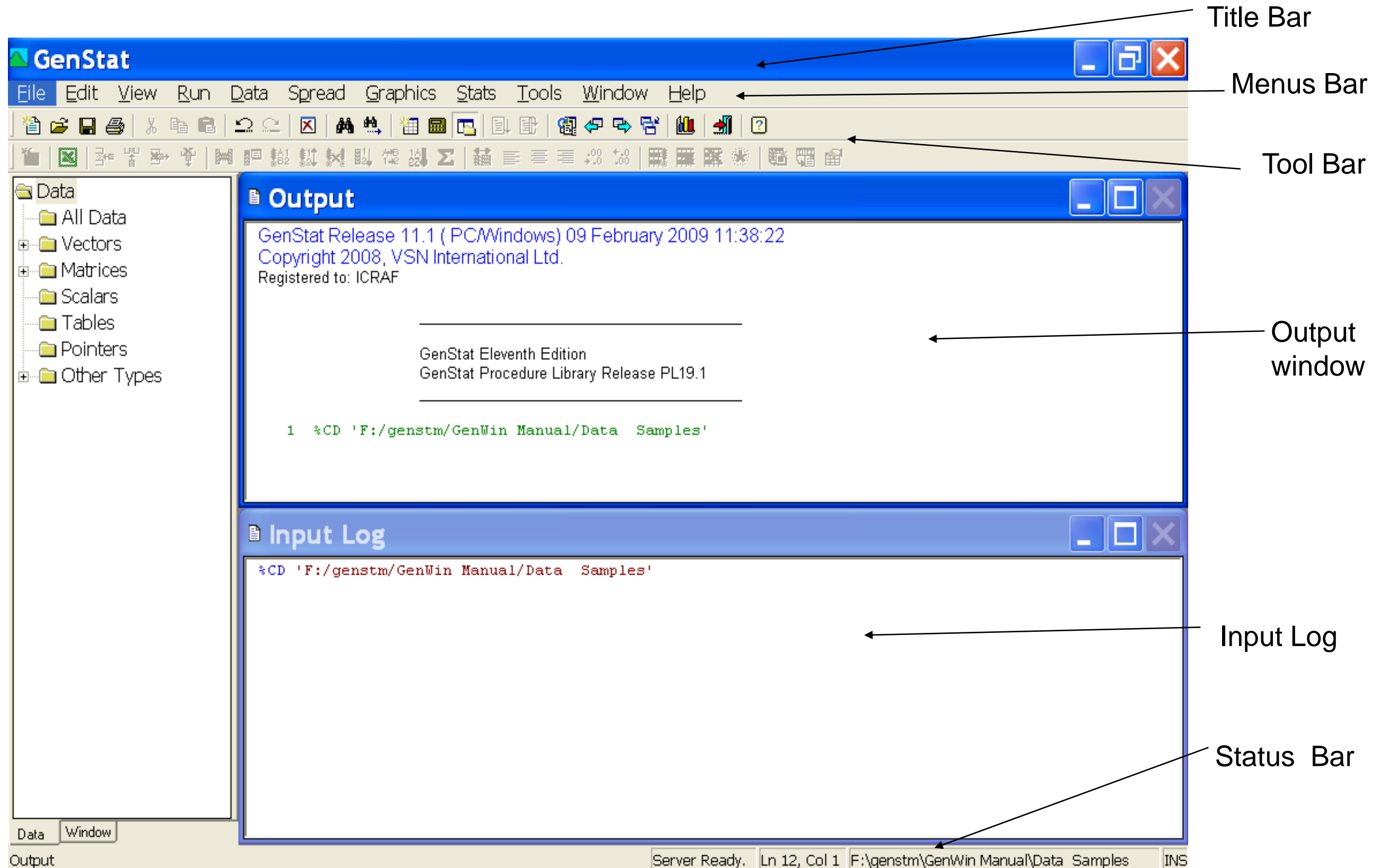


# Introduction to GenStat Edition 14



# Accessing GenStat

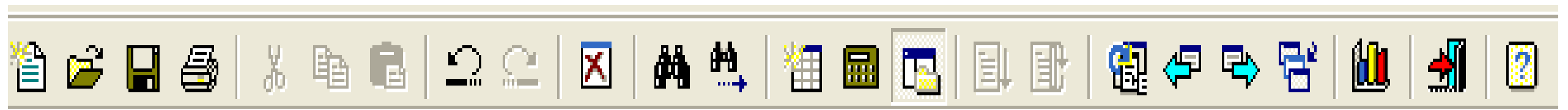
Start → All Programs → GenStat → GenStat 14<sup>th</sup> Edition



