

Test Group Summary Report
C02A Metals (Full Range) in Water
March 2019

Rev. 2.0



CALA
Proficiency Testing

1.0 THE PROFICIENCY TESTING REPORT

The Proficiency Testing Report consists of two parts.

CALA Proficiency Testing Report: This report contains participant-specific evaluations and other confidential information. This report is emailed to participants at the end of the study.

Test Group Summary Report: A Test Group Summary Report is created for each test group at the end of the study. These reports contain more detailed information on the study than are found in the participant-specific CALA Proficiency Testing Report. These reports do not contain any confidential information and are made available on the CALA web site.

2.0 DEFINITIONS

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

Code:	The registration code that is unique to each analyte that a participant is registered for.
App:	If a participant is accredited by CALA, this three digit number is the appendix number that the accredited method is assigned to.
N:	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.
Assigned:	The Assigned Value is the robust mean of the reported results, outliers excluded. This is often referred to as the “target” value.
+ u:	The uncertainty of the assigned value.
Reported:	The result reported by the participant.
s:	The Standard Deviation of Proficiency Assessment. This value is used to determine the acceptance limits for the PT evaluation.
z-Score:	A value assigned to each reported result that is a measure of how much it deviates from the Assigned Value.
Score:	The composite score of the four results reported for each analyte. It is normalized to a score out of 100.
Bias:	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 CALA. The detailed evaluation procedure is described in PT15-03 - *CALA PT Program - Procedures*, which is available on the CALA website (www.CALA.ca).

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 until the impact is minimized.

3.2 The z score

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

where: x = participant's result;

\bar{X} = the Assigned Value for the sample;

s = the Standard Deviation for Proficiency Assessment.

$$z = \frac{(x - \bar{X})}{s}$$

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:

1. The inter-laboratory Robust standard deviation (stdev) is calculated using reported results, obvious outliers removed;
2. The expected inter-laboratory standard deviation ($s!$) is estimated from regression equations derived from previous studies (see PT15-05-CALA PT Program – Regression Equations for details);
3. If $s!$ is higher than stdev then $s!$ is used in the z score equation;
4. If $s!$ is lower than stdev then stdev is used in the z score equation;
5. 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 study involves four or two separate samples of distinct concentrations 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.

where z = the z- score

N = the number of samples

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

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 PT report.

4.0 STUDY SPECIFIC DATA SUMMARY

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

4.1 Overall Data Distribution

Kernel density plots are generated for each data set. These plots are a statistical way to represent the overall data distribution and are used to visualize deviations from normality and bi-modality.

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.

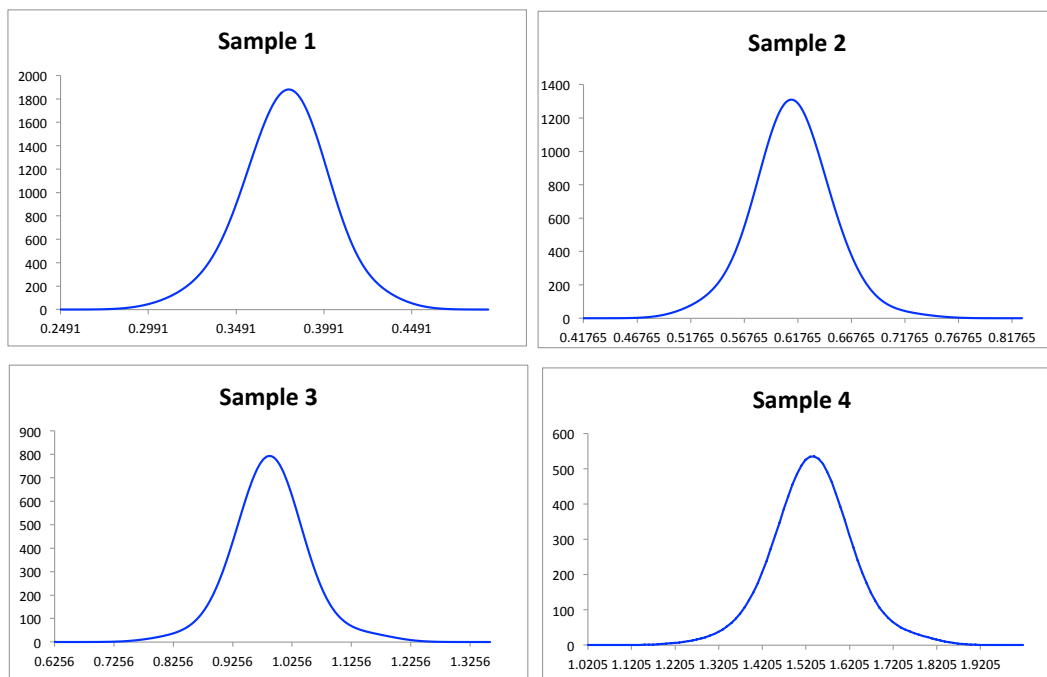
4.3 Statistical Summary by Method

Statistical summaries are provided for the four most commonly reported methods. The statistics included in these tables for mean and standard deviation are the mathematical values, not the robust values. As such, there will be slight differences between these and those displayed in the participant specific CALA Proficiency Testing Report.

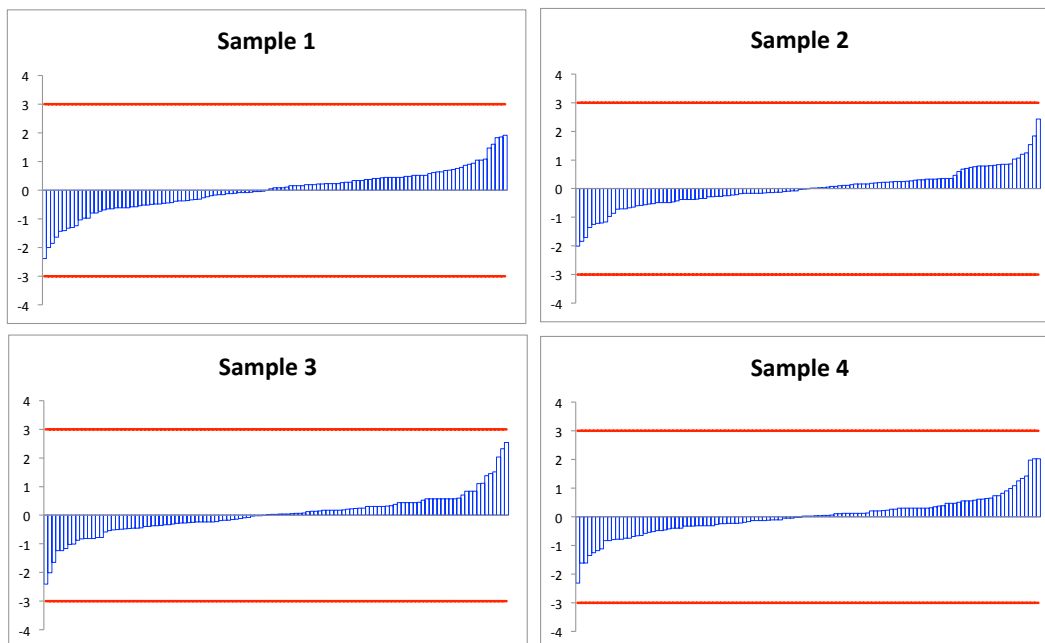
In addition to this, z-Score plots are provided for the four most common methods. As these plots use the Assigned Value and Standard Deviation for Proficiency Assessment estimated using all of the data, any method that does not have approximately the same number of positive and negative z-scores is an indication that the method may be biased relative to other methods.

Aluminum

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.378	0.377	0.38	0.385	0.375
Stdev	0.0283	0.0215	0.0219	0.00502	0
Number	117	83	31	2	1
z >3	0	0	0	0	0
z 2 - 3	2	2	0	0	0

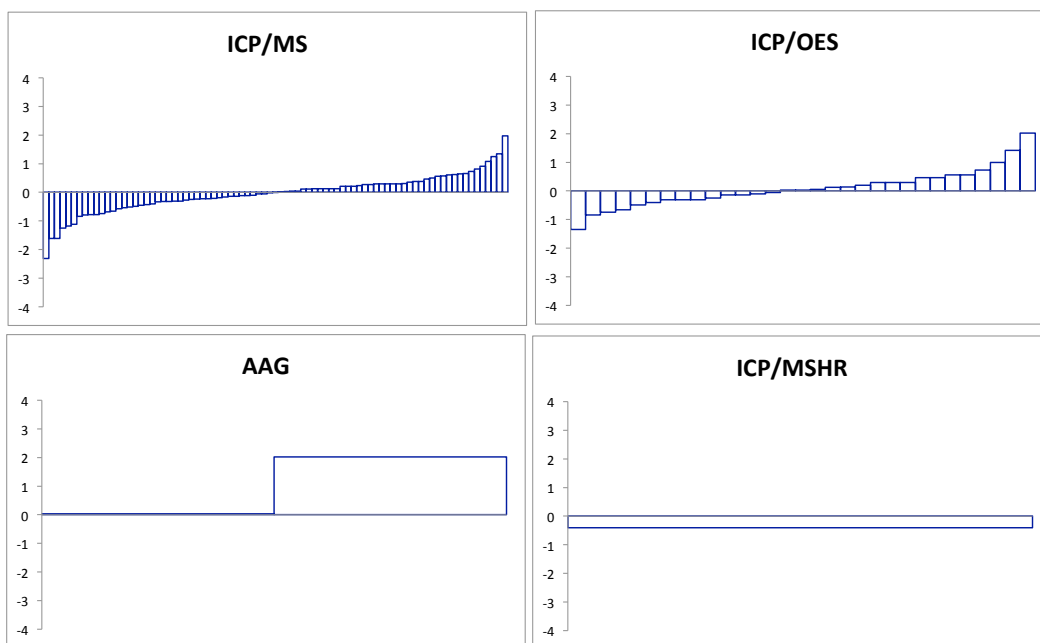
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.613	0.609	0.616	0.629	0.613
Stdev	0.046	0.0272	0.0414	0.0327	0
Number	117	83	31	2	1
z >3	0	0	0	0	0
z 2 - 3	2	1	1	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.988	0.99	0.991	1.07	0.948
Stdev	0.0741	0.0524	0.0491	0.145	0
Number	117	83	31	2	1
z >3	0	0	0	0	0
z 2 - 3	5	3	1	1	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	1.54	1.54	1.54	1.65	1.49
Stdev	0.115	0.076	0.0761	0.162	0
Number	117	83	31	2	1
z >3	0	0	0	0	0
z 2 - 3	3	1	1	1	0

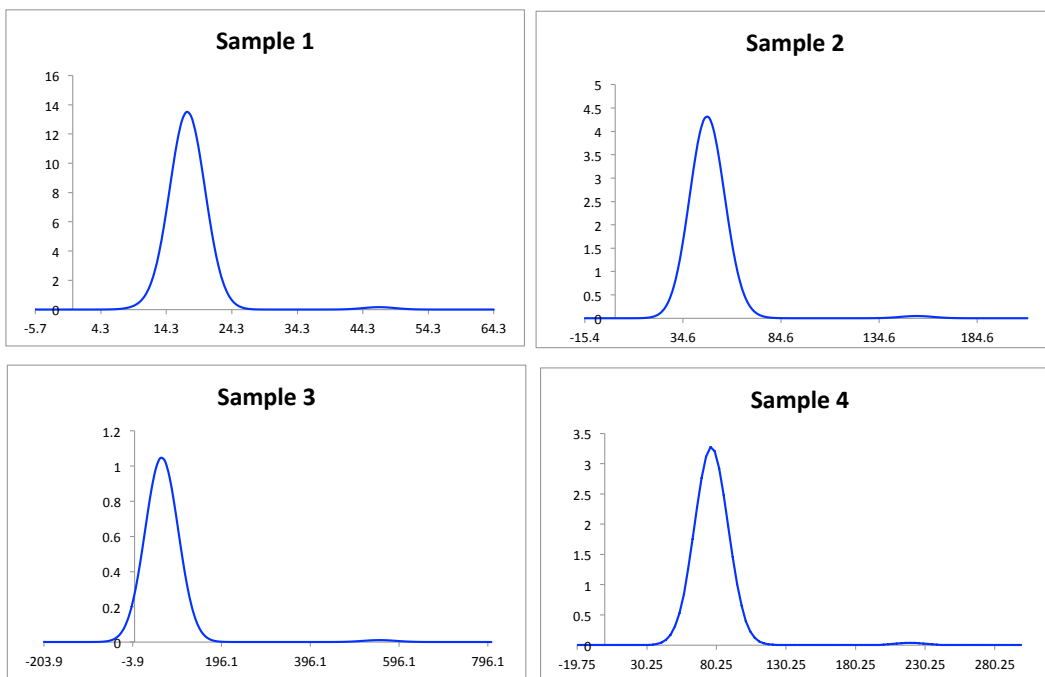
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

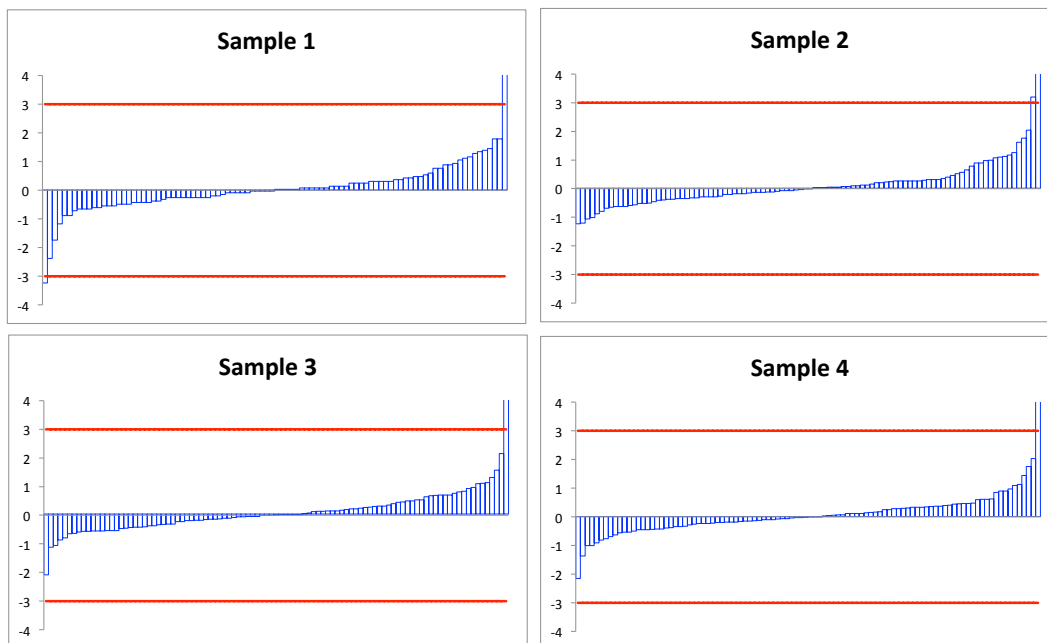


Antimony

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAG	AAHY
Median	17.5	17.5	17.4	33.4	16.7
Stdev	1.75	1.06	2.03	19	0
Number	94	81	8	2	1
z > 3	2	0	0	1	0
z 2 - 3	1	0	1	0	0

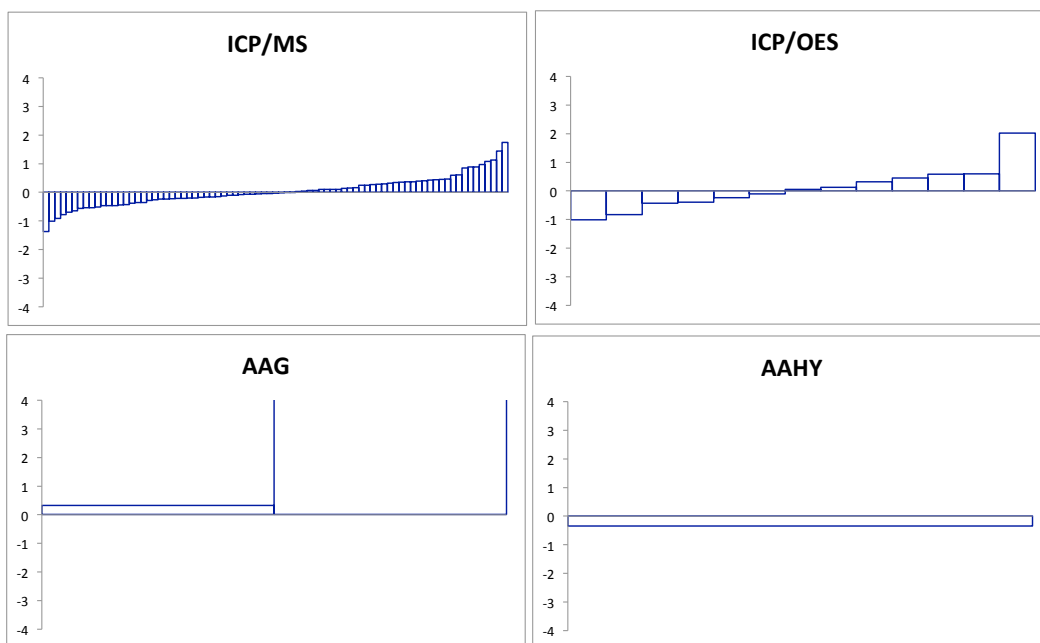
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAG	AAHY
Median	46.8	46.6	46.9	101	49.4
Stdev	4.68	2.71	5.52	74.7	0
Number	98	81	12	2	1
z > 3	2	0	1	1	0
z 2 - 3	1	1	0	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAG	AAHY
Median	61.1	60.8	61	310	60.8
Stdev	6.11	3.48	4.8	342	0
Number	99	81	13	2	1
z > 3	1	0	0	1	0
z 2 - 3	2	1	1	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAG	AAHY
Median	76.5	76.3	76.9	149	73.9
Stdev	7.65	4.02	5.9	99.3	0
Number	100	81	13	2	1
z > 3	1	0	0	1	0
z 2 - 3	2	0	1	0	0

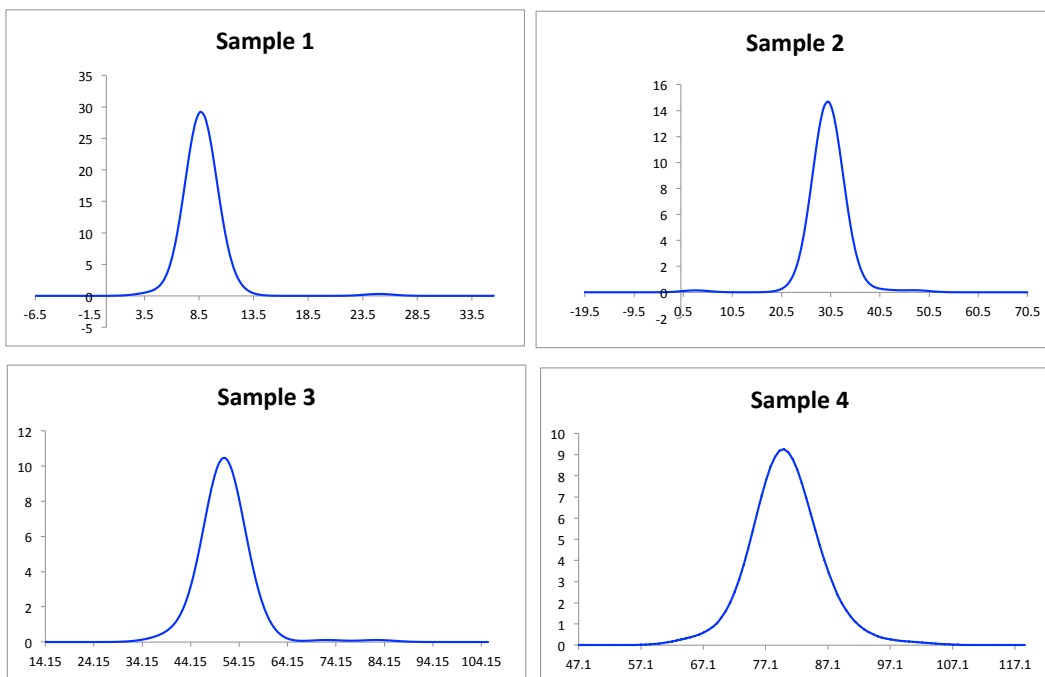
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

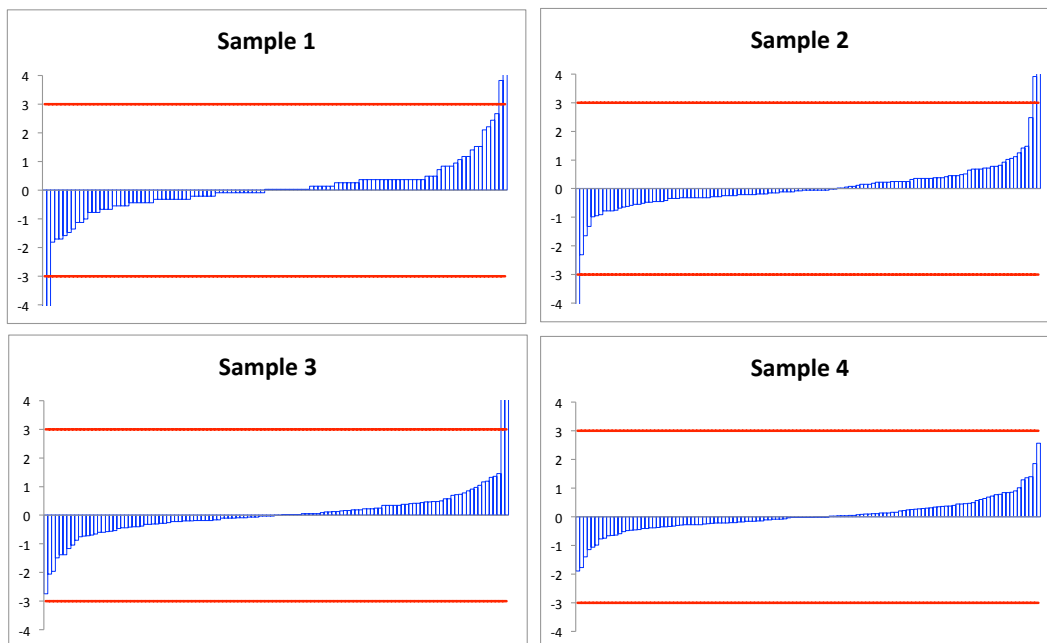


Arsenic

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAHY	AAG
Median	8.68	8.7	9.4	8.2	8.95
Stdev	0.868	0.771	5.12	1.28	2.33
Number	113	93	11	3	2
z >3	4	2	2	0	0
z 2 - 3	4	1	2	0	1

