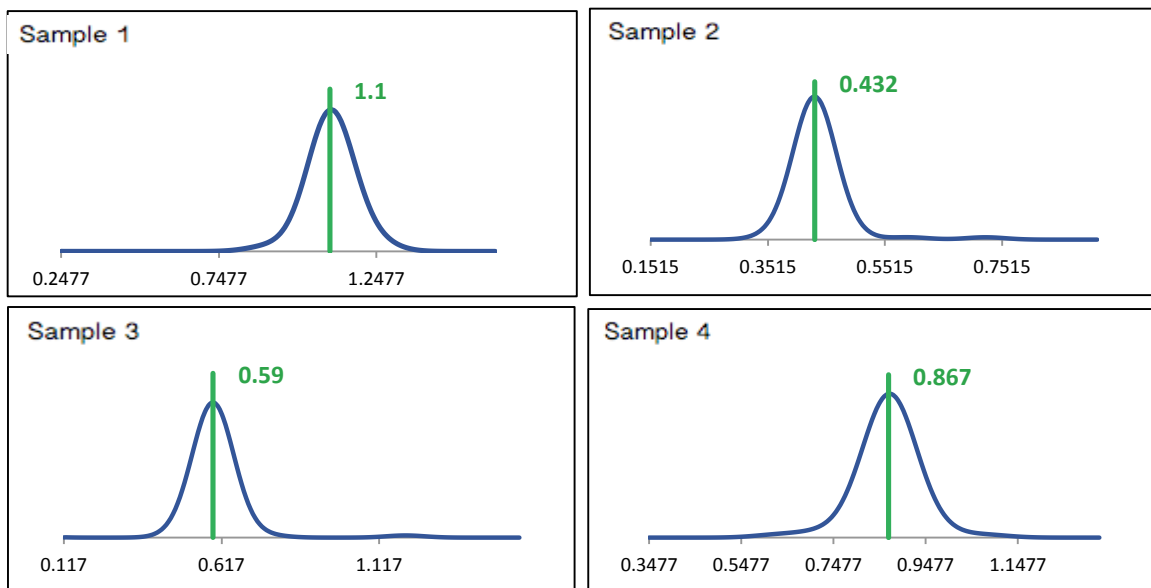


STRONTIUM

z-Score Plots

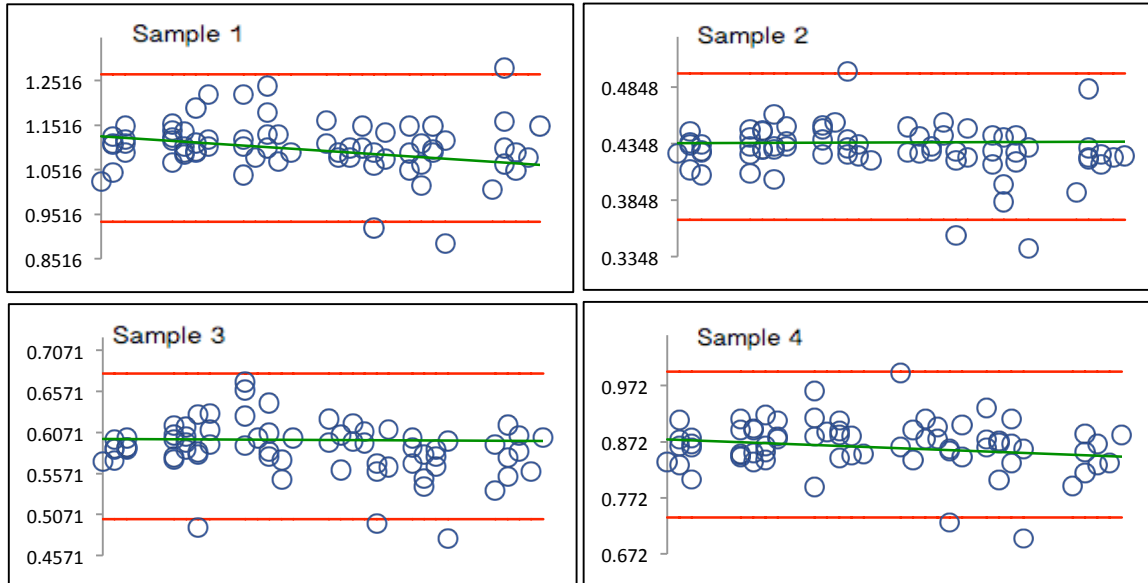


Kernel Density Plots



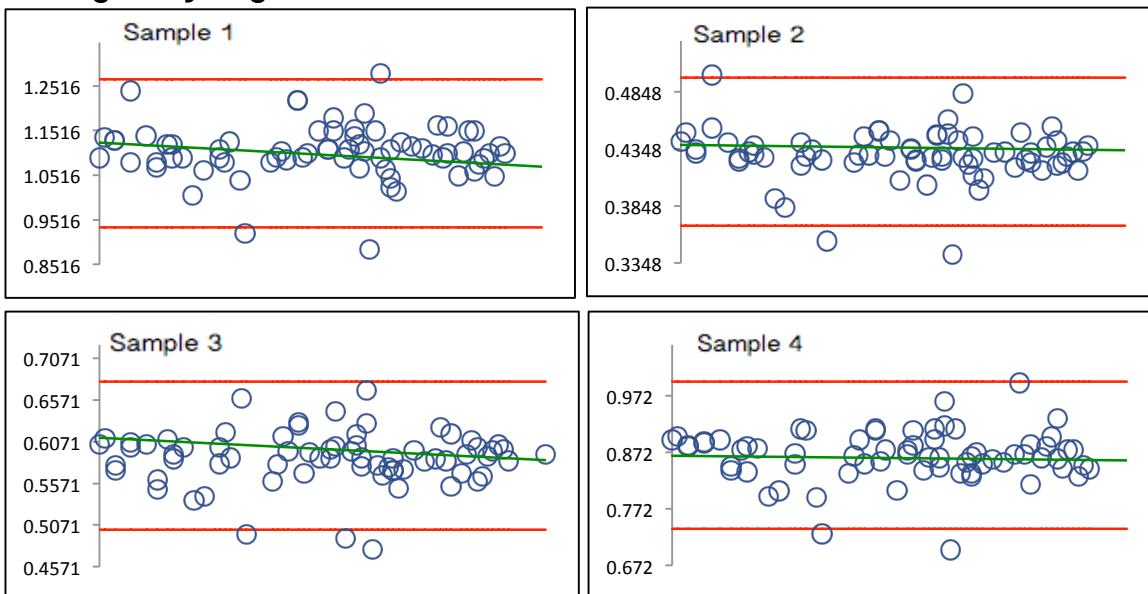
STRONTIUM

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).

THALLIUM

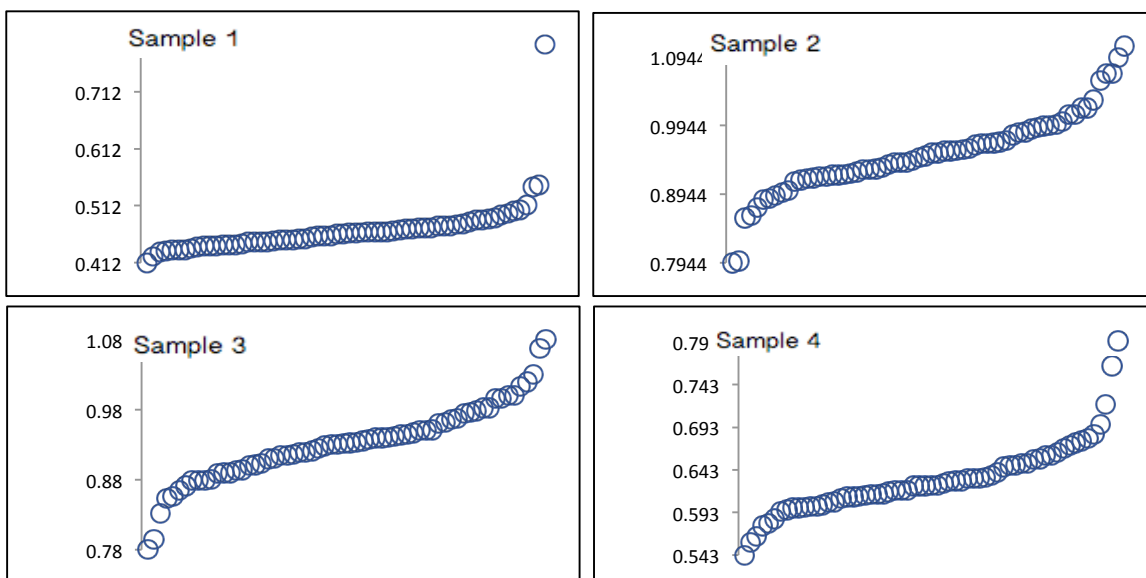
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	64	64	64	63
Median	0.463	0.952	0.933	0.625
Robust Mean	0.463	0.952	0.932	0.629
U	0.00367	0.00795	0.00788	0.00539
Robust Standard Deviation	0.0235	0.0509	0.0504	0.0342
Regression Standard Deviation	0.0463	0.0952	0.0932	0.0629
Stability Flag				
Homogeneity Flag	Homogeneity			
Standard Deviation Used (SDPA)	0.0464	0.0952	0.0932	0.0629
Outliers	1	1	1	2
z >3.0	1	0	0	0
2< z <3	0	0	0	2