# The menu bars

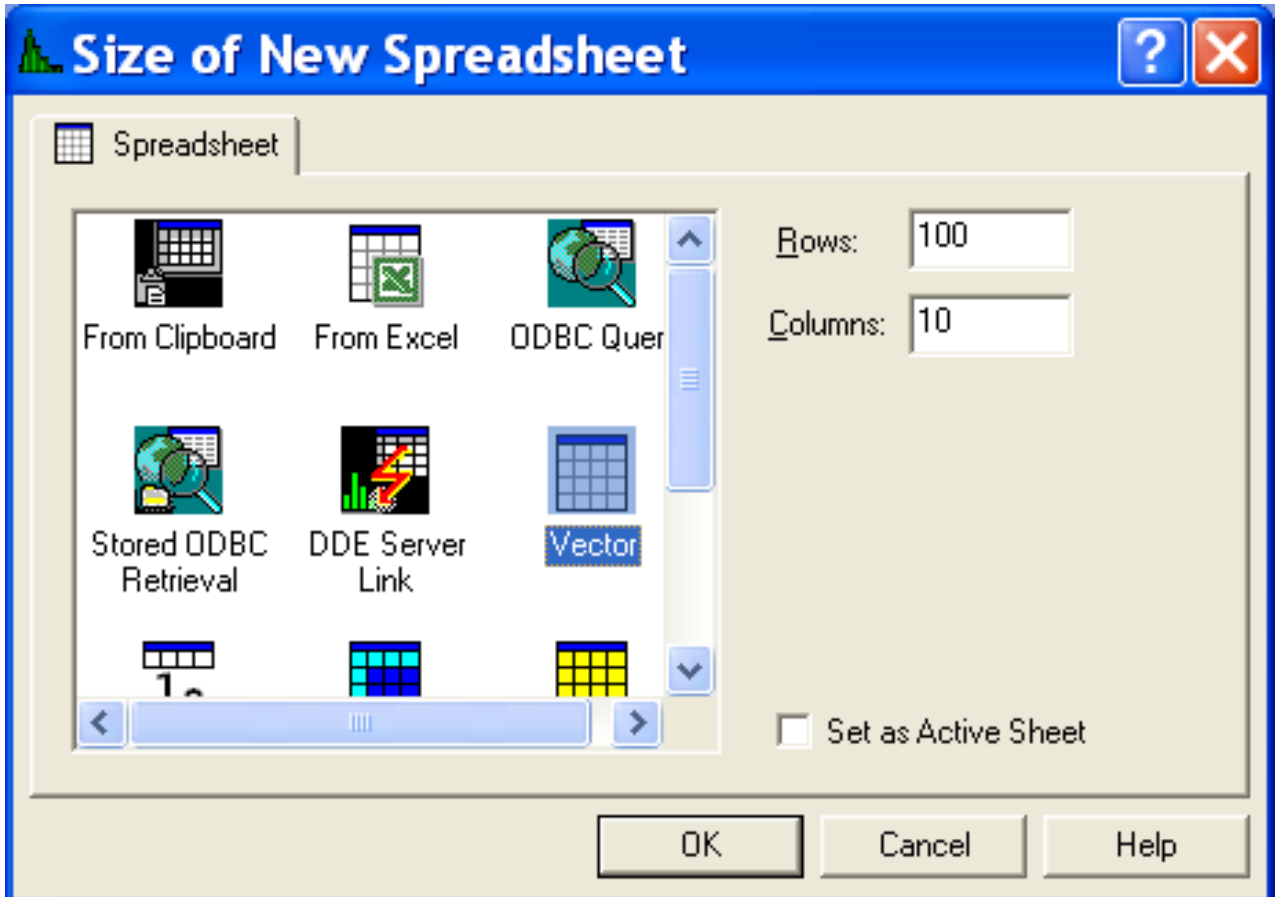
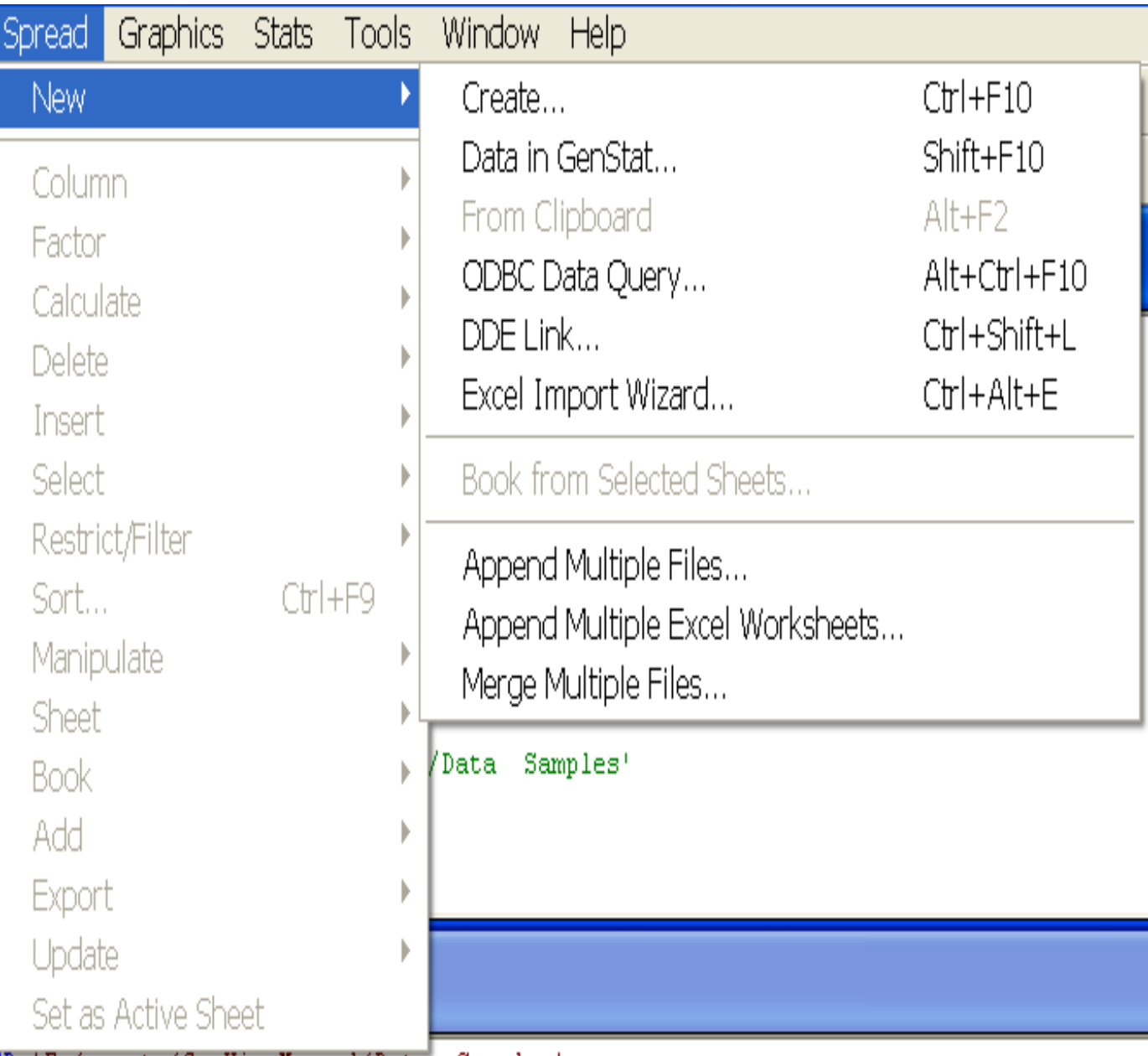
File Edit Search Run Data Spread