

# NCSS 2004 – “Number Cruncher”

## Comprehensive, Easy to use, Statistical Software

NCSS is a comprehensive, easy-to-use, statistical program. It is...

- Comprehensive and accurate. Includes over 220 procedures and graphics.
- Easy to learn and use.
- Windows 98/ME/NT/2000/XP compatible.
- Imports/ exports major spreadsheet, database, and statistical file formats.
- Year 2000 Compliant.
- Output mixes text and graphics and is easily transferred to word processors.
- Processes large data files (over 1000

### Trial Copy Available

You can try out NCSS by downloading it from our website. This trial copy allows the analysis of up to one hundred rows of data. It is good for 30 days from the time you install the software.

	Height	Weight	Group	YidA	YidB	Rt
1	64	159	1	452	546	
2	63	155	2	874	547	
3	67	157	2	554	774	
4	60	125	1	447	465	
5	52	103	2	356	459	
6	58	122	2	754	665	

### Built-In Spreadsheet

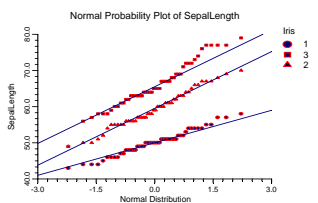
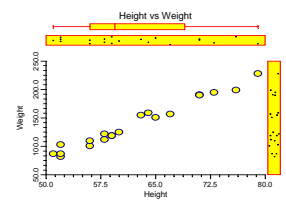
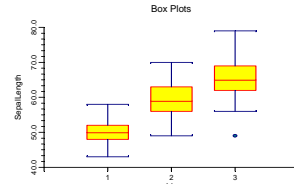
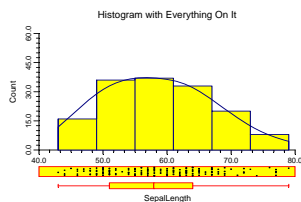
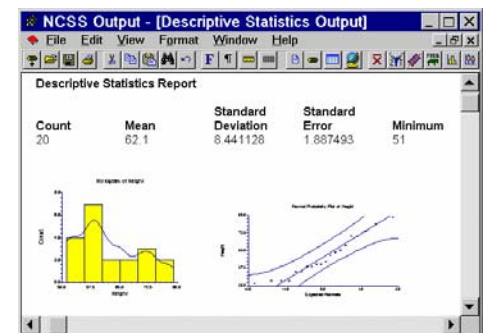
Entering data is simple using our Microsoft Excel™ compatible spreadsheet. We import (and export) Lotus™, Excel™, dBase™, Access™, SAS™, SPSS™, Paradox™, and ASCII formats. So if your data is in another format, chances are you can easily import it into NCSS.

### System Requirements

Runs on all modern Windows compatible computers with at least 64 megs of RAM and 60 megs of hard disk space.

### Built-In Word Processor

All reports are displayed using our built-in word processor. You can quickly view, edit, save, and print your output. Reports are stored in the rich-text format that can be read by most word processors, so you can easily save NCSS reports for further use in Word™. The output document mixes text and graphs together. The text portions of the reports are formatted using tabs (not spaces), so they are easily reformatted.



### ANOVA and T-Tests

Analysis of Covariance  
Analysis of Variance  
Bartlett Variance Test  
Crossover Design Analysis  
Factorial Design Analysis  
Friedman Test  
Geiser-Greenhouse  
General Linear Models  
Mann-Whitney Test  
MANOVA  
Multiple Comparisons  
One-Sample T-Tests  
One-Way ANOVA  
Paired T-Tests  
Power Calculations  
Repeated Measures  
T-Tests – 1 or 2 Groups  
T-Tests – From Means, SD's  
Wilcoxon Test

### Time Series Analysis

ARIMA / Box - Jenkins  
Decomposition  
Exponential Smoothing  
Harmonic Analysis  
Holt - Winters  
Seasonal Analysis  
Spectral Analysis  
Trend Analysis

### Plots and Graphs

Bar Charts  
Box Plots  
Contour Plot  
Dot Plots  
Error Bar Charts  
Histograms  
Histograms: Combined  
Percentile Plots  
Pie Charts  
Probability Plots  
ROC Curves  
Scatter Plots  
Scatter Plot Matrix  
Surface Plots  
Violin Plots  
**Experimental Designs**  
Balanced Inc. Block  
Box-Behnken  
Central Composite  
D-Optimal Designs  
Fractional Factorial  
Latin Squares  
Plackett-Burman  
Response Surface  
Screening  
Taguchi

### Regression / Correlation

All-Possible Search  
Canonical Correlation  
Correlation Matrices  
Cox Regression  
Kendall's Tau Correlation  
Linear Regression  
Logistic Regression  
Multiple Regression  
Nonlinear Regression  
PC Regression  
Poisson Regression  
Response-Surface  
Ridge Regression  
Robust Regression  
Stepwise Regression  
Spearman Correlation  
Variable Selection  
**Curve Fitting**  
Bootstrap C.I.'s  
Built-In Models  
Group Fitting and Testing  
Model Searching  
Nonlinear Regression  
Randomization Tests  
Ratio of Polynomials  
User-Specified Models

### Survival / Reliability

Accelerated Life Tests  
Cumulative Incidence  
Exponential Fitting  
Extreme-Value Fitting  
Hazard Rates  
Kaplan-Meier Curves  
Life-Table Analysis  
Lognormal Fitting  
Log-Rank Tests  
Probit Analysis  
Proportional-Hazards  
Survival Distributions  
Time Calculator  
Weibull Analysis  
**Multivariate Analysis**  
Cluster Analysis  
Correspondence  
Analysis  
Discriminant Analysis  
Factor Analysis  
Hotelling's T-Squared  
Item Analysis  
Item Response Analysis  
Loglinear Models  
MANOVA  
Multi-Way Tables  
Multidimensional Scaling  
Principal Components

### Quality Control

Xbar-R Chart  
C, P, NP, U Charts  
Capability Analysis  
Cusum, EWMA Chart  
Individuals Chart  
Moving Average Chart  
Pareto Chart  
R & R Studies  
**Miscellaneous**  
Area Under Curve  
Chi-Square Test  
Confidence Limits  
Cross Tabulation  
Data Screening  
Fisher's Exact Test  
Frequency Distributions  
Nonparametric Tests  
Normality Tests  
Probability Calculator  
Tables of Means, Etc.  
Trimmed Means  
Univariate Statistics  
**Meta-Analysis**  
Independent  
Proportions  
Correlated Proportions  
Hazard Ratios  
Means

### Binary Diagnostic Tests

One Sample  
Two Samples  
Paired Samples  
Clustered Samples  
**Proportions**  
Tolerance Intervals  
Two Independent  
Two Correlated  
Exact Tests  
Exact Confidence Intervals  
Farrington-Manning  
Fisher Exact Test  
Gart-Nam Method  
Mantel-Haenszel Test  
McNemar Test  
Miettinen-Nurminen  
Wilson's Score Method  
Equivalence Tests  
Noninferiority Tests  
**Mass Appraisal**  
Comparables Reports  
Hybrid (Feedback) Model  
Nonlinear Regression  
Sales Ratios

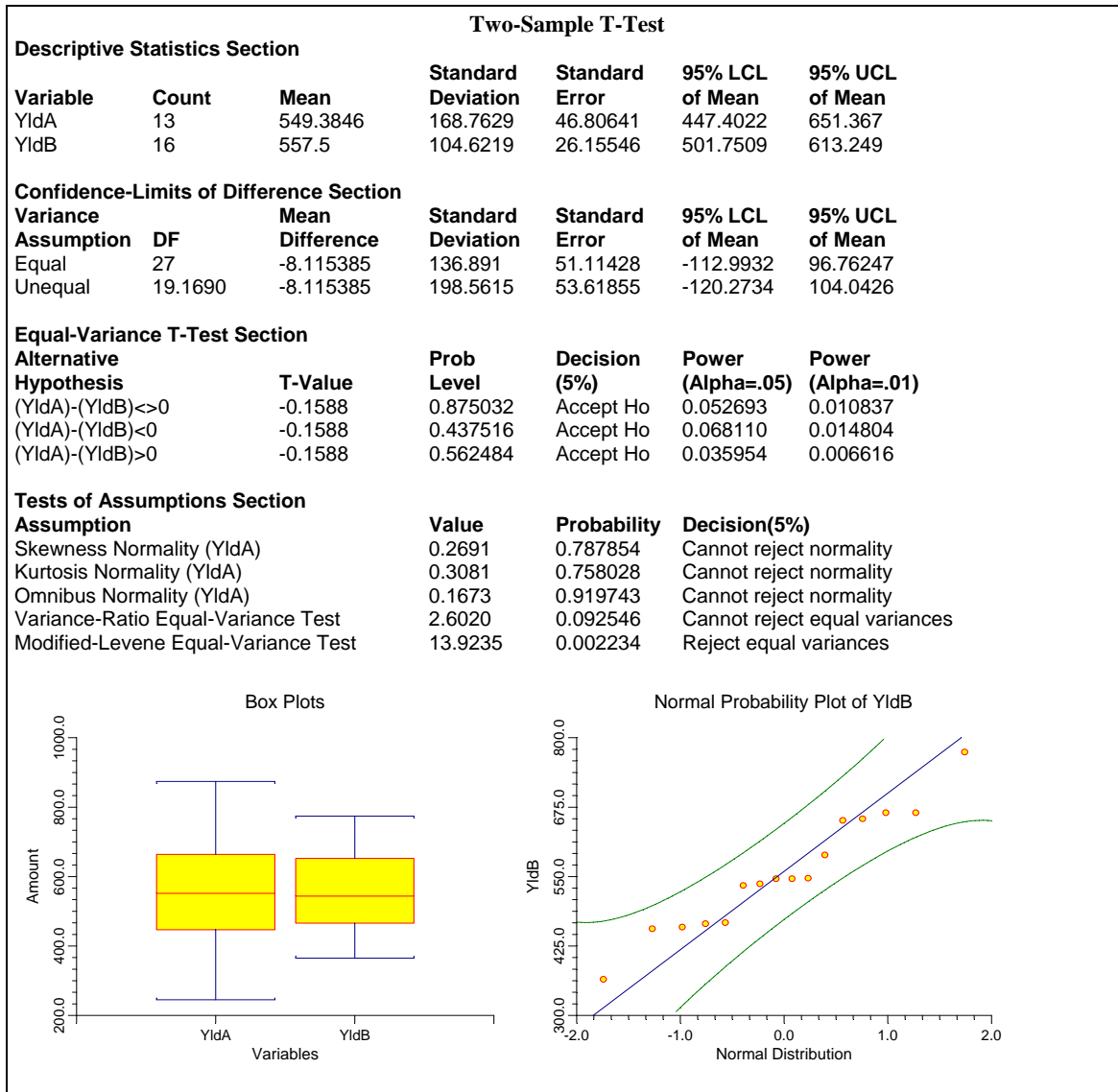
NCSS Statistical Software • 329 North 1000 East • Kaysville, Utah 84037