Methods Used

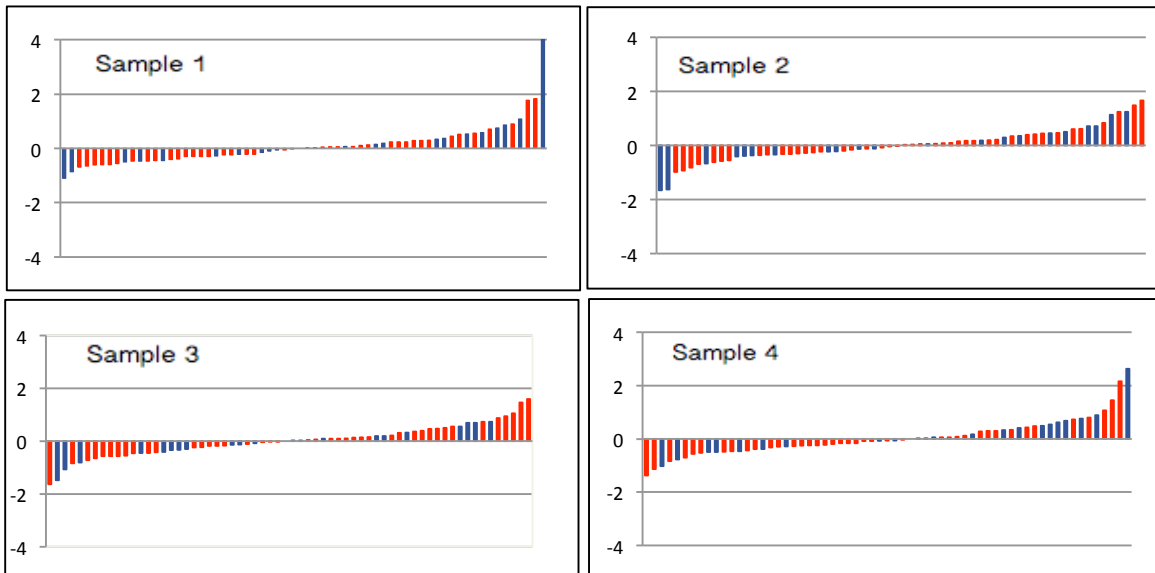
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES	21	21	21	21
ICP/MS	43	43	43	42

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

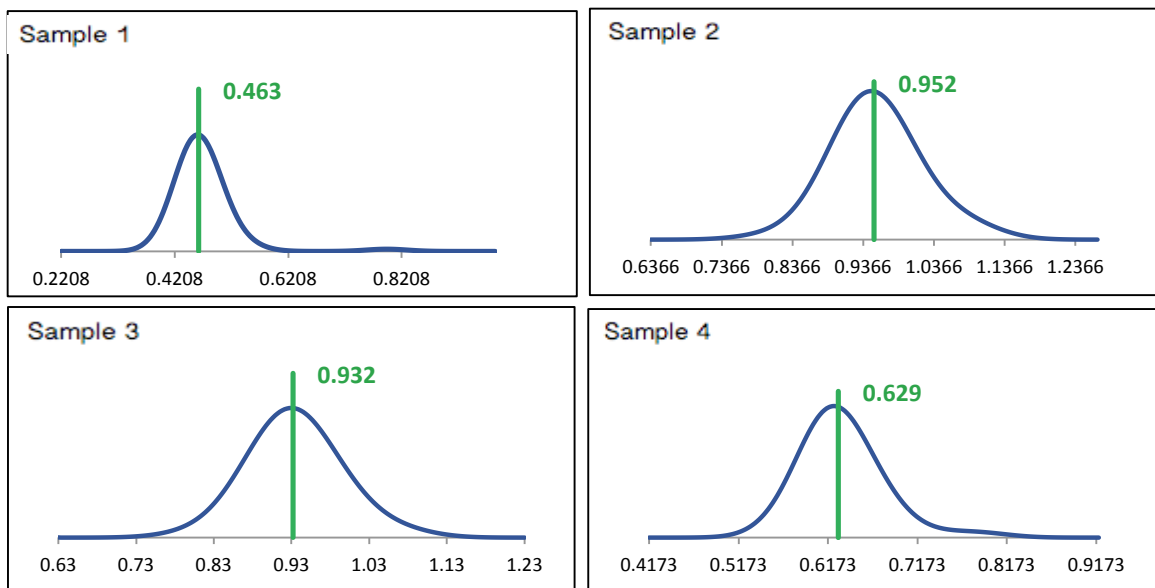


THALLIUM

z-Score Plots

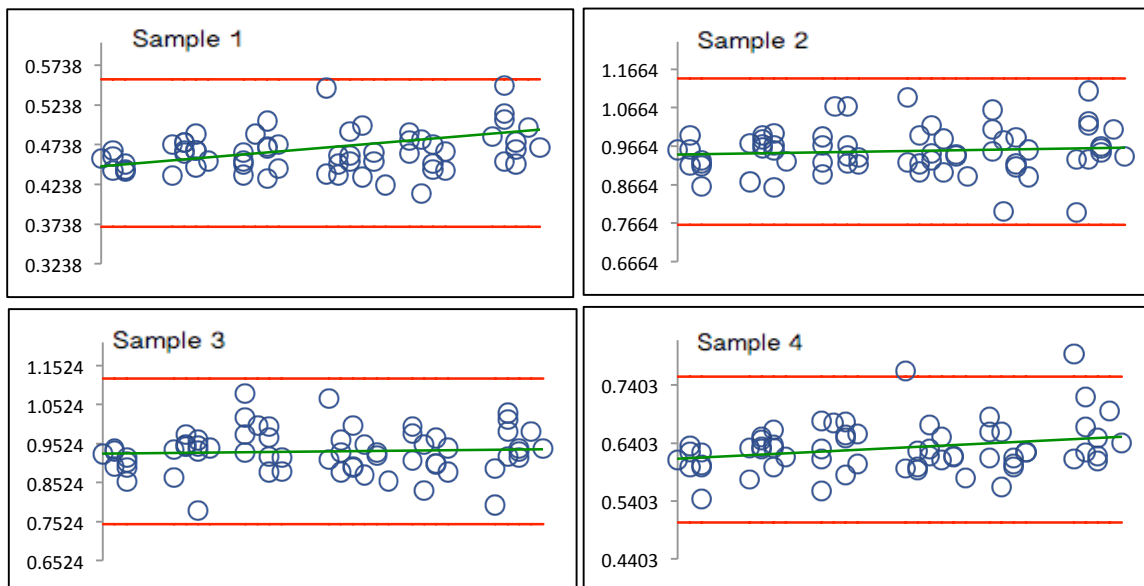


Kernel Density Plots



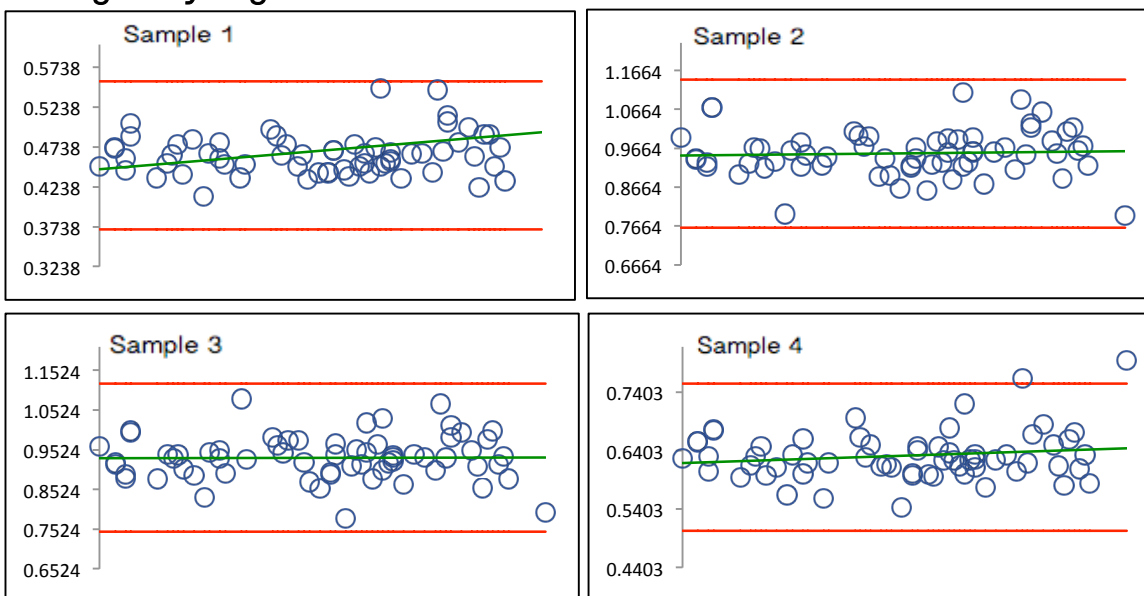
THALLIUM

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).