Graphics Stats Options Window Help

# Tool bars

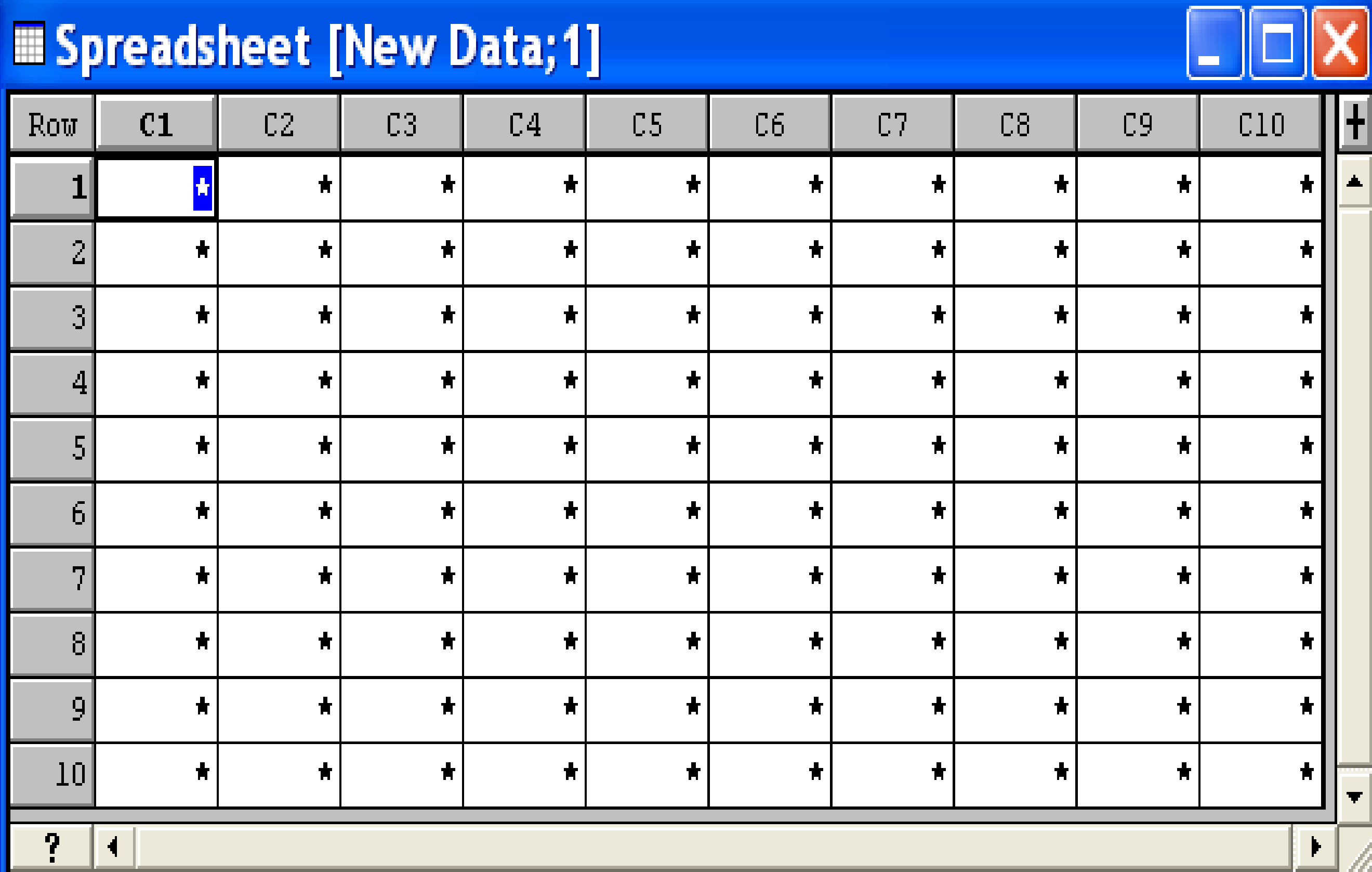


# Data input

Choose Spread → New → Create.