Internet (download free demo version): <http://www.ncss.com> • Email: [sales@ncss.com](mailto:sales@ncss.com)

Toll Free: (800) 898-6109 • Tel: (801) 546-0445 • Fax: (801) 546-3907

# T-Tests

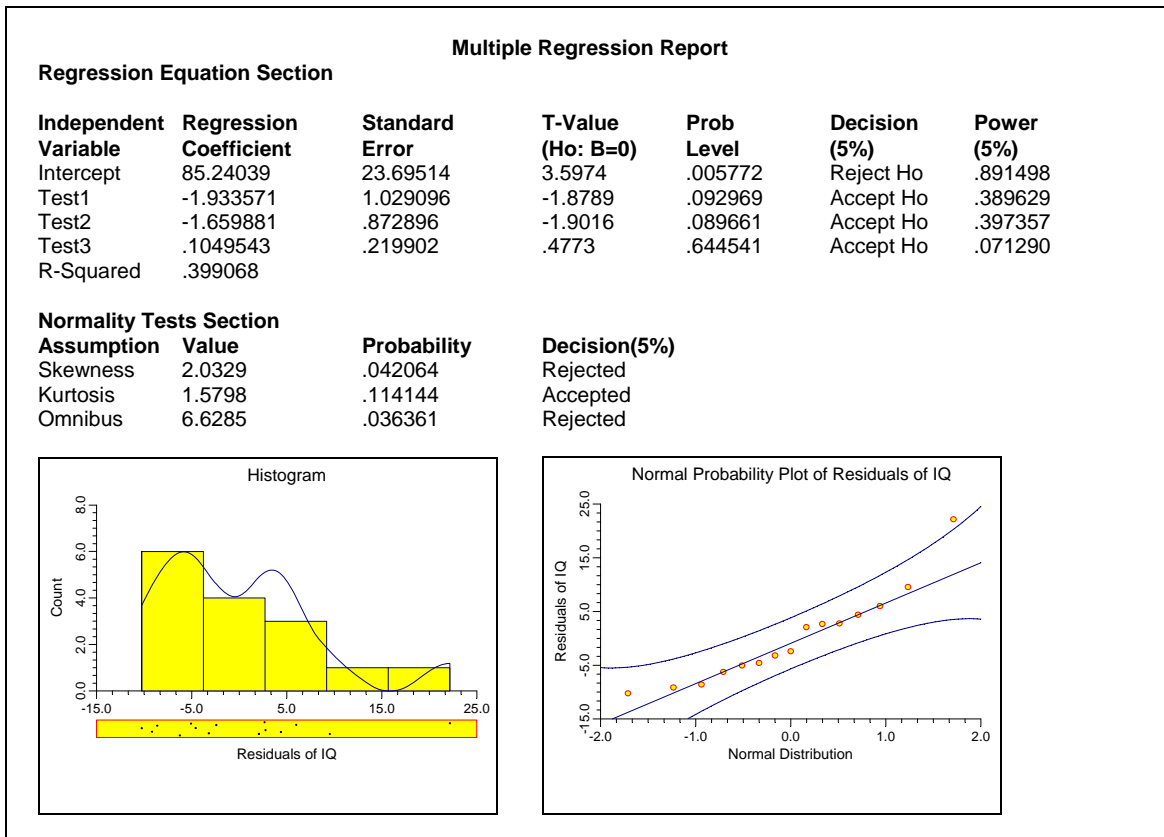
The *t*-test procedures test the difference between two averages. The *two sample t-test* is used when the means come from two independent samples. The *paired t-test* is used when the observations are obtained in pairs. The *one sample t-test* is used to compare a single mean with a target value. *NCSS* offers a comprehensive *t*-test analysis. It automatically checks all model assumptions, performs analogous nonparametric tests, displays appropriate plots, and computes confidence limits.



- Aspin-Welch unequal-variance test
- Box plots
- Confidence limits
- Descriptive statistics
- Hotelling's T-Squared
- Kolmogorov-Smirnov test
- Levene equal-variance test
- Mann-Whitney U test
- Normal probability plots
- Normality tests
- One and two tailed tests
- One sample t-test
- Pair t-test
- Power calculations
- Probability levels
- Quantile test
- Randomization Tests
- Two sample t-test
- T-Tests on summary stats
- Unequal variance case
- Wilcoxon rank sum test

# Regression Analysis

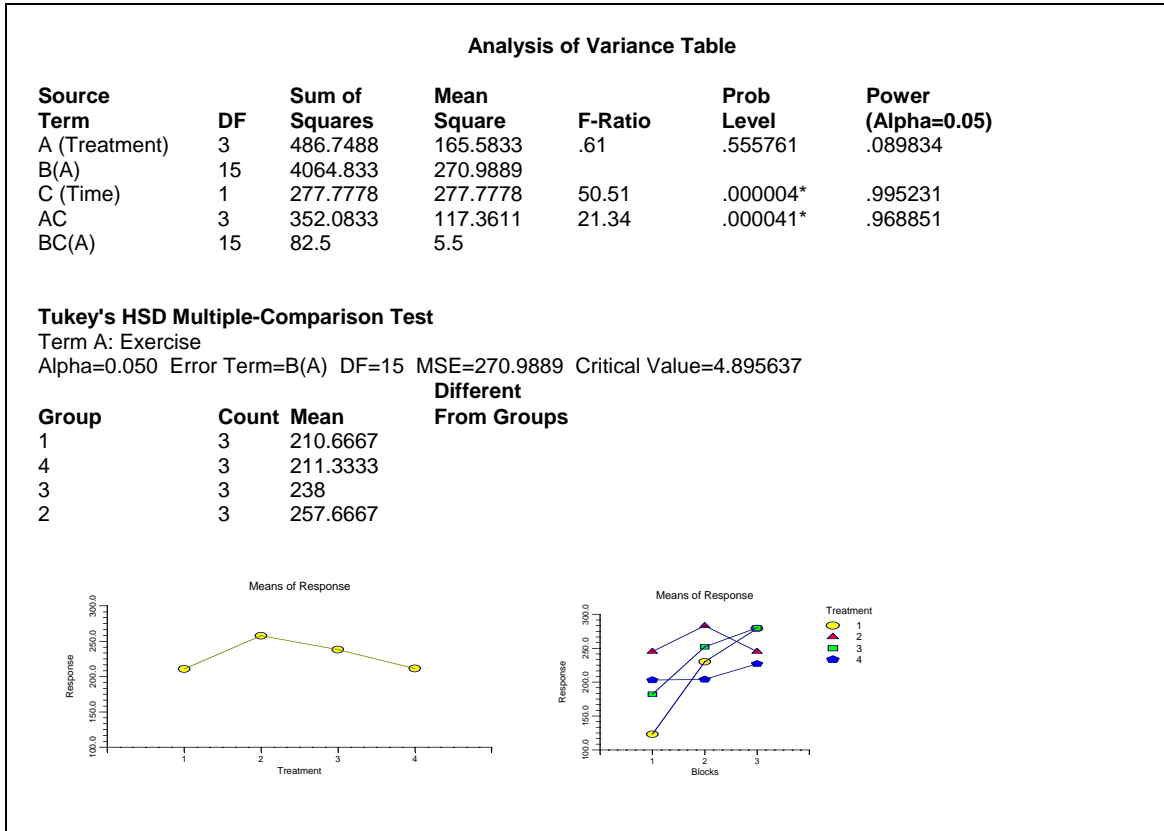
Regression analysis refers to a group of techniques for studying the relationships among two or more variables. *NCSS* makes it easy to run either a simple linear regression analysis or a complex multiple regression analysis. You can perform a regression analysis with modern graphical and numeric residual analysis. Major options include multiple regression (with bootstrapping), stepwise regression, Cox regression, correlation matrix, residual analysis, robust regression, all-possible regressions, linear regression, response surface regression, proportional hazards regression, ridge regression, Poisson regression, and logistic regression.



- All-possible regressions
- Alpha level is flexible
- Beta coefficients
- Bootstrap C.I.'s
- Coefficient of variation
- Condition number
- Cook's D
- Correlations
- CovRatio
- Cox regression
- Cp Statistic
- DFBetas
- Dffits
- Durbin Watson statistic
- Eigenvalues
- Eigenvectors
- F-ratios
- Hat diagonal
- Inverse diagonal
- Linear regression
- Logistic regression
- Mean squares
- Multiple regression
- Multiple regression
- Normal probability plot
- Normality tests of residuals
- Partial correlation
- Poisson regression
- Power calculations
- Predicted values
- Prediction limits
- Predicts new observations
- Press statistic
- P.C. Regression
- Proportional-Hazards
- Randomization Tests
- R-squared
- Regression coefficient
- Residual analysis and plots
- Response surface analysis
- Ridge Regression
- Robust regression
- Rstudent
- Serial correlation plot
- Simple linear regression
- Spearman's rank correlation
- Standard error of beta
- Standardized coefficient
- Stepwise regression
- Sum of squares
- T-test for beta=0
- Through the origin
- Tolerance level
- Variable selection
- Variance inflation factor
- Weighted regression

# Analysis of Variance

Analysis of variance is the statistical technique for testing differences among group means. NCSS contains several analysis of variance procedures, including general linear models (GLM), one-way analysis of variance, unweighted means analysis of variance, and MANOVA. You can perform a simple one-way analysis of variance, a complex repeated-measures analysis of variance, a factorial analysis of variance, an analysis of covariance, and a host of multiple-comparison tests. All procedures work with balanced and unbalanced experimental designs.