TIN

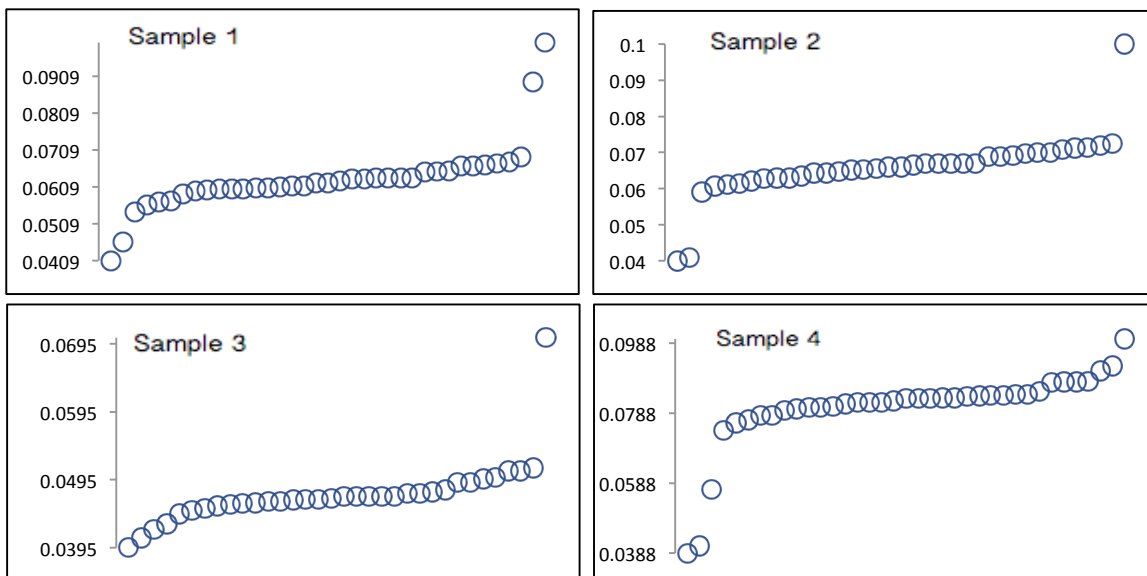
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	37	37	34	37
Median	0.0620	0.0660	0.0469	0.0830
Robust Mean	0.0622	0.0661	0.0469	0.0822
U	0.00091	0.00092	0.00052	0.00099
Robust Standard Deviation	0.00441	0.00440	0.00238	0.00475
Regression Standard Deviation	0.00622	0.00661	0.00469	0.00822
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00622	0.00661	0.00469	0.00822
Outliers	0	0	0	0
$ z > 3.0$	3	3	1	3
$2 < z < 3$	1	0	0	1

Methods Used

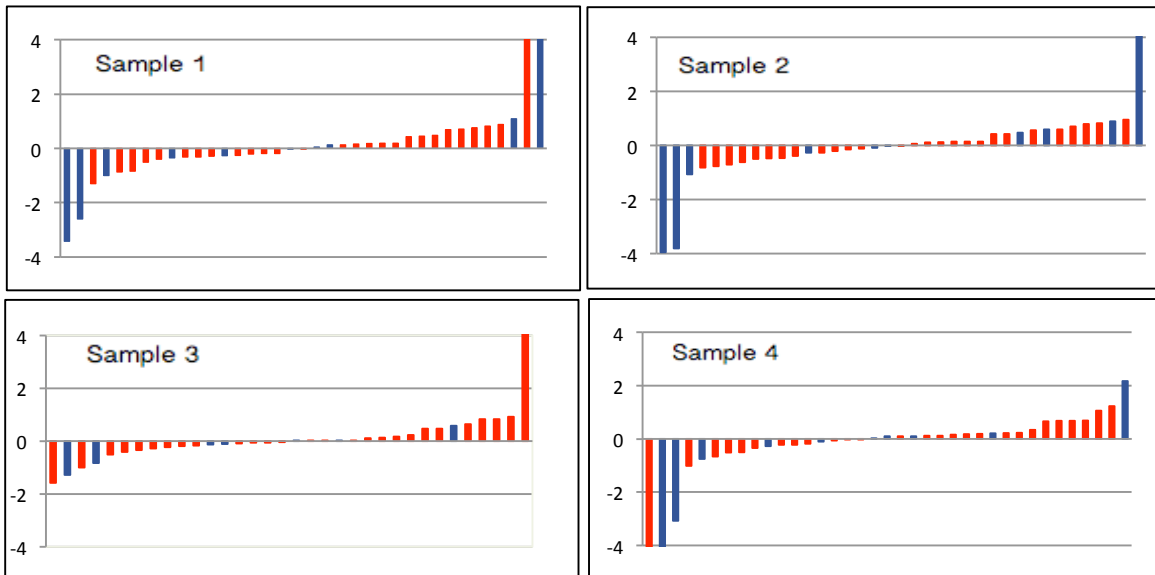
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES	10	10	7	10
ICP/MS	27	27	27	27

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

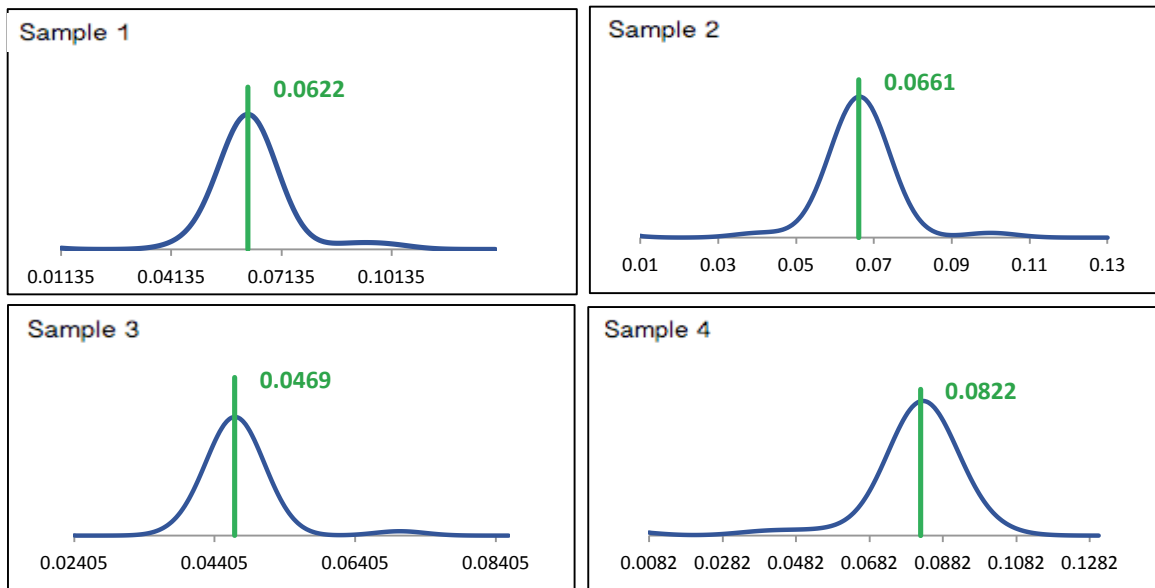


TIN

z-Score Plots

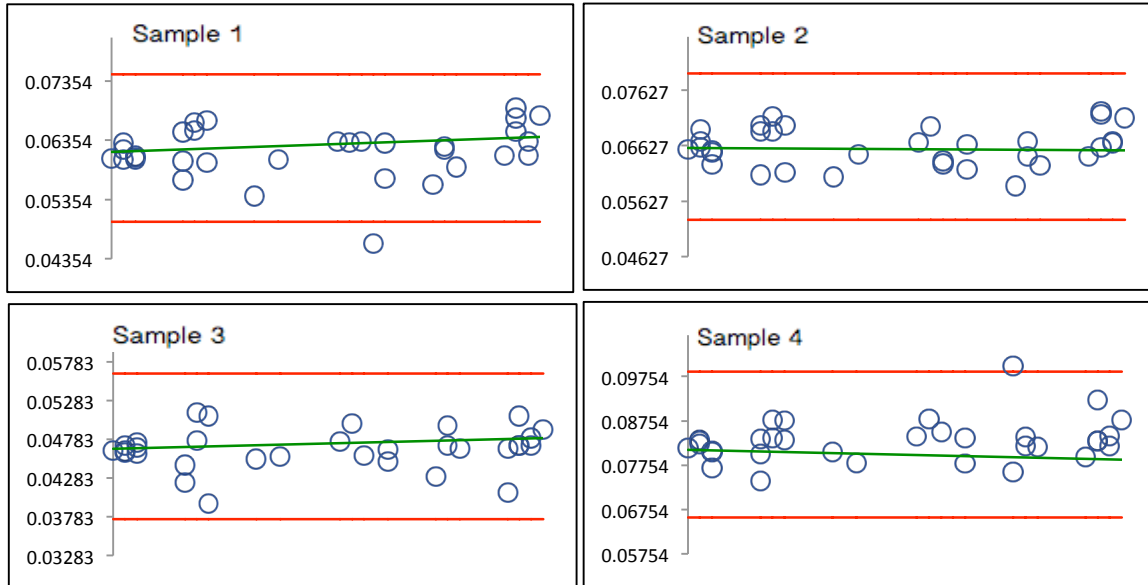


Kernel Density Plots



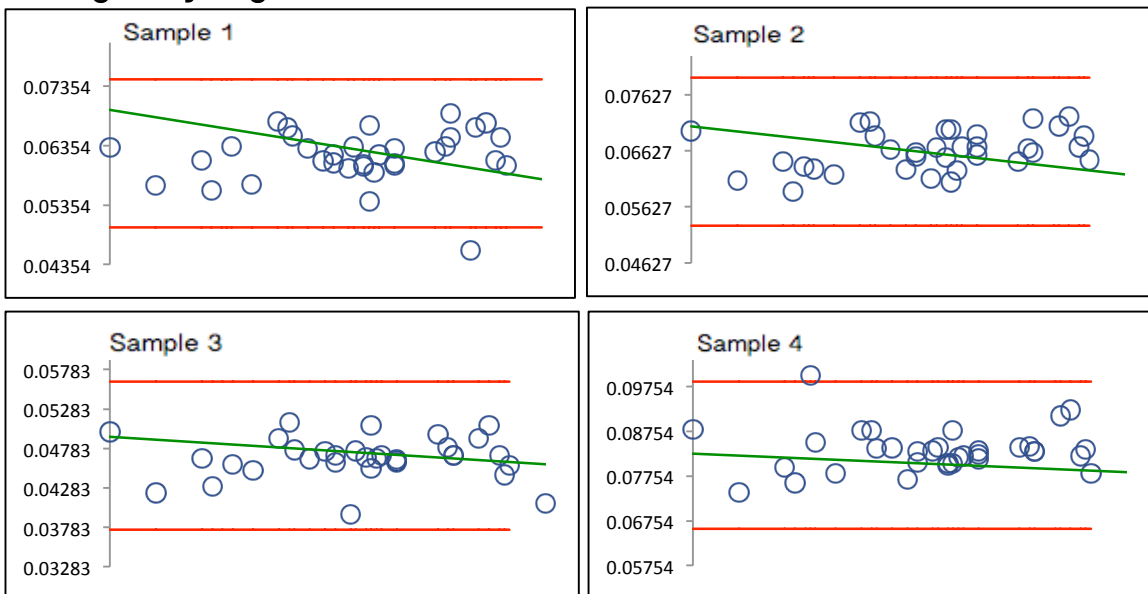
TIN

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).