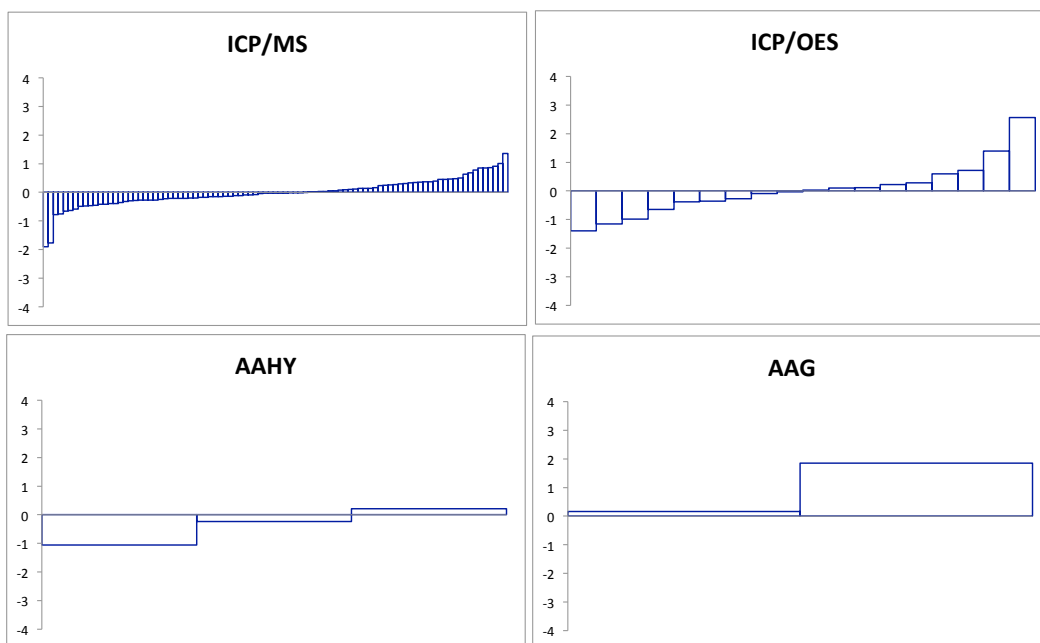
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAHY	AAG
Median	30	29.6	30.7	30.7	36.3
Stdev	3	3.15	5.29	1.25	7.64
Number	121	93	18	3	2
z >3	3	1	1	0	1
z 2 - 3	2	0	2	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAHY	AAG
Median	51.1	50.9	51.3	52.8	61.7
Stdev	5.11	3.01	8.89	1.57	14.7
Number	121	93	18	3	2
z >3	2	0	1	0	1
z 2 - 3	2	2	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAHY	AAG
Median	80.2	80	80.3	78.3	88.3
Stdev	8.02	3.89	7.42	5.17	9.62
Number	121	93	18	3	2
z >3	0	0	0	0	0
z 2 - 3	1	0	1	0	0

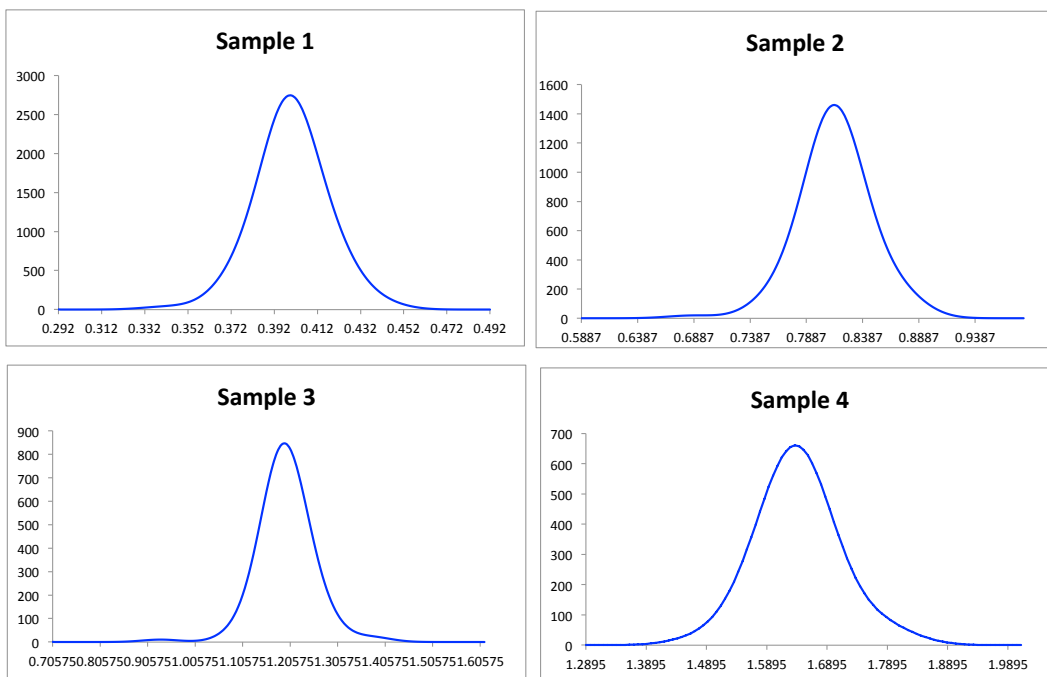
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

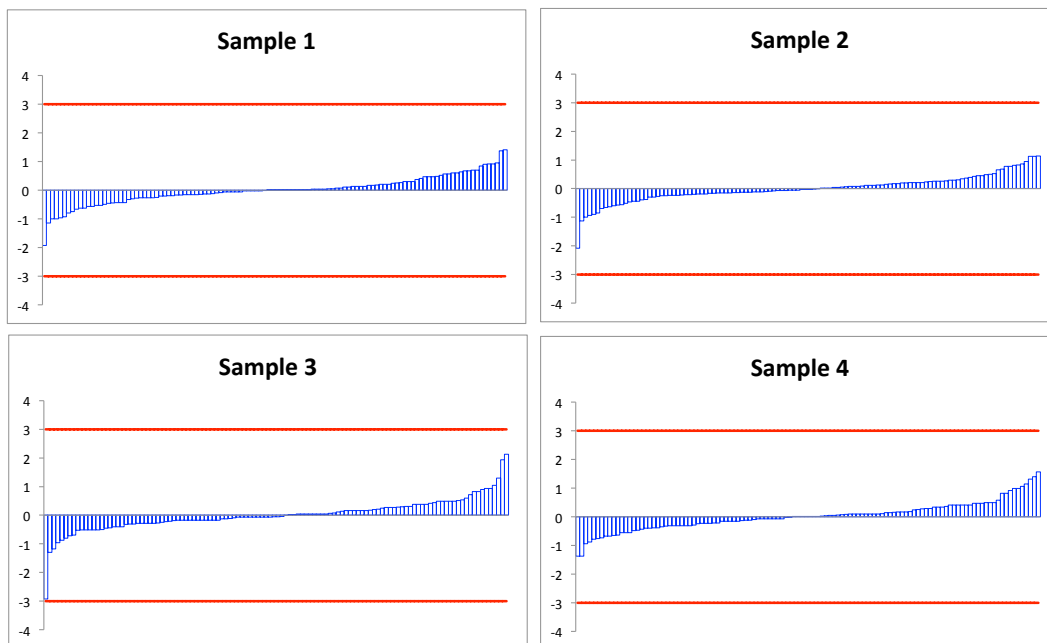


Barium

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.4	0.399	0.401	0.405	0.395
Stdev	0.03	0.0148	0.0151	0	0
Number	116	82	32	1	1
z > 3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

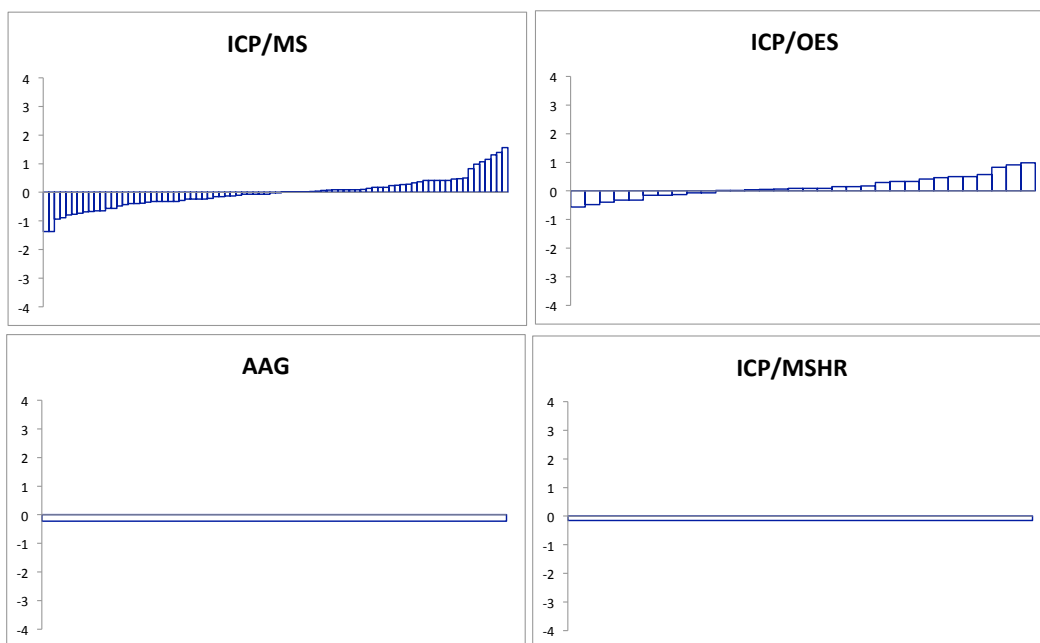
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.814	0.811	0.819	0.8	0.872
Stdev	0.0611	0.0298	0.023	0	0
Number	116	82	32	1	1
z > 3	0	0	0	0	0
z 2 - 3	1	1	0	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	1.2	1.19	1.2	1.17	1.17
Stdev	0.0897	0.0582	0.0317	0	0
Number	116	82	32	1	1
z > 3	0	0	0	0	0
z 2 - 3	2	2	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	1.64	1.64	1.65	1.61	1.62
Stdev	0.123	0.0668	0.0467	0	0
Number	116	82	32	1	1
z > 3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

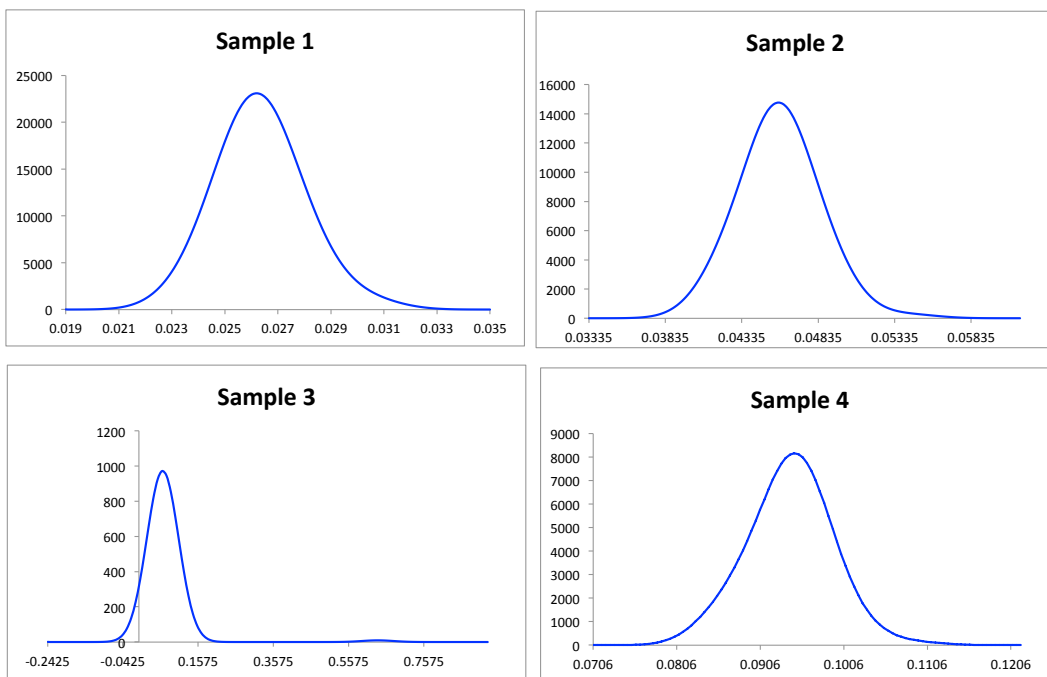
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

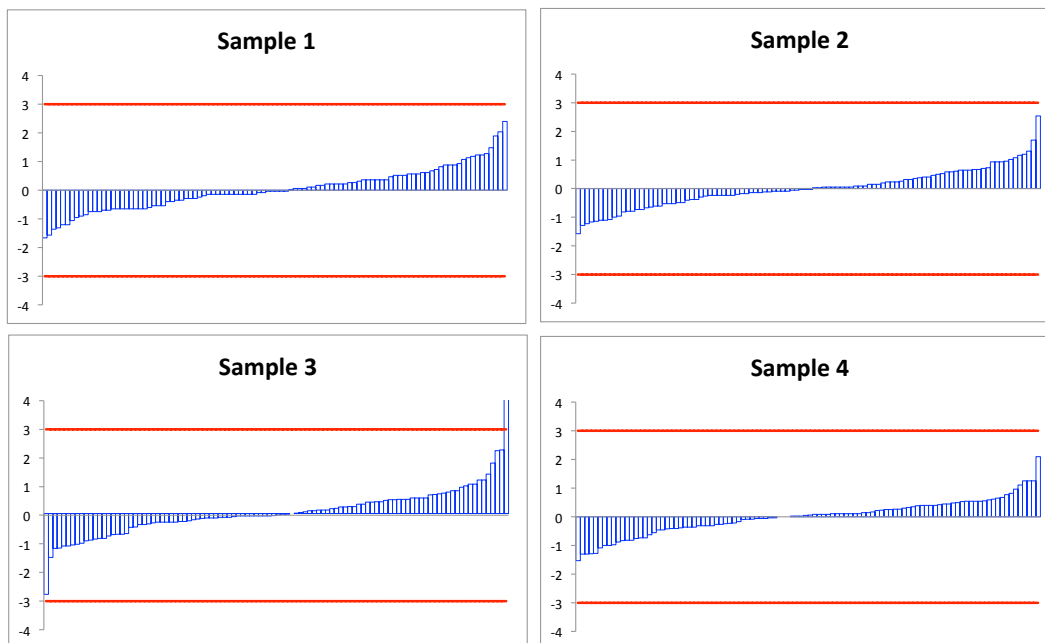


Beryllium

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.0263	0.0263	0.026	0.0284	0.0285
Stdev	0.00197	0.00158	0.00102	0	0
Number	102	76	24	1	1
z >3	0	0	0	0	0
z 2 - 3	2	2	0	0	0

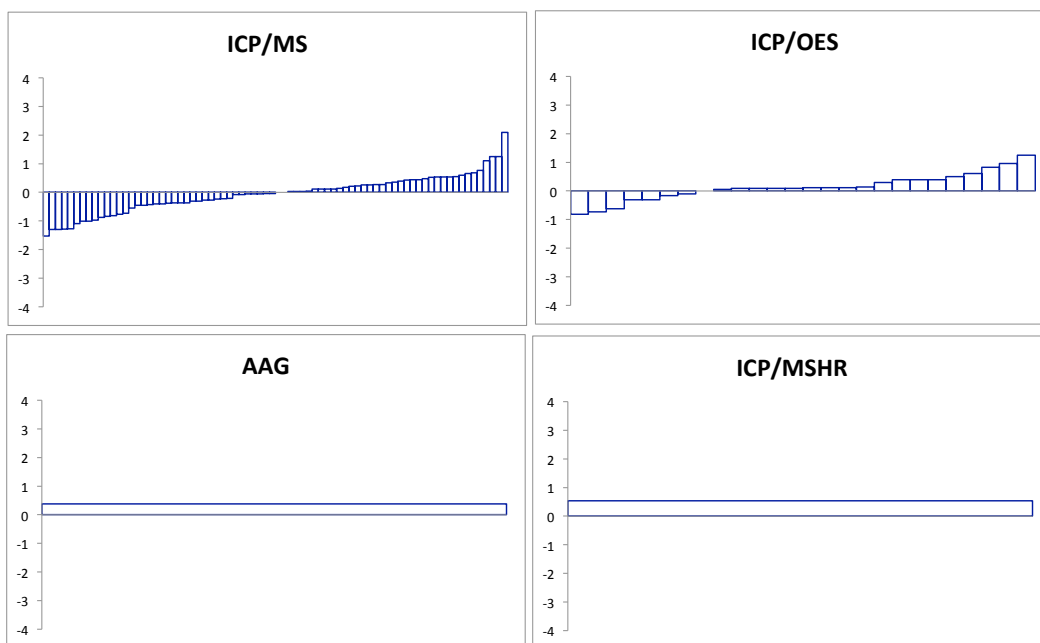
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.0458	0.0457	0.0458	0.0463	0.0493
Stdev	0.00343	0.00252	0.0016	0	0
Number	102	76	24	1	1
z >3	0	0	0	0	0
z 2 - 3	1	1	0	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.0634	0.063	0.0635	0.0653	0.0665
Stdev	0.00476	0.00384	0.112	0	0
Number	104	76	26	1	1
z >3	1	0	1	0	0
z 2 - 3	3	3	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.0942	0.0941	0.0949	0.0969	0.098
Stdev	0.00706	0.00462	0.0034	0	0
Number	104	76	26	1	1
z >3	0	0	0	0	0
z 2 - 3	1	1	0	0	0

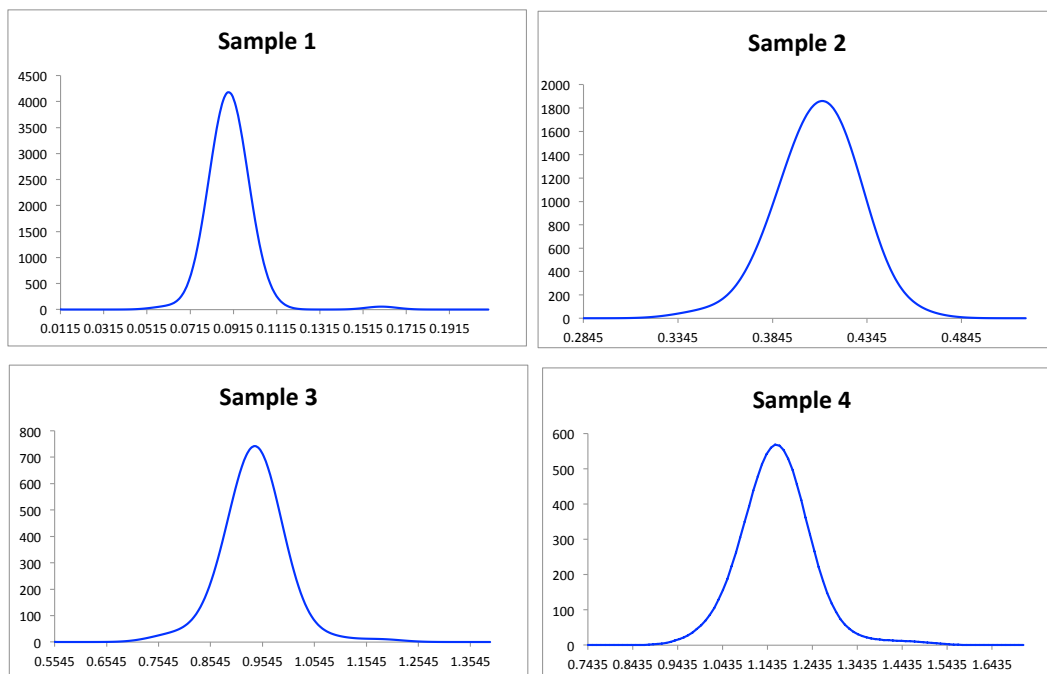
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

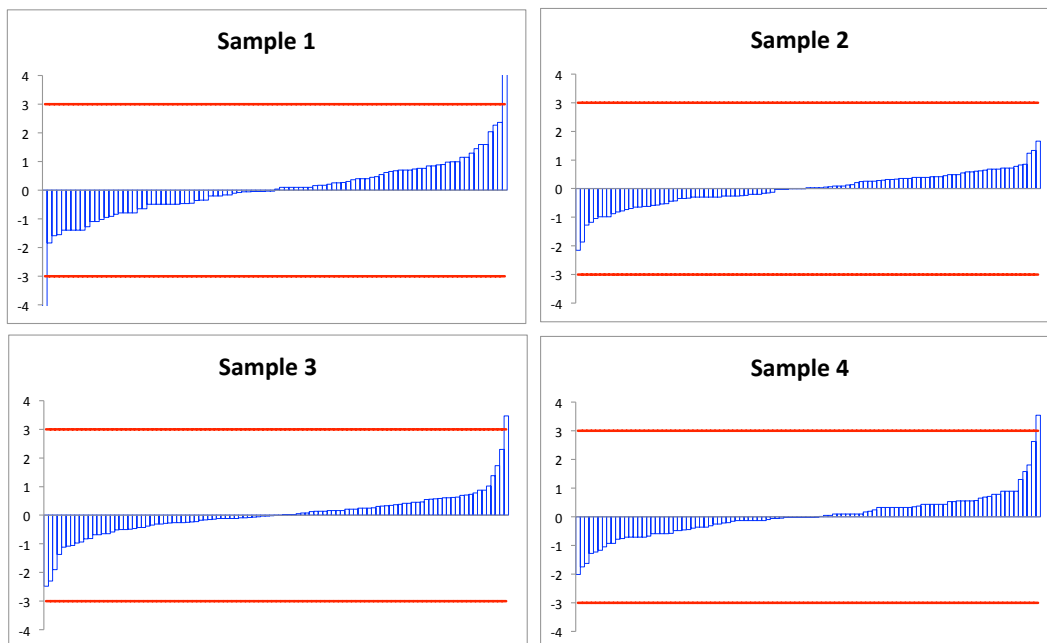


Boron

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.0894	0.089	0.09	0.0935	0
Stdev	0.0067	0.0108	0.00597	0	0
Number	98	70	27	1	0
z >3	2	2	0	0	0
z 2 - 3	3	2	1	0	0