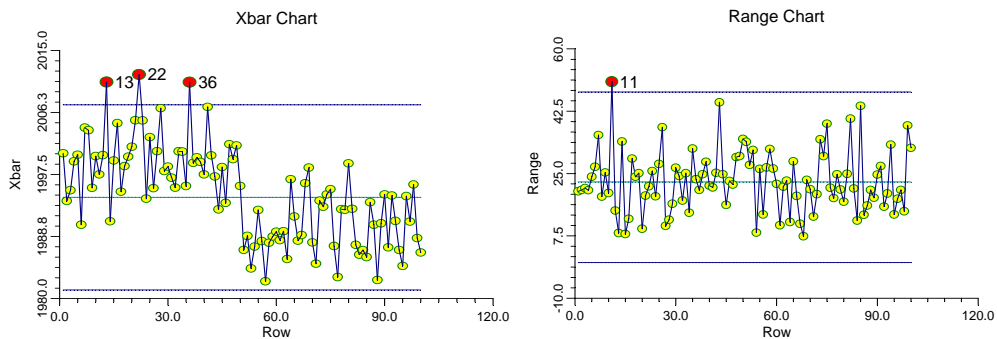


- Analysis of covariance
- ANOVA table
- Area Under Curve
- Assumptions testing
- Automatic F-ratios
- Bonferroni tests
- Box plots
- Box's M test
- Comparisons
- Covariance analysis
- Crossover Analysis
- Duncans test
- Expected mean squares
- F-ratios
- Factorial designs
- Fishers LSD test
- Fixed terms
- Fractional factorial designs
- Geisser-Greenhouse
- GLM solution
- Hotelling's trace
- Huynh-Feldt Correction
- Interaction plots
- Kruskal Wallis z tests
- Latin square designs
- Least-squares means
- Levene Variance test
- MANOVA (with up to 10 factors)
- Mauchley's Test
- Mean Squares
- Means plots
- Multiple comparisons of factors
- Multiple comparisons of interactions
- Nested terms
- Newman-Keuls test
- Normality tests
- Pillai's Trace
- Planned comparisons
- Post-hoc tests
- Power calculations
- Random terms
- Randomized complete block
- Repeated measures
- R and R Study
- Roy's Root
- Scheffe's test
- Split-plot designs
- Tukey-Kramer HSD tests
- Unbalanced data
- Wilks' Lambda

# Quality Control Charts and SPC

NCSS provides a complete set of the latest variables and attribute control charts. It includes popular features such as runs tests, individuals charts, automatic outlier removal, capability analysis, user-supplied sigma, and comprehensive chart labeling. Since the quality control programs are completely integrated with the rest of the system, once you detect an out-of-control signal, you can investigate with the other procedures in NCSS.

## Xbar and R Charts



### Out-of-Control List

Row	Mean	Range	Row Label	Reason
4	6.8	5	4	Range: 4 of 5 in zone B or beyond
5	12.2	48	5	Xbar: beyond control limits
6	9.8	27	6	Xbar: 2 of 3 in zone A
7	5.6	4	7	Xbar: 2 of 3 in zone A

### Capability Analysis Section

Parameter	Lower	Center	Upper
3-Sigma Limits	-5.390758	6.036585	17.46393
4-Sigma Limits	-9.199872	6.036585	21.27304
Specification Limits	1		14
Specification z-Values	-1.322246		2.090621
Percent Outside Specification	3.252033		2.439024
Capacities	0.440749		0.696874
Cp Index	0.518452	0.568811	0.619112
Cpk Index	0.383108	0.440749	0.498389
Count = 246   Sigma = 3.809114   Alpha Level = 0.050000			

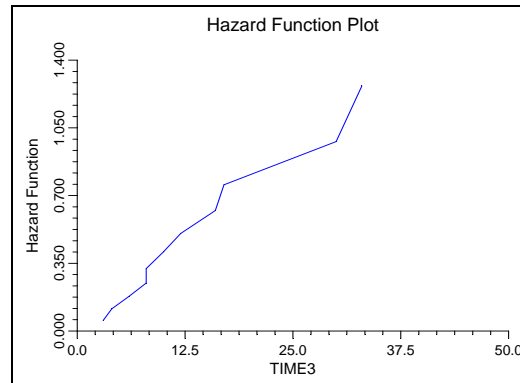
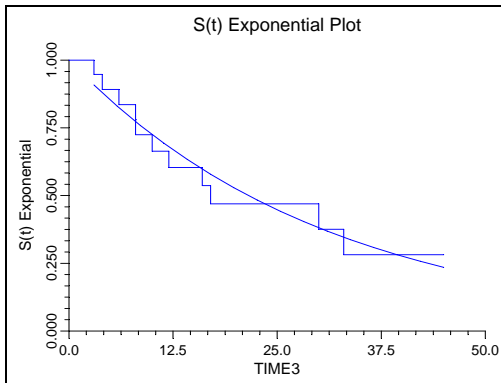
- Attribute charts
- C chart
- Capability analysis
- Cp index
- Cpk Index
- Cusum chart
- EWMA chart
- Exception report
- Frequency distribution
- Histogram
- Individuals chart
- Moving average chart
- Moving range chart
- Normality test
- NP chart
- Out-of-control list
- P chart
- Pareto charts
- Primary control limits
- R and R Study
- R chart
- Robust chart analysis
- Runs tests
- S (sigma) chart
- Secondary control limits
- U chart
- Variables charts
- Xbar chart
- Zone display

# Survival Analysis

Survival analysis includes several techniques to study data in which the response variable is elapsed time. Procedures include survival distribution analysis (including the Kaplan-Meier survival distribution estimate), log rank tests, and proportional hazards regression.

## Kaplan-Meier Product-Limit Survival Distribution

Rank	Sample Size	Time	Survivorship S(t)	Std Error of S(t)	Hazard Fn H(t)=-Log(S(t))	Std Error of H(t)
1	19	3.0	.947368	.051228	.054067	.238910
2	18	3.0+				
3	17	4.0	.891641	.072440	.114692	.301855
4	16	6.0	.835913	.086738	.179230	.352326
5	15	8.0	.780186	.097223	.248223	.399657
6	14	8.0	.724458	.105043	.322331	.447373
7	13	8.0+				
8	12	10.0	.664087	.112306	.409343	.504634
9	11	12.0	.603715	.117205	.504653	.567076
10	10	13.0+				
11	9	16.0	.536636	.121875	.622436	.650547
12	8	17.0	.469556	.123732	.755967	.749122
13	7	21.0+				
14	6	26.0+				
15	5	30.0	.375645	.129821	.979111	.959169
16	4	33.0	.281734	.126865	1.266793	1.264245
17	3	35.0+				
18	2	44.0+				
19	1	45.0+				

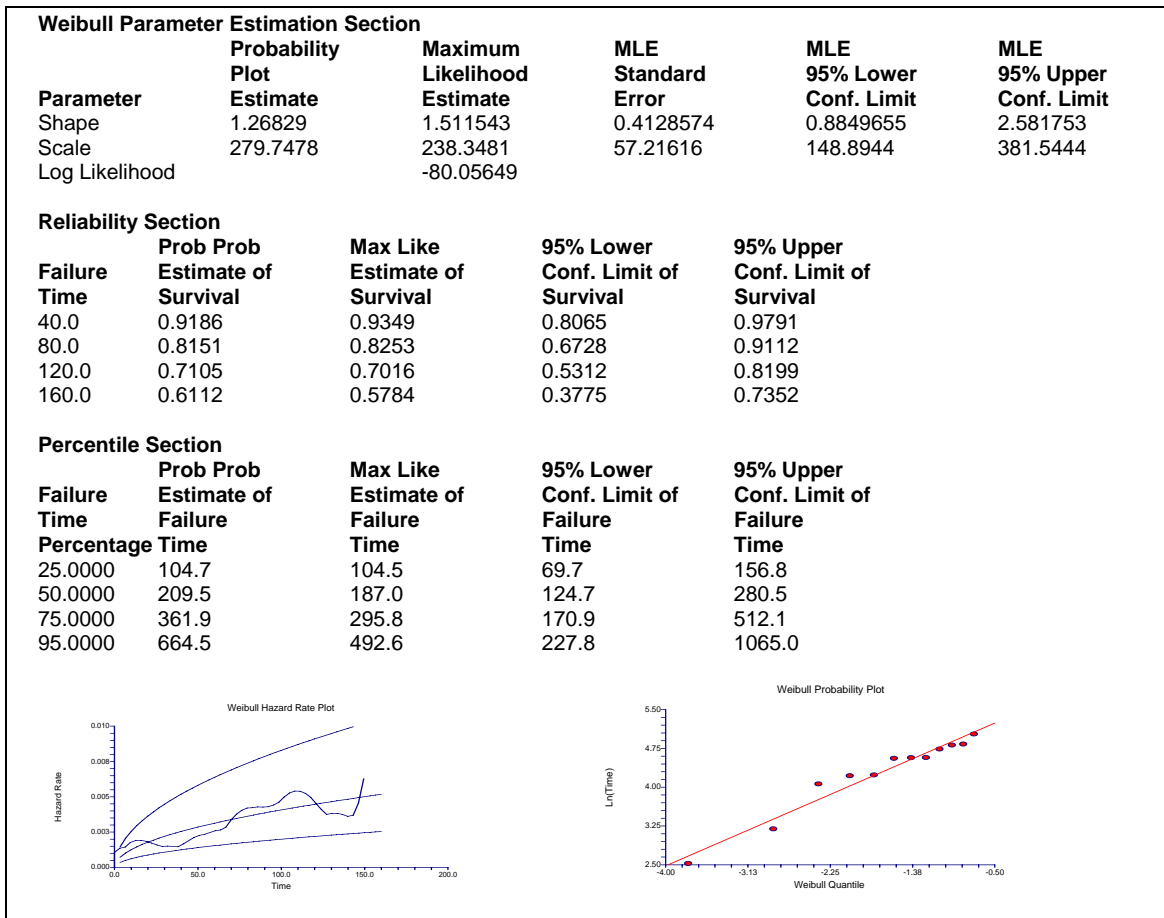


- Accelerated life testing
- Beta distribution
- Censoring – All Types
- Cox regression
- Cox-Mantel test
- Cumulative Incidence
- Exponential distribution
- Exponential regression
- Extreme Value distribution
- Extreme Value regression
- Gamma distribution
- Gehan's Wilcoxon test
- Goodness of fit
- Hazard rate plots
- Hazard functions & plots
- Kaplan-Meier curves
- Least squares estimates
- Life-Table Analysis
- Log-logistic distribution
- Log-logistic regression
- Log rank test
- Lognormal distribution
- Lognormal regression
- Maximum likelihood
- Peto / Wilcoxon test
- Probit Analysis
- Proportional hazards regression
- Rayleigh distribution
- Reliability statistics
- Stress variables
- Survival functions & plots
- Survival percentiles
- Variable selection options
- Weibull distribution
- Weibull regression

