

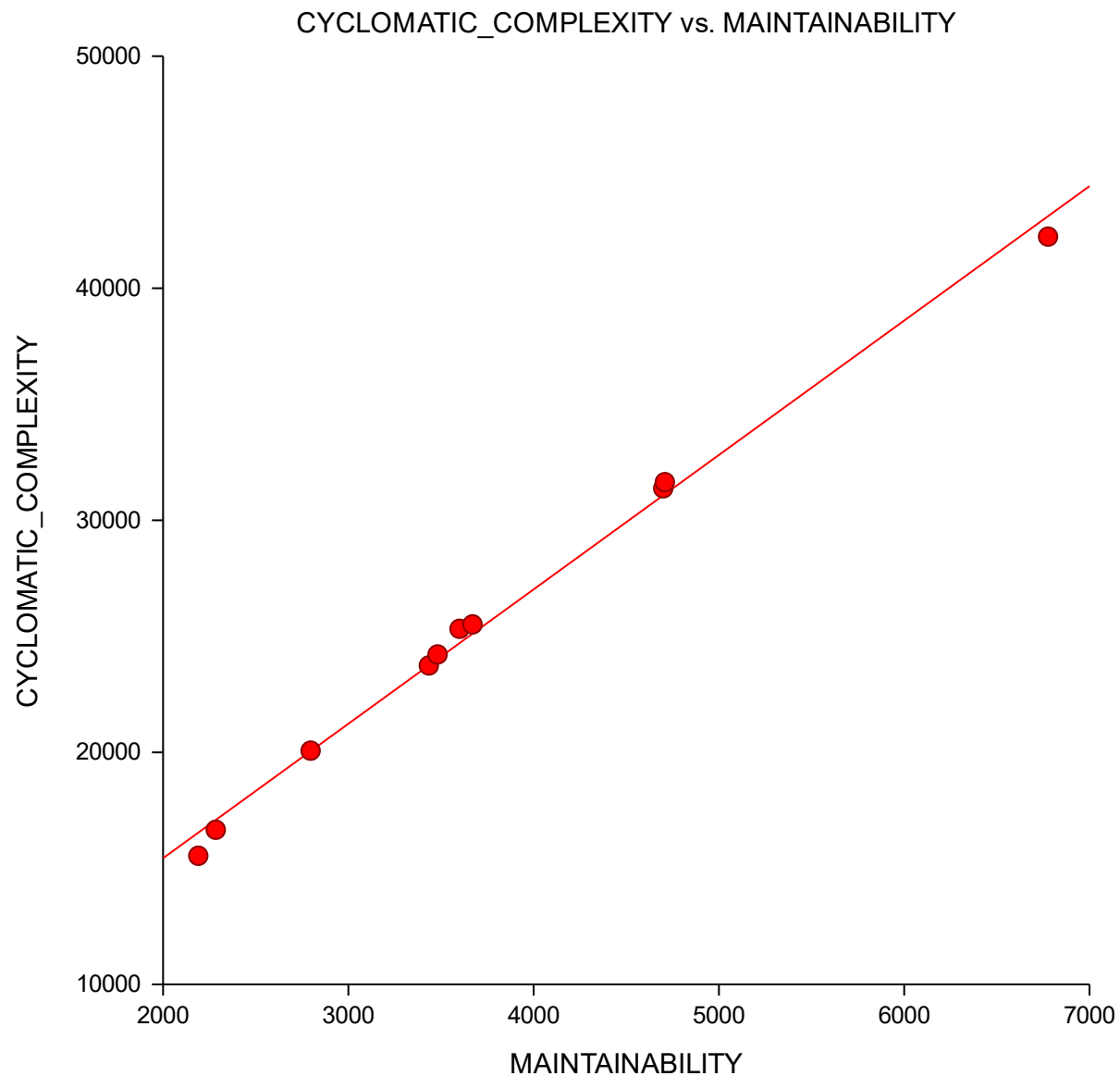
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### Linear Regression Report