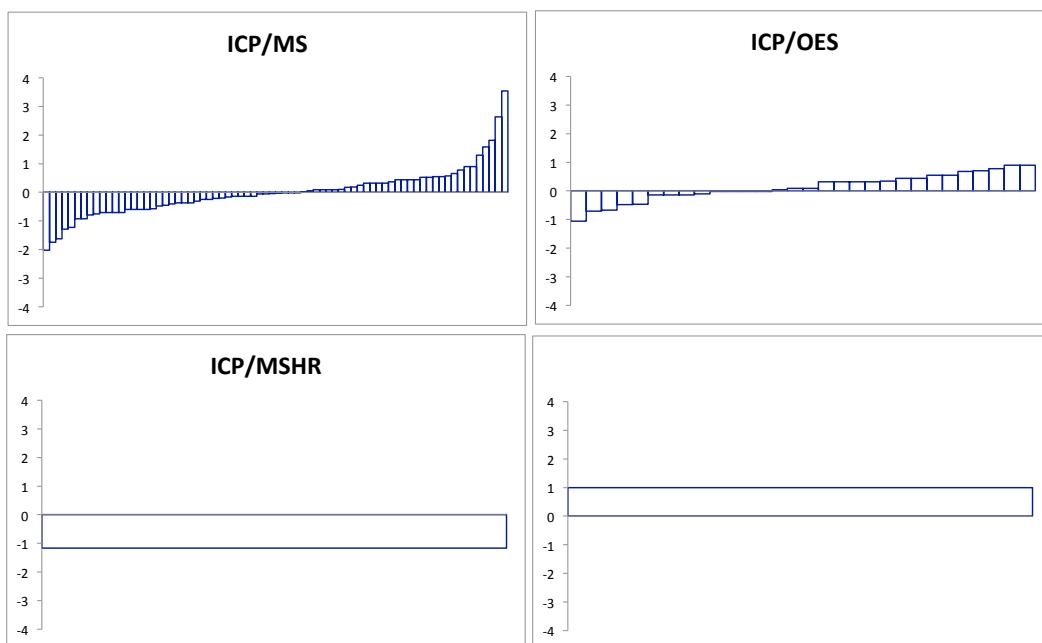
Sample 2					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.409	0.407	0.418	0.401	0
Stdev	0.0307	0.02	0.0158	0	0
Number	105	74	30	1	0
z >3	0	0	0	0	0
z 2 - 3	1	1	0	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.939	0.933	0.949	0.904	0
Stdev	0.0704	0.0608	0.0298	0	0
Number	105	74	30	1	0
z >3	1	1	0	0	0
z 2 - 3	3	3	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	1.16	1.16	1.17	1.06	0
Stdev	0.0872	0.0747	0.0423	0	0
Number	105	74	30	1	0
z >3	1	1	0	0	0
z 2 - 3	2	2	0	0	0

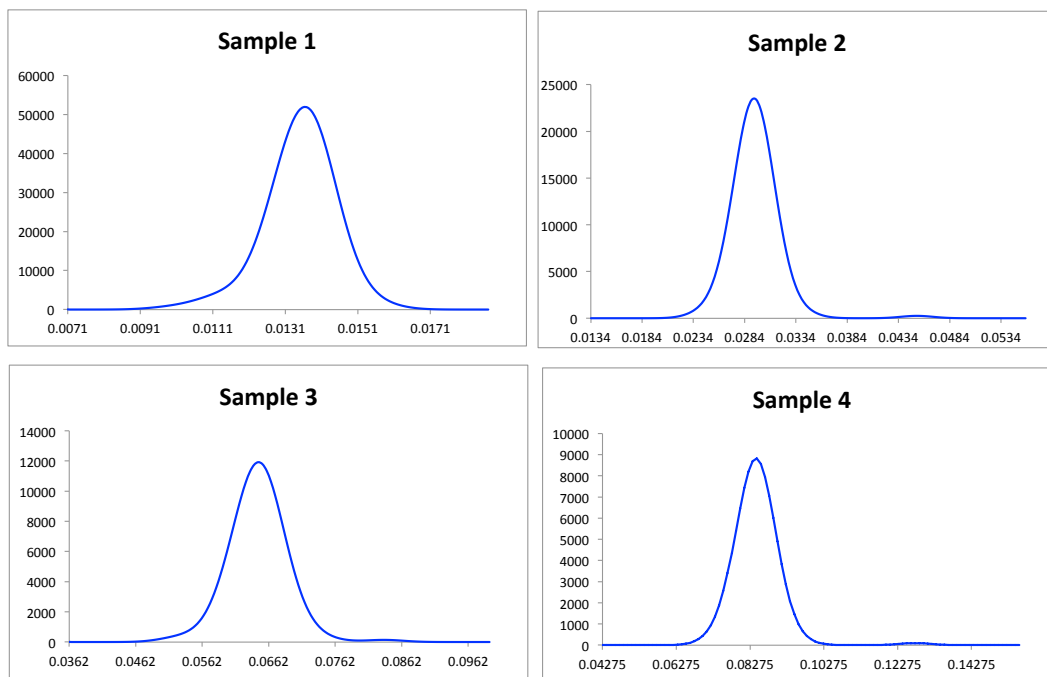
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

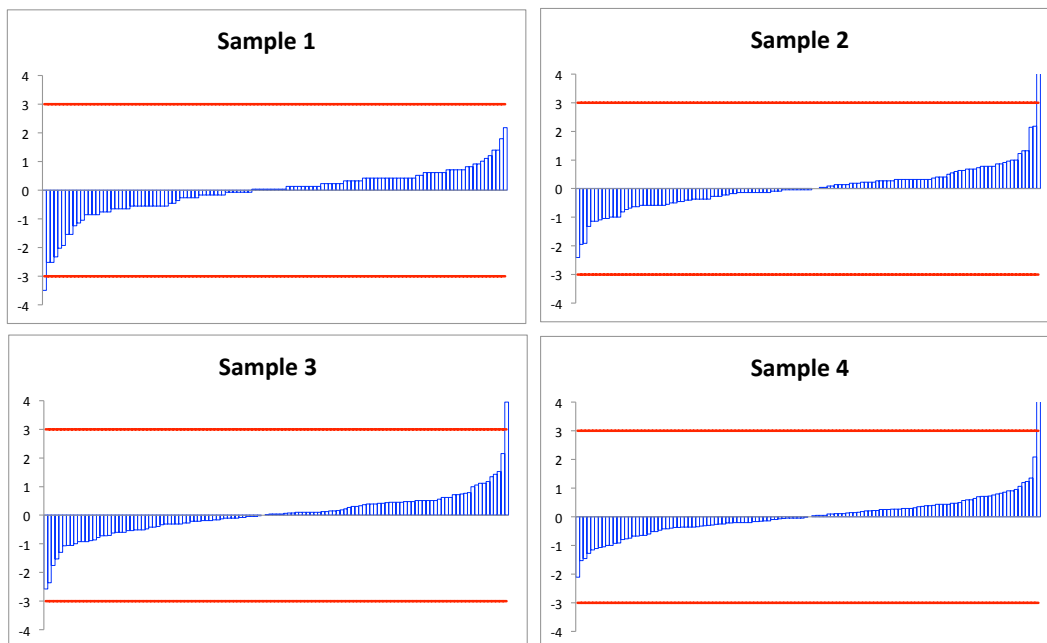


Cadmium

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.0136	0.0136	0.0133	0.0127	0.0142
Stdev	0.00102	0.000705	0.00111	0	0
Number	122	87	33	1	1
z >3	1	0	1	0	0
z 2 - 3	5	2	3	0	0

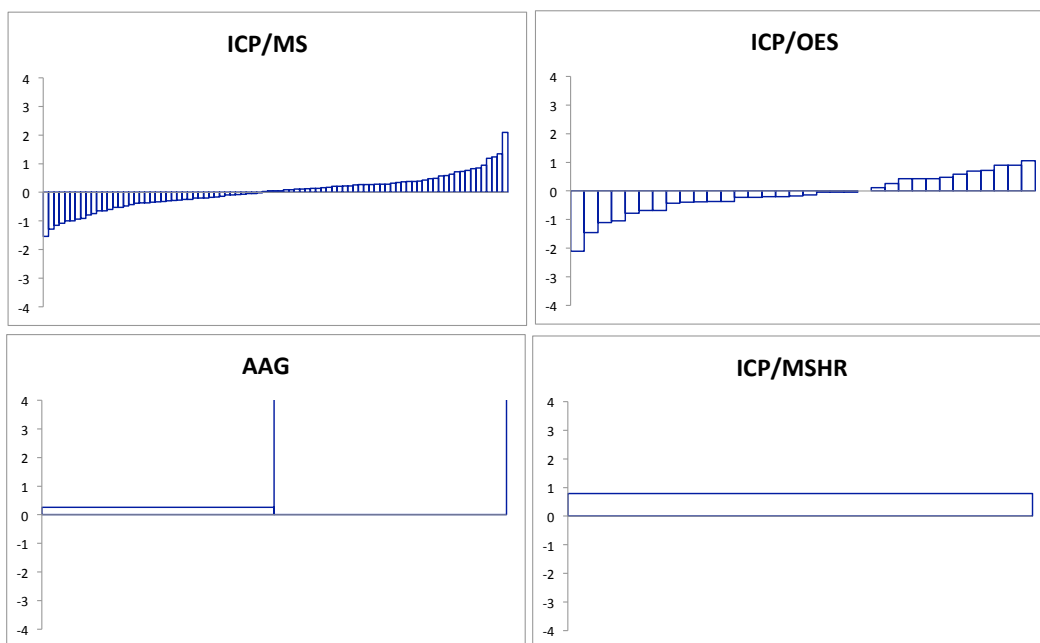
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.0293	0.0294	0.029	0.0374	0.031
Stdev	0.0022	0.00131	0.00193	0.011	0
Number	124	87	34	2	1
z >3	1	0	0	1	0
z 2 - 3	3	1	2	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.0645	0.0647	0.0639	0.0743	0.0719
Stdev	0.00484	0.00328	0.0035	0.0132	0
Number	124	87	34	2	1
z >3	1	0	0	1	0
z 2 - 3	3	2	1	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.0843	0.0846	0.0833	0.107	0.0893
Stdev	0.00632	0.00381	0.00438	0.0294	0
Number	124	87	34	2	1
z >3	1	0	0	1	0
z 2 - 3	2	1	1	0	0

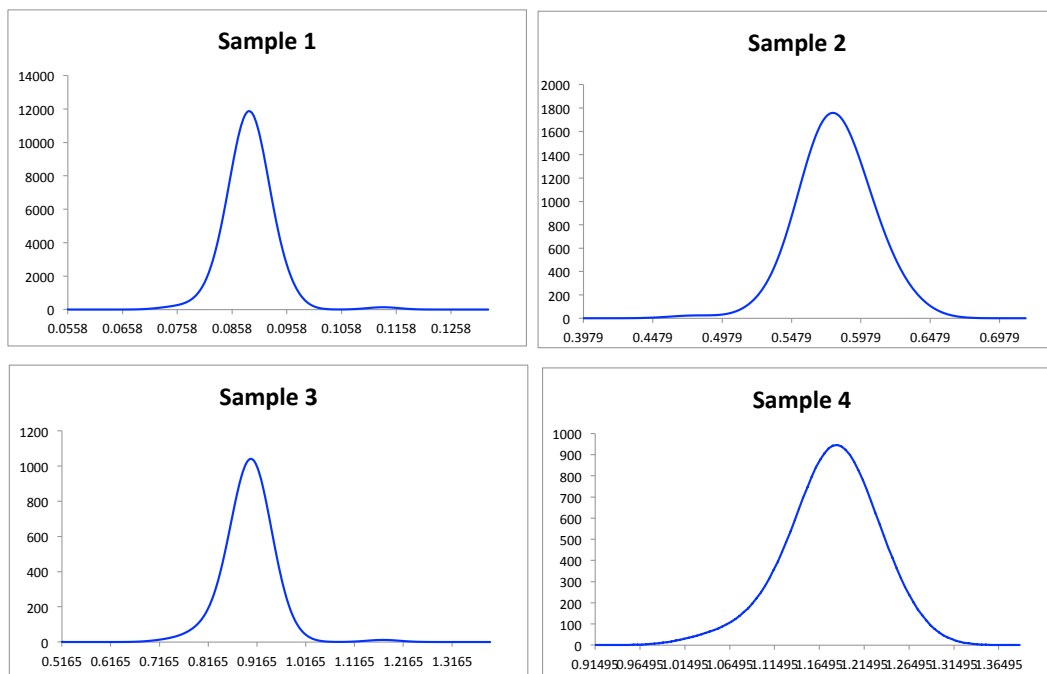
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

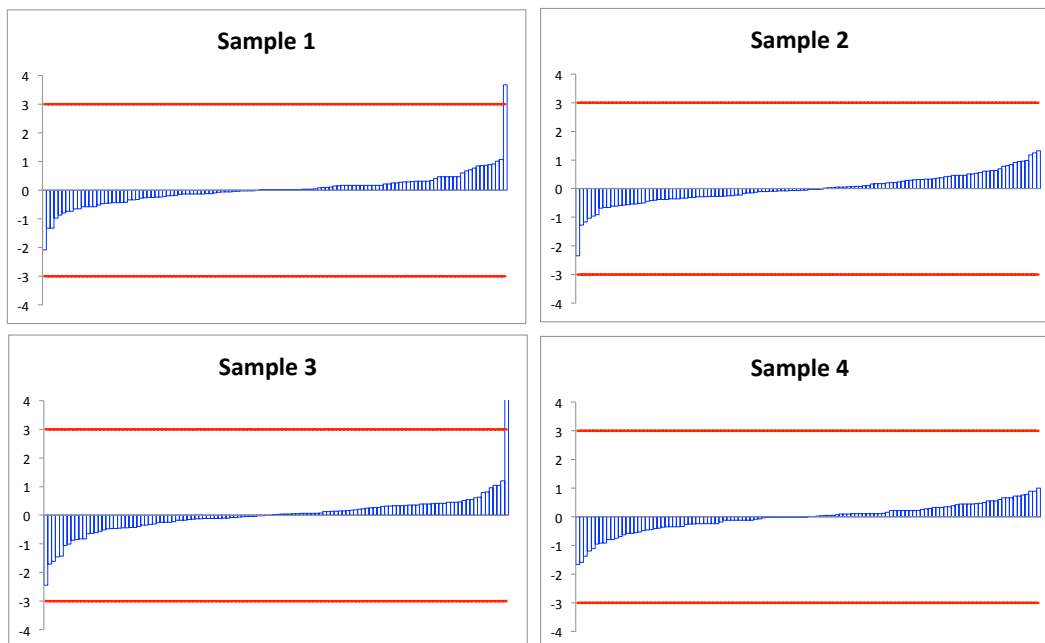


Chromium

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	0.0889	0.0887	0.09	0.113	0.0879
Stdev	0.00667	0.00274	0.00427	0	0
Number	120	85	32	1	1
z >3	1	0	0	1	0
z 2 - 3	1	0	1	0	0

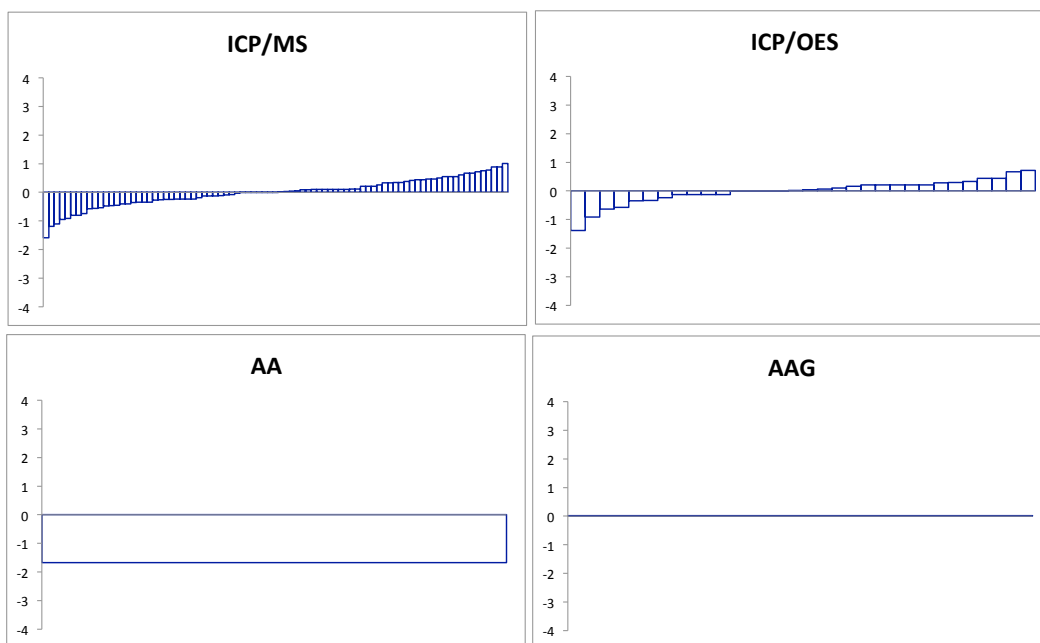
Sample 2					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	0.58	0.577	0.581	0.478	0.568
Stdev	0.0435	0.0225	0.0195	0	0
Number	120	85	32	1	1
z >3	0	0	0	0	0
z 2 - 3	1	0	0	1	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	0.902	0.904	0.903	0.786	0.881
Stdev	0.0676	0.0464	0.0371	0	0
Number	120	85	32	1	1
z >3	1	1	0	0	0
z 2 - 3	1	1	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	1.18	1.18	1.18	1.03	1.18
Stdev	0.0886	0.0436	0.038	0	0
Number	120	85	32	1	1
z >3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

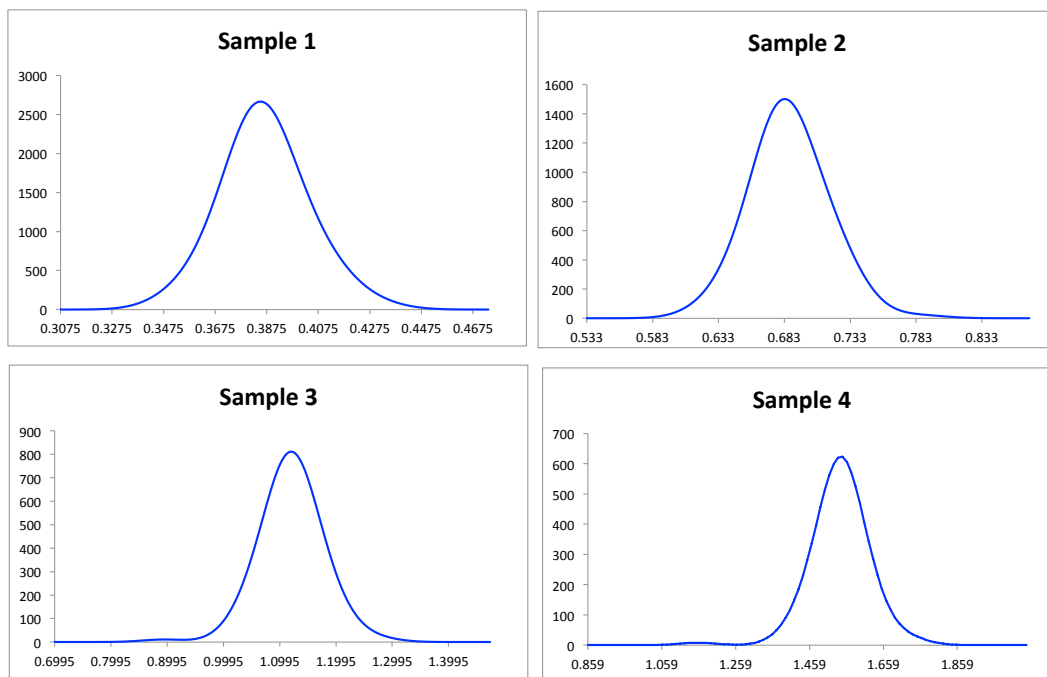
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

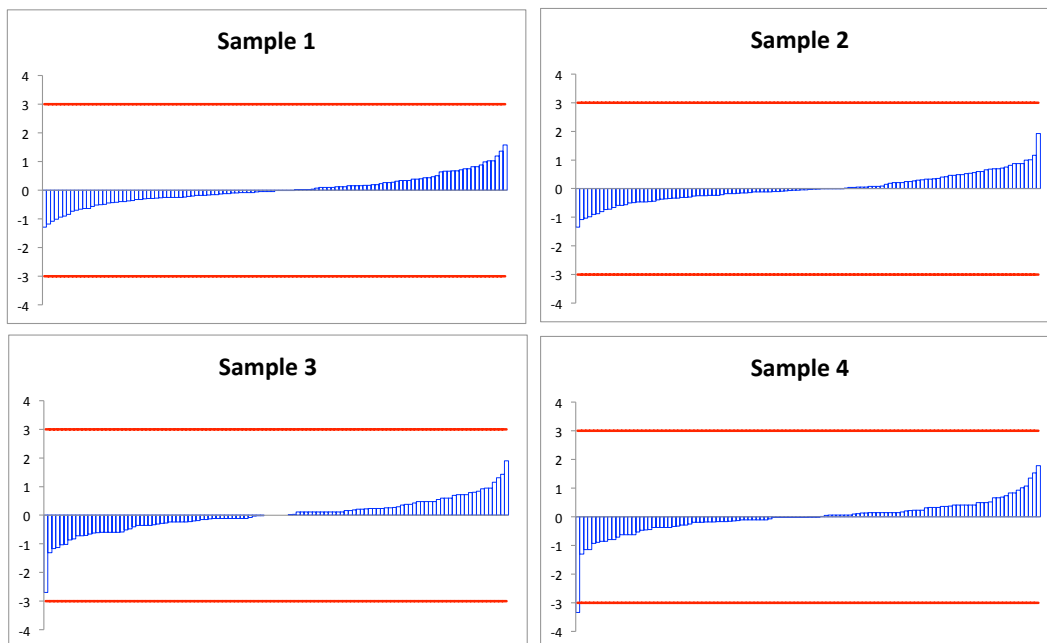


Cobalt

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	0.386	0.385	0.387	0.381	0.383
Stdev	0.029	0.0155	0.0137	0	0
Number	116	80	33	1	1
z >3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