# Reliability Analysis

The reliability procedure estimates the parameters of the exponential, extreme value, logistic, log-logistic, lognormal, normal, and Weibull probability distributions by maximum likelihood and least squares. It can fit complete, right censored, left censored, interval censored (readout), and grouped data values. It also computes the nonparametric Kaplan-Meier and Nelson-Aalen estimates of reliability and associated hazard rates.

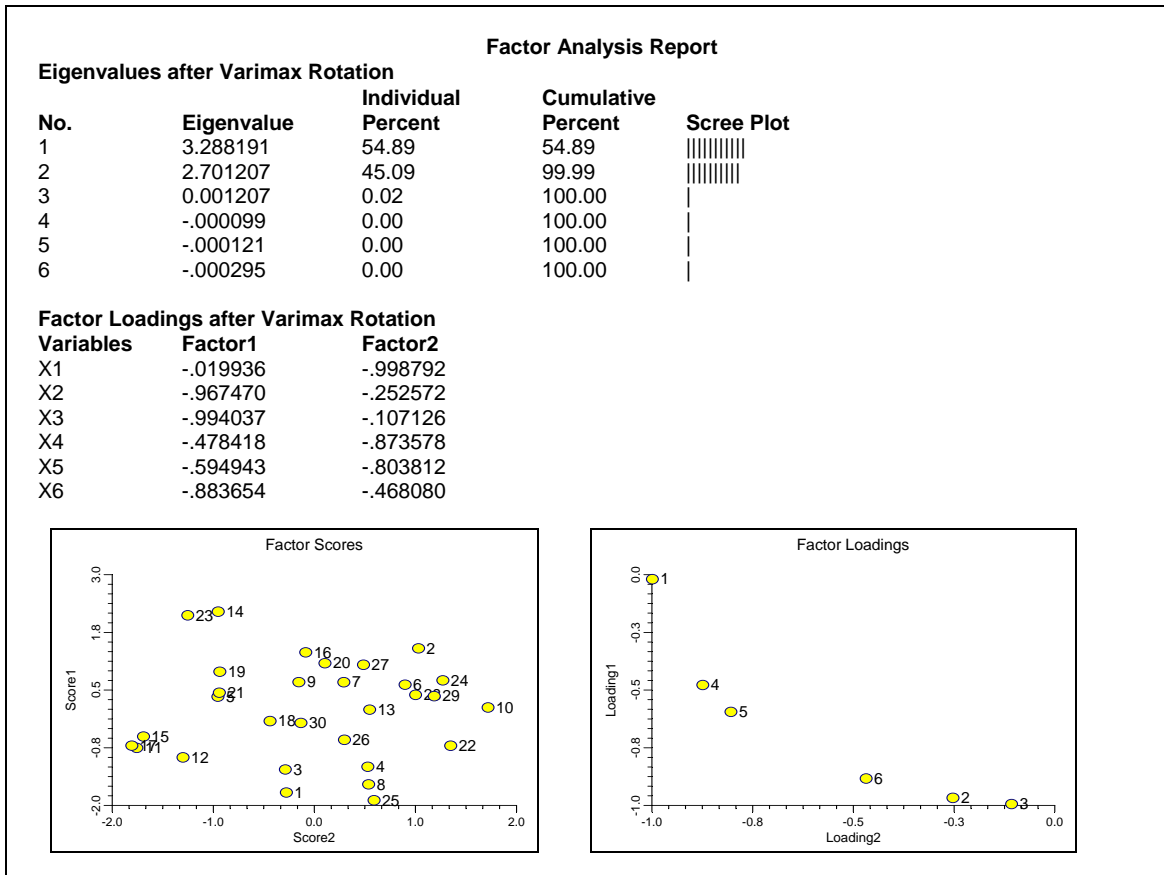
Another module fits the regression relationship between time-to-failure and one or more independent variables. The distribution of the residuals (errors) can follow the exponential, extreme value, logistic, log-logistic, lognormal, lognormal10, normal, or Weibull distributions. The data may include failed, left censored, right censored, and interval observations. This type of data often arises in the area of *accelerated life testing*.



- Accelerated life testing
- Arrhenius transformation
- Beta distribution
- Censoring – All Types
- Cox regression
- Cox-Snell Residuals
- Distribution selection
- Exponential distribution
- Exponential regression
- Extreme-value distribution
- Extreme-value regression
- Failure time percentiles
- Gamma distribution
- Goodness of fit
- Hazard rate plots
- Hazard functions & plots
- Information Matrix
- Kaplan-Meier product limit
- Least squares estimates
- Log-logistic distribution
- Log-logistic regression
- Lognormal distribution
- Lognormal regression
- Maximum likelihood
- Probability plots
- Reliability statistics
- Residual Analysis
- Residual Life Report
- Stress variables
- Stress plots
- Threshold Estimate
- Weibull distribution
- Weibull regression

# Multivariate Analysis

Multivariate analysis refers to a group of statistical techniques that analyze two or more variables at a time, including: discriminant analysis, factor analysis, cluster analysis, (multinomial) logistic regression, MANOVA, and principal component analysis.



- **Discriminant Analysis**

- Canonical coefficient
- Classification reports
- Influential variable reports
- Linear discriminant functions, scores, and coefficients
- Prior probabilities
- Stepwise variable selection
- **Cluster Algorithms**
- Complete Linkage
- Dendrograms
- Fuzzy clustering
- Hierarchical
- K-means algorithm
- Mediod partitioning
- Nearest neighbor
- Regression clustering
- Single Linkage

- **Factor and Principal Component Analysis**

- Bartlett's sphericity test
- Communality estimates
- Correlation matrix input
- Eigenvalue/vector analysis
- Factor loadings and scores
- Gleason-Staelin redundancy
- Missing value estimation
- Outlier detection
- Principal axis method
- Quartimax rotation
- Robust estimation
- Score and Loading Plots
- Scree plot
- T<sup>2</sup> analysis
- Varimax rotation
- **Equality of Covariance**
- Bartlett's variance test
- Box's M test
- Cronbachs alpha
- Eigenvalue analysis

- **MANOVA**

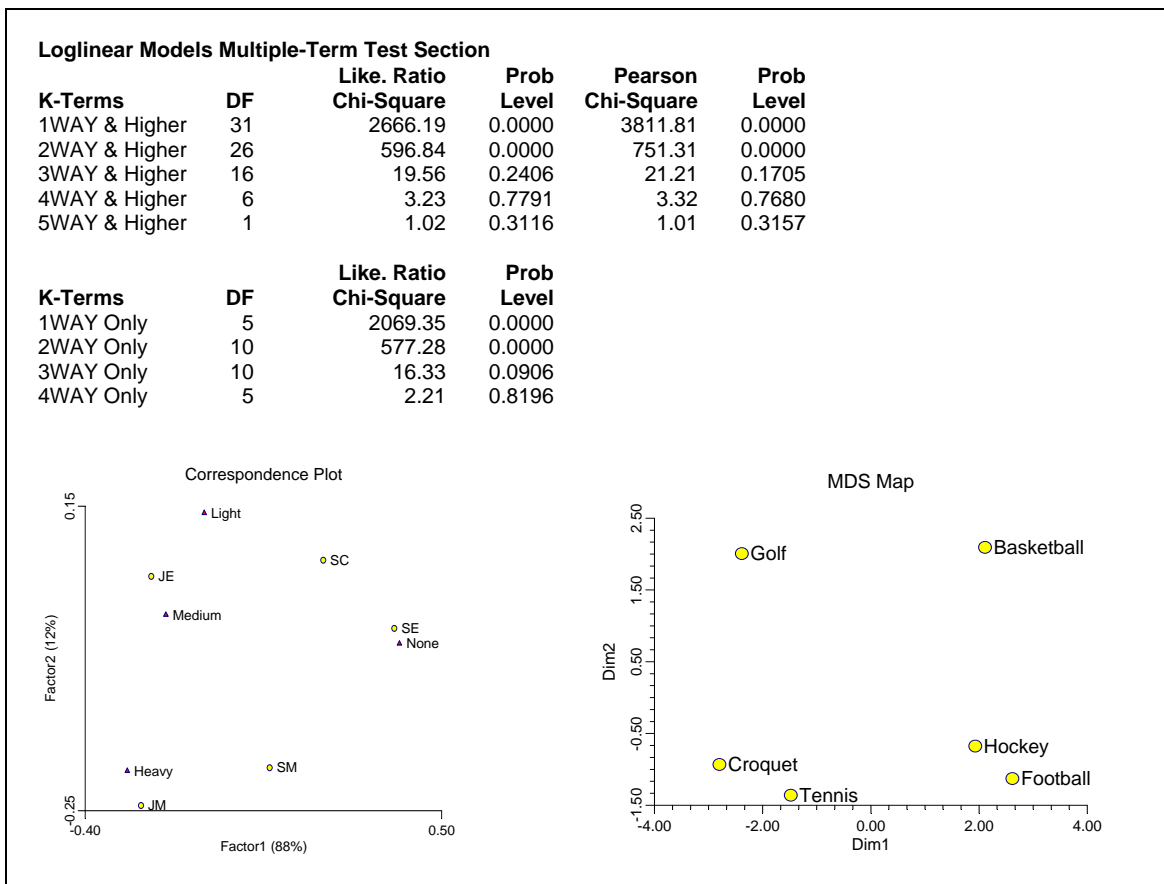
- Approximate F-test
- Box's M test
- Canonical analysis
- Homogeneity of variance test
- Hotelling's T<sup>2</sup>
- Lawley-Hotelling trace
- Pillai's trace
- Roy's largest root
- Wilks' lambda
- **Logistic Regression**
- Analysis of Deviance
- Beta estimates
- Categorical IV's
- Chi-square tests
- Classification table
- Multiple Groups
- Normal probability plots
- Odds ratios
- Predict new observations
- Step-down variable selection
- Step-up variable selection

# More Multivariate Procedures

*Loglinear models* techniques are used to analyze the relationships among the factors in a multi-way contingency table. Several model selection techniques, goodness of fit tests, and parameter estimation reports are provided.