TITANIUM

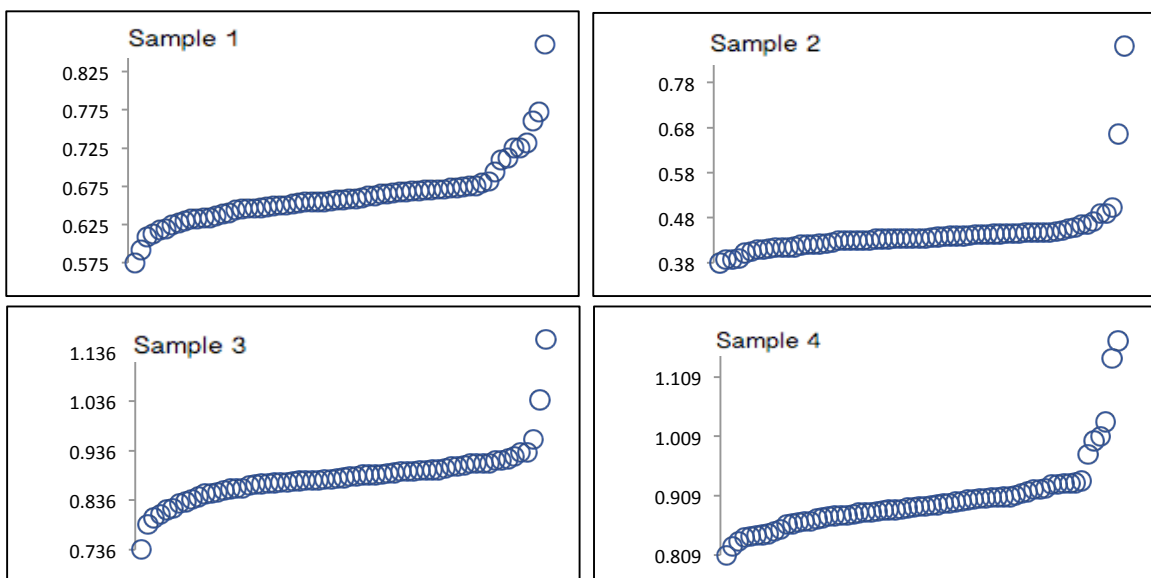
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	66	66	65	66
Median	0.657	0.434	0.881	0.891
Robust Mean	0.658	0.435	0.881	0.892
U	0.00397	0.00308	0.00512	0.00535
Robust Standard Deviation	0.0258	0.0200	0.0330	0.0348
Regression Standard Deviation	0.0493	0.0326	0.0660	0.0669
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0493	0.0326	0.0660	0.0669
Outliers	0	0	1	0
$ z > 3.0$	1	2	1	2
$2 < z < 3$	2	1	2	1

Methods Used

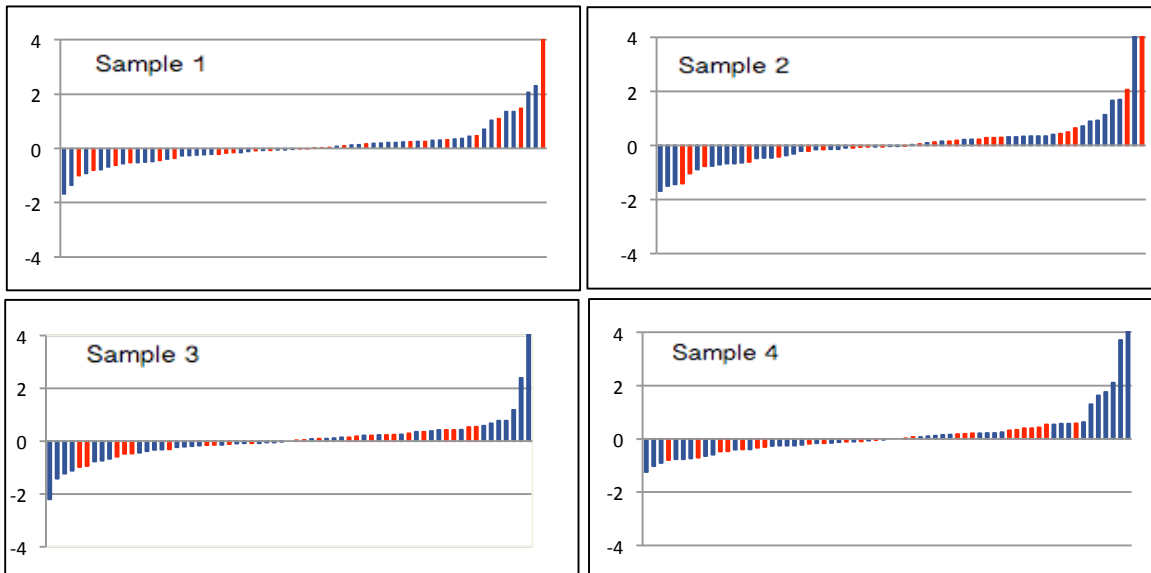
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	41	41	40	41
ICP/OES	25	25	25	25