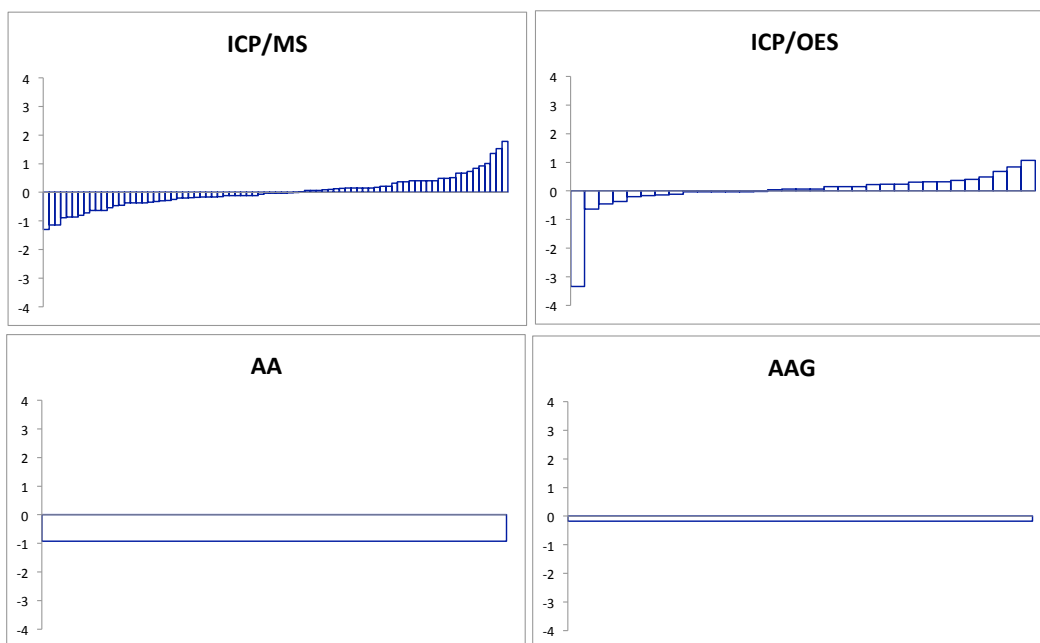
Sample 2					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	0.686	0.681	0.689	0.649	0.677
Stdev	0.0515	0.0285	0.018	0	0
Number	116	80	33	1	1
z >3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	1.12	1.12	1.13	1.05	1.11
Stdev	0.084	0.0555	0.035	0	0
Number	116	80	33	1	1
z >3	0	0	0	0	0
z 2 - 3	1	1	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	1.54	1.54	1.55	1.44	1.52
Stdev	0.116	0.0647	0.0803	0	0
Number	116	80	33	1	1
z >3	1	0	1	0	0
z 2 - 3	0	0	0	0	0

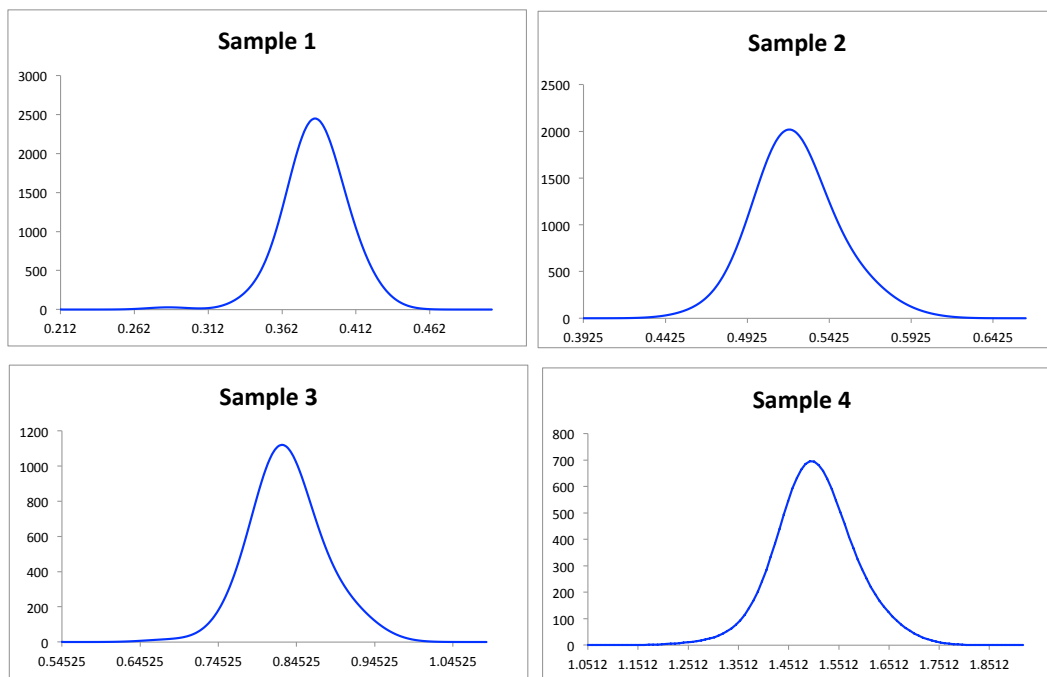
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

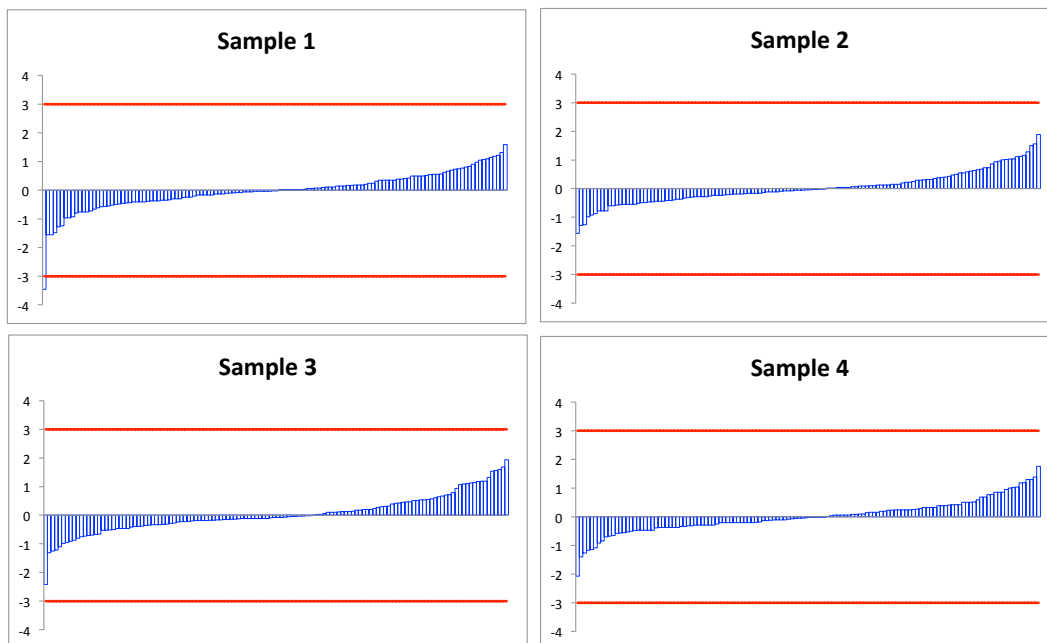


Copper

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	0.385	0.385	0.384	0.378	0.389
Stdev	0.0289	0.0196	0.0181	0.00636	0
Number	130	91	35	2	1
z >3	1	1	0	0	0
z 2 - 3	0	0	0	0	0

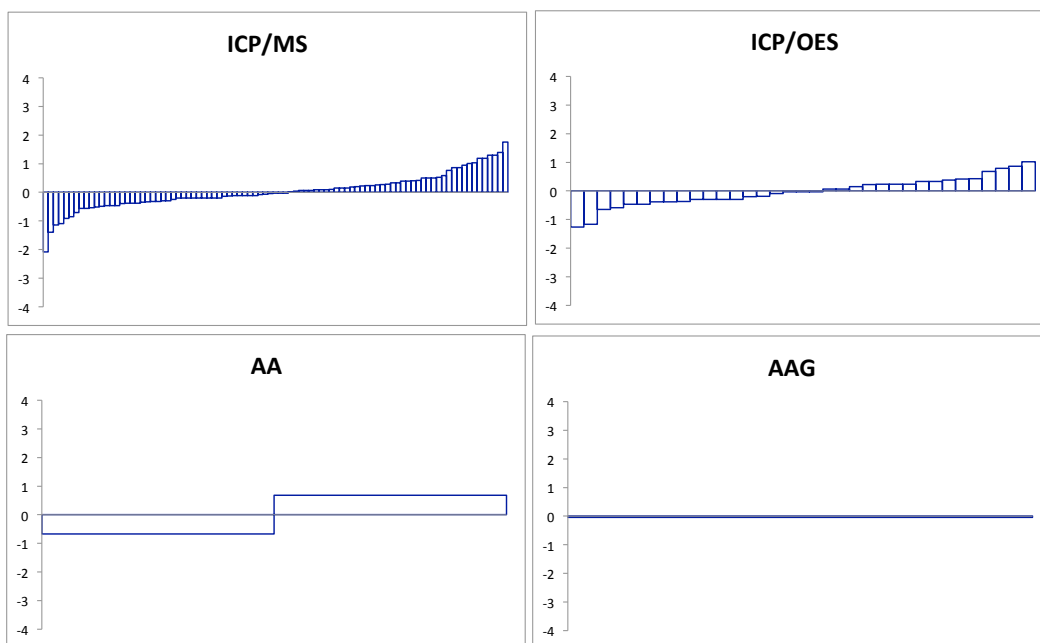
Sample 2					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	0.521	0.52	0.515	0.54	0.521
Stdev	0.0391	0.0228	0.0221	0.0148	0
Number	130	91	35	2	1
z >3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	0.832	0.827	0.829	0.829	0.811
Stdev	0.0624	0.0441	0.0341	0.0583	0
Number	130	91	35	2	1
z >3	0	0	0	0	0
z 2 - 3	1	1	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	1.5	1.5	1.5	1.5	1.5
Stdev	0.113	0.0691	0.0576	0.108	0
Number	130	91	35	2	1
z >3	0	0	0	0	0
z 2 - 3	1	1	0	0	0

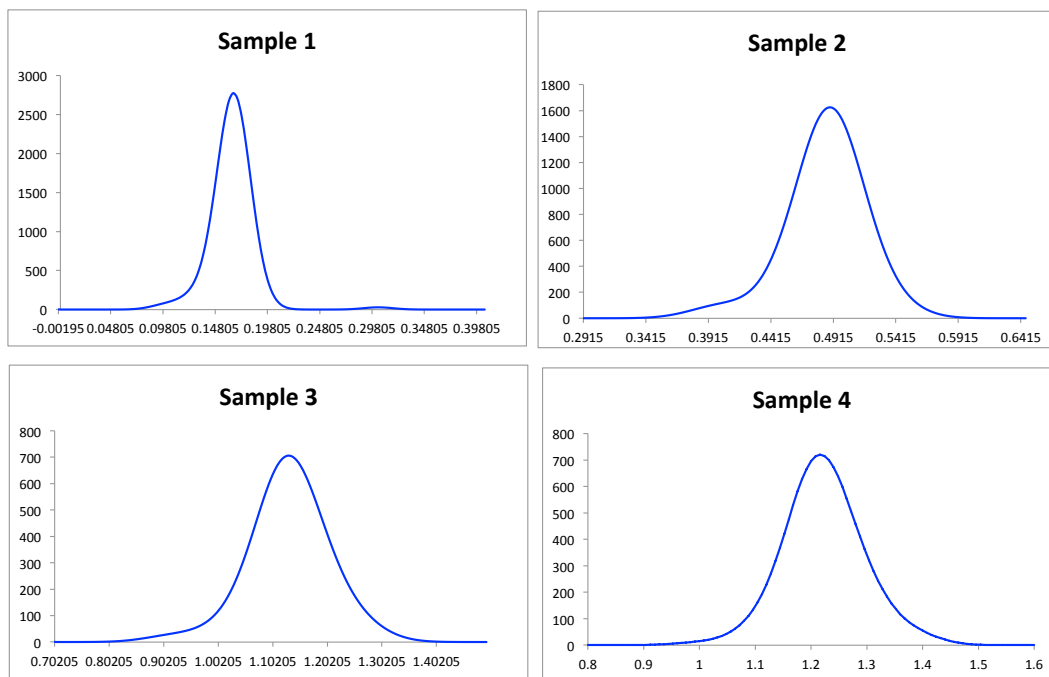
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

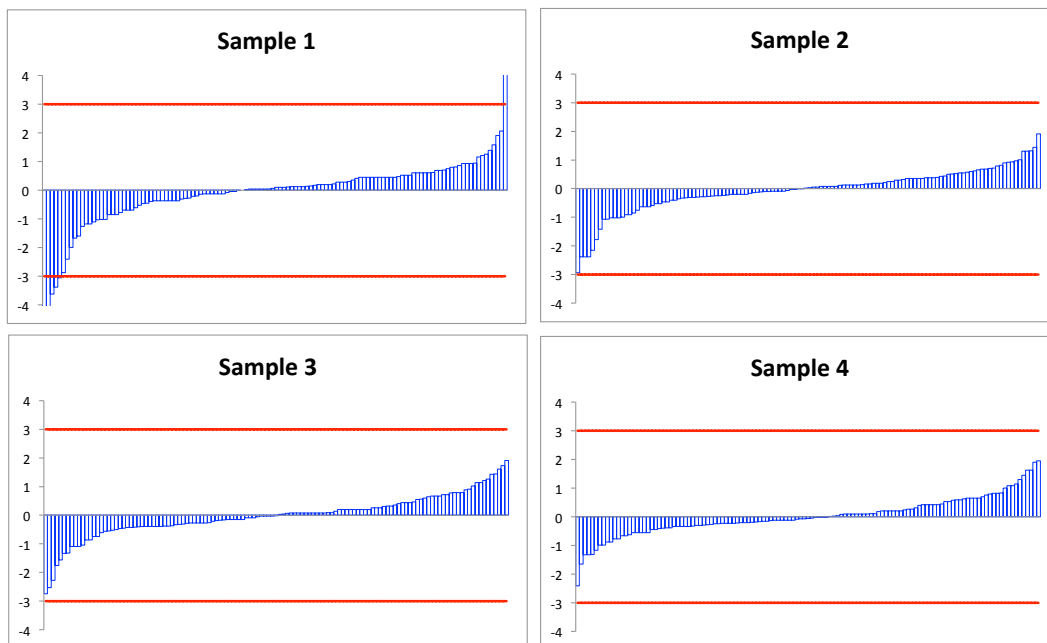


Iron

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	0.165	0.166	0.164	0.165	0.152
Stdev	0.0123	0.0108	0.0188	0.0802	0
Number	122	77	40	3	1
z >3	6	1	4	1	0
z 2 - 3	3	2	1	0	0

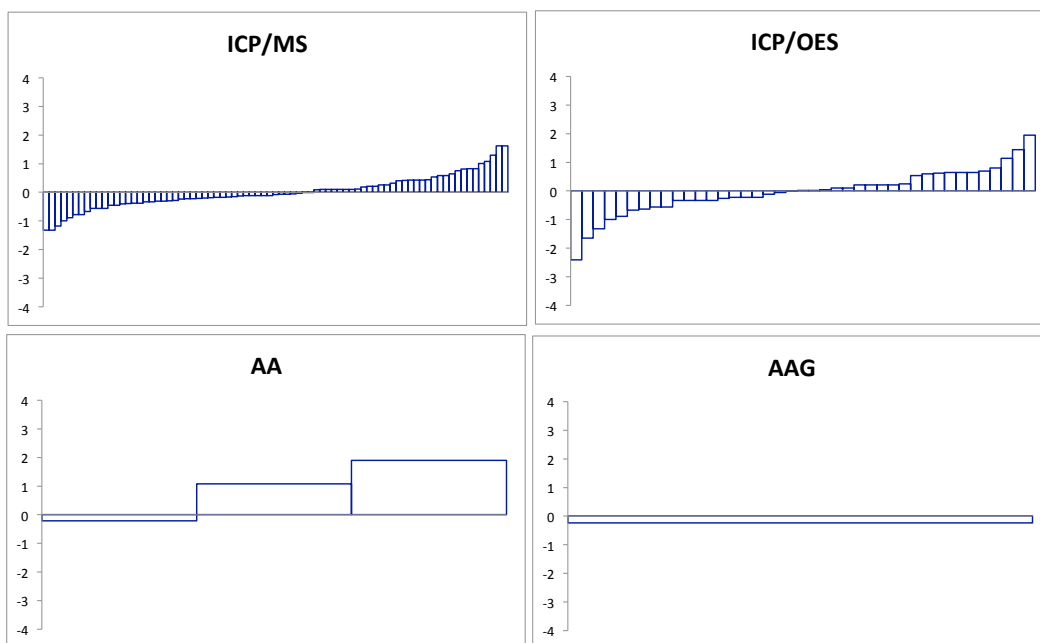
Sample 2					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	0.487	0.486	0.492	0.506	0.468
Stdev	0.0365	0.0245	0.0338	0.0252	0
Number	124	79	41	2	1
z >3	0	0	0	0	0
z 2 - 3	5	2	3	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	1.13	1.13	1.14	1.27	1.09
Stdev	0.085	0.058	0.069	0.0921	0
Number	125	79	41	3	1
z >3	0	0	0	0	0
z 2 - 3	3	1	2	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AA	AAG
Median	1.22	1.21	1.22	1.32	1.2
Stdev	0.0916	0.0528	0.0724	0.0975	0
Number	125	79	41	3	1
z >3	0	0	0	0	0
z 2 - 3	1	0	1	0	0

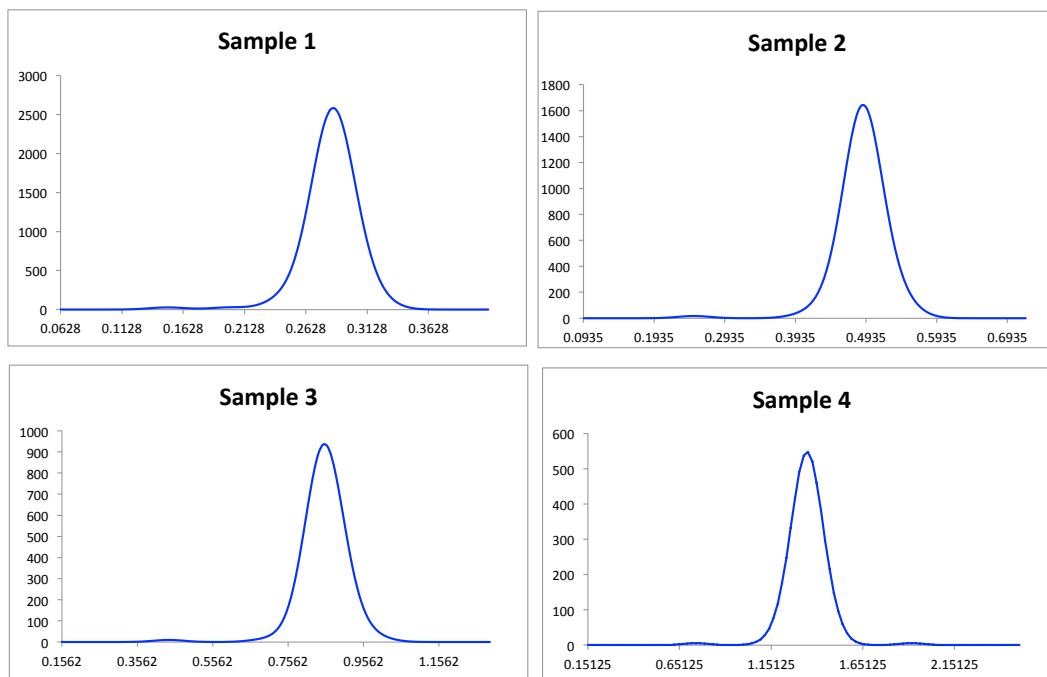
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

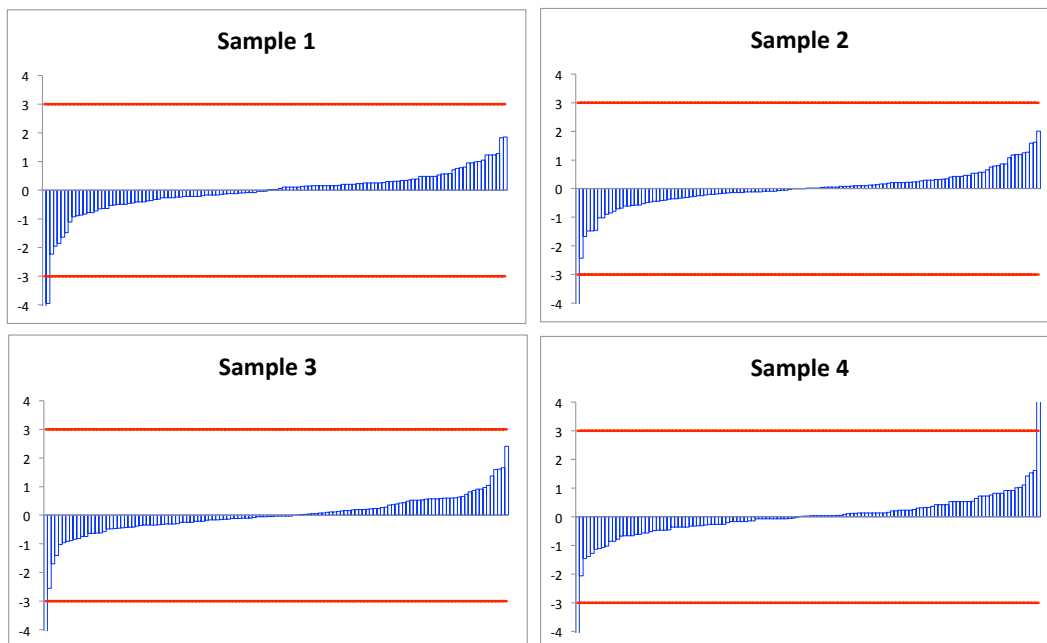


Lead

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.285	0.284	0.288	0.292	0.281
Stdev	0.0214	0.0184	0.0241	0.00629	0
Number	126	90	33	2	1
z > 3	2	1	1	0	0
z 2 - 3	1	1	0	0	0