*Correspondence analysis* is a technique for graphically displaying a two-way contingency table by calculating coordinates representing its rows and columns. These coordinates are analogous to factors in a factor analysis.

*Multidimensional scaling* is a technique that creates a map displaying the relative positions of a number of objects, given only a table of the distances between them. The program calculates either the metric or the non-metric solution.



- **Loglinear Models**

- Automatic model selection
- Delta value for zero cells
- Estimated effects
- Goodness of fit statistics
- Hierarchical models
- Likelihood ratio tests
- Pearson chi-square tests
- Residual analysis
- Up to seven factors

- **Correspondence Analysis**

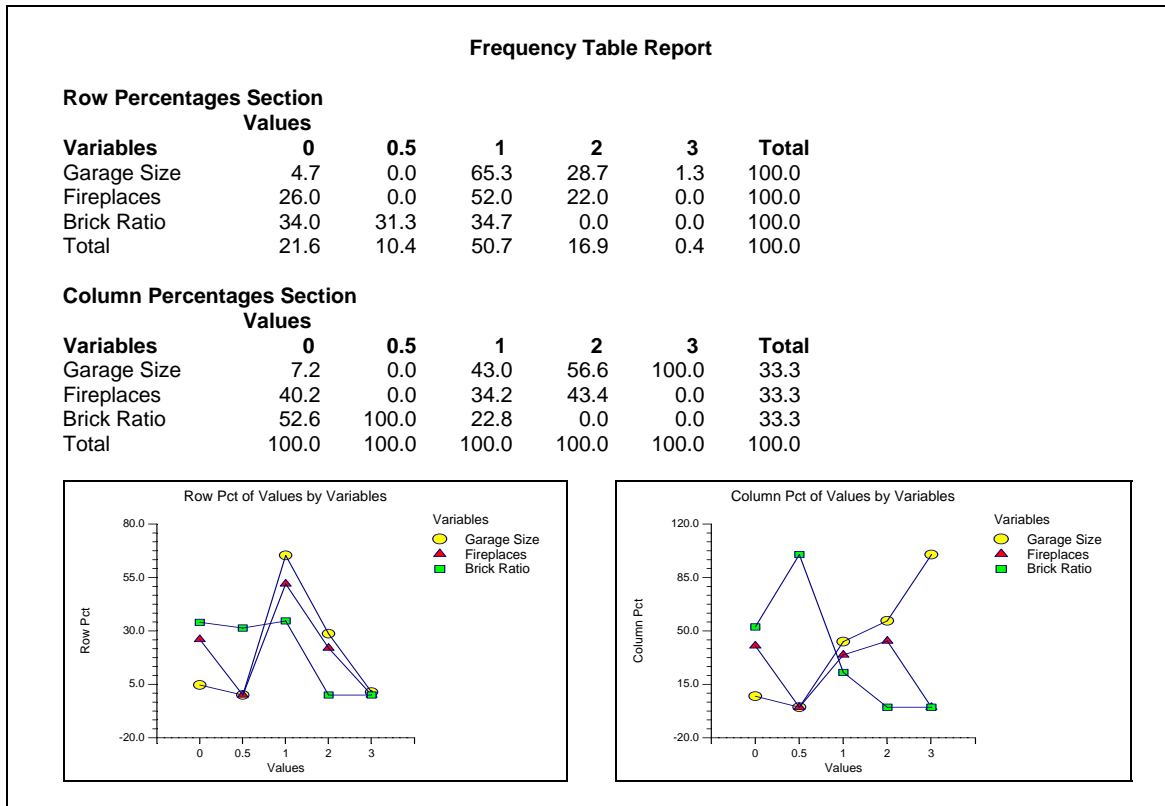
- Chi-square contributions
- Column/row profiles
- Coordinates report
- Eigenvalues
- Mass values
- Point quality index
- Supplementary rows
- Variable/profile correlation

- **Multidimensional Scaling**

- Classical (metric) scaling
- Dissimilarity and correlation input
- Eigenvalue report
- Kruskal's stress statistic
- Non-metric scaling

# Descriptive Statistics and Cross Tabulation

Several procedures are available for tabulating and summarizing your data. The frequency table procedure provides tabulation of single variables. The cross tabulation procedure provides tabulation of two variables into two-way tables. The descriptive tables procedure computes summary statistics (means, median, standard deviations, etc.) according to up to eight breakdown variables. All of these procedures provide numeric and graphic reports. A specialized appraisal ratio module provides reports for mass appraisal.



## • Cross Tabulation

- Armitage test for trend
- Break Variables (up to five)
- Chi-square test
- Contingency analysis
- Continuous variables allowed
- Cramer's V
- Expected values
- Fisher's exact test
- Gamma
- Kendall's tau - B & C
- Lambda A & B
- McNemar Test
- Percentages
- Phi coefficient
- Text variables allowed
- Tschuprow's T
- Value labels

## • Descriptive Statistics

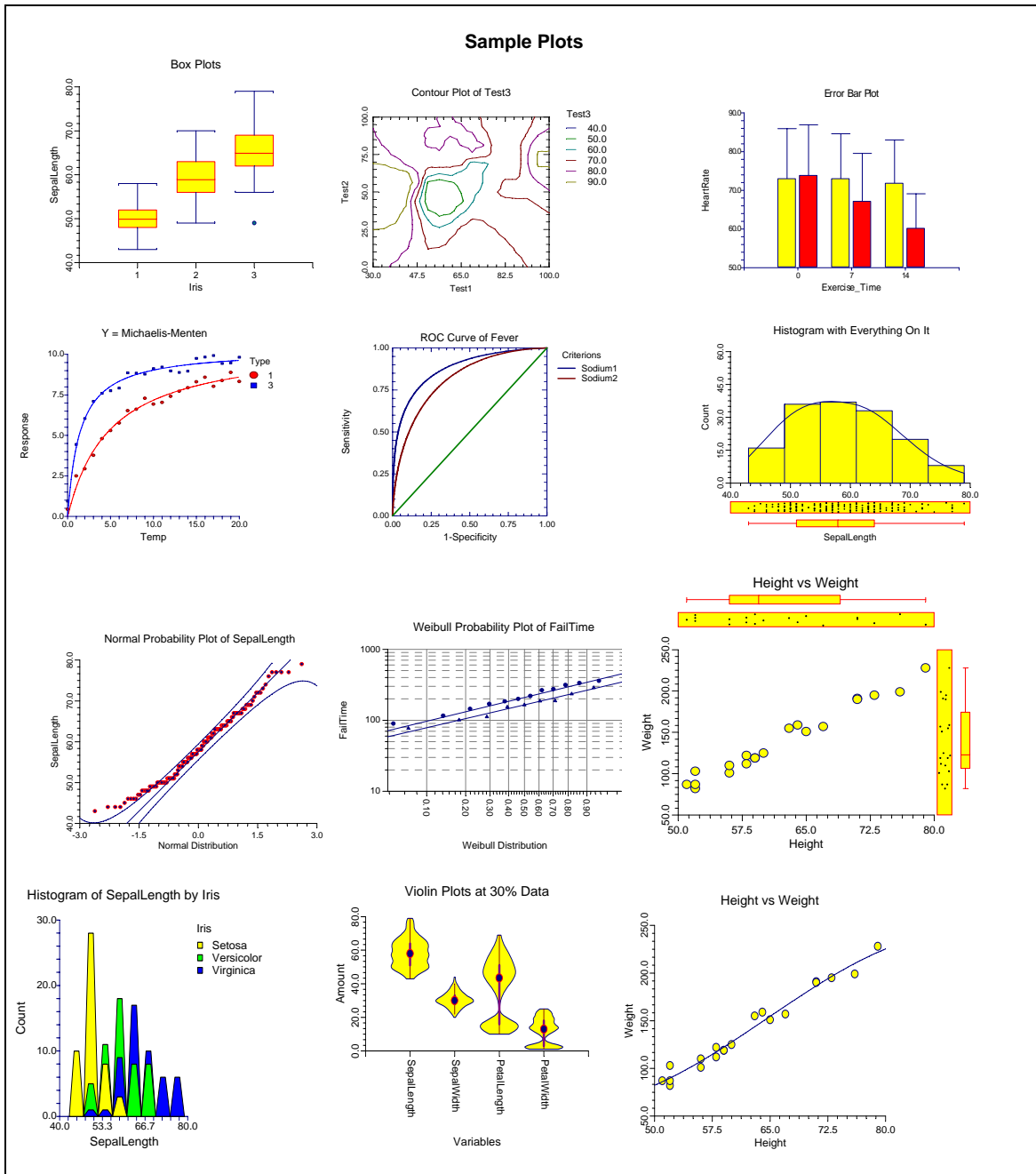
- Average absolute deviation
- Coef. of dispersion - COD
- Coefficient of variation
- Confidence limits
- Density trace
- Fisher's g1 and g2
- Geometric mean
- Harmonic mean
- Histogram
- Kurtosis measures
- Means, medians, modes
- Minimum and maximum
- Normal probability plot
- Normality tests
- Percentiles
- Price-related diff. - PRD
- Skewness measures
- Standard deviation / error
- Stem-leaf plot
- Trimmed mean

## • Descriptive Tables

- Numeric break variables
- One-way and Two-way tables
- Plots of tabulated statistics
- Tables of medians, means, standard deviations, counts, COV's, and COD's
- Text break variables
- Value labels
- **Frequency Tables**
- Chi-square test
- Counts
- Cumulative statistics
- Frequency distribution
- Multinomial test
- Percents

# Charts and Graphs

NCSS provides a complete set of statistical charts and graphs. You control the labels, lines, and colors of the graphs. The graphs may be copied to your favorite word processor or graphics editing package.