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

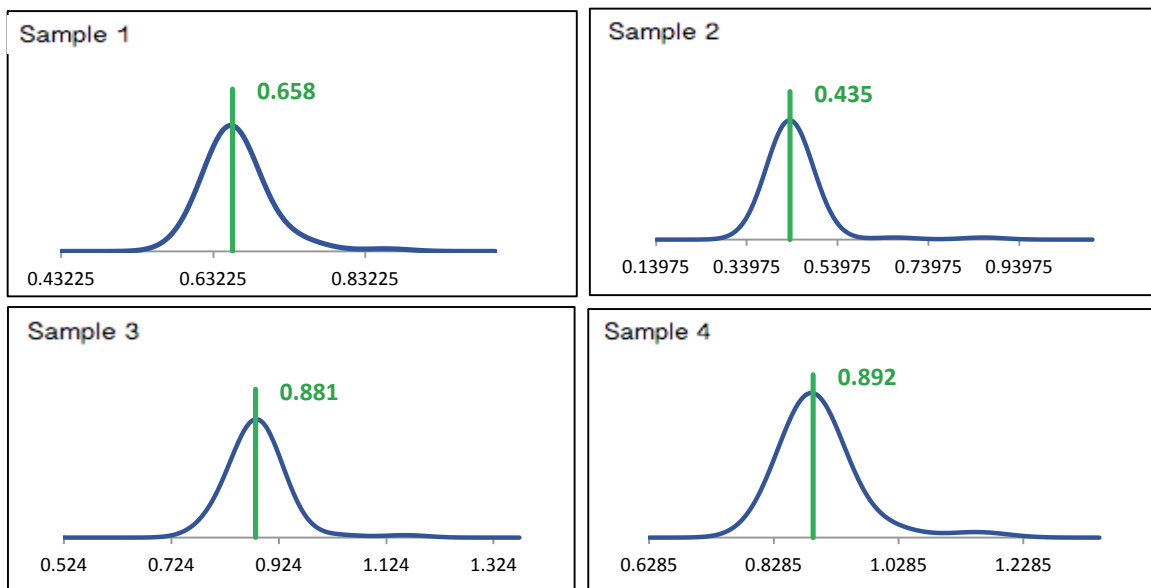


TITANIUM

z-Score Plots

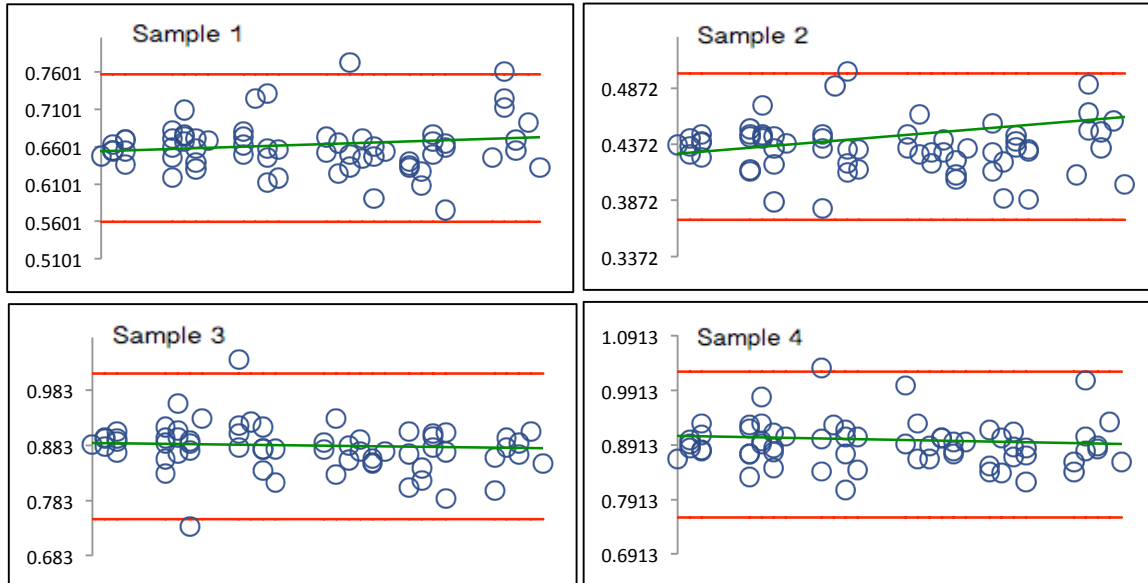


Kernel Density Plots



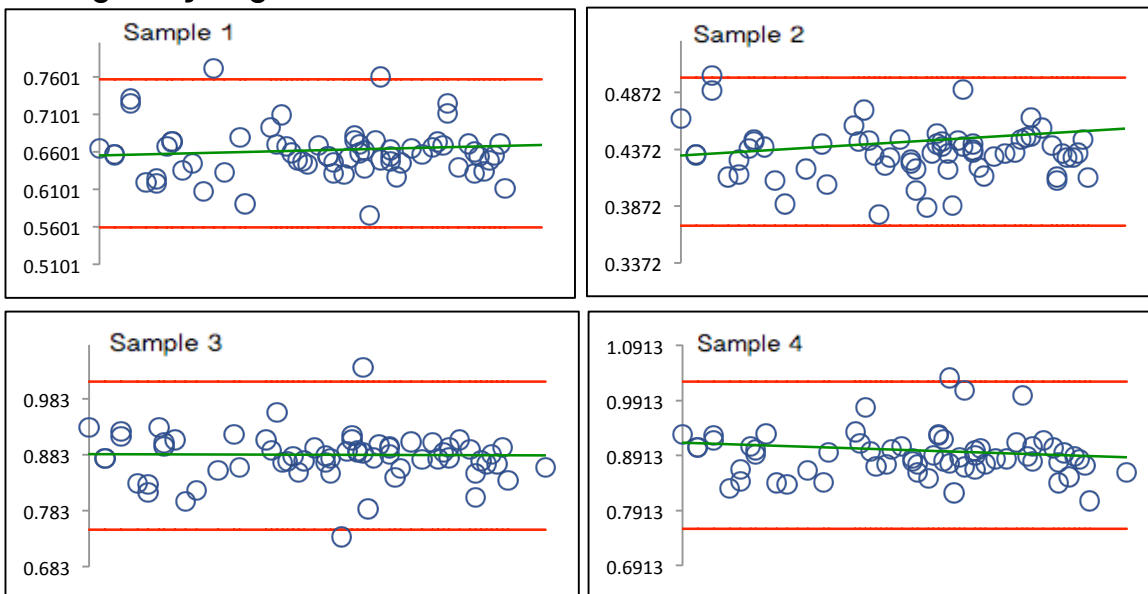
TITANIUM

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).

URANIUM

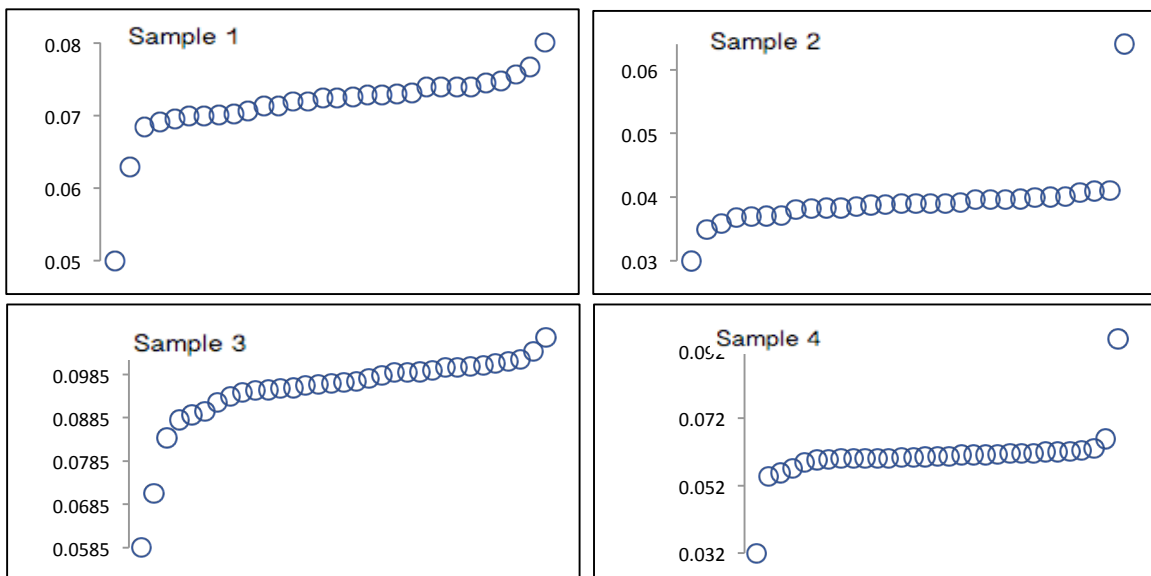
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	30	30	33	31
Median	0.0725	0.0390	0.0966	0.0607
Robust Mean	0.0721	0.0388	0.0964	0.0607
U	0.00060	0.00038	0.00114	0.00037
Robust Standard Deviation	0.00261	0.00164	0.00514	0.00162
Regression Standard Deviation	0.00541	0.00291	0.00723	0.00455
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.00541	0.00291	0.00723	0.00455
Outliers	1	1	0	0
$ z > 3.0$	1	2	2	2
$2 < z < 3$	0	0	0	0

Methods Used

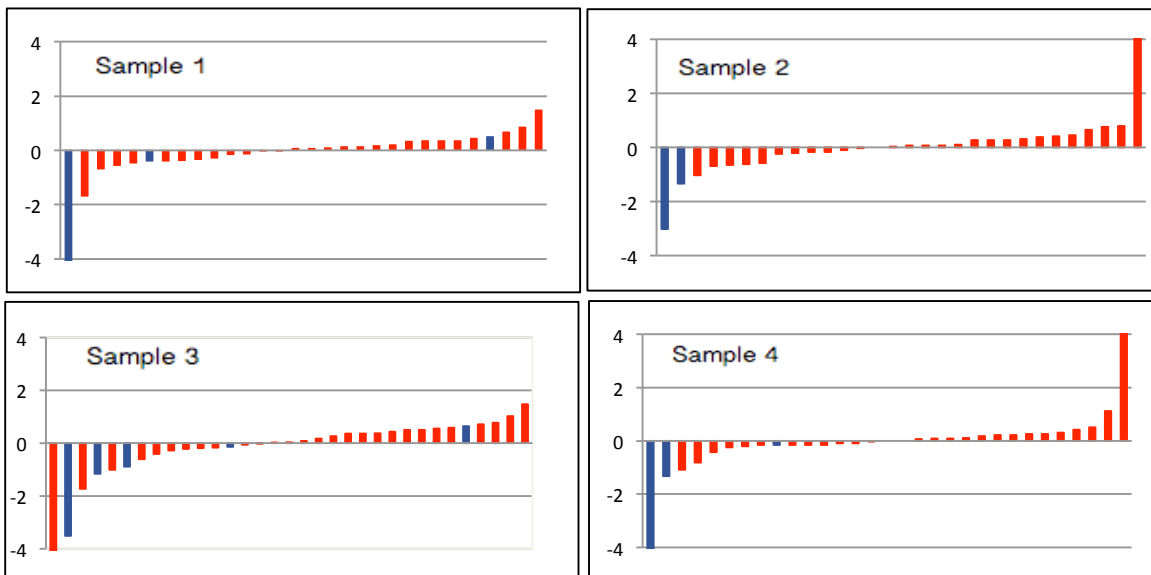
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES	3	2	5	3
ICP/MS	27	28	28	28