Dataset                  Untitled  
Y = CYCLOMATIC\_COMPLEXITY   X = MAINTAINABILITY

#### Linear Regression Plot Section

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#### Run Summary Section

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Parameter	Value	Parameter	Value
Dependent Variable	CYCLOMATIC_COMPLEXITY		Rows Processed
10			
Independent Variable	MAINTAINABILITY	Rows Used in Estimation	10
Frequency Variable	None	Rows with X Missing	0
Weight Variable	None	Rows with Freq Missing	0
Intercept	3810.8578	Rows Prediction Only	0
Slope	5.7986	Sum of Frequencies	10
R-Squared	0.9949	Sum of Weights	10.0000
Correlation	0.9974	Coefficient of Variation	0.0234
Mean Square Error	361053.9	Square Root of MSE	600.8776

#### Summary Statement

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The equation of the straight line relating CYCLOMATIC\_COMPLEXITY and MAINTAINABILITY is estimated as:  $\text{CYCLOMATIC\_COMPLEXITY} = (3810.8578) + (5.7986) \text{MAINTAINABILITY}$  using the 10 observations in this dataset. The y-intercept, the estimated value of CYCLOMATIC\_COMPLEXITY when MAINTAINABILITY is zero, is 3810.8578 with a standard error of 585.6470. The slope, the estimated change in CYCLOMATIC\_COMPLEXITY per unit change in MAINTAINABILITY, is 5.7986 with a standard error of 0.1472. The value of R-Squared, the proportion of the variation in CYCLOMATIC\_COMPLEXITY that can be accounted for by variation in MAINTAINABILITY, is 0.9949. The correlation between CYCLOMATIC\_COMPLEXITY and MAINTAINABILITY is 0.9974.

A significance test that the slope is zero resulted in a t-value of 39.3975. The significance level of this t-test is 0.0000. Since  $0.0000 < 0.0500$ , the hypothesis that the slope is zero is rejected.

The estimated slope is 5.7986. The lower limit of the 95% confidence interval for the slope is 5.4592 and the upper limit is 6.1380. The estimated intercept is 3810.8578. The lower limit of the 95% confidence interval for the intercept is 2460.3533 and the upper limit is 5161.3622.

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#### Regression Estimation Section

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Parameter	Intercept B(0)	Slope B(1)
Regression Coefficients	3810.8578	5.7986
Lower 95% Confidence Limit	2460.3533	5.4592
Upper 95% Confidence Limit	5161.3622	6.1380
Standard Error	585.6470	0.1472
Standardized Coefficient	0.0000	0.9974
T Value	6.5071	39.3975
Prob Level (T Test)	0.0002	0.0000
Reject H0 (Alpha = 0.0500)	Yes	Yes
Power (Alpha = 0.0500)	0.9999	1.0000
Regression of Y on X	3810.8578	5.7986
Inverse Regression from X on Y	3698.3705	5.8285
Orthogonal Regression of Y and X	3701.6036	5.8276

#### Notes:

The above report shows the least-squares estimates of the intercept and slope followed by the corresponding standard errors, confidence intervals, and hypothesis tests. Note that these results are based on several assumptions that should be validated before they are used.

#### Estimated Model

$(3810.85775801676) + (5.79861901322685) * (\text{MAINTAINABILITY})$

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#### Correlation and R-Squared Section

Parameter	Pearson Correlation Coefficient	R-Squared	Spearman Rank Correlation Coefficient
Estimated Value	0.9974	0.9949	1.0000
Lower 95% Conf. Limit (r dist'n)	0.9875		
Upper 95% Conf. Limit (r dist'n)	0.9993		
Lower 95% Conf. Limit (Fisher's z)	0.9888		1.0000
Upper 95% Conf. Limit (Fisher's z)	0.9994		1.0000
Adjusted (Rbar)		0.9942	
T-Value for H0: Rho = 0	39.3975	39.3975	
Prob Level for H0: Rho = 0	0.0000	0.0000	0.0000

#### Notes:

The confidence interval for the Pearson correlation assumes that X and Y follow the bivariate normal distribution. This is a different assumption from linear regression which assumes that X is fixed and Y is normally distributed.