- Box plot
- Chi-square probability plot
- Density trace
- Dot plot
- Error-bar plot
- Exponential probability plot
- Frequency polygon

- Gamma probability plot
- Grid plot
- Half normal probability plot
- Histogram
- Normal probability plot
- Percentile plot
- Scatter plot

- Scatter plot matrix
- Sunflower plot
- Uniform probability plot
- Violin plot
- Weibull probability plot

# Meta Analysis

NCSS provides procedures for combining studies measuring paired proportions, means, independent proportions, and hazard ratios. Plots include the forest plot, radial plot, and L'Abbe plot. Both fixed and random effects models are available for combining the results.

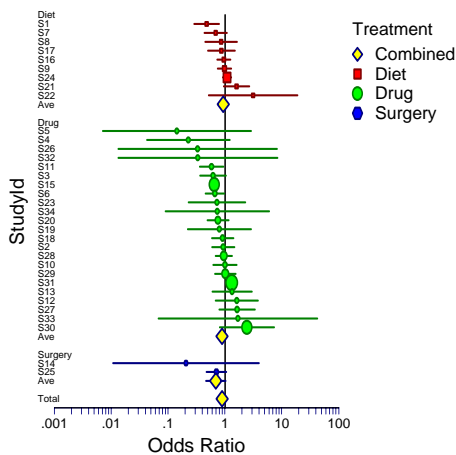
## Numeric Summary Section

[Treatment]	Study/Id	Data	P1	P2	Odds Ratio	Risk Ratio	Risk Difference
[Diet]	S1	28/204 51/202	0.1373	0.2525	0.4750	0.5480	-0.1147
	S7	41/206 55/206	0.1990	0.2670	0.6845	0.7477	-0.0676
	S8	20/123 24/129	0.1626	0.1860	0.8529	0.8772	-0.0231
	S9	111/1018 113/1015	0.1090	0.1113	0.9770	0.9795	-0.0023
	S16	174/424 178/422	0.4104	0.4218	0.9542	0.9730	-0.0114
	S17	28/199 31/194	0.1407	0.1598	0.8626	0.8821	-0.0190
	S21	39/221 28/237	0.1765	0.1181	1.5910	1.4859	0.0582
	S22	8/54 1/26	0.1481	0.0385	3.1075	2.7818	0.0990
	S24	269/4541 248/4516	0.0592	0.0549	1.0835	1.0785	0.0043
	Average (random effects model)				0.9292	0.9440	-0.0082

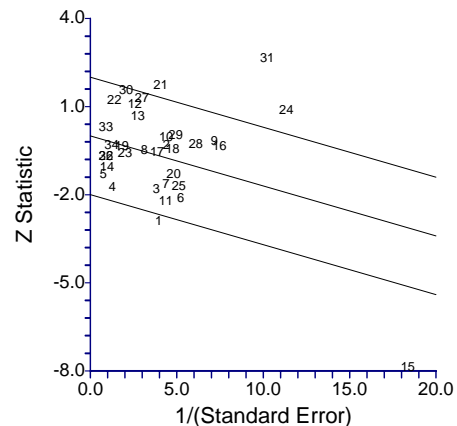
## Effect-Equality (Heterogeneity) Test

Treatment	Outcome Measure	Cochran's Q	DF	Prob Level
Diet	Odds Ratio	16.7499	8	0.0328
Drug	Odds Ratio	61.8806	22	0.0000
Surgery	Odds Ratio	0.6536	1	0.4188
Combined	Odds Ratio	88.6987	33	0.0000

Forest Plot of Odds Ratio



Radial Plot of Odds Ratio



- Meta-analysis of means
- Meta-analysis of proportions
- Meta-analysis of odds ratios
- Meta-analysis of risk ratios
- Meta-analysis of correlated proportions
- Meta-analysis of hazard ratios
- Forest plots
- Radial plots

- L'Abbe plots
- Heterogeneity test
- Cochran's Q test
- Random-effects confidence interval
- Fixed-effects confidence interval
- Directional zero-effect test
- Nondirectional zero-effect test

# Binary Diagnostic Tests

NCSS has four procedures that provide the specialized analysis necessary for diagnostic testing with binary outcome data. These provide appropriate specificity and sensitivity output. Four experimental designs can be analyzed including independent or paired groups, comparison with a gold standard, and cluster randomized.

Sensitivity Confidence Intervals Section				
Statistic	Test	Value	Lower 95.0% Conf. Limit	Upper 95.0% Conf. Limit
Sensitivity (Se1)	1	0.8000	0.6087	0.9114
Sensitivity (Se2)	2	0.8400	0.6535	0.9360
Difference (Se1-Se2)		-0.0400	-0.2618	0.1824
Ratio (Se1/Se2)		0.9524	0.7073	1.2659

Sensitivity & Specificity Hypothesis Test Section					
Hypothesis	Test of	Value	Chi-Square	Prob Level	Decision at 5.0% Level
Se1 = Se2		-0.0400	0.1355	0.7128	Cannot Reject H0
Sp1 = Sp2		-0.0800	0.4386	0.5078	Cannot Reject H0

Hypothesis Tests of the Equivalence of Sensitivity						Reject H0 and Conclude Equivalence at the 5.0% Significance Level
Statistic	Prob Level	Lower 90.0% Conf. Limit	Upper 90.0% Conf. Limit	Lower Equiv. Bound	Upper Equiv. Bound	
Diff. (Se1-Se2)	0.0314	-0.2246	0.1446	-0.2500	0.2500	Yes
Ratio (Se1/Se2)	0.1109	0.7471	1.2021	0.8000	1.2500	No

Hypothesis Tests of the Noninferiority of Specificity						Reject H0 and Conclude Noninferiority at the 5.0% Significance Level
Statistic	Prob Level	Lower 90.0% Conf. Limit	Upper 90.0% Conf. Limit	Lower Equiv. Bound	Upper Equiv. Bound	
Diff. (Sp1-Sp2)	0.0041	-0.2787	0.1216	-0.2500	0.2500	Yes
Ratio (Sp1/Sp2)	0.0250	0.6744	1.1799	0.8000	1.2500	Yes

Cluster Proportion Detail										
Cluster	Test	Sens.		Spec.		Total True	Total False	Total Pos	Total Neg	Prop. Cluster of Total
		True Pos	False Neg	True Neg	False Pos					
1	1	0.9130	0.0870	0.7692	0.2308	0.6389	0.3611	0.6667	0.3333	0.1026
2	1	0.6667	0.3333	0.8824	0.1176	0.4688	0.5313	0.3750	0.6250	0.0912
3	1	0.8378	0.1622	0.8846	0.1154	0.5873	0.4127	0.5397	0.4603	0.1795
4	1	0.7778	0.2222	0.9000	0.1000	0.4737	0.5263	0.4211	0.5789	0.0541
11	2	0.7813	0.2188	0.7143	0.2857	0.6038	0.3962	0.5849	0.4151	0.1510
12	2	0.8500	0.1500	0.9167	0.0833	0.4545	0.5455	0.4318	0.5682	0.1254
13	2	0.6364	0.3636	0.5926	0.4074	0.5500	0.4500	0.5333	0.4667	0.1709
14	2	0.6190	0.3810	0.6087	0.3913	0.4773	0.5227	0.5000	0.5000	0.1254
Total	1	0.8214	0.1786	0.8636	0.1364	0.5600	0.4400	0.5200	0.4800	0.4274
Total	2	0.7170	0.2830	0.7053	0.2947	0.5274	0.4726	0.5174	0.4826	0.5726

- Clustered-binary diagnostic tests
- Equivalence reports
- Likelihood ratio tests
- Noninferiority reports
- Odds ratio reports
- Paired-binary diagnostic tests
- Sensitivity reports
- Single-binary diagnostic tests
- Specificity reports
- Two-independent binary diagnostic tests

# Mass Appraisal

NCSS provides a complete set of procedures for mass appraisal. These include sales ratio reports, comparables, multiple regression, nonlinear regression, hybrid (feedback) model, frequency tables, histograms, and descriptive statistics.