# 10 x 10 row by column vector



Row	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
1	★	★	★	★	★	★	★	★	★	★
2	★	★	★	★	★	★	★	★	★	★
3	★	★	★	★	★	★	★	★	★	★
4	★	★	★	★	★	★	★	★	★	★
5	★	★	★	★	★	★	★	★	★	★
6	★	★	★	★	★	★	★	★	★	★
7	★	★	★	★	★	★	★	★	★	★
8	★	★	★	★	★	★	★	★	★	★
9	★	★	★	★	★	★	★	★	★	★
10	★	★	★	★	★	★	★	★	★	★

Replace variable names (C1, C2,..) either by using **Spread** → **Column** → **Attributes/Formats** (pressing F9) or very easily by right clicking in each of the Cs and clicking **Rename** and proceeding.

**Column Attributes/Format for C1** ? X

Column: C1 Type:  Variate

Name: Plots

Description: Experimental plot

Decimals: \* Width: 6

Restrict data entered to be in the range:

Minimum: \* Maximum: \*

Identifying information used in output: Default

Justification:  Default  Left  Right  Centred

Numeric Format:  General  Scientific  Fixed  Date

Column created: 9-Feb-2009 2:48:17.97 pm

**Change Sheet or Column...** ? X

Sheet: Soils

Sheet Type:  Vector  Matrix  Symmetric Matrix  Diagonal Matrix  Table  Scalar

Column Type:  Variate  Factor  Text  Units Vector

Read Text as Date

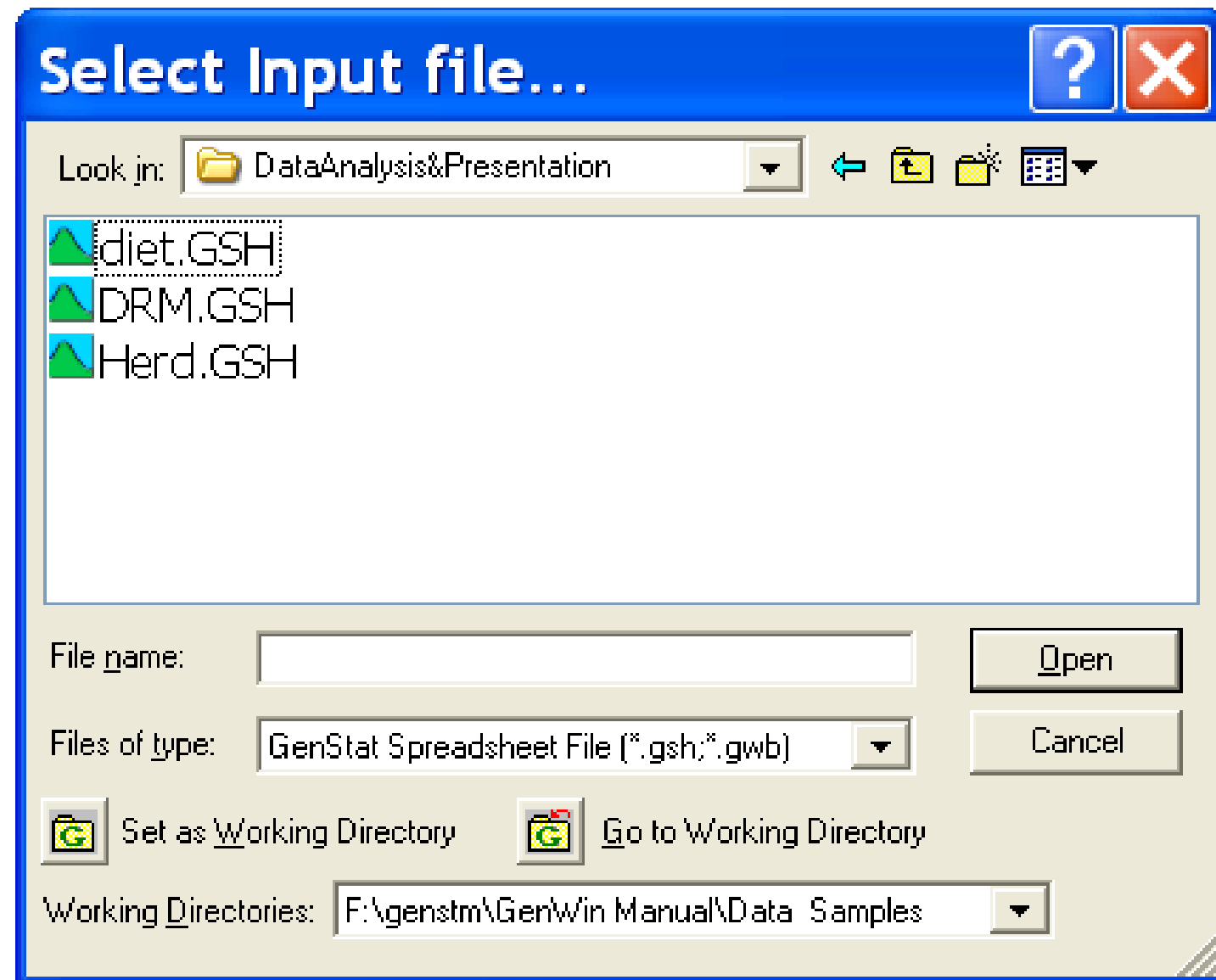
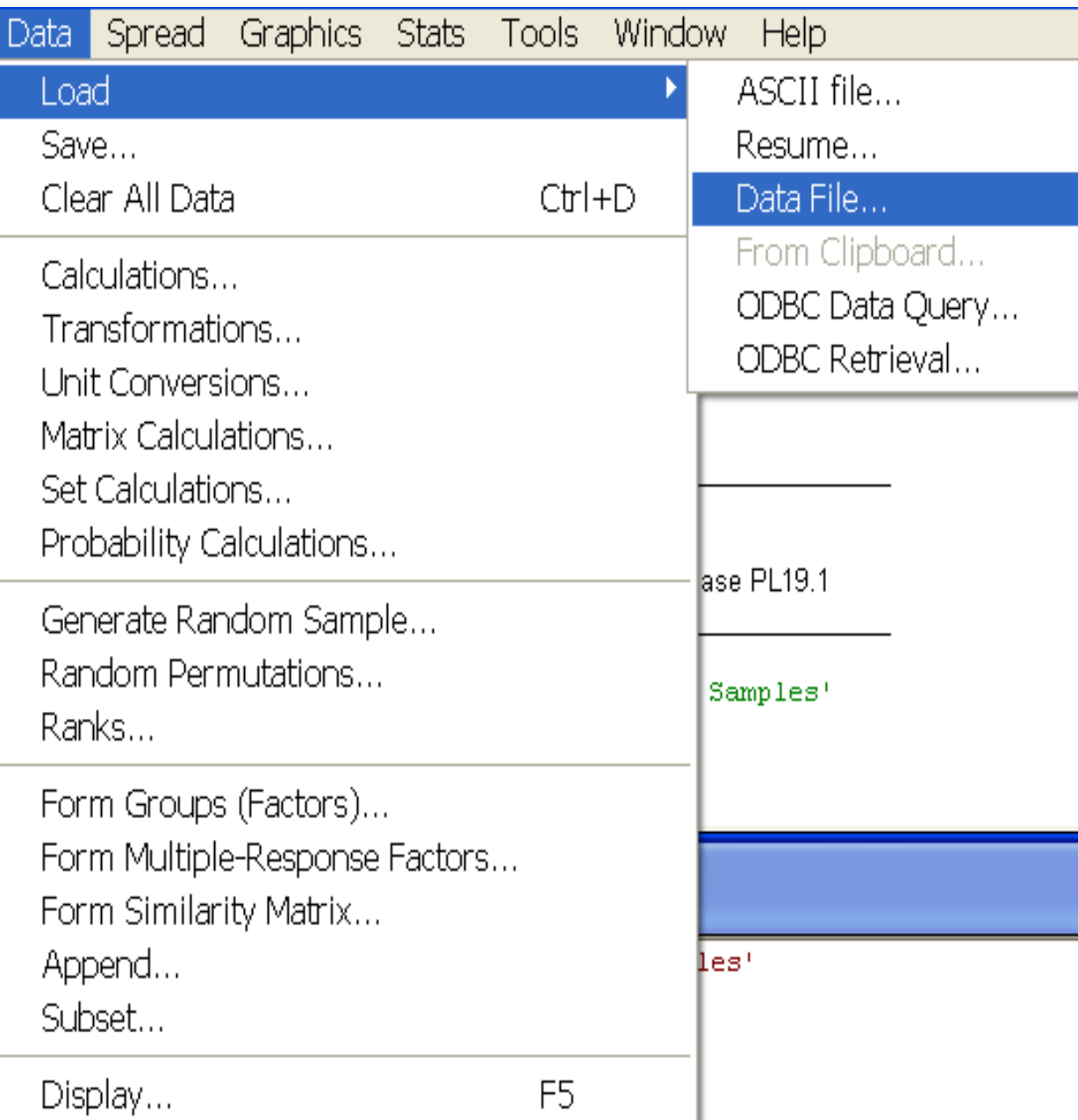
Factor Options:  Sort Levels