Two confidence intervals are given. The first is based on the exact distribution of Pearson's correlation. The second is based on Fisher's z transformation which approximates the exact distribution using the normal distribution. Why are both provided? Because most books only mention Fisher's approximate method, it will often be needed to do homework. However, the exact methods should be used whenever possible.

The confidence limits can be used to test hypotheses about the correlation. To test the hypothesis that rho is a specific value, say  $r_0$ , check to see if  $r_0$  is between the confidence limits. If it is, the null hypothesis that  $\rho = r_0$  is not rejected. If  $r_0$  is outside the limits, the null hypothesis is rejected.

Spearman's Rank correlation is calculated by replacing the original data with their ranks. This correlation is used when some of the assumptions may be invalid.

#### Summary Matrices

Index	X'X 0	X'X 1	X'Y 2	X'X Inverse 0	X'X Inverse 1
0	10	37638	256357	0.949948	-0.0002258218
1	37638	1.58329E+08	1.061523E+09	-0.0002258218	5.999835E-08
2 (Y'Y)			7.135195E+09		
Determinant		1.666713E+08			5.999835E-09

#### Variance - Covariance Matrix of Regression Coefficients

Index	VC(b) 0	VC(b) 1
0	342982.4	-81.53384
1	-81.53384	0.02166264

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#### Tests of Assumptions Section

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Assumption/Test	Test Value	Prob Level	Is the Assumption Reasonable at the 0.2000 Level of Significance?
<b>Residuals follow Normal Distribution?</b>			
Shapiro Wilk	0.8911	0.174540	No
Anderson Darling	0.5107	0.196424	No
D'Agostino Skewness	-1.2308	0.218393	Yes
D'Agostino Kurtosis	-0.3071	0.758731	Yes
D'Agostino Omnibus	1.6092	0.447258	Yes
<b>Constant Residual Variance?</b>			
Modified Levene Test	0.0043	0.949283	Yes
<b>Relationship is a Straight Line?</b>			
Lack of Linear Fit F(0, 0) Test	0.0000	0.000000	No

#### No Serial Correlation?

Evaluate the Serial-Correlation report and the Durbin-Watson test if you have equal-spaced, time series data.

#### Notes:

A 'Yes' means there is not enough evidence to make this assumption seem unreasonable. This lack of evidence may be because the sample size is too small, the assumptions of the test itself are not met, or the assumption is valid.

A 'No' means the that the assumption is not reasonable. However, since these tests are related to sample size, you should assess the role of sample size in the tests by also evaluating the appropriate plots and graphs. A large dataset (say  $N > 500$ ) will often fail at least one of the normality tests because it is hard to find a large dataset that is perfectly normal.

#### Normality and Constant Residual Variance:

Possible remedies for the failure of these assumptions include using a transformation of Y such as the log or square root, correcting data-recording errors found by looking into outliers, adding additional independent variables, using robust regression, or using bootstrap methods.

#### Straight-Line:

Possible remedies for the failure of this assumption include using nonlinear regression or polynomial regression.