Comparative Sales Price Adjustment Report for Subject = Subject1									
PropID	Subject1	A-14	A-8	A-1	A-2				
	Value	Value	\$Adj	Value	\$Adj	Value	\$Adj	Value	\$Adj
YearSold		1997		1996		1995		1996	
Comparability		92%		87%		84%		81%	
SalePrice		88474	6193	78728	3149	71589	15034	50535	1516
Quality	2	2	0	2	0	1	2599	2	0
SqFt	965	1309	-17200	1181	-10800	1165	-10000	735	11500
LotSize	5502	6484	-4910	5350	760	4670	4160	3805	8485
Net \$Adj.			-15917		-7691		12192		21501
Sum  \$Adj.			22110		12360		17159		19985
Adj Sales Price	73197		72557		71037		83781		72036

Sales Ratio Report						
Neighborhood	Count	Median	Mean	W Mean	PRD	COD
0	190	83.62	88.96	85.56	1.04	18.00
110	2	59.94	59.94	59.50	1.01	6.84
1120	1	102.58	102.58	102.58	1.00	0.00
1140	1	94.45	94.45	94.45	1.00	0.00
.	.	.	.	.	.	.
.	.	.	.	.	.	.
Total	275	83.76	88.71	85.39	1.04	18.37

Model Specification and Estimation Section					
Parm Name	Variable Type	Variable Name	Parameter Estimate	Starting Value	Parameter Bounds
B1	Overall Rate	Date	4.343036E-02	1	-1 to 2
B2	Overall Binary	Neighborhood=4	0.9396282	1	0 to 4
B4	Building Rate	GradeLinear	1.933066	1	0.1 to 2
B5	Building Amount	SqFt1stFlr	1.99108	2	1 to 6
B7	Building Amount	Baths	5.991871	2	1 to 6
B8	Land Rate	LotAdjusted	3.050522	1	0.1 to 5
B9	Land Amount	LotSize	0.6004827	1	0.1 to 2
B10	Garage Amount	GarageSqFt	2.135916	5	2 to 25

Assessment Ratio Section				
Statistic Name	Actual Sale	Predicted Sale	Ratio	Percent Error
Number of Cases	76	76	76	76
Mean	55.9	55.1	1.01	11.84
Minimum	22.5	29.6	0.78	0.01
Median	51.9	49.2	0.98	8.94
Maximum	117.5	131.0	1.58	58.31
Range	95.0	101.4	0.80	58.30
I. Q. Range	22.6	20.4	0.15	12.99
Std. Deviation	20.5	19.3	0.17	12.27
Ave  Dev. from Median	14.7	13.3	0.12	8.38
Coef. of Variation x 100	36.62	34.97	16.94	103.60
Coef. of Dispersion x 100	28.38	26.96	11.96	93.67
Weighted Mean			0.99	
Price Related Differential			1.02	

- Access file import
- Coefficient of dispersion
- Coefficient of variation
- Comparables
- Descriptive statistics
- Feedback model
- Frequency tables
- Histograms
- Hybrid model
- Means
- Multiple regression
- Nonlinear regression
- Price-related differential
- Sales ratios
- Scatter plots
- Standard deviation

# Proportions

NCSS provides both large sample and exact procedures for calculating hypothesis tests and confidence intervals on functions of two proportions. These functions include the difference, the risk ratio, and the odds ratio. Both independent and correlated (paired) group designs may be analyzed. Output includes classical as well as equivalence and noninferiority sections.

<b>Confidence Intervals of Difference (P1-P2)</b>			
<b>Confidence Interval Method</b>	<b>Estimated Value</b>	<b>Lower 95% Confidence Limit</b>	<b>Upper 95% Confidence Limit</b>
Exact	0.2876	0.0177	0.5258
Quasi-Exact (Chen)	0.2876	0.0208	0.5230
Score (Farrington & Manning)	0.2876	0.0255	0.5124
Score w/Skewness (Gart-Nam)	0.2876	0.0268	0.5196
Score (Wilson)	0.2876	0.0245	0.4989
Chi-Square C.C. (Yates)	0.2876	0.0003	0.5750
Chi-Square (Pearson)	0.2876	0.0412	0.5340

<b>Hypothesis Tests</b>				
<b>Two-Sided Tests of Zero Difference (H0: P1 = P2 versus H1: P1 &lt;&gt; P2)</b>				
<b>Estimated Difference (P1 - P2) = 0.2876</b>				
<b>Test Name</b>	<b>Test Statistic's Distribution</b>	<b>Test Statistic Value</b>	<b>Prob Level</b>	<b>Conclude H1 at 5% Significance?</b>
Fisher's Exact	Hypergeometric		0.0388	Yes
Chi-Square Test	Chi-Square(1)	4.591	0.0321	Yes
Chi-Square Test (C.C.)	Chi-Square(1)	3.376	0.0661	No
Z-Test	Normal	2.143	0.0321	Yes
Z-Test (C.C.)	Normal	1.837	0.0661	No
Mantel-Haenszel Test	Normal	2.121	0.0339	Yes
Likelihood Ratio	Chi-Square(1)	4.763	0.0291	Yes
T-Test using 0's and 1's	Student's T(47)	1.963	0.0556	No

<b>Noninferiority Test Output</b>				
<b>Upper-Tail, One-Sided Tests of Ratio (H0: P1 / P2 = 0.800 versus H1: P1 / P2 &gt; 0.800)</b>				
<b>Estimated Ratio (P1 / P2) = 1.534</b>				
<b>Test Name</b>	<b>Test Statistic's Distribution</b>	<b>Test Statistic Value</b>	<b>Prob Level</b>	<b>Conclude H1 at 5% Significance?</b>
Exact (Miettinen & Nurminen)	Double Binomial	3.104	0.0010	Yes
Score (Farrington & Manning)	Normal	3.136	0.0009	Yes
Score (Miettinen & Nurminen)	Normal	3.104	0.0010	Yes
Score (Gart & Nam)	Normal	3.130	0.0009	Yes

- Barnard's methods
- Chen's quasi-exact c.i.'s
- Chi-square test
- Conditional exact tests
- Continuity correction
- Equivalence tests
- Exact binomial c.i.'s
- Exact confidence intervals
- Exact tests
- Farrington & Manning methods
- Fisher's exact test
- Gart & Nam methods
- Independent designs
- Likelihood ratio
- Mantel-Haenszel test
- McNemar's tests
- Meta-analysis
- Miettinen & Nurminen methods
- Nam & Blackwelder
- Noninferiority tests
- Odds ratio
- Paired designs
- Proportion difference
- Proportion ratio
- Risk ratio
- Sensitivity output
- Specificity output
- Unconditional exact tests
- Wald test

# Curve Fitting

Curve fitting refers to nonlinear-regression techniques for fitting curved lines to X-Y data. You can select a standard model from the large list of pre-coded models or you can enter your own. If you do not have a specific model in mind, the program can search through hundreds of possible models looking for the one that best fits your data. The program will fit models with up to four independent variables. It will compare the curves across two or more groups using randomization tests and bootstrap confidence intervals.

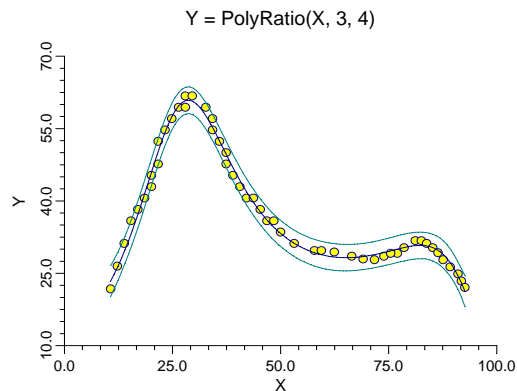
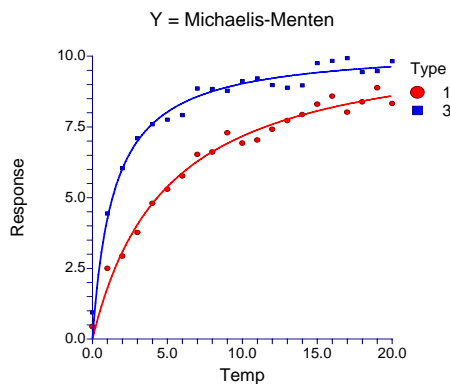
## Model Estimation Section

Parameter Name	Parameter Estimate	Asymptotic Standard Error	Lower 95% C.L.	Upper 95% C.L.
A	0.3901402	5.033759E-03	0.3799816	0.4002987
B	0.101633	1.336168E-02	7.466801E-02	0.1285979

Dependent Y  
 Independent X  
 Model  $Y = A + (0.49 - A) * \text{EXP}(-B * (X - 8))$   
 R-Squared 0.873375  
 Iterations 13  
 Estimated Model  
 $(.3901402) + (0.49 - (.3901402)) * \text{EXP}(-(.101633) * ((X) - 8))$

## Predicted Values and Residuals Section

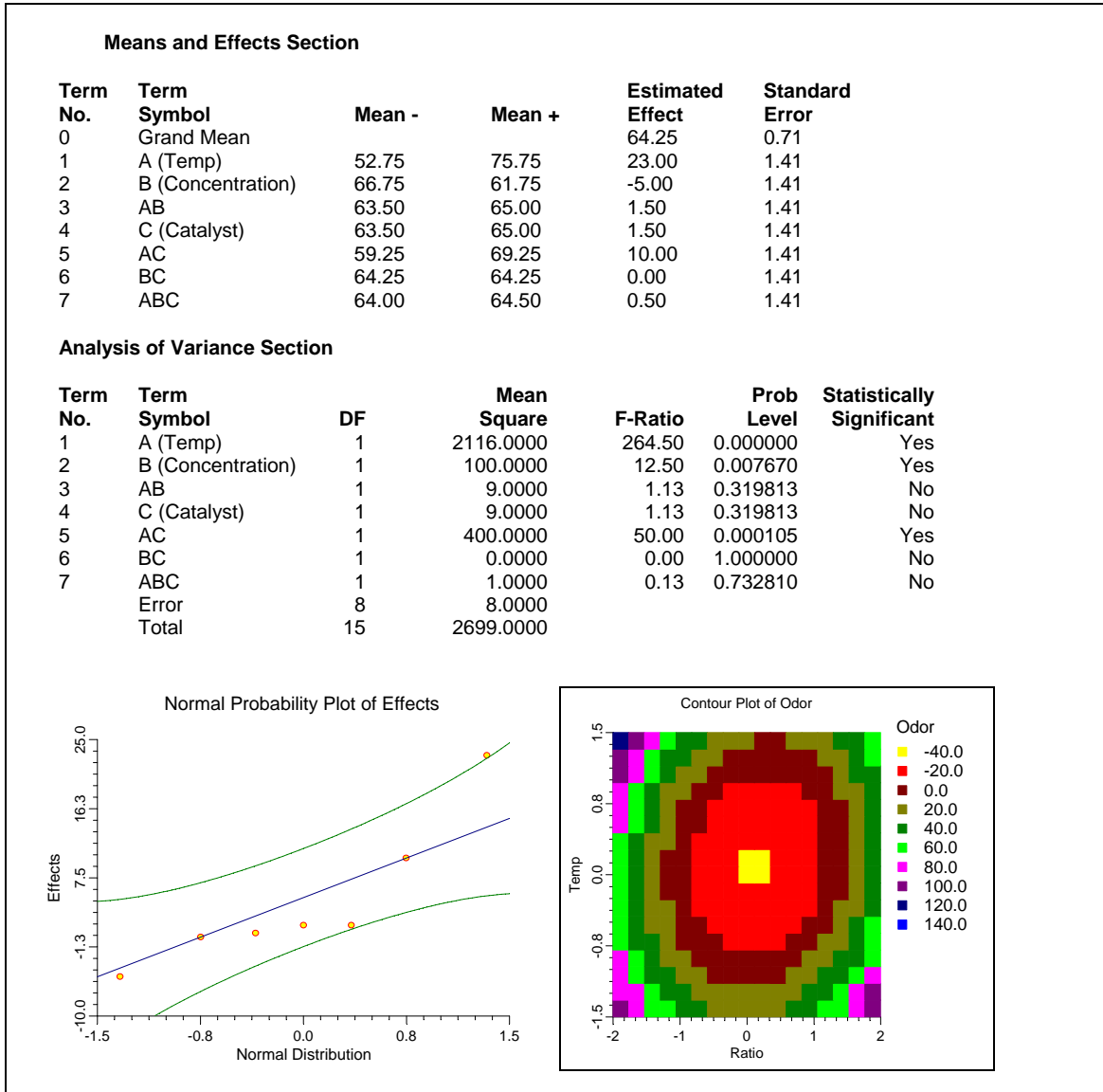
Row No.	X	Y	Predicted Value	Lower 95.0% Value	Upper 95.0% Value	Residual
1	8	0.49	0.49	0.4679772	0.5120228	0
2	8	0.49	0.49	0.4679772	0.5120228	0
3	10	0.48	0.4716319	0.4494232	0.4938406	0.0083681
4	10	0.47	0.4716319	0.4494232	0.4938406	-0.0016319
5	10	0.48	0.4716319	0.4494232	0.4938406	0.0083681