Tolerance: 0

# Loading Data From a GenStat file

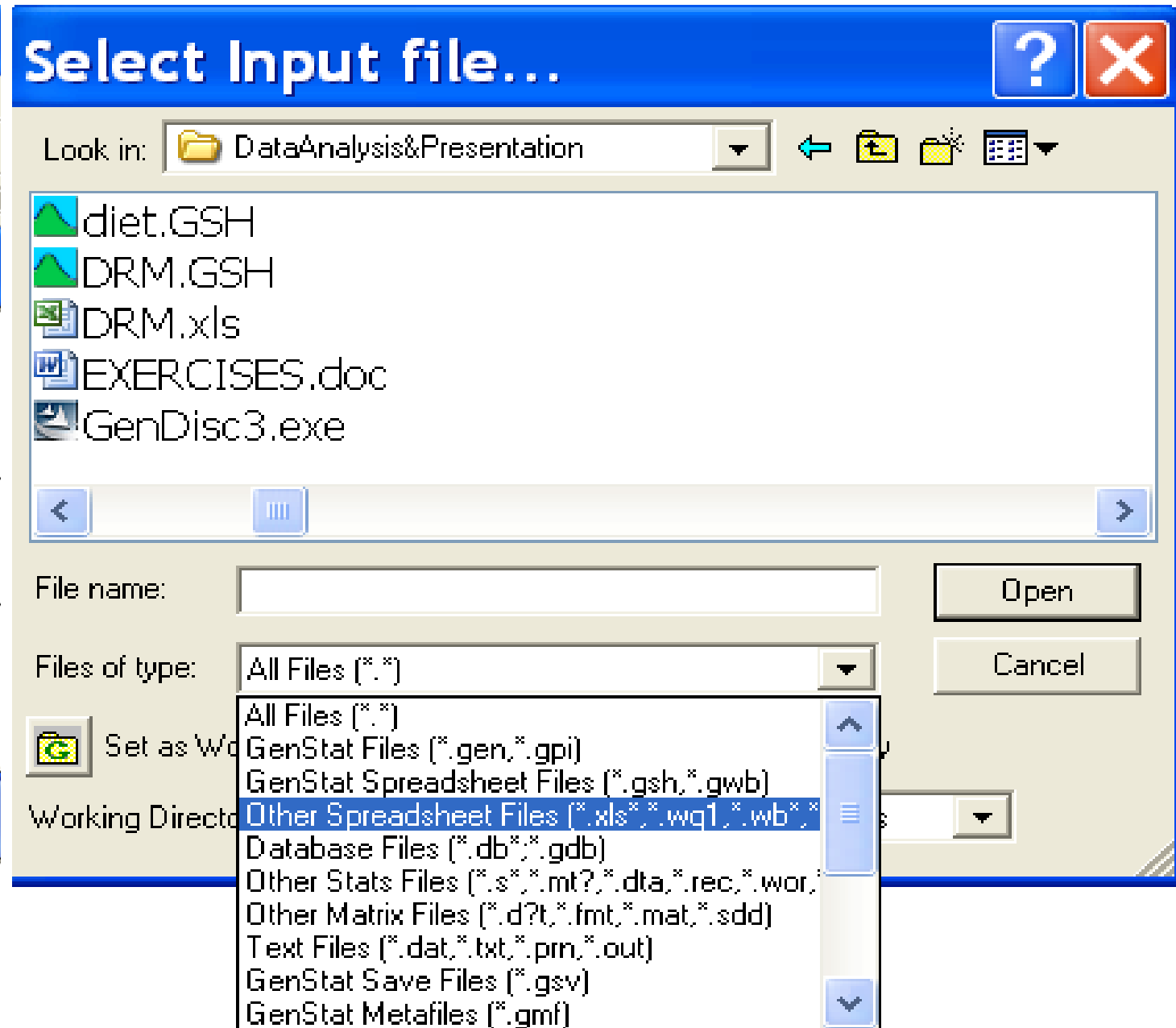
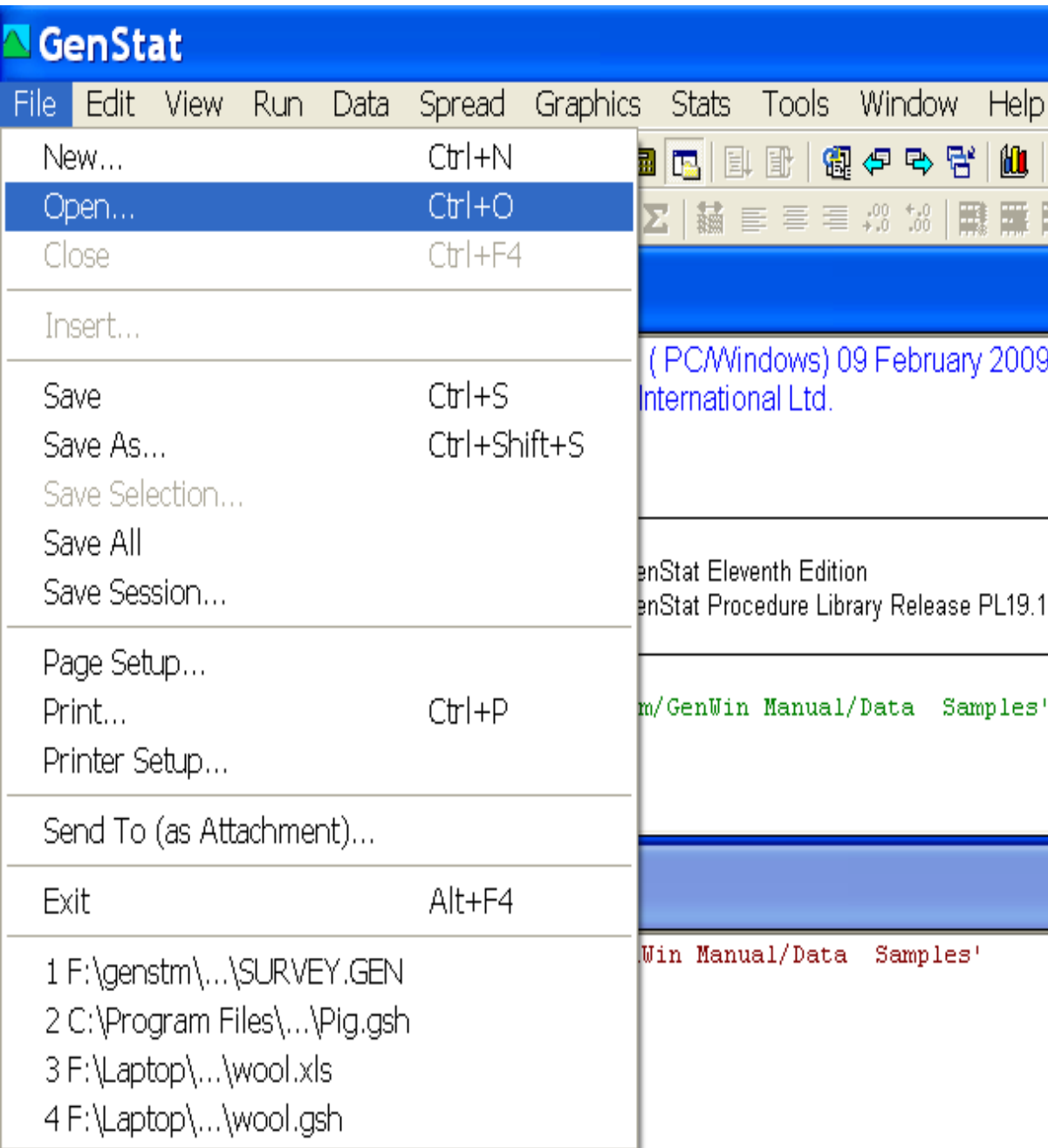
Select **Data** → **Load** → **Data file...**