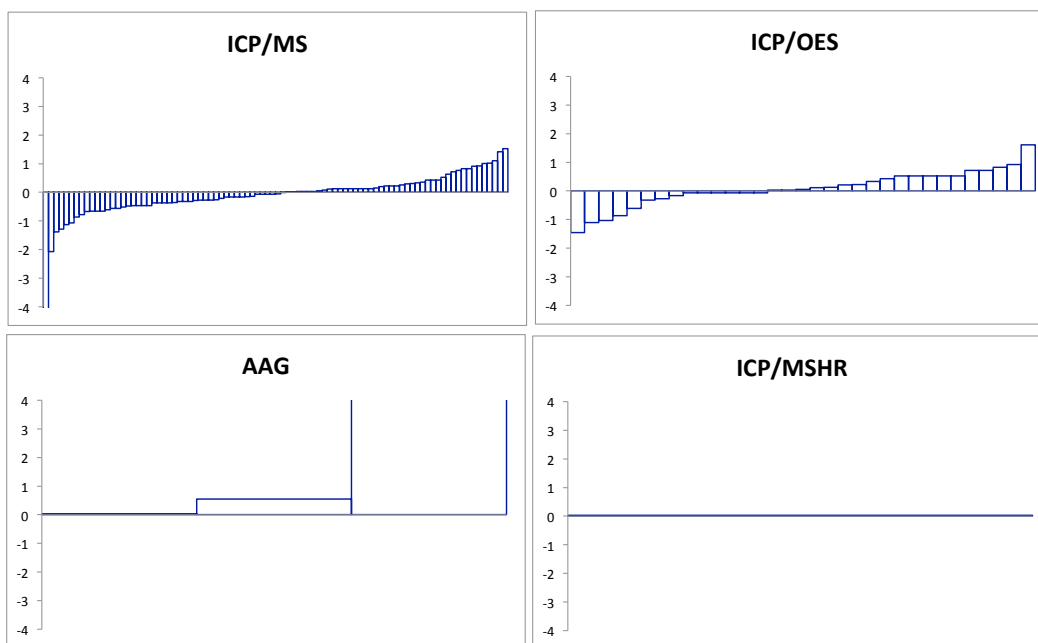
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.489	0.488	0.491	0.498	0.484
Stdev	0.0367	0.0319	0.0309	0.024	0
Number	127	90	33	3	1
z > 3	1	1	0	0	0
z 2 - 3	2	0	2	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.854	0.85	0.856	0.891	0.813
Stdev	0.064	0.0575	0.0409	0.0806	0
Number	127	90	33	3	1
z > 3	1	1	0	0	0
z 2 - 3	2	1	0	1	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	1.35	1.34	1.35	1.4	1.35
Stdev	0.101	0.0871	0.0631	0.314	0
Number	127	90	33	3	1
z > 3	2	1	0	1	0
z 2 - 3	1	1	0	0	0

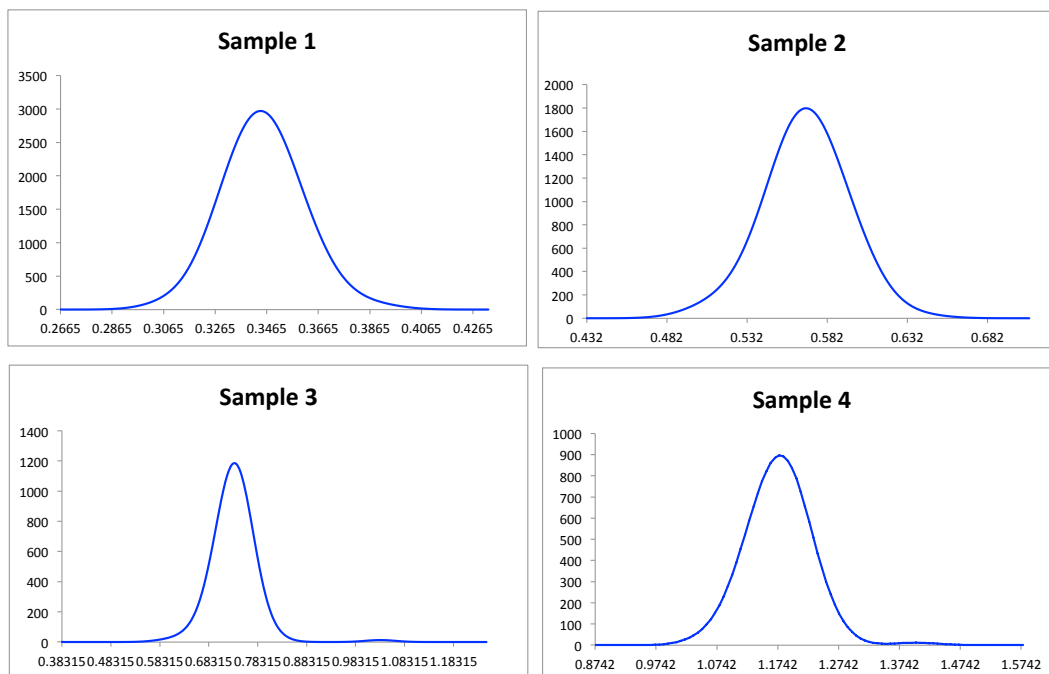
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

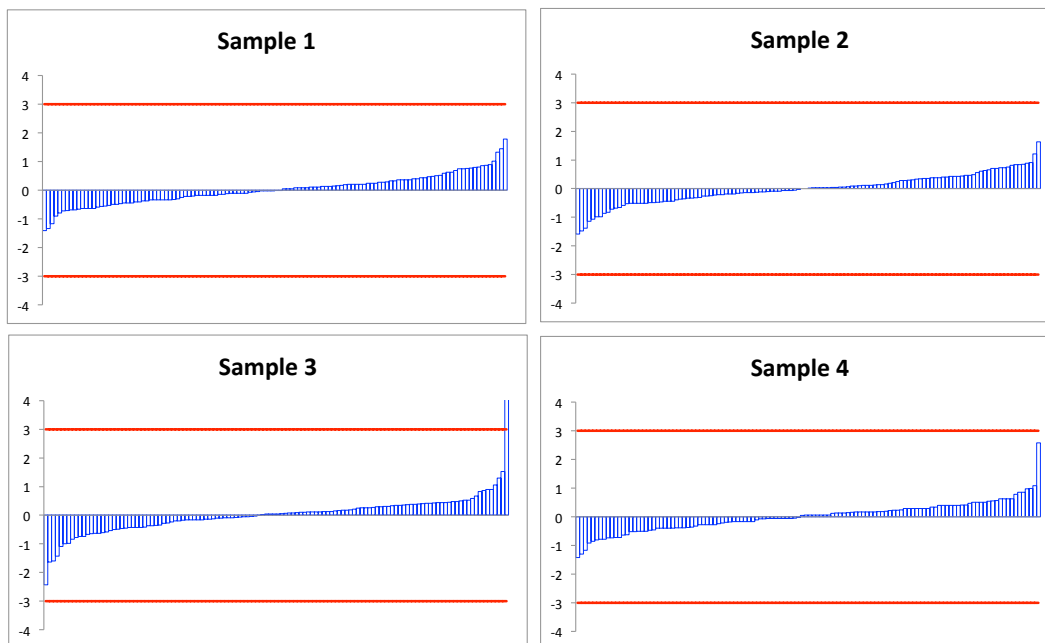


Manganese

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAG	AA
Median	0.345	0.342	0.348	0.366	0.333
Stdev	0.0259	0.014	0.0111	0.0347	0
Number	122	80	38	2	1
z >3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

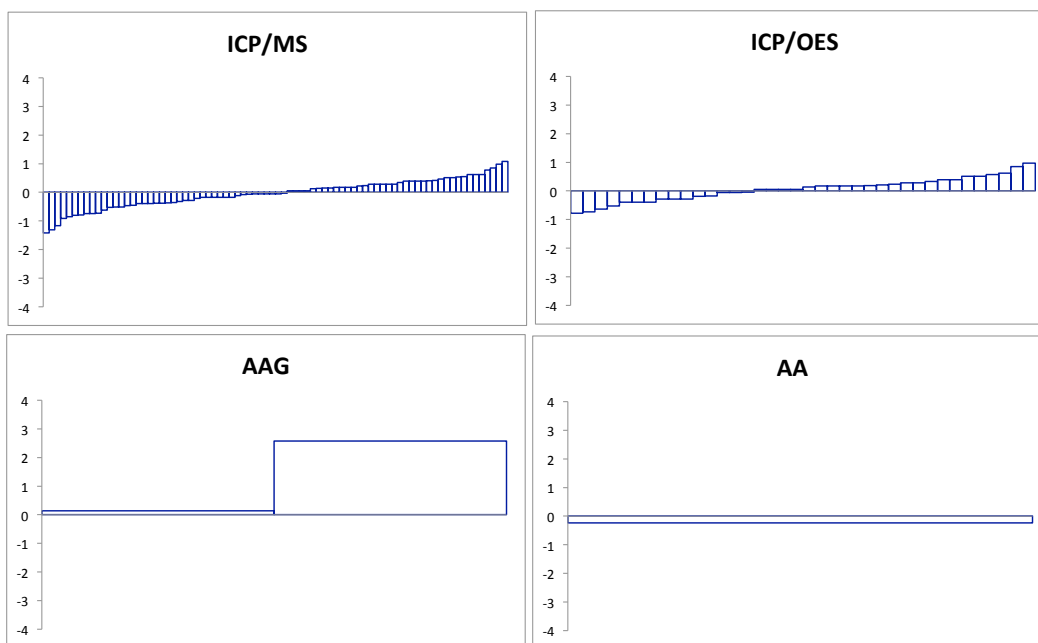
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAG	AA
Median	0.569	0.566	0.573	0.535	0.56
Stdev	0.0427	0.0242	0.019	0.0165	0
Number	122	80	38	2	1
z >3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAG	AA
Median	0.734	0.734	0.741	0.69	0.707
Stdev	0.055	0.0479	0.022	0.0153	0
Number	122	80	38	2	1
z >3	1	1	0	0	0
z 2 - 3	1	1	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAG	AA
Median	1.18	1.17	1.18	1.29	1.15
Stdev	0.0881	0.0447	0.0362	0.152	0
Number	122	80	38	2	1
z >3	0	0	0	0	0
z 2 - 3	1	0	0	1	0

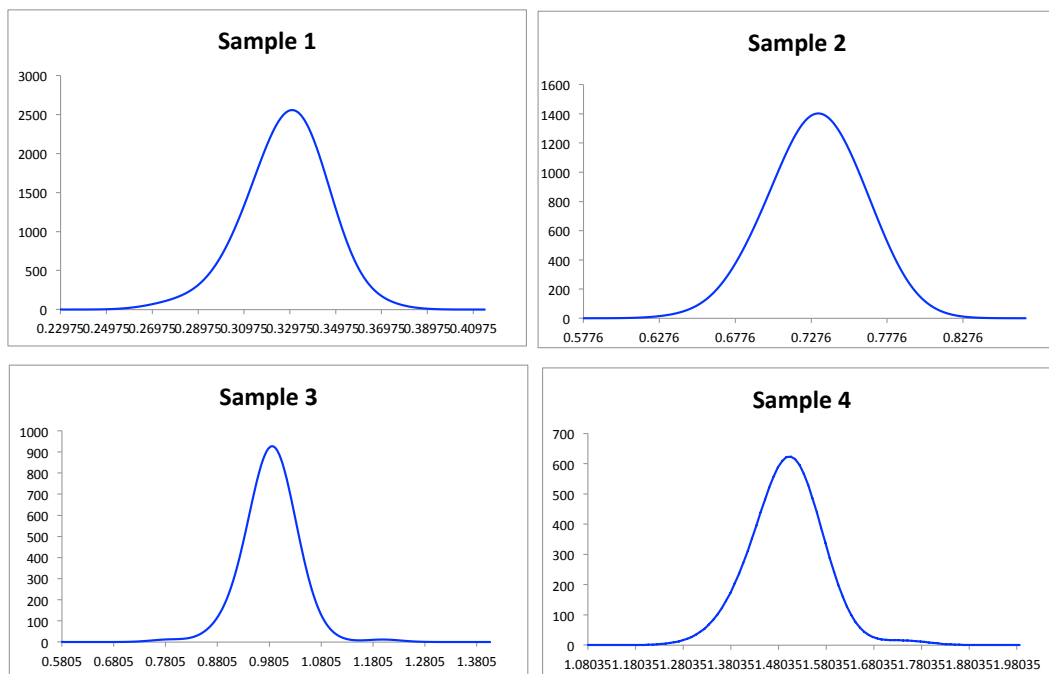
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

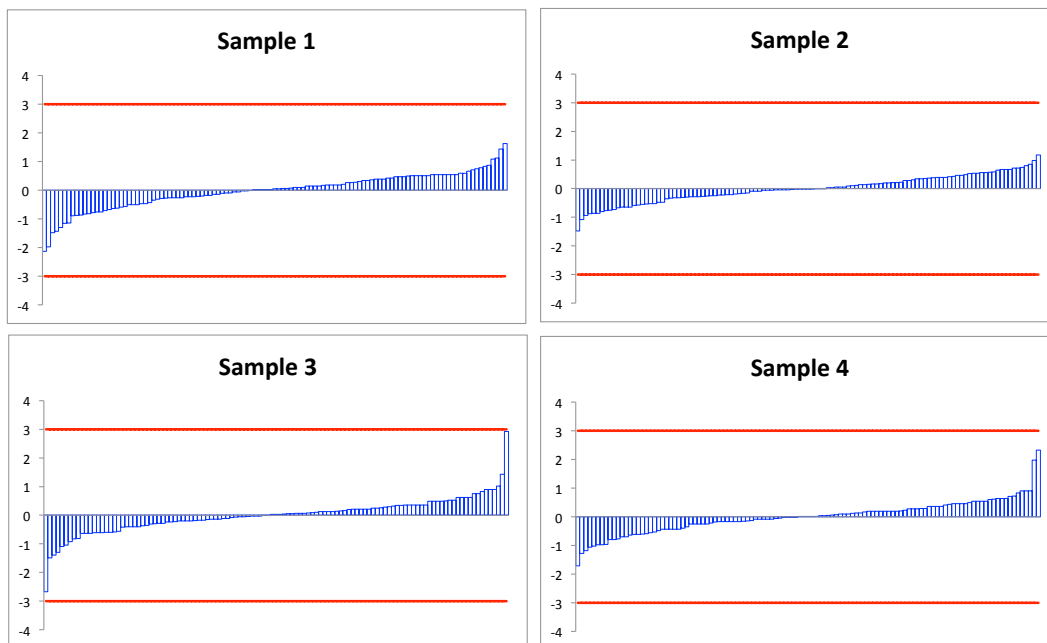


Molybdenum

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.329	0.329	0.334	0.333	0.317
Stdev	0.0246	0.0151	0.0163	0	0
Number	115	83	30	1	1
z >3	0	0	0	0	0
z 2 - 3	1	1	0	0	0

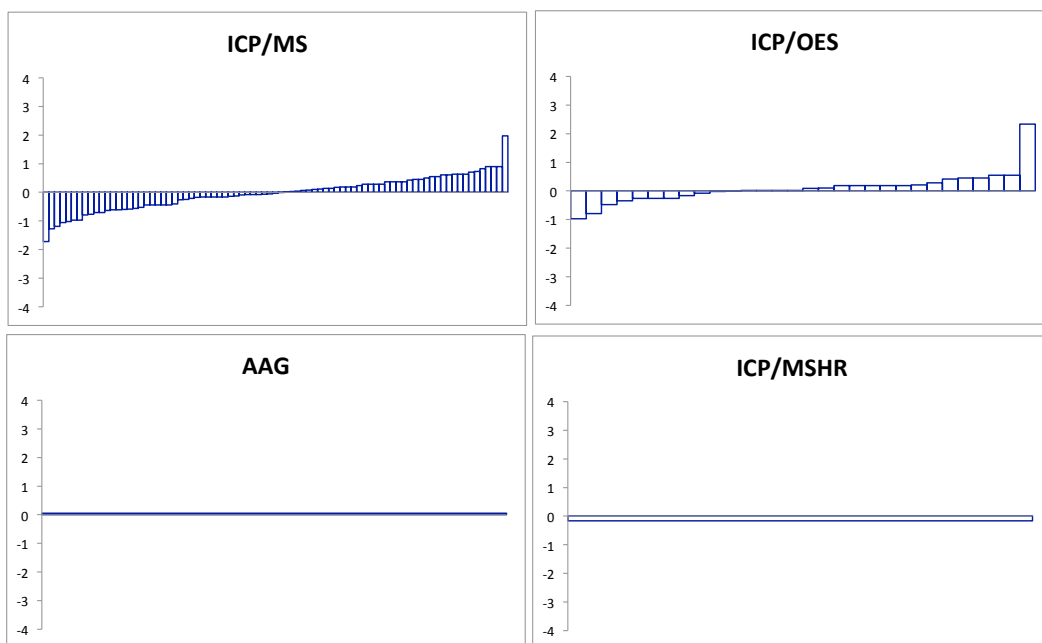
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.731	0.73	0.731	0.726	0.714
Stdev	0.0548	0.0282	0.0207	0	0
Number	115	83	30	1	1
z >3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.984	0.987	0.984	0.97	0.939
Stdev	0.0738	0.0447	0.0502	0	0
Number	115	83	30	1	1
z >3	0	0	0	0	0
z 2 - 3	2	1	1	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	1.5	1.5	1.5	1.5	1.48
Stdev	0.112	0.0662	0.0618	0	0
Number	115	83	30	1	1
z >3	0	0	0	0	0
z 2 - 3	1	0	1	0	0

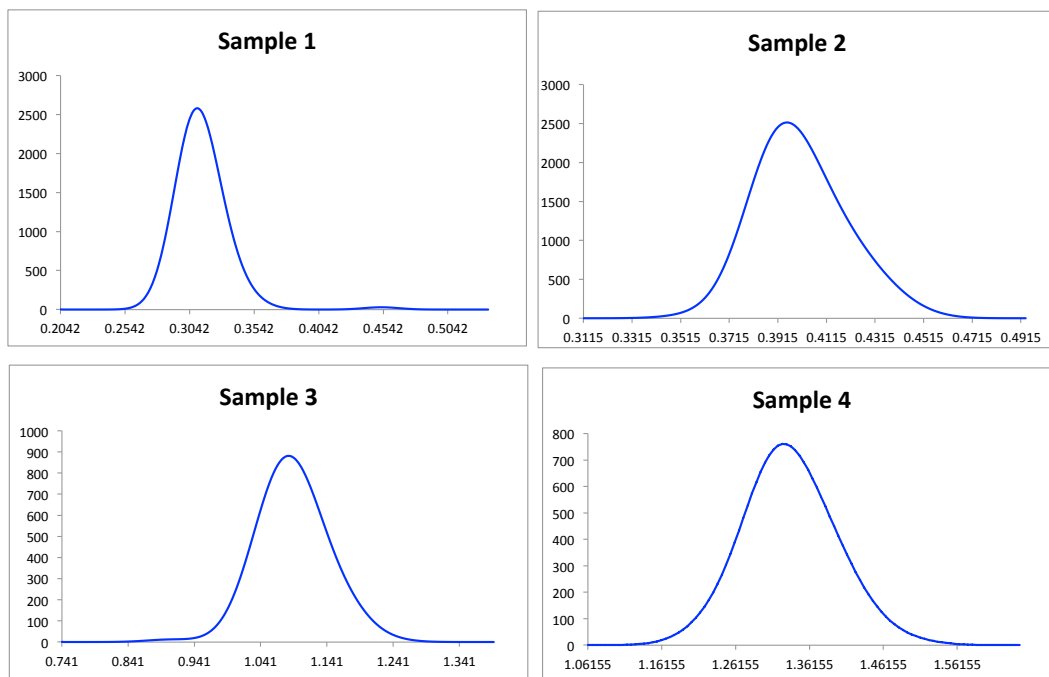
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

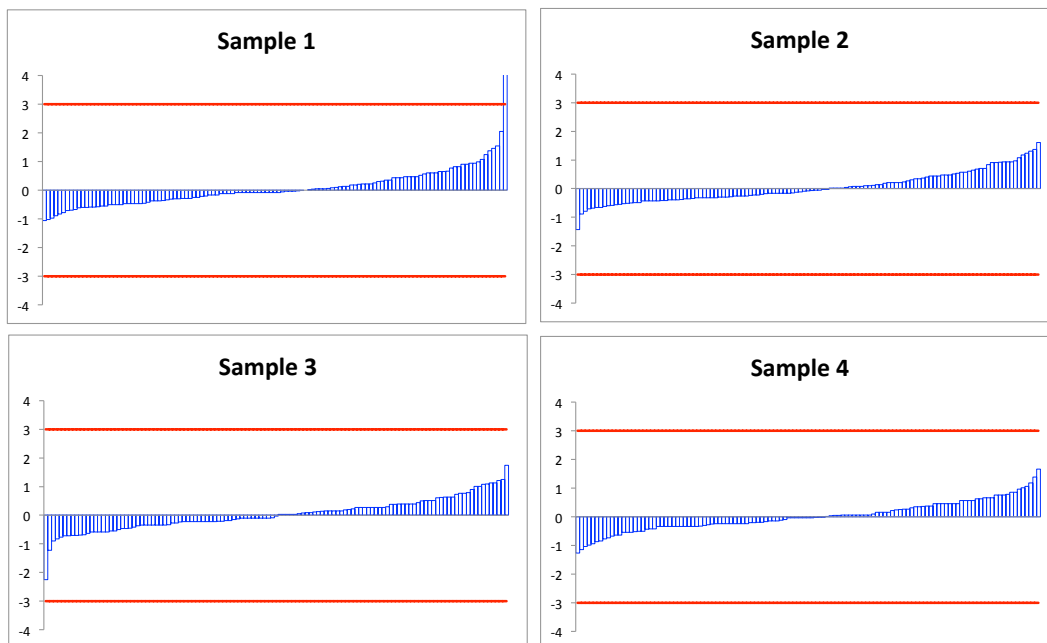


Nickel

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.312	0.31	0.31	0.388	0.346
Stdev	0.0234	0.0129	0.0133	0.0917	0
Number	121	86	32	2	1
z >3	1	0	0	1	0
z 2 - 3	1	1	0	0	0