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

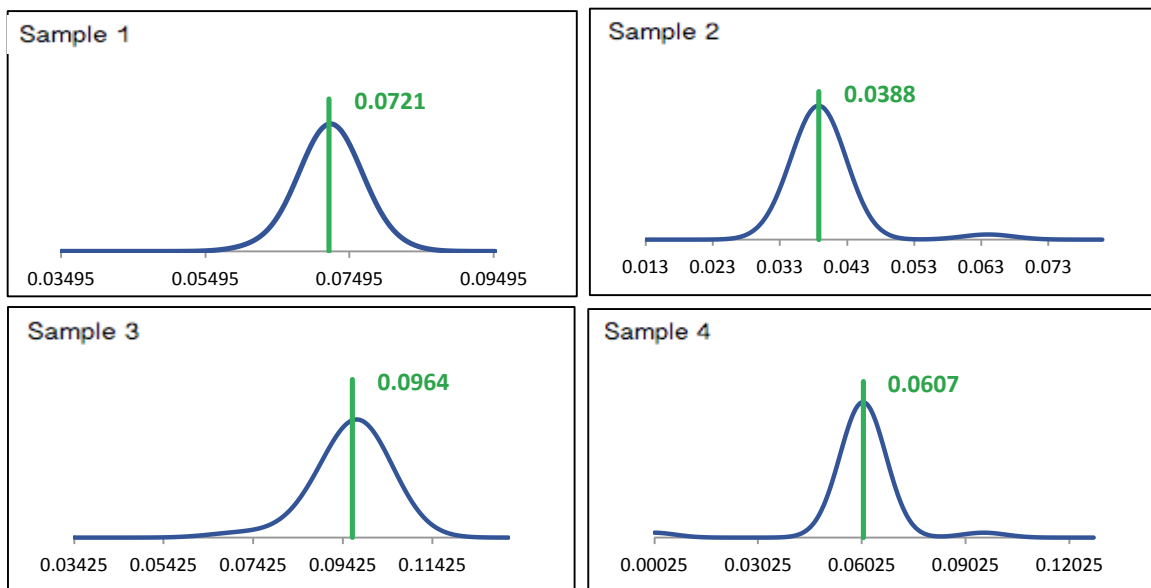


URANIUM

z-Score Plots

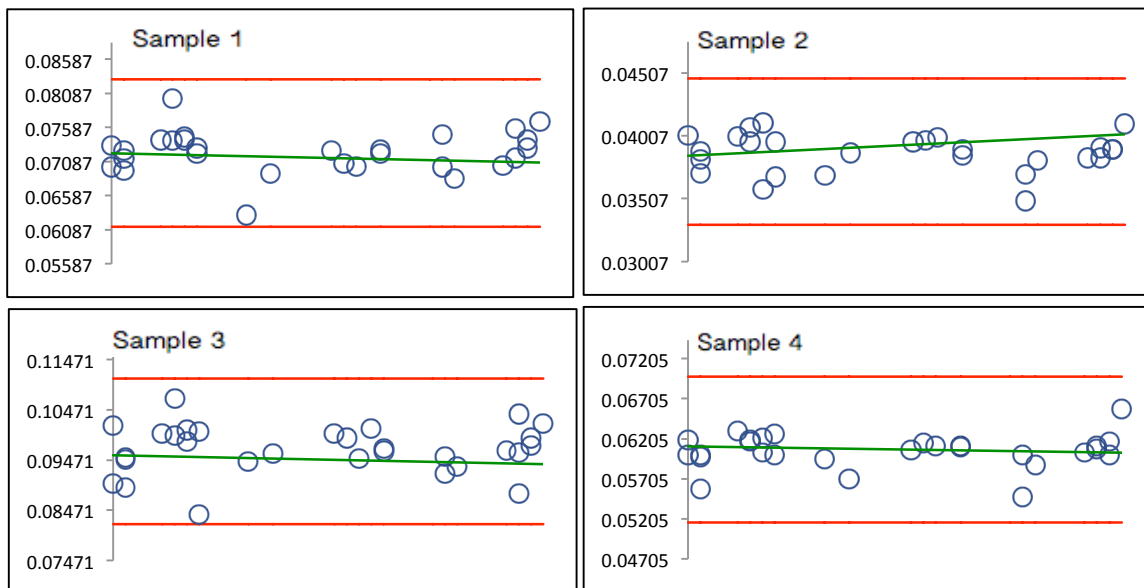


Kernel Density Plots



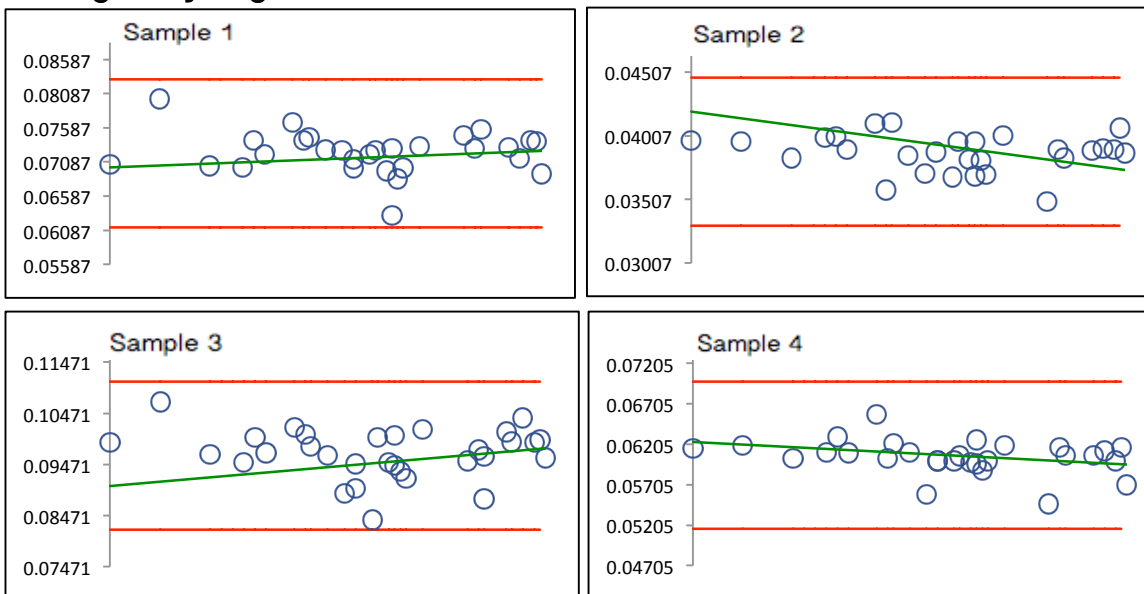
URANIUM

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).

VANADIUM

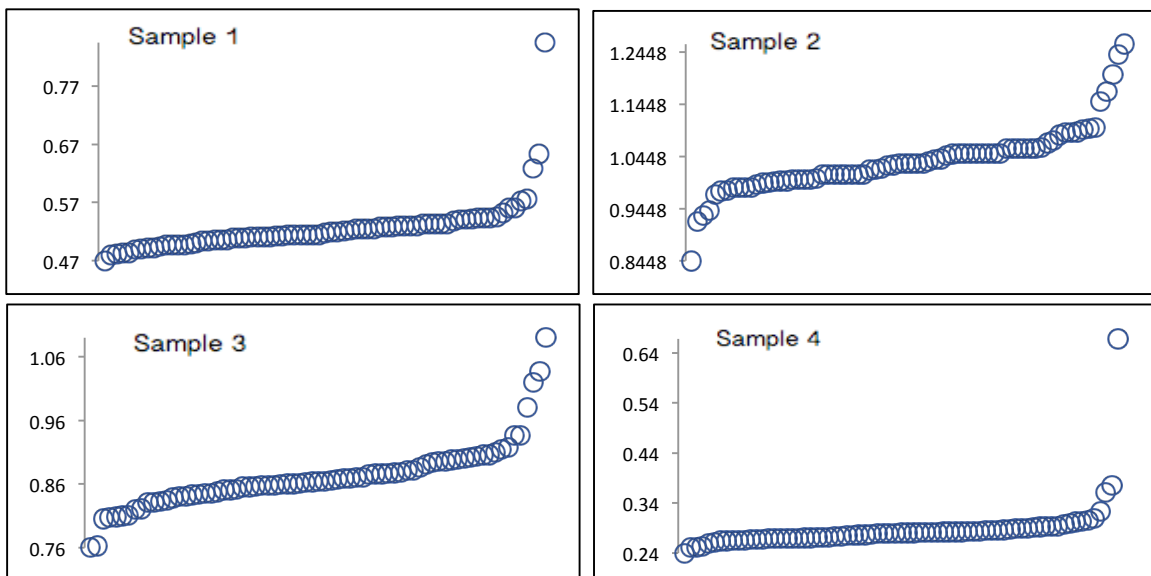
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	73	74	73	73
Median	0.518	1.03	0.864	0.280
Robust Mean	0.519	1.03	0.867	0.279
U	0.00338	0.00654	0.00528	0.00203
Robust Standard Deviation	0.0231	0.0450	0.0361	0.0139
Regression Standard Deviation	0.0389	0.0774	0.0650	0.0210
Stability Flag				
Homogeneity Flag	Homogeneity			
Standard Deviation Used (SDPA)	0.0442	0.0774	0.0650	0.0210
Outliers	1	0	1	1
z >3.0	2	0	1	3
2< z <3	1	4	2	1

Methods Used

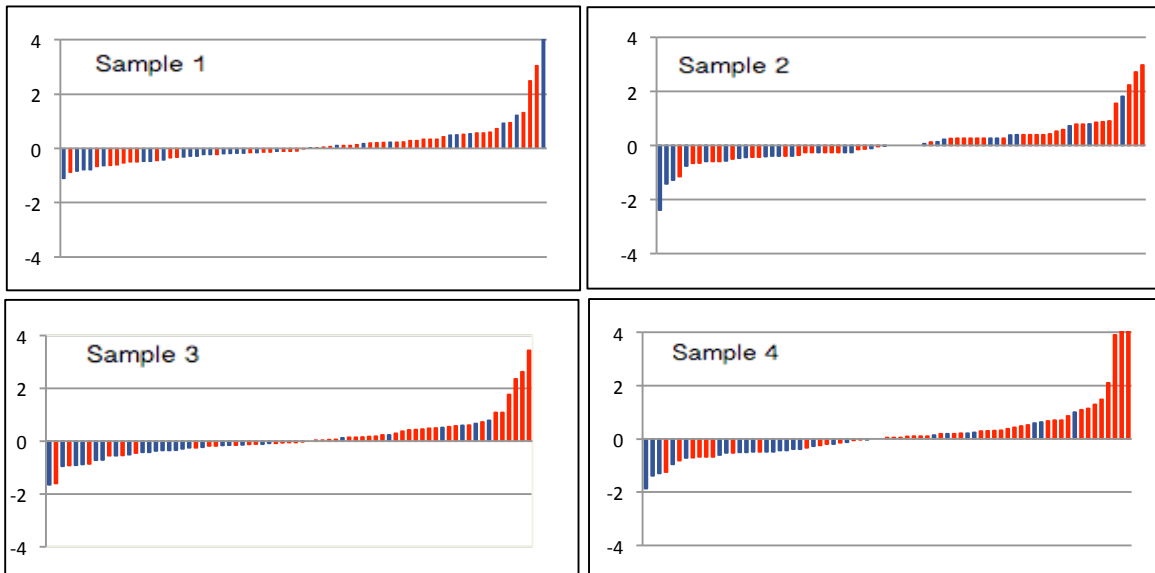
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES	29	29	29	28
ICP/MS	44	45	44	45