OR Select **File** → **Open...** OR using the **Open Tool Bar**



# Loading Data From Excel Spreadsheet file

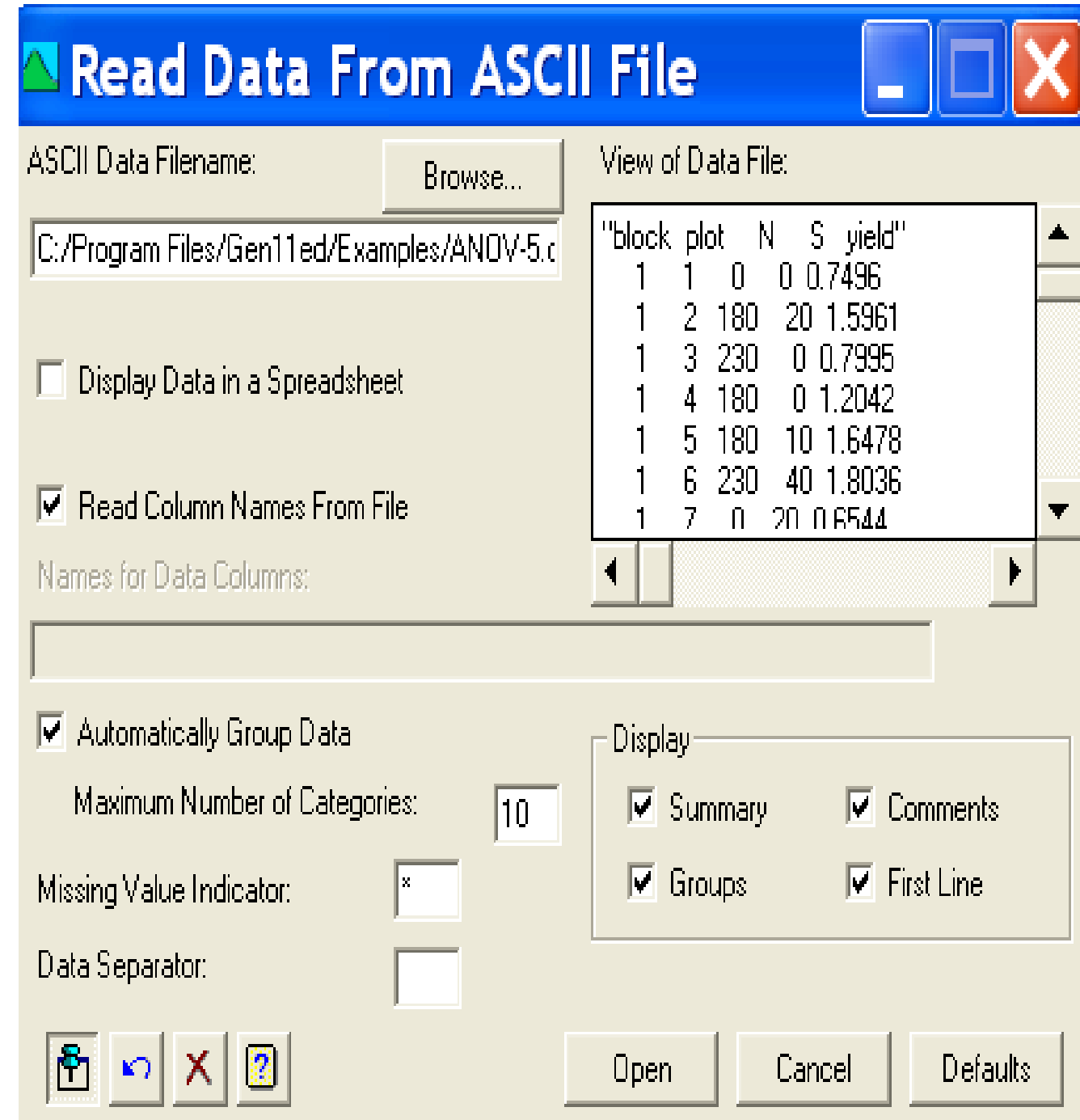
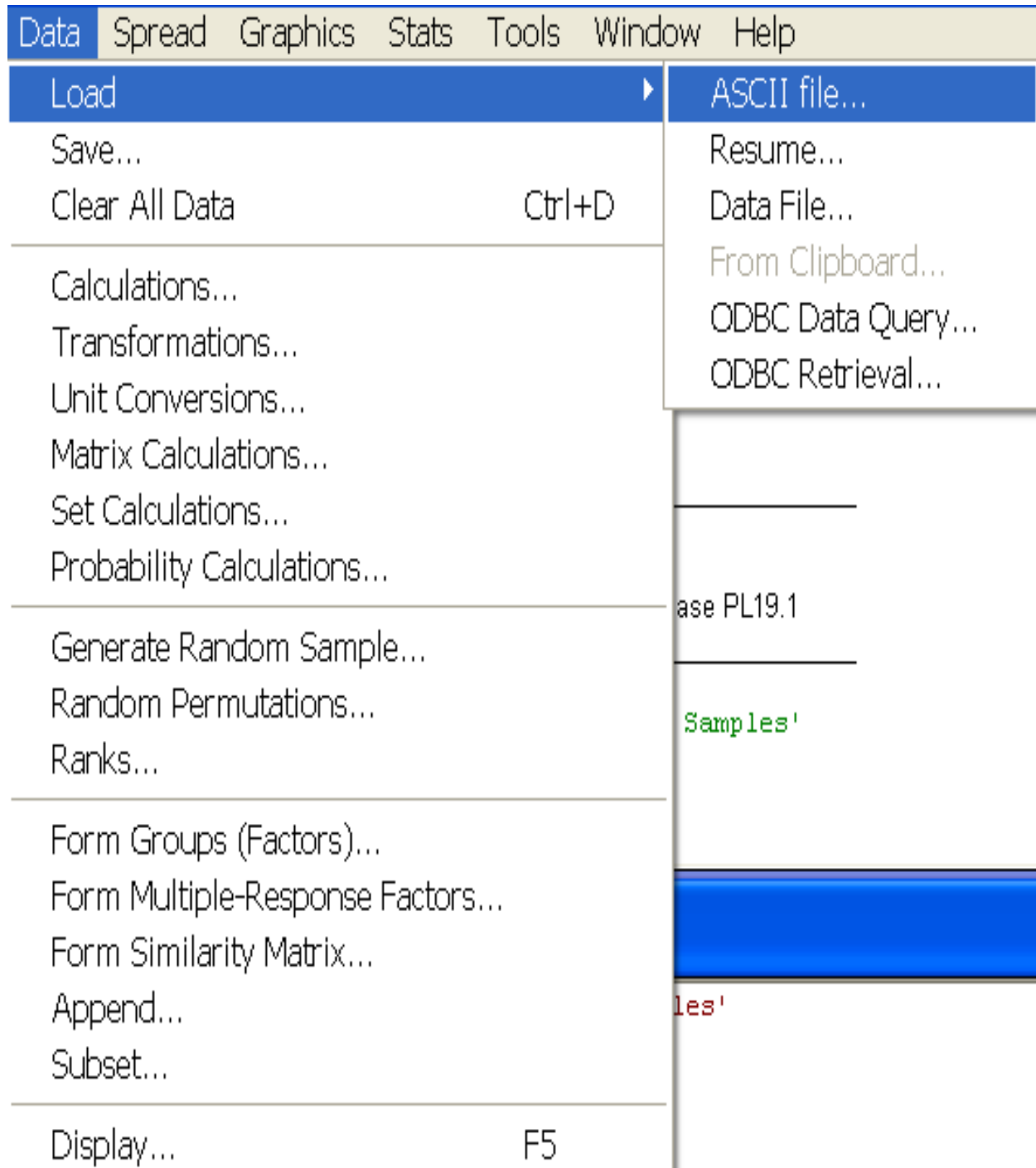
Select **File** → **Open...** OR using the **Open Tool Bar**