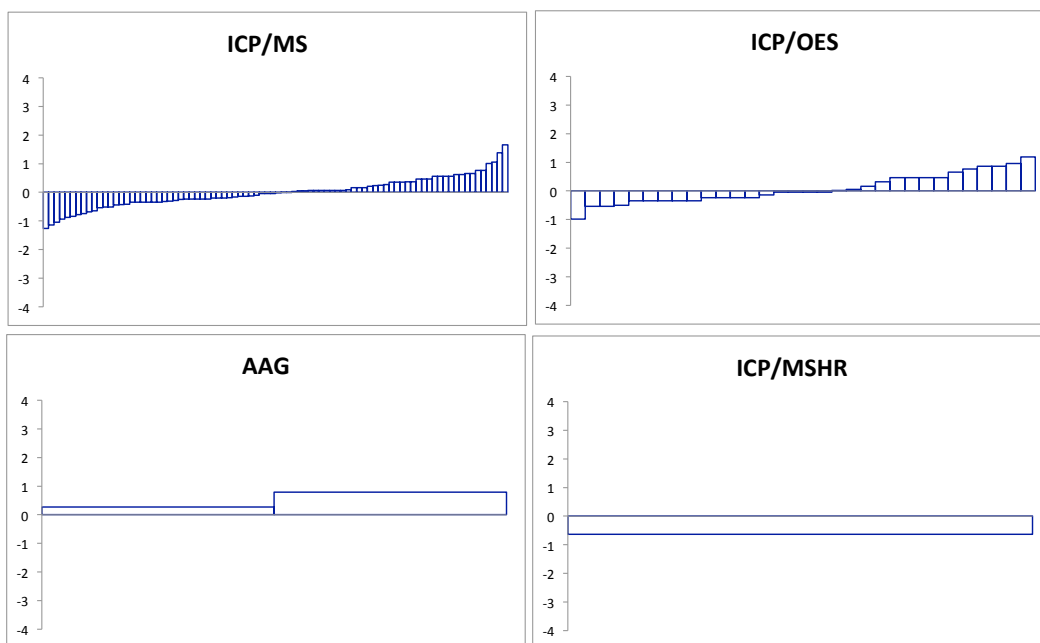
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.4	0.395	0.403	0.421	0.437
Stdev	0.03	0.0158	0.0152	0.00962	0
Number	121	86	32	2	1
z >3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	1.09	1.08	1.09	1.11	1.11
Stdev	0.0816	0.0489	0.0399	0.0578	0
Number	121	86	32	2	1
z >3	0	0	0	0	0
z 2 - 3	1	1	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	1.33	1.33	1.33	1.39	1.27
Stdev	0.1	0.0529	0.0517	0.037	0
Number	121	86	32	2	1
z >3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

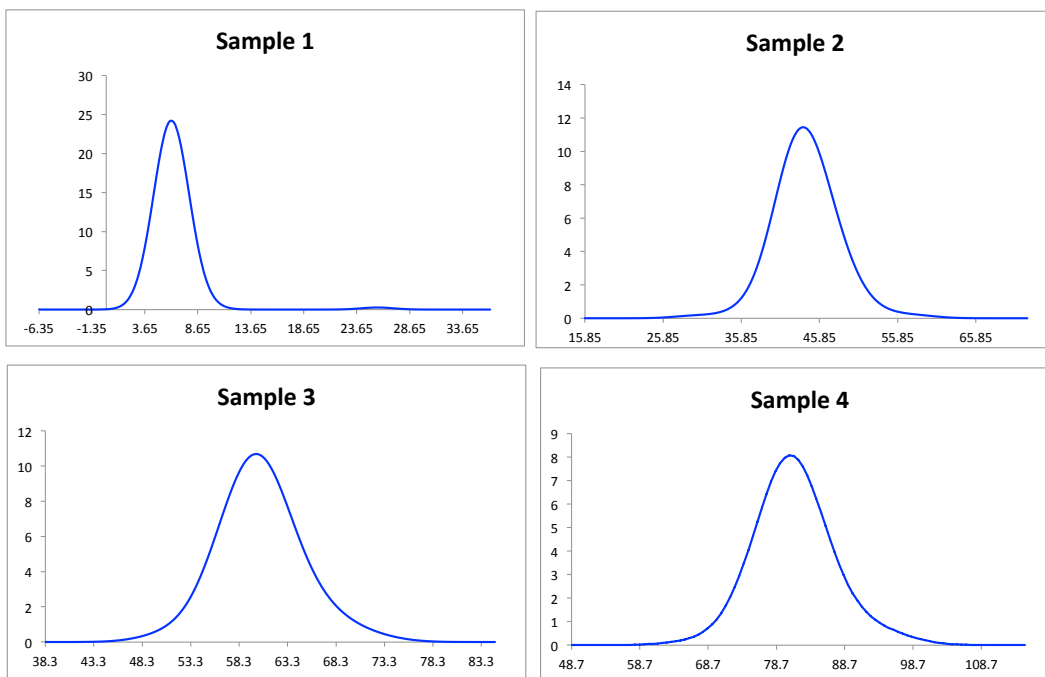
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

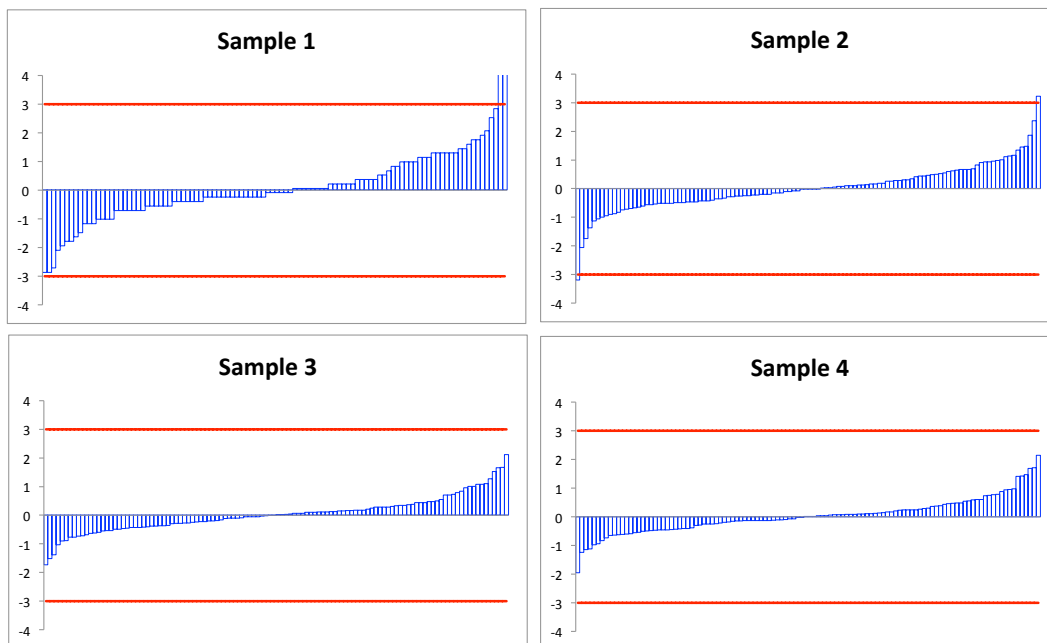


Selenium

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAHY	ICP/MSHR
Median	6.17	6.1	6.9	5.3	6.1
Stdev	0.648	0.708	6.75	0.707	0
Number	104	91	8	2	1
z >3	2	1	1	0	0
z 2 - 3	7	4	1	1	0

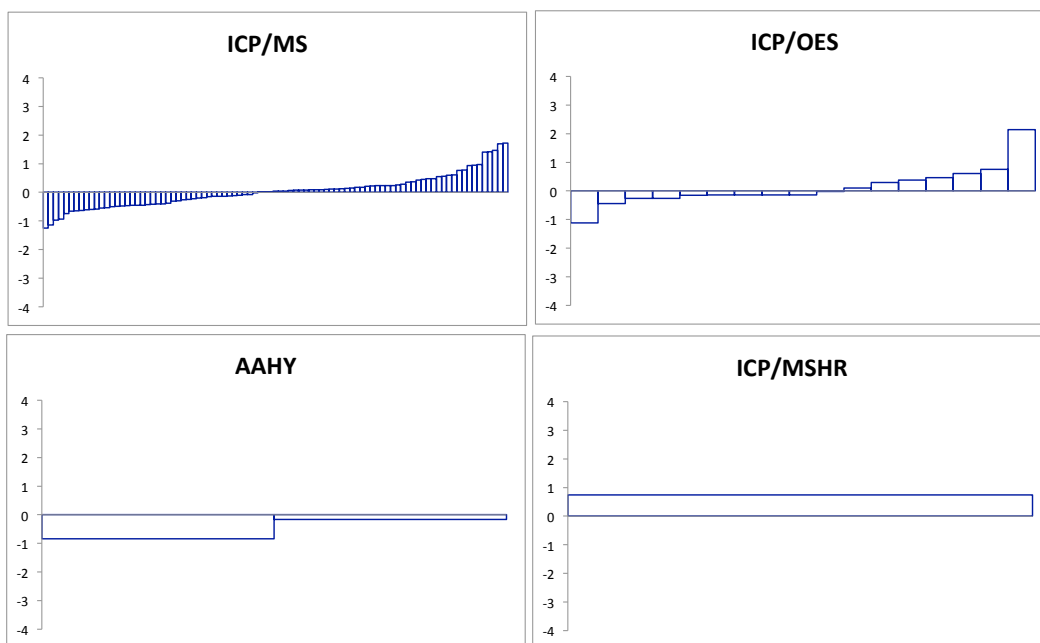
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAHY	ICP/MSHR
Median	44.1	44	44.3	41.7	46
Stdev	4.41	3.06	5.56	2.47	0
Number	114	91	17	2	1
z >3	2	1	1	0	0
z 2 - 3	2	0	2	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAHY	ICP/MSHR
Median	60.3	60.4	60	58.7	61.1
Stdev	6.03	3.48	4.66	5.3	0
Number	114	91	17	2	1
z >3	0	0	0	0	0
z 2 - 3	1	0	1	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAHY	ICP/MSHR
Median	81.1	81.4	80	77.1	87.1
Stdev	8.11	4.68	5.54	3.89	0
Number	114	91	17	2	1
z >3	0	0	0	0	0
z 2 - 3	1	0	1	0	0

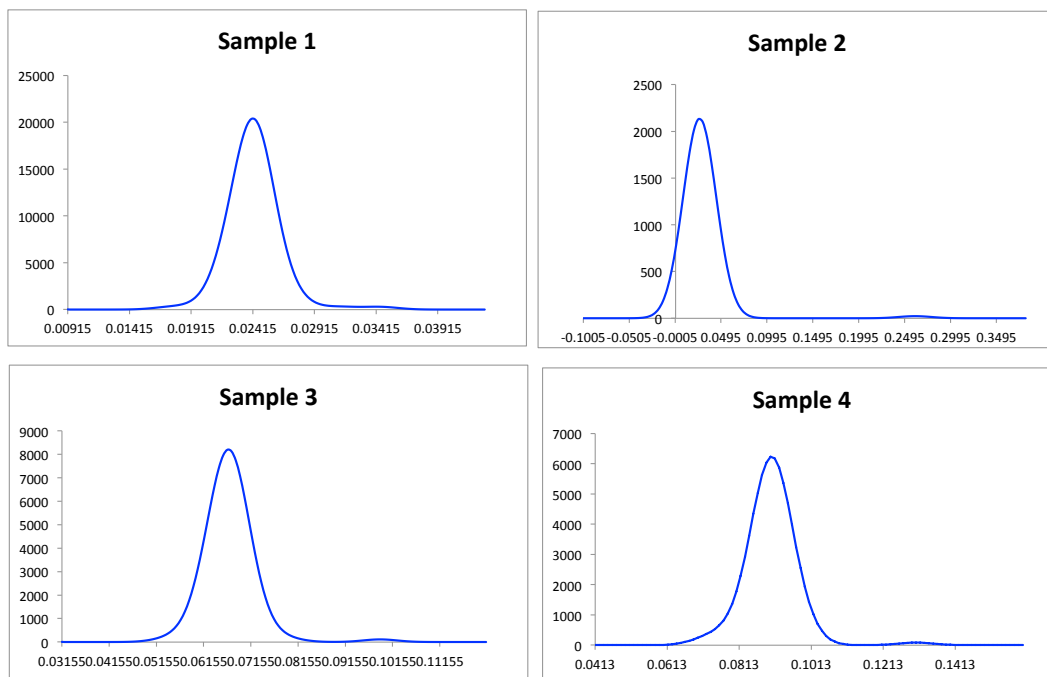
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

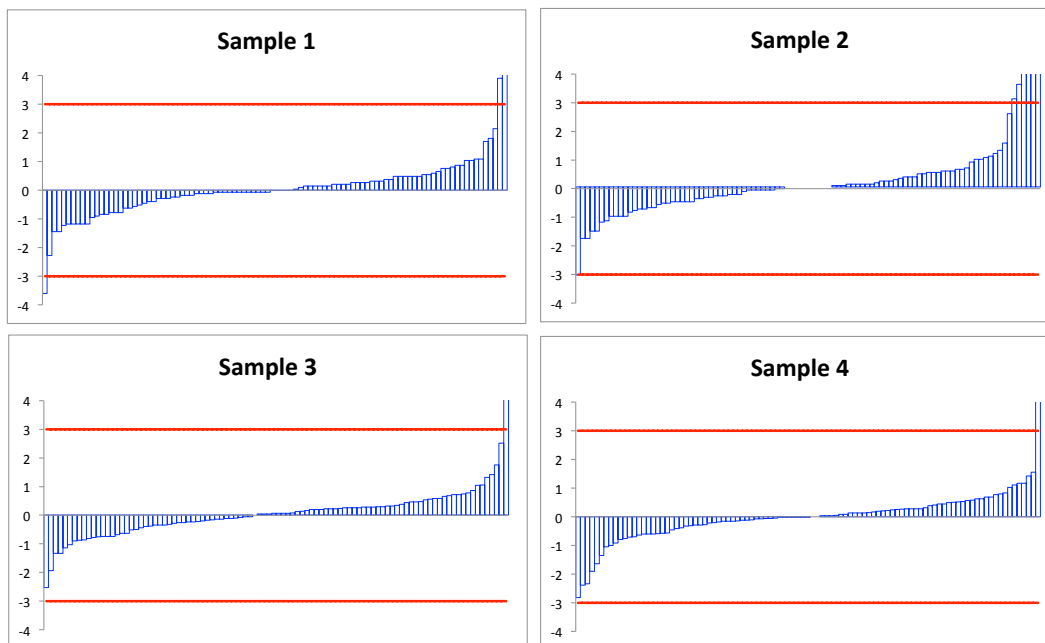


Silver

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AA	ICP/MSHR
Median	0.0241	0.0241	0.024	0.0257	0.0239
Stdev	0.00181	0.00179	0.00237	0	0
Number	98	74	22	1	1
z >3	3	2	1	0	0
z 2 - 3	2	0	2	0	0

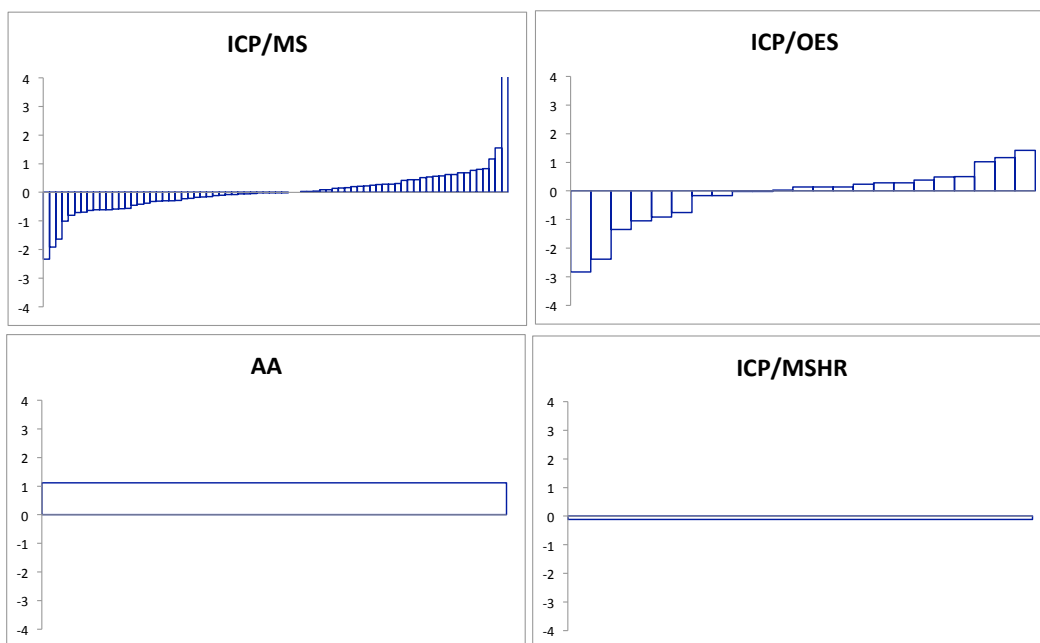
Sample 2					
Method	All*	ICP/MS	ICP/OES	AA	ICP/MSHR
Median	0.026	0.026	0.0255	0.0363	0.0281
Stdev	0.00195	0.0274	0.0031	0	0
Number	98	74	22	1	1
z >3	7	3	3	1	0
z 2 - 3	1	0	1	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AA	ICP/MSHR
Median	0.0667	0.067	0.0665	0.0793	0.0683
Stdev	0.00501	0.00485	0.00404	0	0
Number	98	74	22	1	1
z >3	1	1	0	0	0
z 2 - 3	2	1	0	1	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AA	ICP/MSHR
Median	0.0901	0.09	0.091	0.0976	0.0893
Stdev	0.00676	0.0063	0.00689	0	0
Number	99	74	23	1	1
z >3	1	1	0	0	0
z 2 - 3	3	1	2	0	0

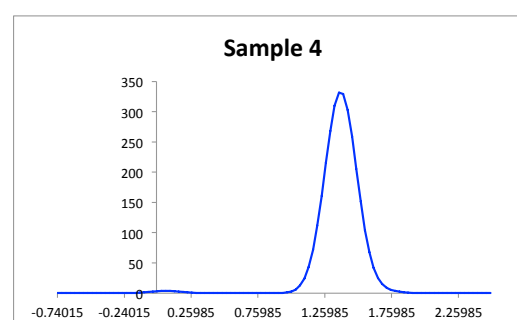
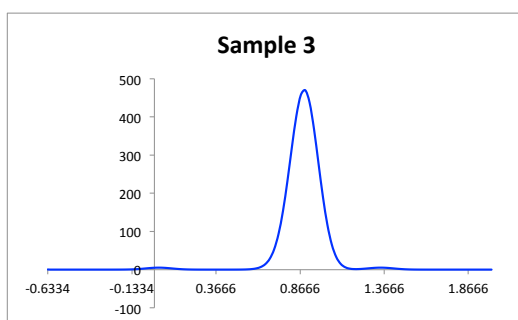
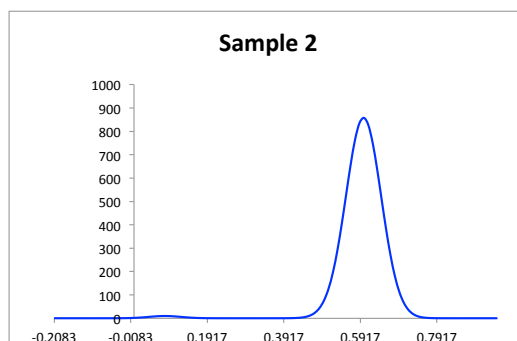
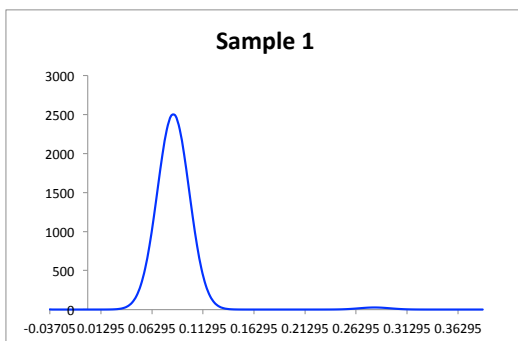
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

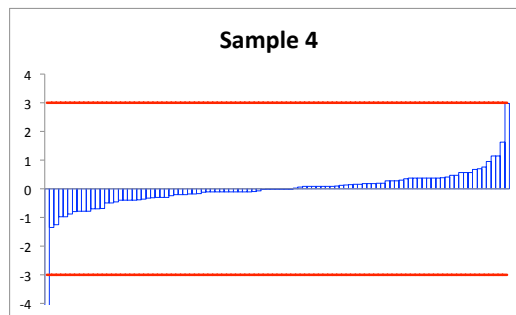
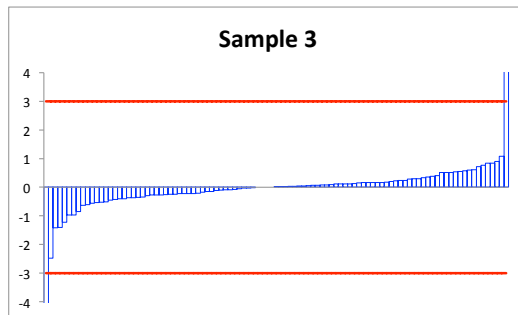
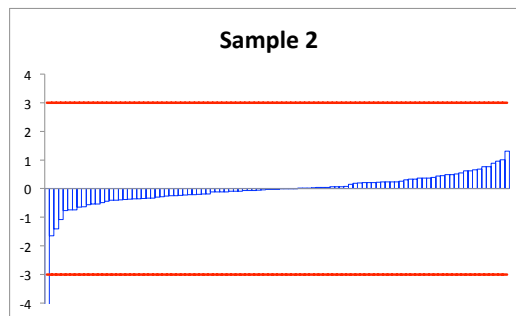
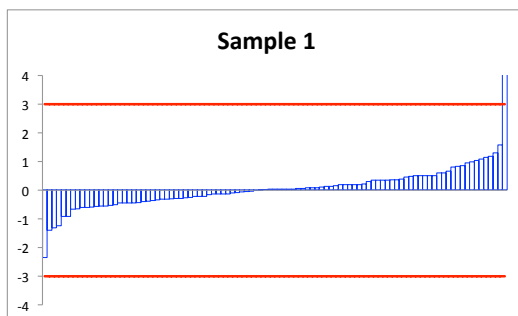


Strontium

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.0839	0.0831	0.085	0.0806	0.0796
Stdev	0.00629	0.0236	0.00284	0	0
Number	99	72	25	1	1
z >3	1	1	0	0	0
z 2 - 3	1	1	0	0	0

