

Appendix J – Statistical outputs

UCL Statistics for Uncensored Full Data Sets

User Selected Options
 Date/Time of Computation 25/10/2018 1:43:18 PM
 From File WorkSheet.xls
 Full Precision OFF
 Confidence Coefficient 95%
 Number of Bootstrap Operations 2000

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General Statistics

Total Number of Observations	64	Number of Distinct Observations	10
		Number of Missing Observations	6
Minimum	0.5	Mean	2.248
Maximum	100	Median	0.5
SD	12.43	Std. Error of Mean	1.554
Coefficient of Variation	5.528	Skewness	7.969

Normal GOF Test

Shapiro Wilk Test Statistic	0.145	Shapiro Wilk GOF Test
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.455	Lilliefors GOF Test
5% Lilliefors Critical Value	0.111	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	4.842	95% Adjusted-CLT UCL (Chen-1995)	6.457
		95% Modified-t UCL (Johnson-1978)	5.1

Gamma GOF Test

A-D Test Statistic	20.4	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.816	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.468	Kolmogrov-Smirnoff Gamma GOF Test
5% K-S Critical Value	0.118	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.506	k star (bias corrected MLE)	0.493
Theta hat (MLE)	4.441	Theta star (bias corrected MLE)	4.561
nu hat (MLE)	64.8	nu star (bias corrected)	63.09
MLE Mean (bias corrected)	2.248	MLE Sd (bias corrected)	3.203
		Approximate Chi Square Value (0.05)	45.82
Adjusted Level of Significance	0.0463	Adjusted Chi Square Value	45.48

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	3.096	95% Adjusted Gamma UCL (use when n<50)	3.119
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Lognormal GOF Test

Shapiro Wilk Test Statistic	0.386	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.453	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.111	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.693	Mean of logged Data	-0.442
Maximum of Logged Data	4.605	SD of logged Data	0.786

Assuming Lognormal Distribution

95% H-UCL	1.076	90% Chebyshev (MVUE) UCL	1.158
95% Chebyshev (MVUE) UCL	1.288	97.5% Chebyshev (MVUE) UCL	1.469
99% Chebyshev (MVUE) UCL	1.824		

Nonparametric Distribution Free UCL Statistics
Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	4.804	95% Jackknife UCL	4.842
95% Standard Bootstrap UCL	4.771	95% Bootstrap-t UCL	54.01

95% Hall's Bootstrap UCL	32.36	95% Percentile Bootstrap UCL	5.366
95% BCA Bootstrap UCL	7.011		
90% Chebyshev(Mean, Sd) UCL	6.909	95% Chebyshev(Mean, Sd) UCL	9.02
97.5% Chebyshev(Mean, Sd) UCL	11.95	99% Chebyshev(Mean, Sd) UCL	17.71

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 9.02

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulation results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

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General Statistics

Total Number of Observations	65	Number of Distinct Observations	27
		Number of Missing Observations	5
Minimum	5	Mean	15.35
Maximum	380	Median	6.2
SD	46.69	Std. Error of Mean	5.791
Coefficient of Variation	3.041	Skewness	7.684

Normal GOF Test

Shapiro Wilk Test Statistic	0.222	Shapiro Wilk GOF Test
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.412	Lilliefors GOF Test
5% Lilliefors Critical Value	0.11	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	25.02	95% Adjusted-CLT UCL (Chen-1995)	30.77
		95% Modified-t UCL (Johnson-1978)	25.94

Gamma GOF Test

A-D Test Statistic	9.906	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.782	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.29	Kolmogrov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.114	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.948	k star (bias corrected MLE)	0.914
Theta hat (MLE)	16.2	Theta star (bias corrected MLE)	16.79
nu hat (MLE)	123.2	nu star (bias corrected)	118.8
MLE Mean (bias corrected)	15.35	MLE Sd (bias corrected)	16.06
		Approximate Chi Square Value (0.05)	94.66
Adjusted Level of Significance	0.0463	Adjusted Chi Square Value	94.18

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	19.27	95% Adjusted Gamma UCL (use when n<50)	19.37
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Lognormal GOF Test

Shapiro Wilk Test Statistic	0.712	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk P Value	1.110E-16	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.248	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.11	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.609	Mean of logged Data	2.118
Maximum of Logged Data	5.94	SD of logged Data	0.748

Assuming Lognormal Distribution

95% H-UCL	13.32	90% Chebyshev (MVUE) UCL	14.32
95% Chebyshev (MVUE) UCL	15.86	97.5% Chebyshev (MVUE) UCL	17.98
99% Chebyshev (MVUE) UCL	22.16		

Nonparametric Distribution Free UCL Statistics
Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	24.88	95% Jackknife UCL	25.02
95% Standard Bootstrap UCL	24.82	95% Bootstrap-t UCL	63.5
95% Hall's Bootstrap UCL	57.38	95% Percentile Bootstrap UCL	26.89
95% BCA Bootstrap UCL	33.92		
90% Chebyshev(Mean, Sd) UCL	32.73	95% Chebyshev(Mean, Sd) UCL	40.59
97.5% Chebyshev(Mean, Sd) UCL	51.52	99% Chebyshev(Mean, Sd) UCL	72.97

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	40.59
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Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

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For additional insight the user may want to consult a statistician.