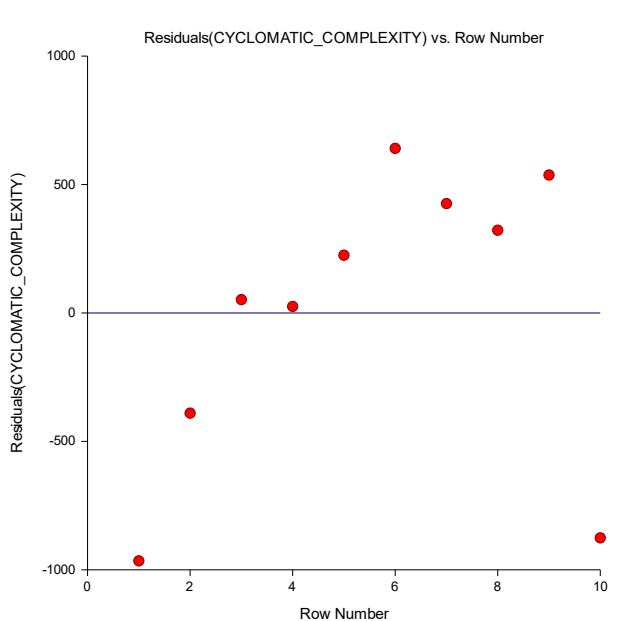
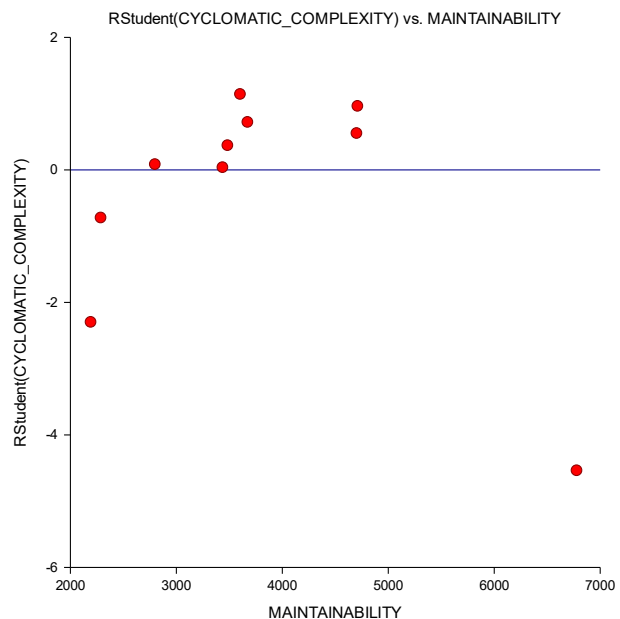
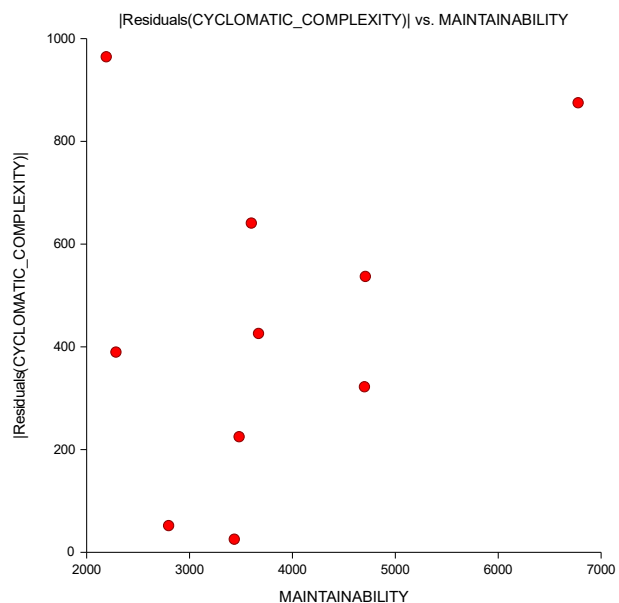
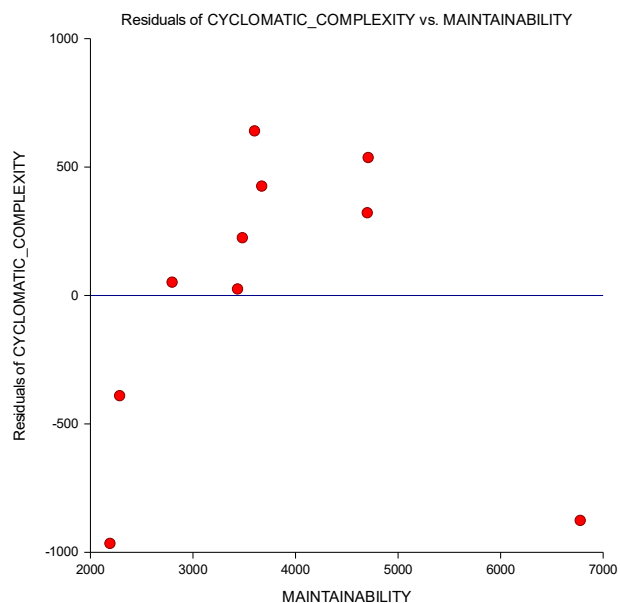
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### Residual Plots Section