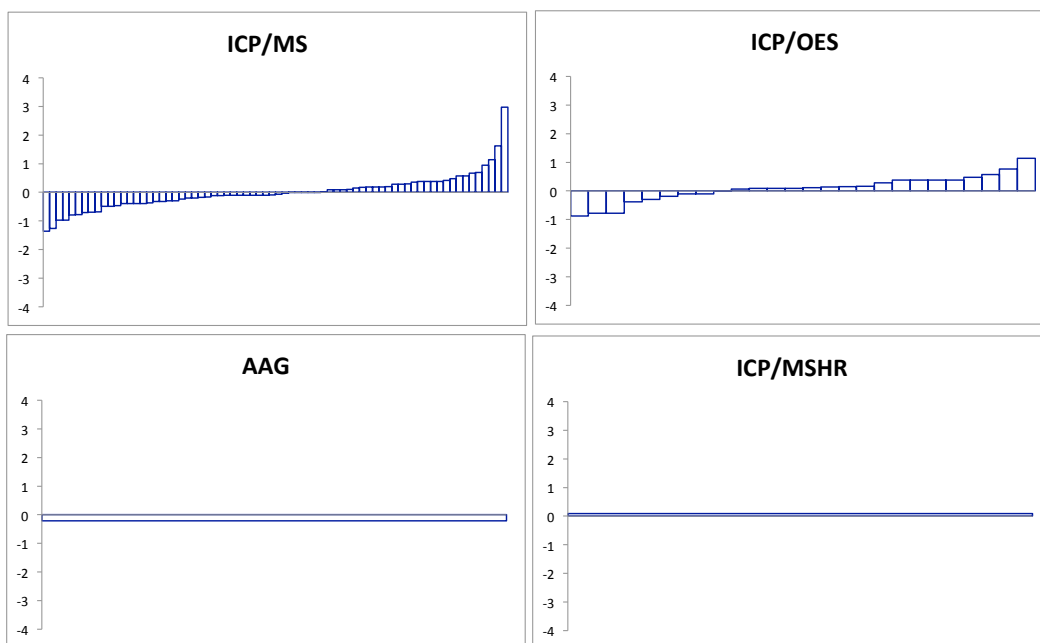
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.6	0.597	0.601	0.584	0.61
Stdev	0.045	0.0224	0.018	0	0
Number	101	72	26	1	1
z >3	1	0	0	0	0
z 2 - 3	0	0	0	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.892	0.893	0.898	0.877	0.863
Stdev	0.0669	0.0653	0.0281	0	0
Number	101	72	26	1	1
z >3	2	1	0	0	0
z 2 - 3	1	1	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	1.38	1.37	1.39	1.36	1.39
Stdev	0.104	0.0641	0.0478	0	0
Number	101	72	26	1	1
z >3	1	0	0	0	0
z 2 - 3	1	1	0	0	0

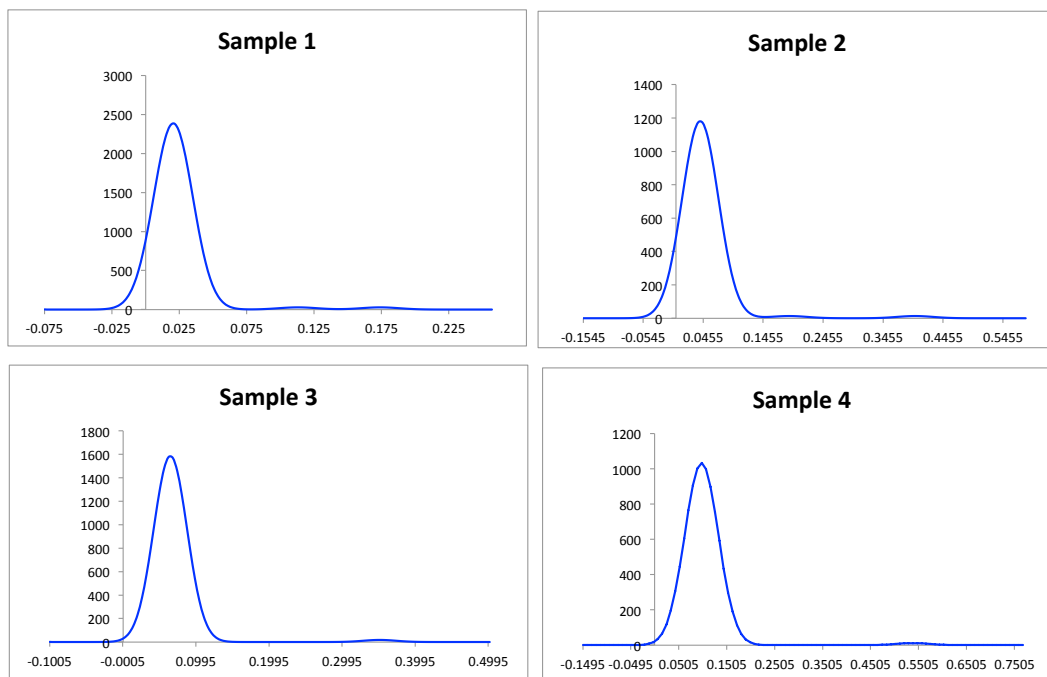
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

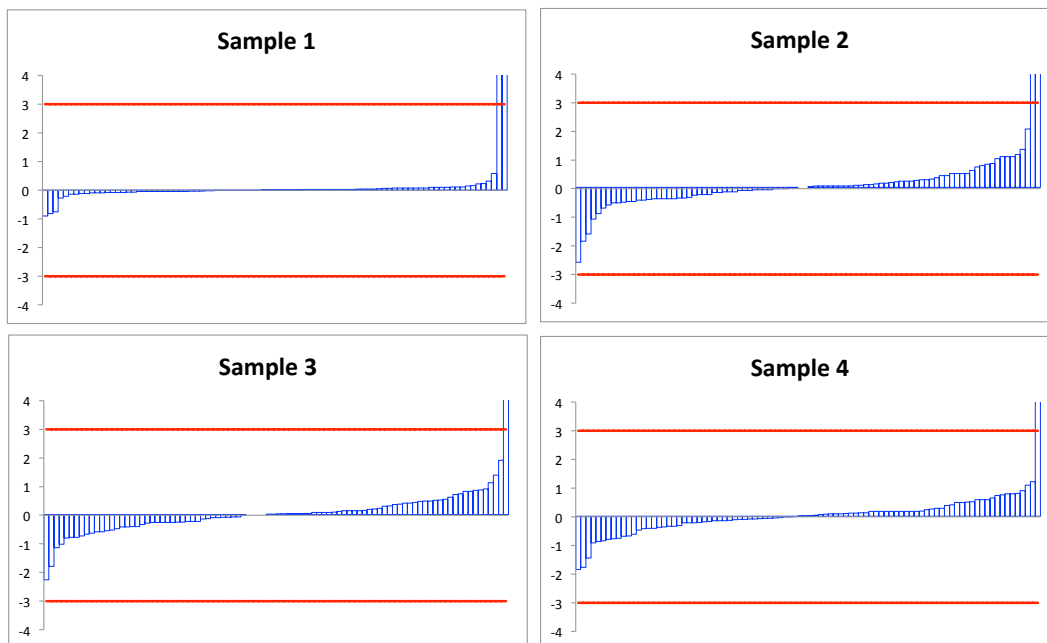


Thallium

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.0206	0.0206	0.022	0.0221	0
Stdev	0.014	0.0203	0.00701	0	0
Number	89	77	11	1	0
z >3	2	2	0	0	0
z 2 - 3	0	0	0	0	0

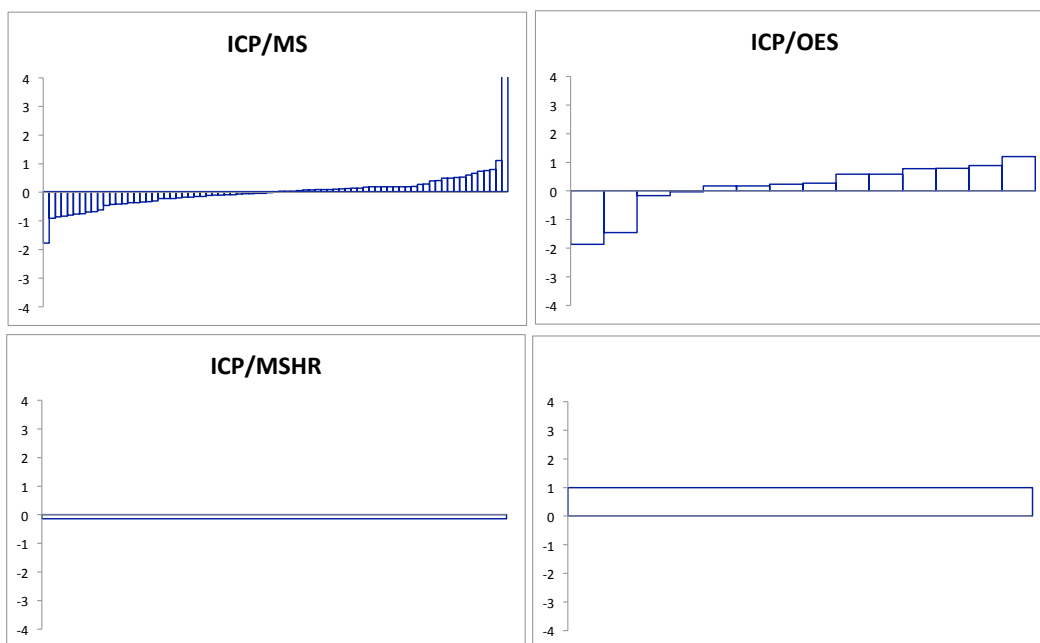
Sample 2					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.0406	0.0405	0.0431	0.0437	0
Stdev	0.00406	0.0441	0.00507	0	0
Number	92	77	14	1	0
z >3	2	2	0	0	0
z 2 - 3	2	0	2	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.0647	0.0647	0.0663	0.0678	0
Stdev	0.00647	0.0328	0.00666	0	0
Number	92	77	14	1	0
z >3	1	1	0	0	0
z 2 - 3	1	0	1	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.0983	0.0982	0.101	0.0969	0
Stdev	0.00983	0.0505	0.00845	0	0
Number	92	77	14	1	0
z >3	1	1	0	0	0
z 2 - 3	0	0	0	0	0

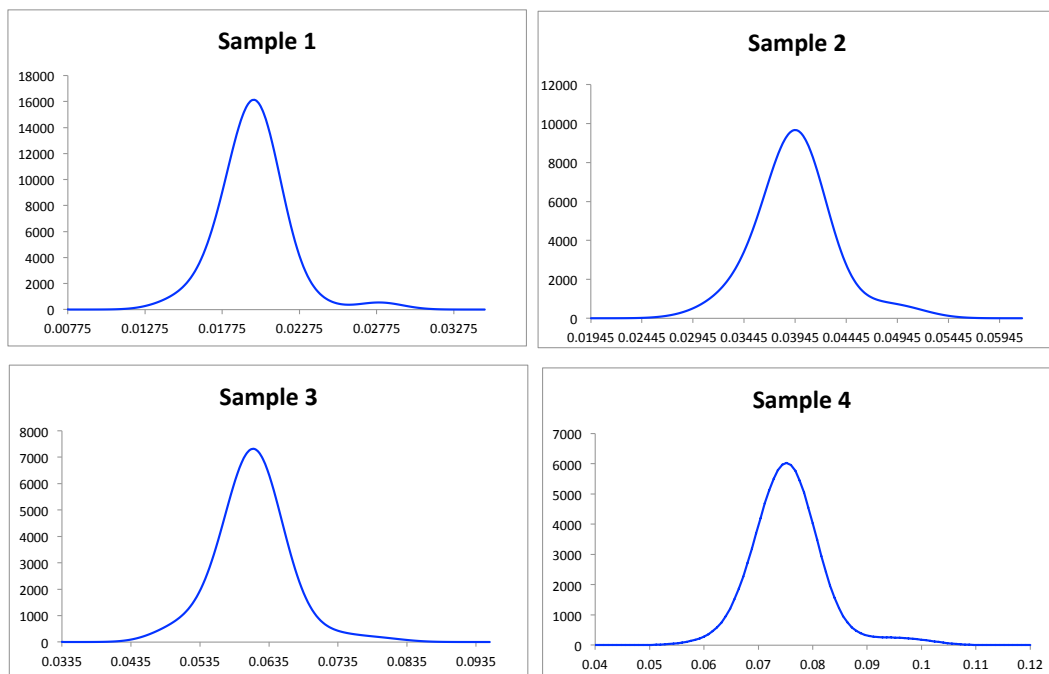
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

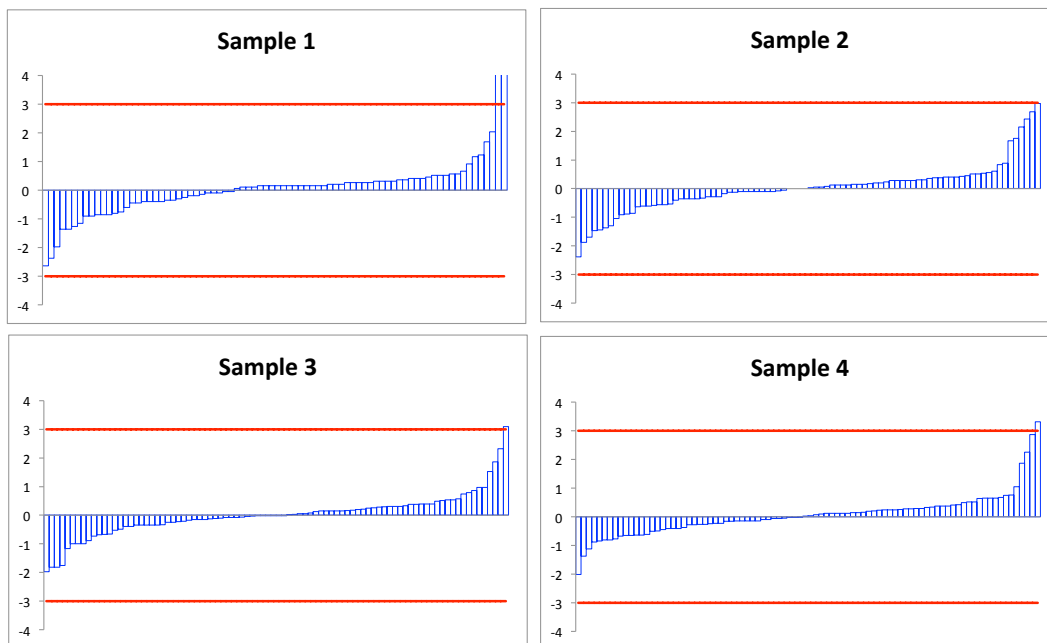


Tin

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.0197	0.02	0.0196	0.02	0
Stdev	0.00197	0.00164	0.0032	0	0
Number	80	65	14	1	0
z >3	2	1	1	0	0
z 2 - 3	3	1	2	0	0

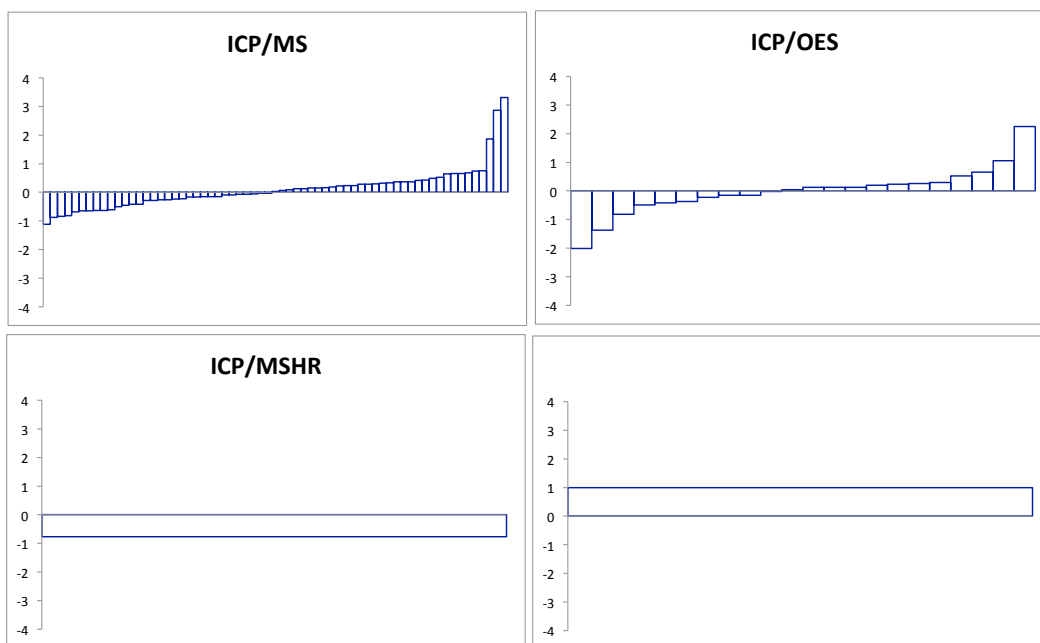
Sample 2					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.0394	0.0395	0.0394	0.0396	0
Stdev	0.00394	0.00309	0.00453	0	0
Number	86	65	20	1	0
z >3	0	0	0	0	0
z 2 - 3	5	3	2	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.0611	0.0614	0.0603	0.0606	0
Stdev	0.00611	0.00439	0.00525	0	0
Number	88	65	22	1	0
z >3	1	1	0	0	0
z 2 - 3	1	1	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.0751	0.0753	0.0757	0.0693	0
Stdev	0.00751	0.00549	0.00622	0	0
Number	88	65	22	1	0
z >3	1	1	0	0	0
z 2 - 3	3	1	2	0	0

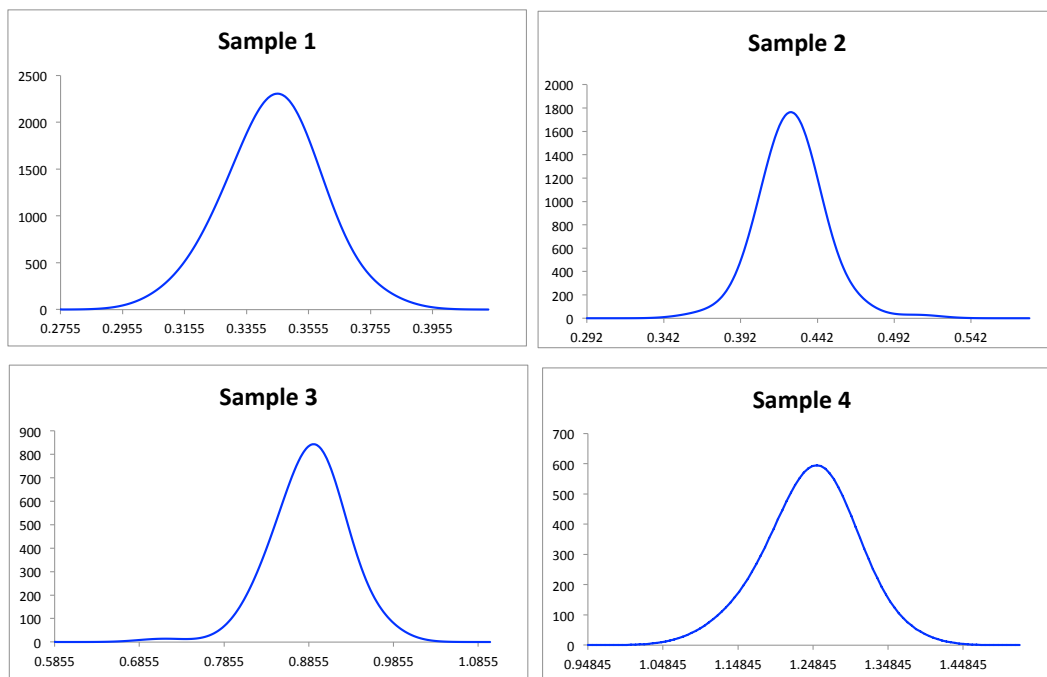
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

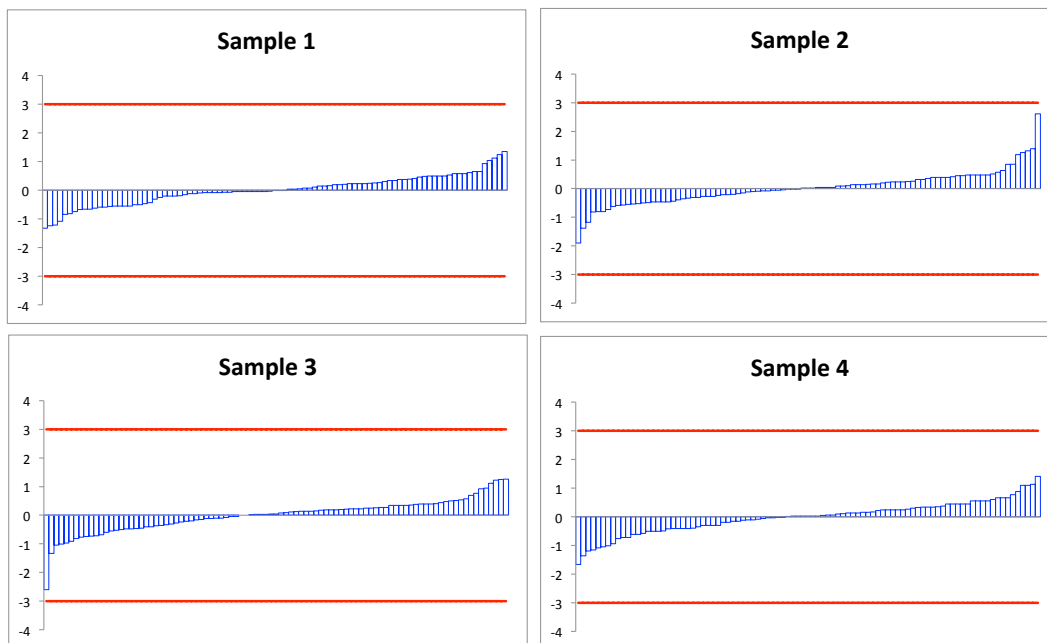


Titanium

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.344	0.343	0.347	0.344	0
Stdev	0.0258	0.0144	0.0097	0	0
Number	93	68	24	1	0
z >3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