- Bleasdale-Nelder Model
- Double-Exponential Model
- Exponential Model
- Farazdaghi Model
- Gompertz Models
- Goodness of Fit Measures
- Group Data
- Holliday Model
- Logistic Model
- Lognormal Model
- Marquart algorithm
- Michaelis-Menten Model
- Monomolecular Model
- Morgan-Mercer Model
- Nonlinear Regression
- Normal Model
- Piecewise-Polynomials
- Probability Plots
- Ratio of Polynomials
- Reciprocal Model
- Richards Model
- Scatter-Plot Matrix
- Search Routines
- Sum of Functions Regression
- Transformation Bias Correction
- User-Supplied Models
- Weibull Model

# Design of Experiments

These programs can generate  $2^k$  factorial designs, B.I.B. designs, d-optimal designs, fractional factorial designs, Latin square designs, screening designs, Taguchi designs, and response surface designs. *NCSS* also provides for the analysis of these designs using either the general purpose ANOVA and regression procedures or specialized procedures for designs with factors at only two levels.



- Aliasing reports
- Analysis of variance tables
- Automatic design detection
- Balanced incomplete block
- Block confounding
- Blocking
- Box-Behnken designs
- Box-Hunter-Hunter designs
- Central composite designs
- Contour plots
- D-optimal designs
- Effect estimation
- Fractional factorials
- Latin Squares
- Factorial designs
- Means Plots
- Plackett-burman designs
- Probability plots of residuals and effects
- Repeated Measures designs
- Residual analysis
- Response-surface designs
- Screening designs (up to 31 Factors)
- Taguchi designs

# Forecasting and Time Series Analysis

NCSS provides several methods of forecasting and time series analysis. For forecasting, it provides classical methods based on exponential smoothing, trend-season-cycle decomposition (like X11), and ARIMA (Box-Jenkins). For time series analysis, it provides spectral analysis, ARIMA, and autocorrelation analysis.

The program contains a theoretical procedure that generates univariate time series from a specified model. This is useful for improving your forecasting skills.

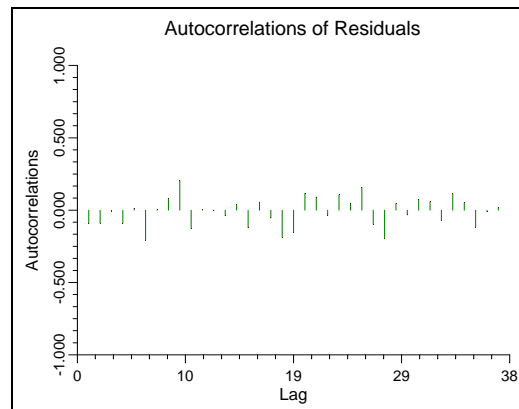
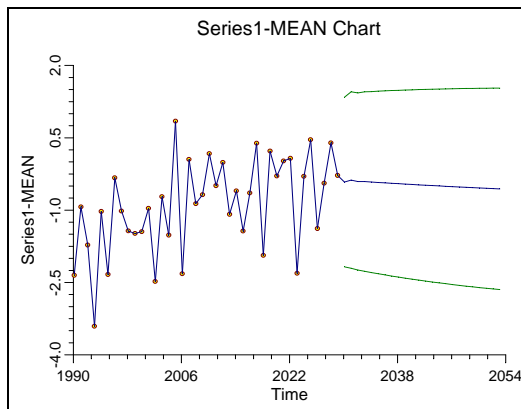
## Model Estimation Section

Parameter Name	Parameter Estimate	Standard Error	T-Value	Prob Level	
AR(1)	0.5778422	0.1725721	3.3484	0.000813	
AR(2)	0.3962256	0.1596349	2.4821	0.013062	
MA(1)	0.7604249	0.1349649	5.6342	0.000000	
Observations		40	Residual Sum of Squares		28.84119
Iterations		20	Mean Square Error		0.7794916
Pseudo R-Squared		21.586142	Root Mean Square		0.8828882

## Autocorrelations of Residuals of Series1-MEAN

Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.091919	11	0.003063	21	0.090220	31	0.057736
2	-0.089101	12	0.000842	22	-0.036684	32	-0.069254
3	-0.006732	13	-0.037963	23	0.105105	33	0.112294
4	-0.091508	14	0.038344	24	0.048037	34	0.049954
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.

Significant if |Correlation| > 0.316228



- ARIMA
- ARMA
- Autocorrelations
- Automatic Box-Jenkins
- Box-Jenkins Method
- Census X11
- Cycle Analysis
- Decomposition Methods
- Double-Exponential Smoothing
- Easy To Use
- Error Plots
- Exponential Smoothing
- Forecast Plots
- Generate Series
- Harmonic Analysis
- Log Transformation
- Modified Yule-Walker Equations
- Partial Autocorrelations
- Periodogram
- Portmanteau Test
- Prediction Limits - ARIMA
- Residual Analysis
- Seasonal Adjustment
- Seasonal Analysis
- Seasonal ARIMA Models
- Spectral Analysis
- Trend Analysis

# Repeated Measures ANOVA

The repeated-measures procedure performs an analysis of variance on within-subject designs using the general linear models approach. The experimental design may include up to three between-subject factors as well as three within-subject factors. Box's M test and Mauchly's test of the assumptions about the within-subject covariance matrices are provided. Geisser-Greenhouse, Box, and Huynh-Feldt corrected probability levels on the within-subject F tests are given along with the associated test power.

## Analysis of Variance Table

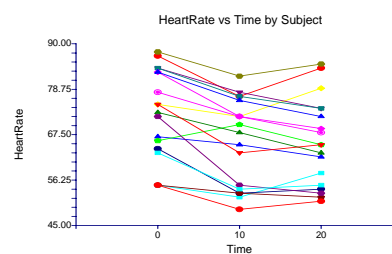
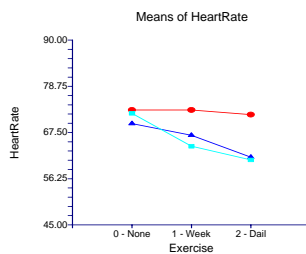
Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)
A: Exercise	2	427.4445	213.7222	0.61	0.555040	0.076179
B(A): Subject	15	5234.556	348.9704			
C: Time	2	547.4445	273.7222	36.92	0.000000*	0.999974
AC	4	191.4444	47.86111	6.45	0.000716*	0.874052
BC(A)	30	222.4444	7.414815			

## Probability Levels for F-Tests with Geisser-Greenhouse Adjustments

Source	DF	F-Ratio	Regular Prob Level	Geisser Epsilon Prob Level	Box Epsilon Prob Level	Huynh Feldt Epsilon Prob Level
A: Exercise	2	0.61	0.555040			
B(A): Subject	15					
C: Time	2	36.92	0.000000*	0.000021*	0.000000*	0.000000*
AC	4	6.45	0.000716*	0.009496*	0.000755*	0.000716*
BC(A)	30					

## Power Values for F-Tests with Geisser-Greenhouse Adjustments

Source	DF	F-Ratio	Regular Power (Alpha=0.05)	Geisser Epsilon Power (Alpha=0.05)	Box Epsilon Power (Alpha=0.05)	Huynh Feldt Epsilon Power (Alpha=0.05)
A: Exercise	2	0.61	0.076179			
B(A): Subject	15					
C: Time	2	36.92	0.999974	0.889537	0.999966	0.999974
AC	4	6.45	0.874052	0.371111	0.867399	0.874052
BC(A)	30					



- Analysis of variance
- Box's M test
- Circularity test
- Compound symmetry test
- Contrasts
- Covariance matrix tests
- Epsilon values
- F ratios
- Fixed or random factors
- Geisser-Greenhouse
- Huynh-Feldt correction
- Mauchly's test
- Means plots
- Multiple comparisons
- Planned comparisons
- Power values
- Probability levels
- Randomized block designs
- Repeated measures
- Subject plots
- Within-subject designs