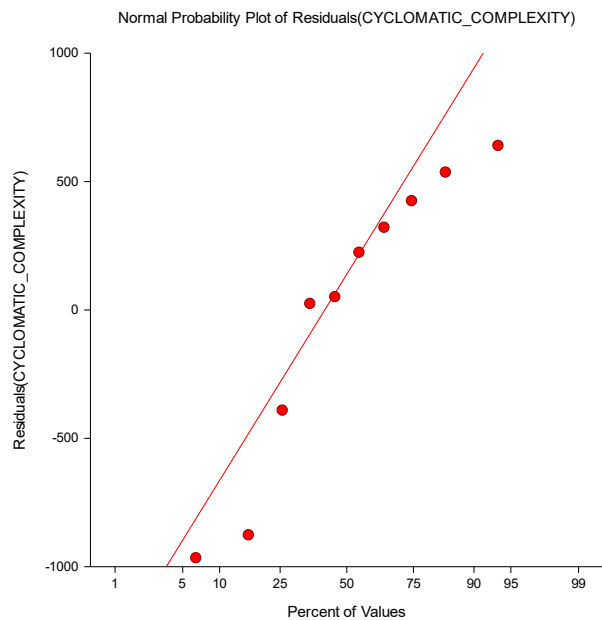
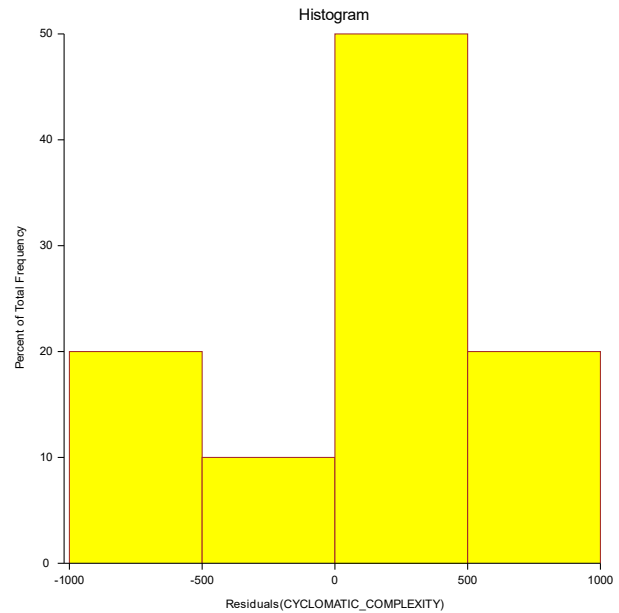
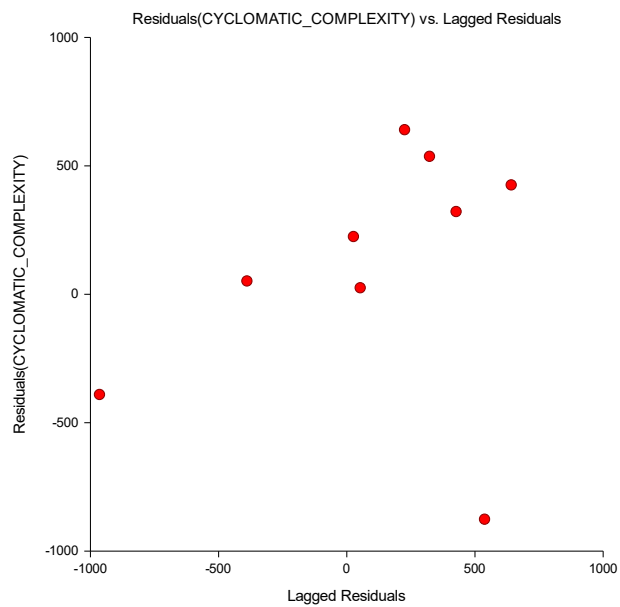
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## Linear Regression Report