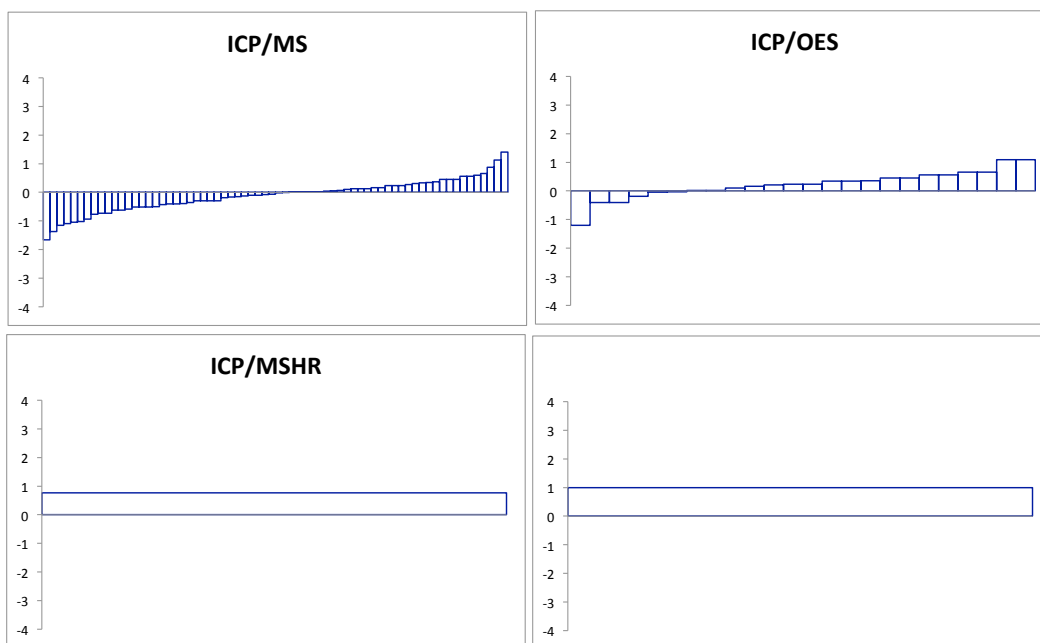
Sample 2					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.425	0.422	0.429	0.433	0
Stdev	0.0319	0.02	0.017	0	0
Number	93	68	24	1	0
z >3	0	0	0	0	0
z 2 - 3	1	1	0	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.887	0.886	0.902	0.884	0
Stdev	0.0665	0.0421	0.0232	0	0
Number	93	68	24	1	0
z >3	0	0	0	0	0
z 2 - 3	1	1	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	1.25	1.24	1.27	1.32	0
Stdev	0.0936	0.0526	0.0456	0	0
Number	93	68	24	1	0
z >3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

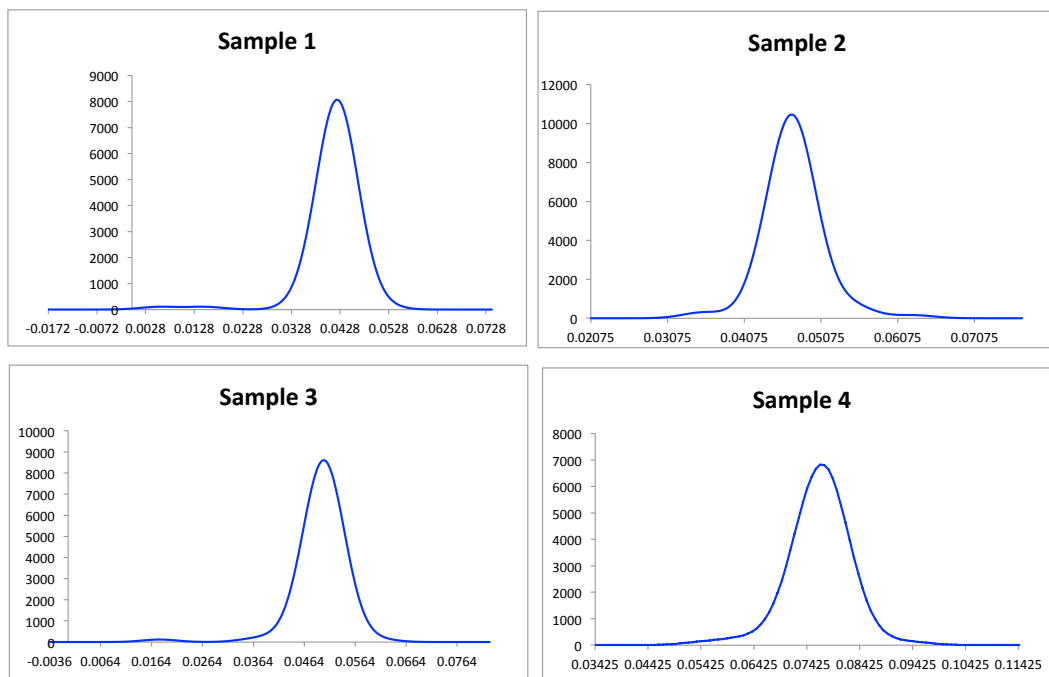
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

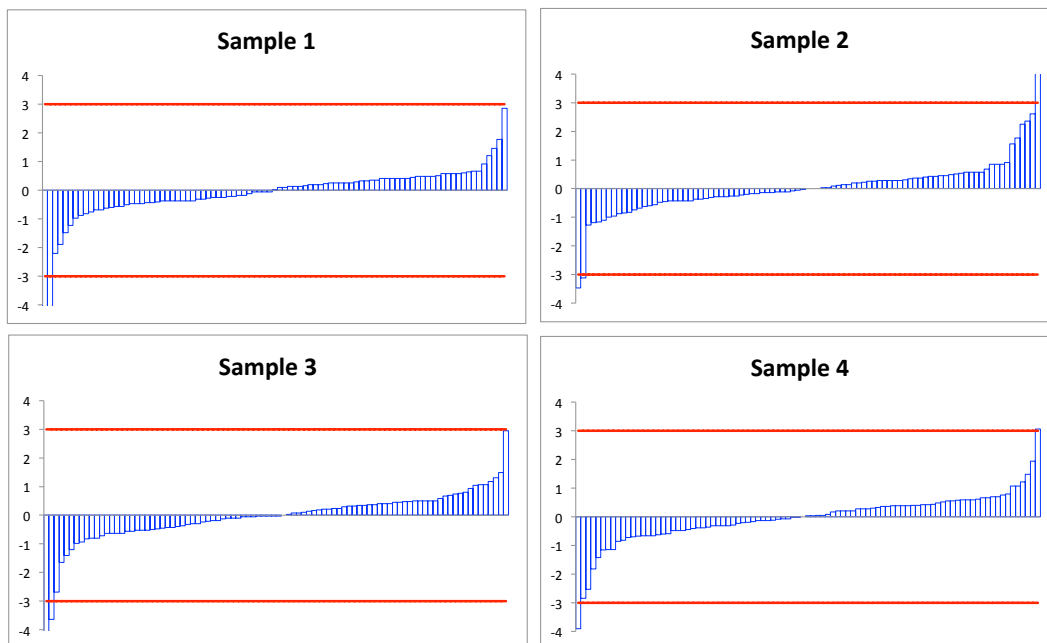


Uranium

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.0422	0.0425	0.0403	0.0407	0
Stdev	0.00316	0.00207	0.0143	0	0
Number	91	81	9	1	0
z >3	2	0	2	0	0
z 2 - 3	2	1	1	0	0

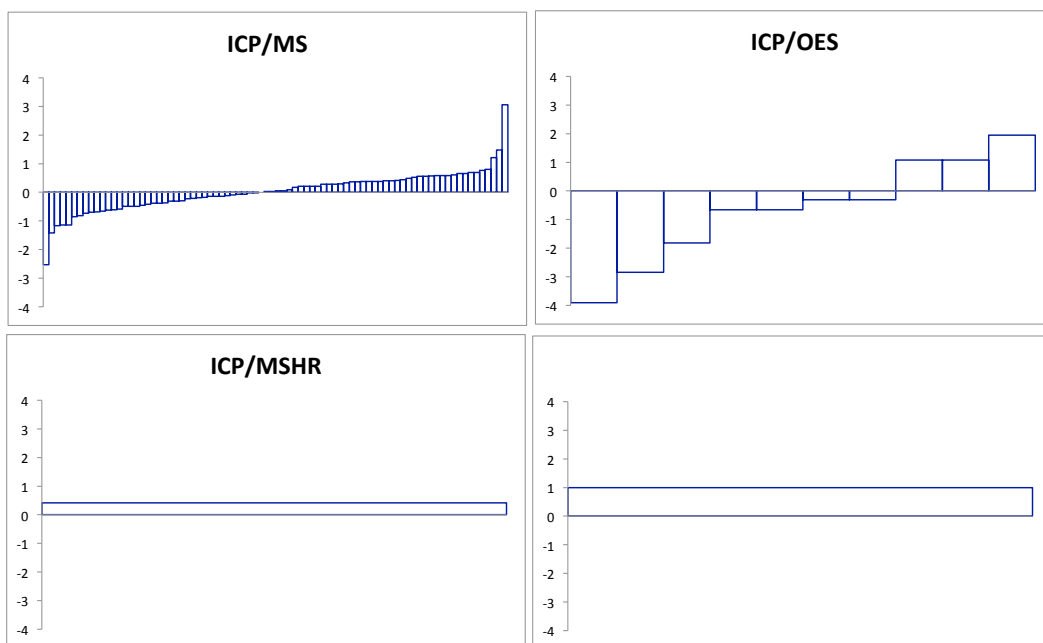
Sample 2					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.047	0.047	0.0475	0.0465	0
Stdev	0.00352	0.00279	0.00748	0	0
Number	91	81	9	1	0
z >3	3	1	2	0	0
z 2 - 3	3	1	2	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.0501	0.05	0.053	0.0482	0
Stdev	0.00376	0.00262	0.0123	0	0
Number	92	82	9	1	0
z >3	2	0	2	0	0
z 2 - 3	2	2	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	ICP/MSHR	
Median	0.0768	0.0771	0.074	0.0792	0
Stdev	0.00576	0.00404	0.0105	0	0
Number	93	82	10	1	0
z >3	2	1	1	0	0
z 2 - 3	2	1	1	0	0

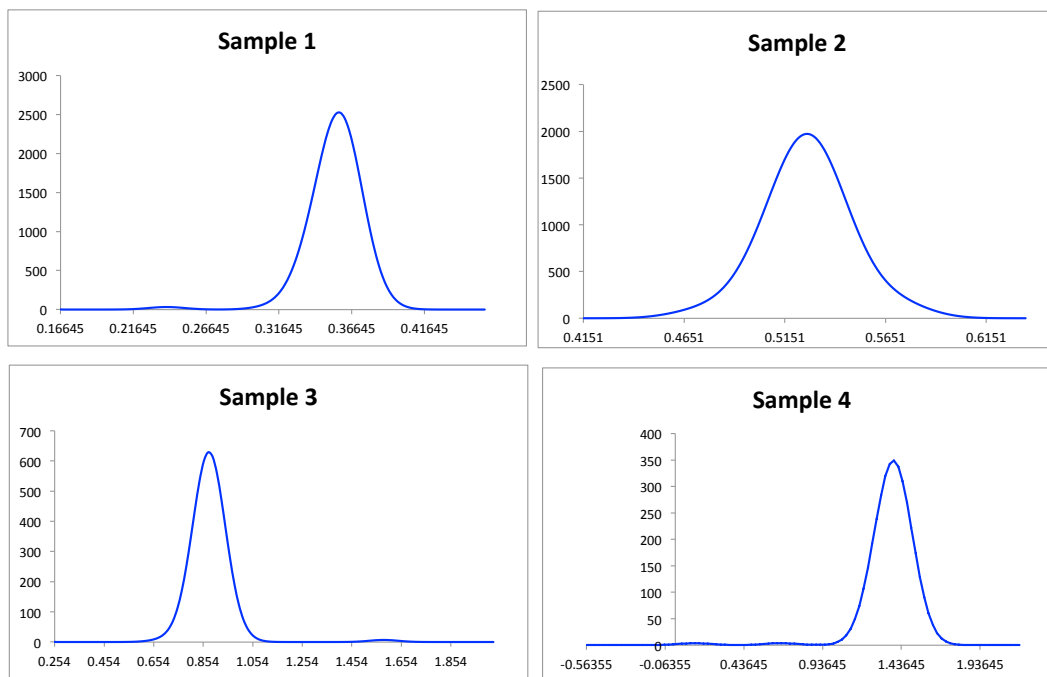
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

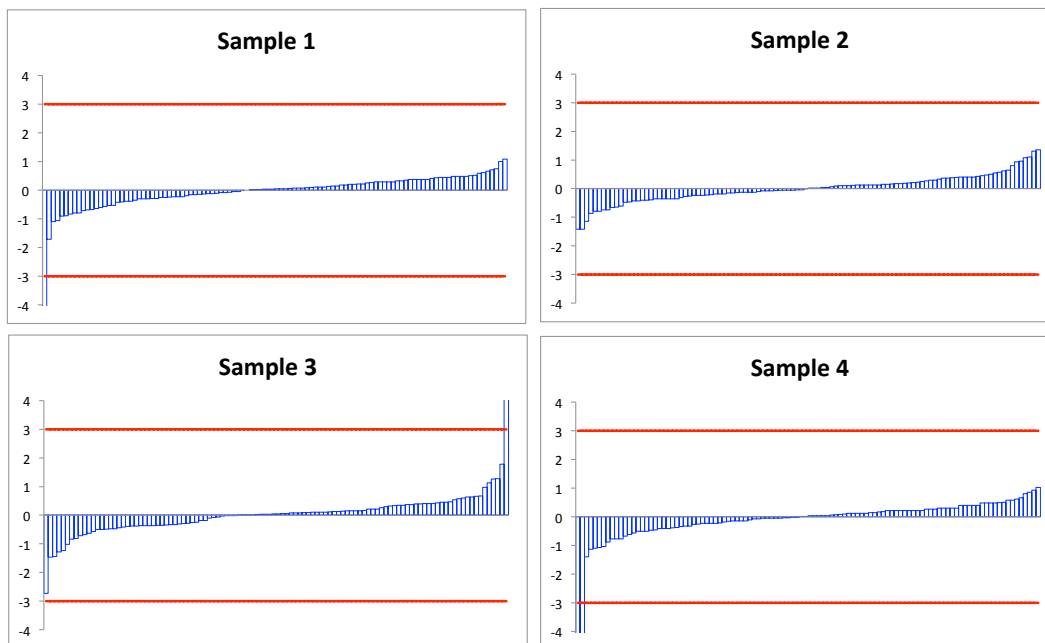


Vanadium

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.356	0.357	0.358	0.298	0.351
Stdev	0.0267	0.013	0.0105	0.0827	0
Number	108	78	27	2	1
z > 3	1	0	0	1	0
z 2 - 3	0	0	0	0	0

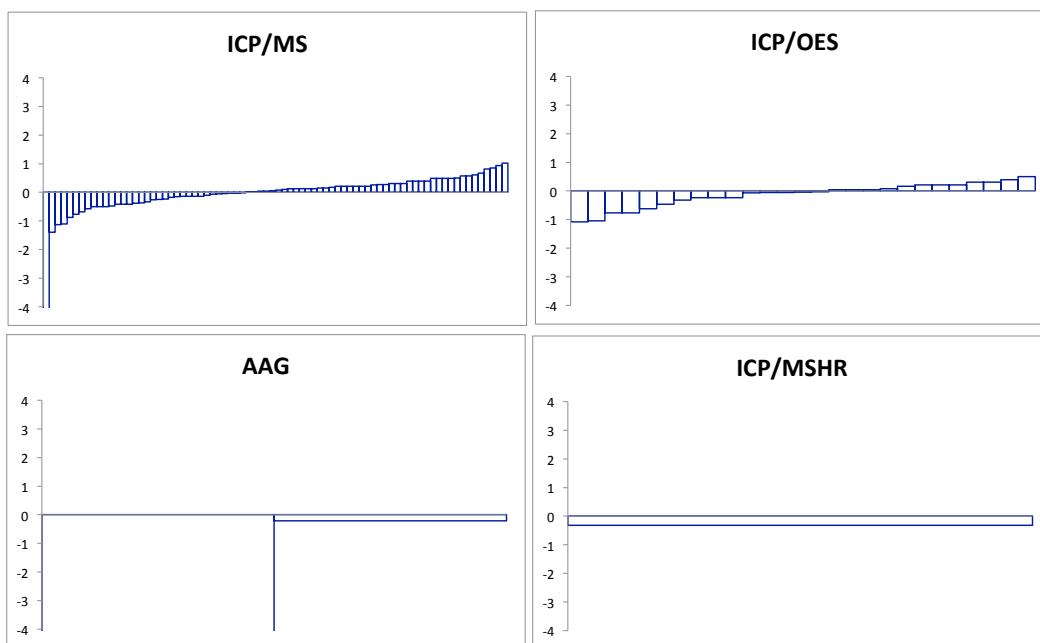
Sample 2					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.526	0.525	0.527	0.553	0.523
Stdev	0.0395	0.0198	0.0165	0.0218	0
Number	108	78	27	2	1
z > 3	0	0	0	0	0
z 2 - 3	0	0	0	0	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	0.877	0.882	0.875	1.22	0.858
Stdev	0.0658	0.042	0.0284	0.516	0
Number	108	78	27	2	1
z > 3	1	0	0	1	0
z 2 - 3	1	1	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AAG	ICP/MSHR
Median	1.39	1.39	1.38	1.02	1.35
Stdev	0.112	0.152	0.047	0.487	0
Number	108	78	27	2	1
z > 3	2	1	0	1	0
z 2 - 3	0	0	0	0	0

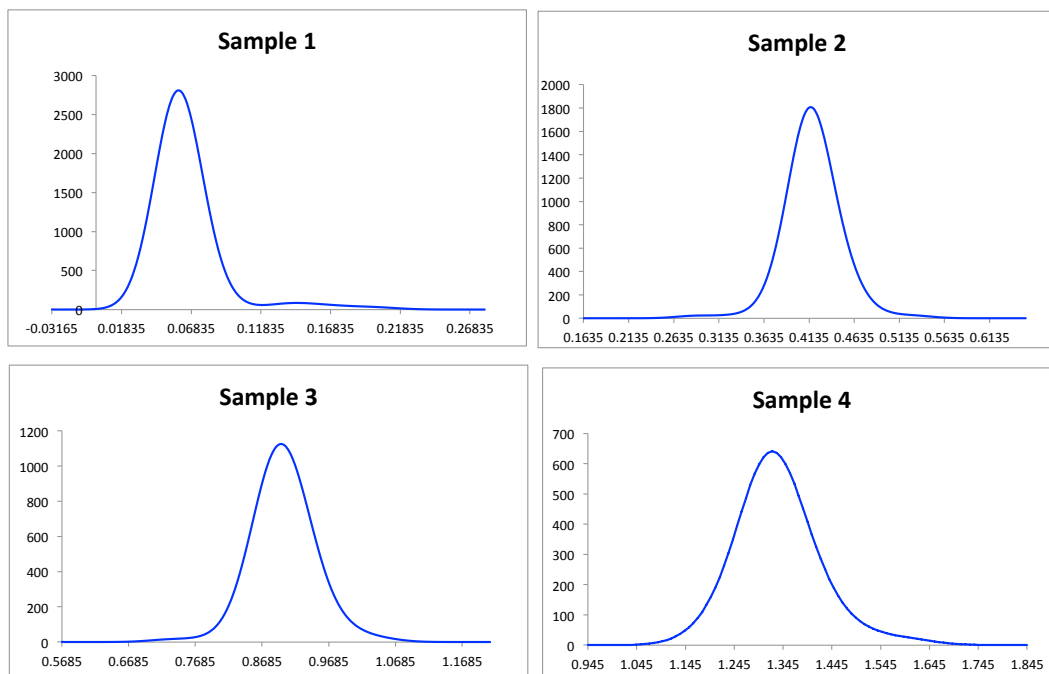
* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

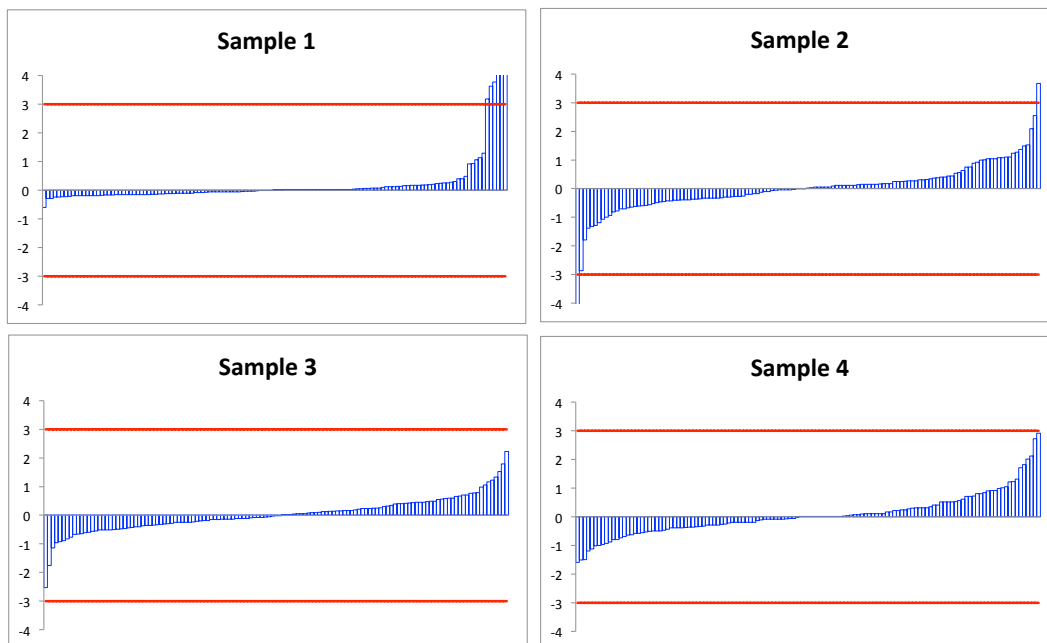


Zinc

Kernel Density Plots



z-Score Plots



Summary Statistics by Four Most Common Methods

Sample 1					
Method	All*	ICP/MS	ICP/OES	AA	ICP/MSHR
Median	0.0594	0.0585	0.06	0.058	0.14
Stdev	0.0222	0.0209	0.0229	0.0156	0
Number	129	90	35	3	1
z >3	6	3	2	0	1
z 2 - 3	0	0	0	0	0

Sample 2					
Method	All*	ICP/MS	ICP/OES	AA	ICP/MSHR
Median	0.416	0.417	0.418	0.408	0.531
Stdev	0.0312	0.0265	0.018	0.0508	0
Number	129	90	35	3	1
z >3	2	1	0	0	1
z 2 - 3	3	2	0	1	0

Sample 3					
Method	All*	ICP/MS	ICP/OES	AA	ICP/MSHR
Median	0.899	0.895	0.903	0.9	0.966
Stdev	0.0675	0.0431	0.0366	0.0223	0
Number	129	90	35	3	1
z >3	0	0	0	0	0
z 2 - 3	2	2	0	0	0

Sample 4					
Method	All*	ICP/MS	ICP/OES	AA	ICP/MSHR
Median	1.33	1.33	1.33	1.32	1.43
Stdev	0.0997	0.0741	0.0709	0.081	0
Number	129	90	35	3	1
z >3	0	0	0	0	0
z 2 - 3	4	3	1	0	0

* Values for the median and standard deviation are the robust mean and acceptance limit deviation. For method statistics, the arithmetic mean and standard deviation are used.

z-Score Plots by Method - Sample 4