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

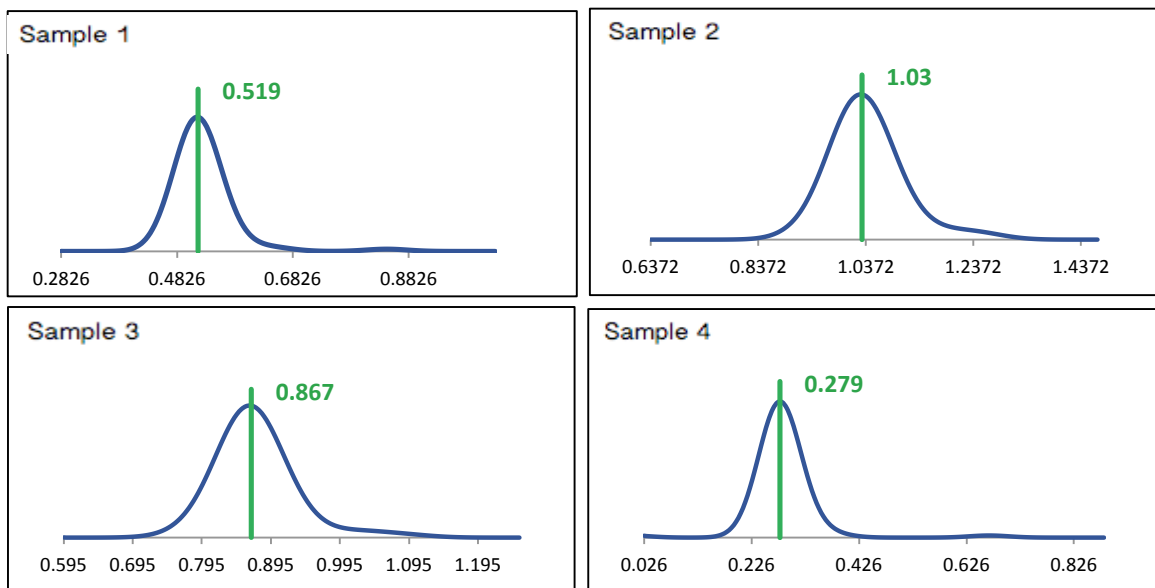


VANADIUM

z-Score Plots

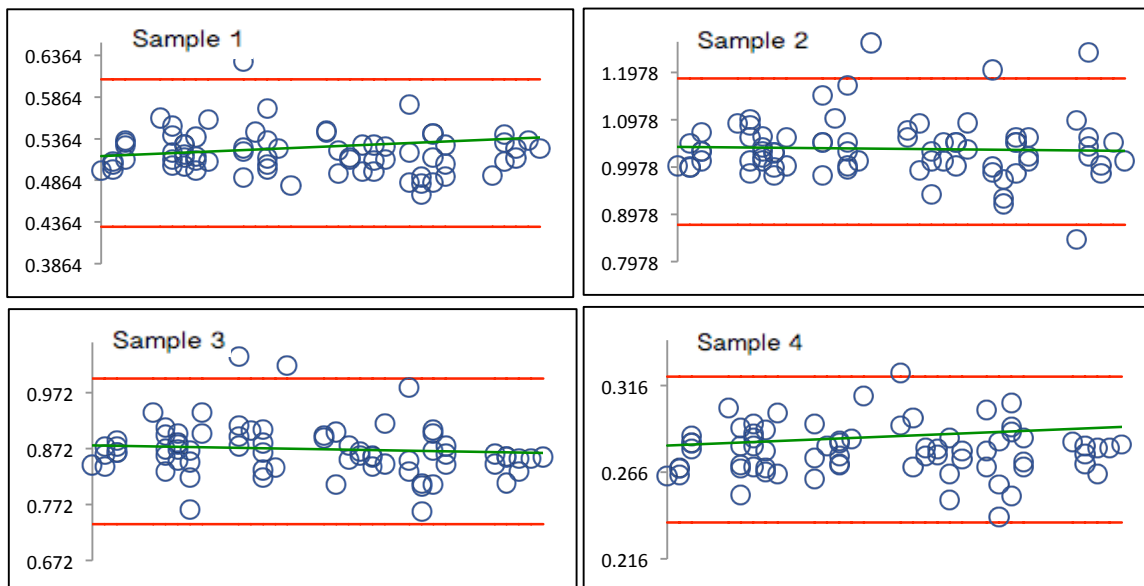


Kernel Density Plots



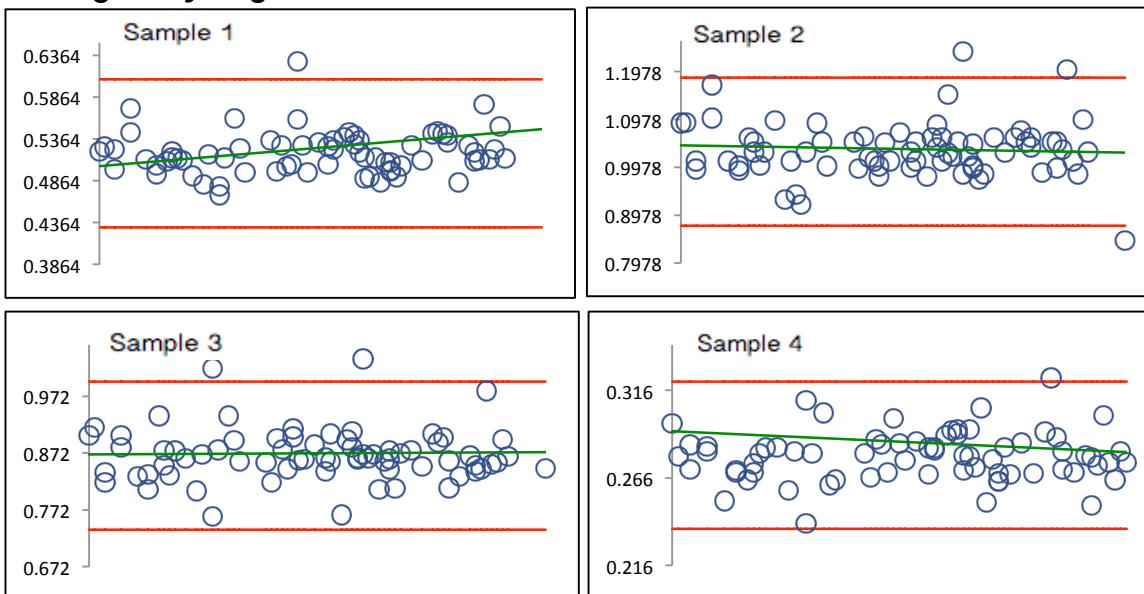
VANADIUM

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).

ZINC

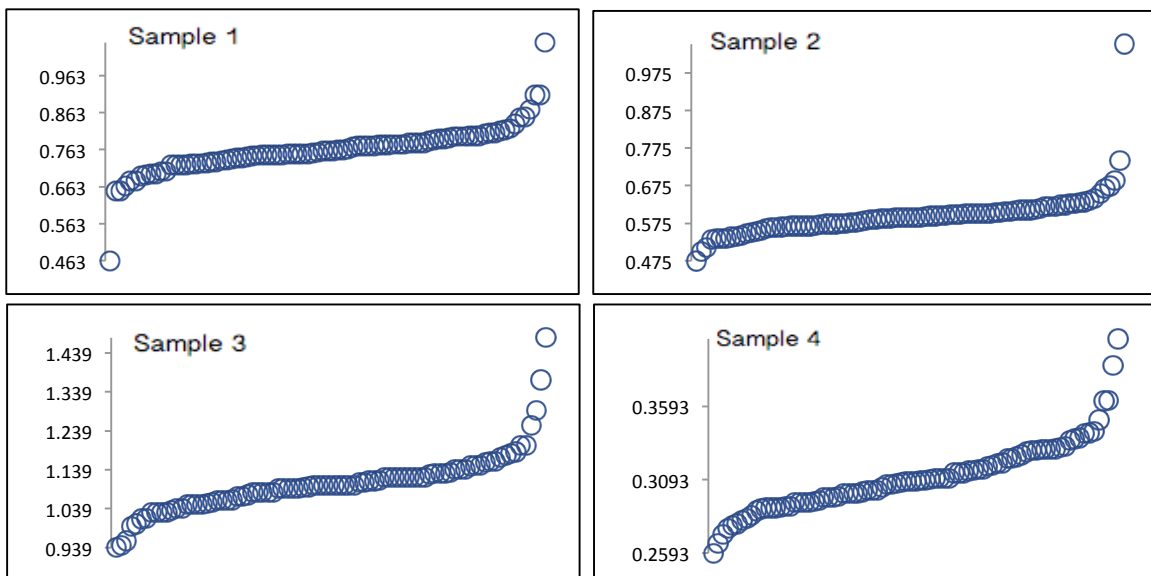
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	87	87	86	85
Median	0.760	0.590	1.10	0.308
Robust Mean	0.760	0.589	1.10	0.310
U	0.00595	0.00448	0.00740	0.00287
Robust Standard Deviation	0.0444	0.0334	0.0549	0.0212
Regression Standard Deviation	0.0570	0.0442	0.0824	0.0232
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.0570	0.0442	0.0824	0.0232
Outliers	0	0	1	2
$ z > 3.0$	2	2	2	2
$2 < z < 3$	2	3	1	3