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### Procedure Input Settings

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#### Autosaved Template File

C:\Users\KASATLA\Documents\NCSS 12\Procedure Templates\Autosave\Linear Regression and Correlation - Autosaved 2018\_3\_30-1\_3\_22.t153

#### Variables Tab

```
-- Variables -----
Y: Dependent Variable(s):      CYCLOMATIC_COMPLEXITY
X: Independent Variable:       MAINTAINABILITY
Frequency Variable:            <Empty>
Weight Variable:               <Empty>

-- Model Specification -----
Remove Intercept                Unchecked

-- Resampling (Increases computation time) -----
Calculate Bootstrap C.I.'s      Unchecked
Run Randomization Tests         Unchecked

-- Alpha Levels -----
Alpha for C.I.'s and Tests:     0.050
Alpha for Assumptions:         0.20
```

#### Reports Tab

```
-- Select Report / Plot Group -----
Select a Group of Reports and Plots:  Display only those items that are CHECKED BELOW
Show Notes                           Checked
Show All Rows                         Checked

-- Select Reports -----
.. Summaries .....
Run Summary                          Checked
Summary Statement                    Checked
Descriptive Statistics                Unchecked
Correlation and R-Squared             Checked
Summary Matrices                     Checked

.. Estimation .....
Regression Estimation                 Checked

.. ANOVA .....
ANOVA                               Unchecked

.. Assumptions .....
Assumptions                          Checked
  Levene Groups:                      2
Durbin-Watson                        Unchecked
PRESS                                Unchecked
```



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### Procedure Input Settings (Continued)

#### Reports Tab (Continued)

.. Prediction .....	
Predict Y at these X values:	<Empty>
Predicted Y - C.L.	Unchecked
Predicted Y - P.L.	Unchecked
.. Row-by-Row Lists .....	
Original Data	Unchecked
Predicted Y Means	Unchecked
Predicted Y Individuals	Unchecked
Simultaneous Bands	Unchecked
Predicted X Means	Unchecked
Predicted X Individuals	Unchecked
.. Regression Diagnostics .....	
Residuals	Unchecked
Residual Diagnostics	Unchecked
Leave One Row Out	Unchecked
Outlier Detection Chart	Unchecked
Influence Detection Chart	Unchecked
Outlier-Influence Chart	Unchecked

#### Report Options Tab

-- Report Options -----	
Precision:	Single
Variable Names:	Names
.. Decimal Places .....	
Probability:	4
Beta (Coefficients):	4
SE:	4
T:	4
R2:	4
X:	4
Y:	4
Residuals:	4
Std Residuals:	4
Sum Squares:	All
Matrix:	All

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### Procedure Input Settings (Continued)

#### Plots Tab

-- Select Plots -----	
Y vs X	Checked
RStudent vs X	Checked
Histogram	Checked
Residuals vs X	Checked
Residuals vs Row	Checked
Probability Plot	Checked
Residuals  vs X	Checked
Serial Correlation	Checked
-- Plot Options -----	
Y vs X Plot Size:	Medium
All Other Plot Sizes:	Small

#### Resampling Tab

-- Bootstrap Calculation Options -----	
.. Sampling .....	
Samples (N):	3000
Sampling Method:	Observations
Retries:	50
.. Estimation .....	
Percentile Type:	Ave X(p[n+1])
C.I. Method:	Reflection
Bootstrap Confidence Coefficients:	0.90 0.95 0.99
-- Randomization Test Options -----	
Monte Carlo Samples:	1000

#### Storage Tab

-- Data Storage Options -----	
Storage Option:	Do not store data