Methods Used

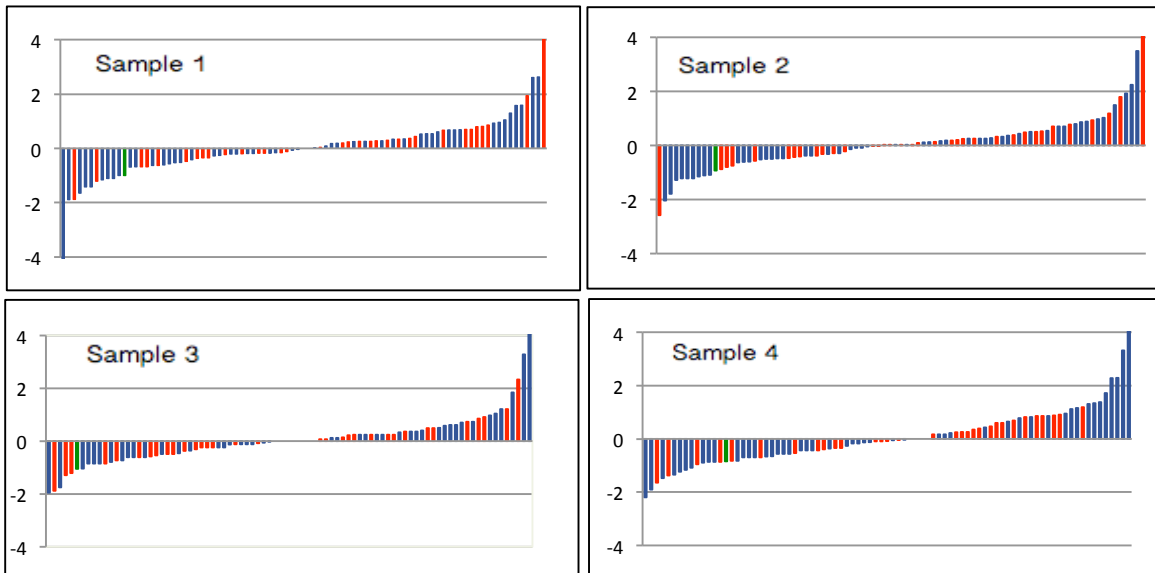
Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS	51	51	50	50
ICP/OES	35	35	35	34
AA	1	1	1	1

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

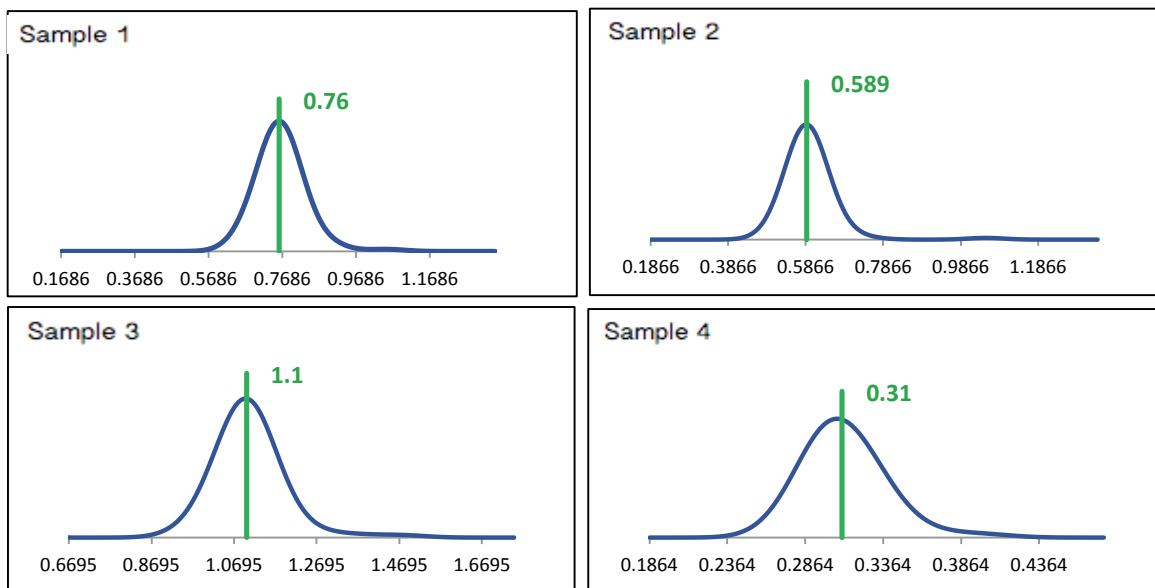


ZINC

z-Score Plots

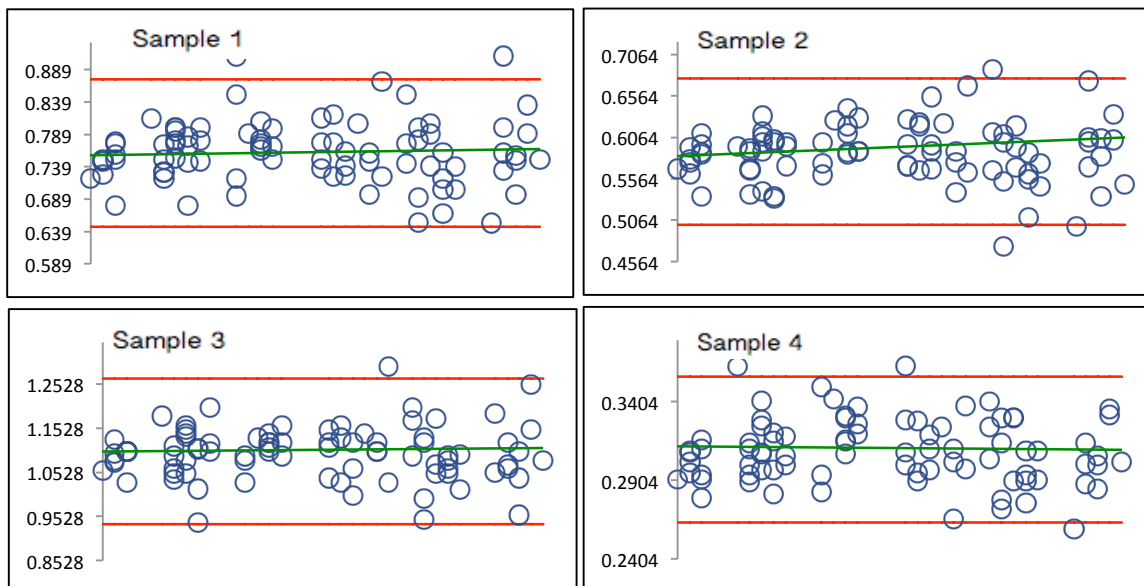


Kernel Density Plots



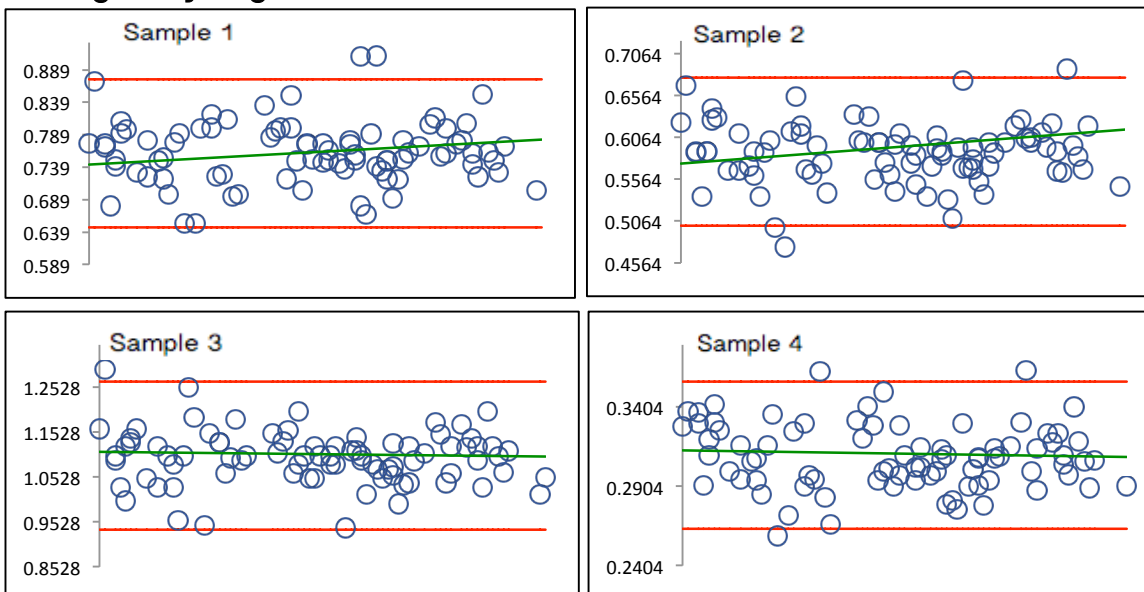
ZINC

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).