# Loading Data From a text file

Select **Data** → **Load** → **ASCII file...**

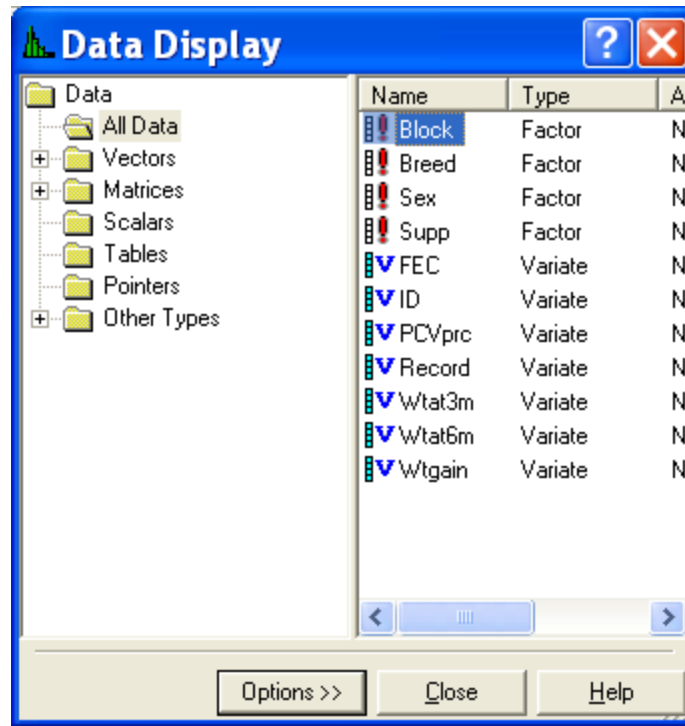


# Data Structures & Spreadsheet

**Factors (!)**

**Variables**

**Data Display Menu:**  
...

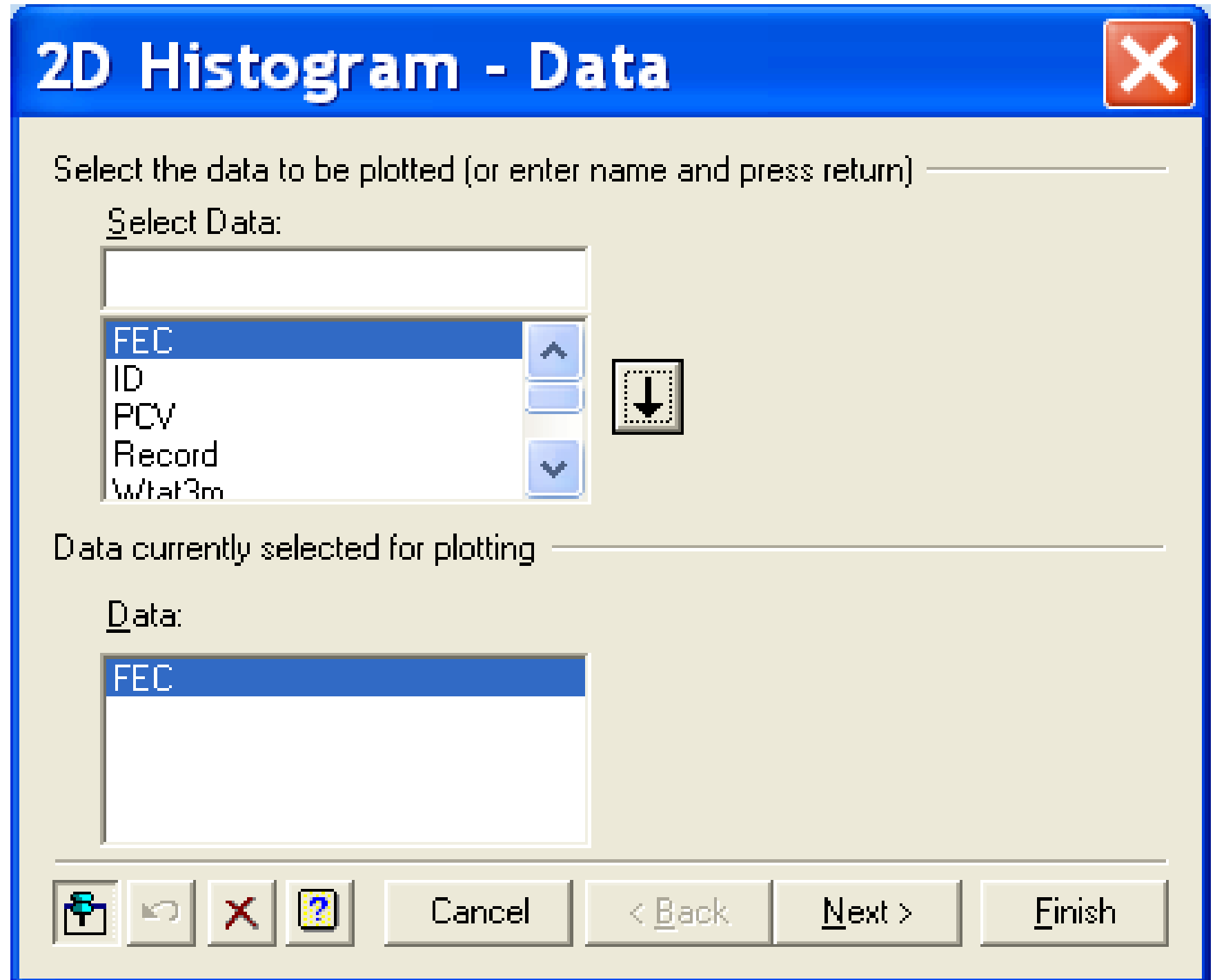
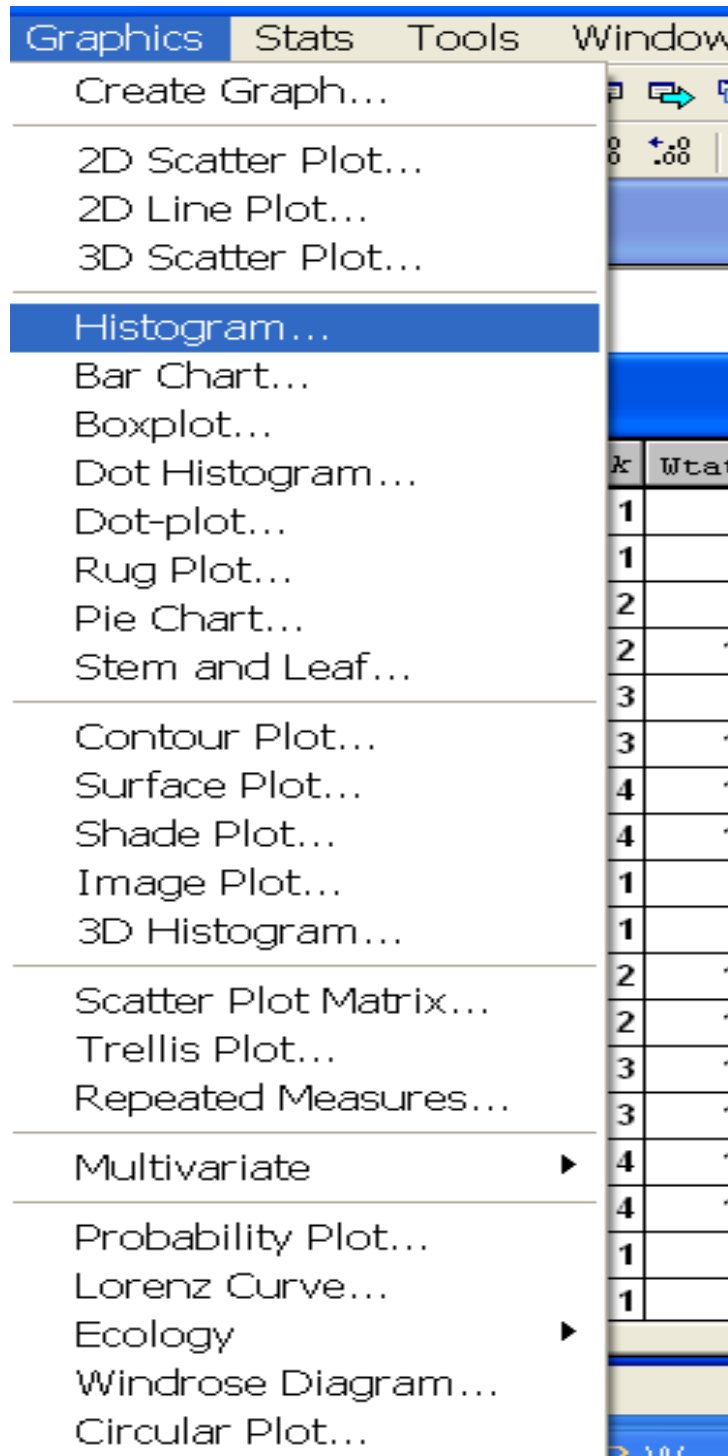


**Spreadsheet [DRM.gsh]**

Row	Record	ID	Breed	Sex	Supp	Block	Wtat3m	Wtat6m	PCVprc	FEC	Wtgain
1	1	349	1	2	1	1	8	8.9	10	6500	0.9
2	2	326	1	2	1	1	9	10.1	11	2650	1.1
3	3	393	1	1	1	2	12	12.6	22	750	0.6
4	4	71	1	1	1	2	12.3	14.6	15	5200	2.3
5	5	271	1	1	1	3	13	13.7	19	4800	0.7
6	6	382	1	2	1	3	15.5	16.8	24	2450	1.3
7	7	85	1	2	1	4	16.3	18.2	27	200	1.9
8	8	176	1	2	1	4	15.9	17.7	21	3000	1.8
9	9	286	1	2	2	1	11	13.6	21	1600	2.6
10	10	183	1	1	2	1	9.9	11.7	21	450	1.8
11	11	21	1	2	2	2	11.6	13.1	25	2900	1.5
12	12	122	1	1	2	2	12.5	14.8	25	300	2.3
13	13	374	1	1	2	3	14.6	17.9	19	2250	3.3
14	14	32	1	2	2	3	14.2	16.9	22	2800	2.7
15	15	282	1	2	2	4	16.3	20.2	20	750	3.9

# Exploring data

## Graphics → Histogram



# Boxplot

## Graphics → Boxplot ...

Graphics | Stats | Tools | Window

Create Graph...

2D Scatter Plot...

2D Line Plot...

3D Scatter Plot...

Histogram...

Bar Chart...

**Boxplot...**

Dot Histogram...

Dot-plot...

Rug Plot...

Pie Chart...

Stem and Leaf...

Contour Plot...

Surface Plot...

Shade Plot...

Image Plot...

3D Histogram...

Scatter Plot Matrix...

Trellis Plot...

Repeated Measures...

Multivariate ▶

Probability Plot...

Lorenz Curve...

Ecology ▶

Windrose Diagram...

Circular Plot...

k	Wtats
1	
1	
2	
2	12
3	
3	15
4	16
4	15
1	
1	9
2	11
2	12
3	14
3	14
4	16
4	16
1	7
1	8

### Boxplot - Data

How are the data organized?

List of variates     Single variate with groups

Select a single data set to be plotted (or enter name and press return)

Select Data:

FEC	↑
ID	
PCV	
Record	↓

Data currently selected for plotting

Data:

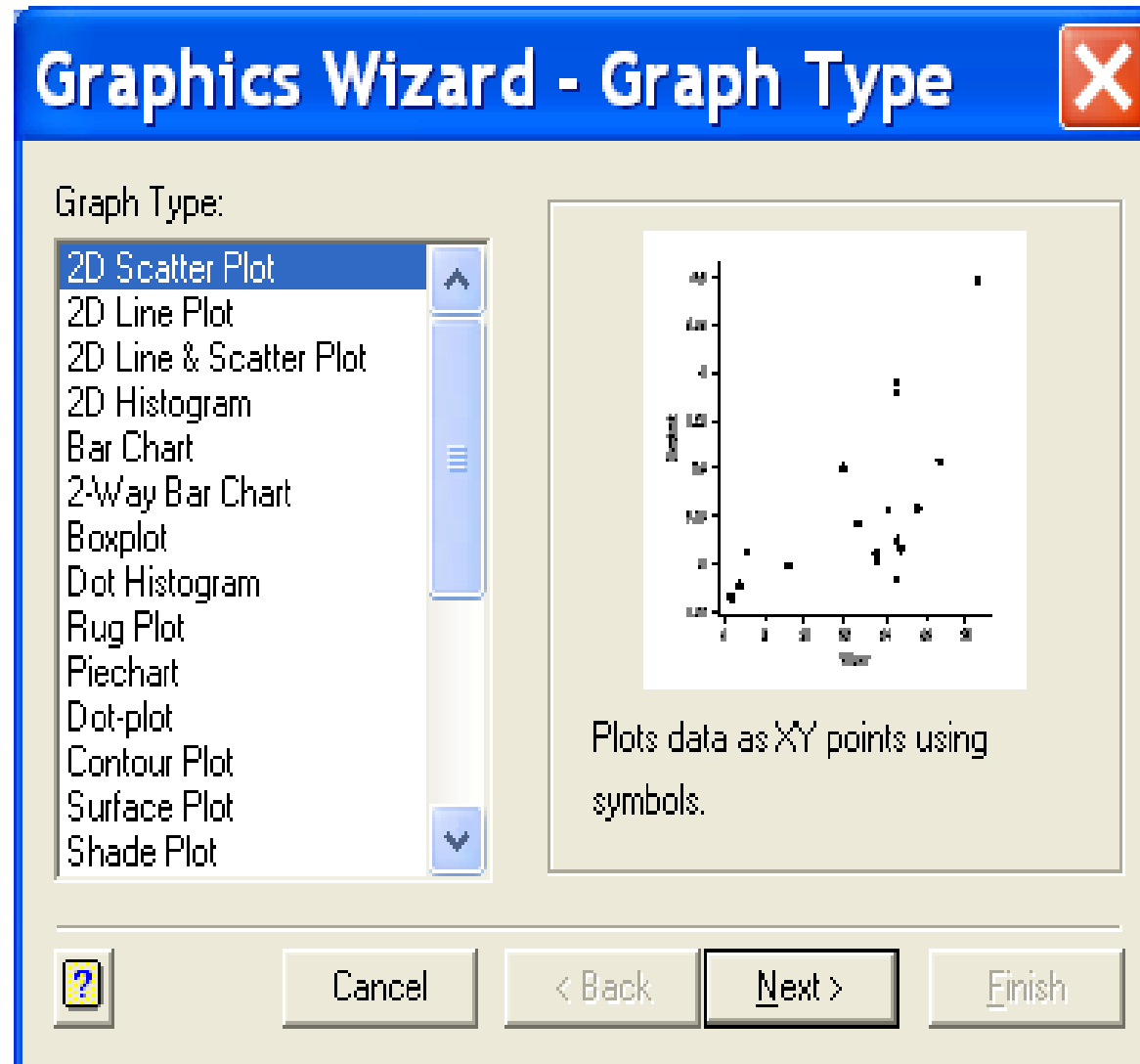
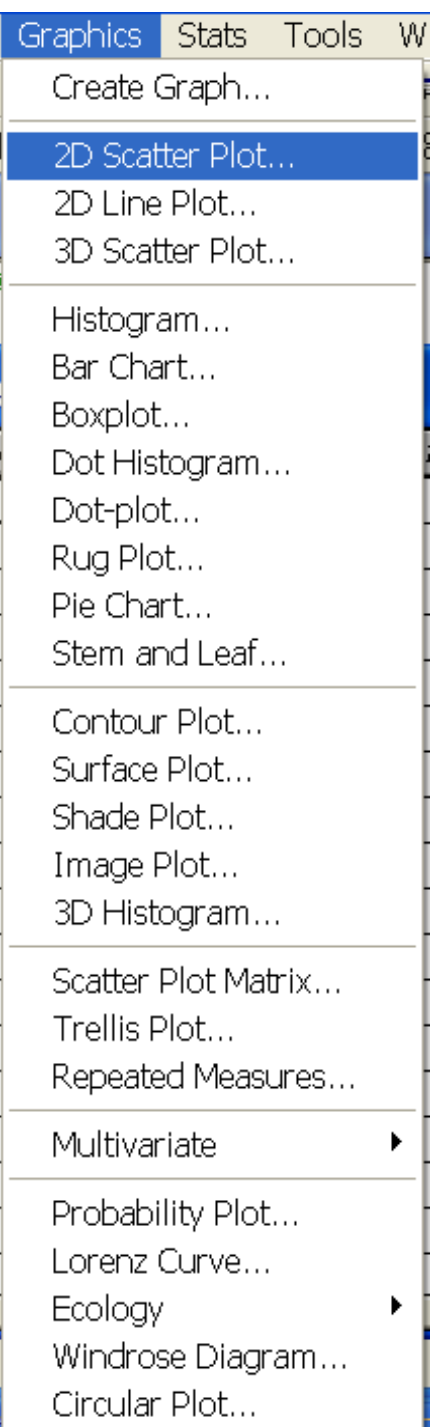
Groups:

Labels:

Cancel < Back Next > Finish

# Scatterplot

Graphics → Graphics Wizard ... then select desired graph here scatterplot



# Summary statistics

Choose **Stats** → **Summary Statistics** → **Summarise Contents of Variates.**

	6m	PCV	FEC	Wtgain
	8.9	10	6500	0.9
	0.1	11	2650	1.1
	2.6	22	750	0.6
	4.6	15	5200	2.3
	3.7	19	4800	0.7
	6.8	24	2450	1.3
	8.2	27	200	1.9
	7.7	21	3000	1.8
	3.6	21	1600	2.6

Available Data: Block, Breed, Sex, Supp

Variates: Wtgain

By Groups: Supp

Options:

- No. of Values
- No. of Non-missing Values
- No. of Missing Values
- Arithmetic Mean
- Median
- Minimum
- Maximum
- Variance
- Standard Deviation
- Range (max-min)
- Lower Quartile
- Upper Quartile
- Sum of Values

Graphics:

- Histogram
- Boxplot
- Stem and Leaf
- Normal Plot

Buttons: Run, Cancel, Defaults, Save...

# Calculating columns

Spread → Calculate → Column

**Group is the combined factor of breed and dietary supplement**

Spreadsheet [DRM.gsh]\*

Row	Record	ID	Breed	Sex	Supp	Block	Wtat3m	Wtat6m	PCVprc	FEC	Wtgain	Group
1	1	349	1	2	1	1	8	8.9	10	6500	0.9	11
2	2	326	1	2	1	1	9	10.1	11	2650	1.1	11
3	3	393	1	1	1	2	12	12.6	22	750	0.6	11
4	4	71	1	1	1	2	12.3	14.6	15	5200	2.3	11
5	5	271	1	1	1	3	13	13.7	19	4800	0.7	11
6	6	382	1	2	1	3	15.5	16.8	24	2450	1.3	11
7	7	85	1	2	1	4	16.3	18.2	27	200	1.9	11
8	8	176	1	2	1	4	15.9	17.7	21	3000	1.8	11
9	9	286	1	2	2	1	11	13.6	21	1600	2.6	12
10	10	183	1	1	2	1	9.9	11.7	21	450	1.8	12
11	11	21	1	2	2	2	11.6	13.1	25	2900	1.5	12
12	12	122	1	1	2	2	12.5	14.8	25	300	2.3	12
13	13	374	1	1	2	3	14.6	17.9	19	2250	3.3	12
14	14	32	1	2	2	3	14.2	16.9	22	2800	2.7	12
15	15	282	1	2	2	4	16.3	20.2	20	750	3.9	12
16	16	94	1	1	2	4	16.7	17.7	13	5600	1	12

Spreadsheet [DRM.qsh]\* Server Ready. [32, 12] Row: 1 Column: 12 <C>

# Hypothesis Testing

Stat → Statistical Tests → One and two sample t-tests ...

The screenshot shows the Minitab software interface. The 'Stat' menu is open, and 'One- and two-sample t-tests...' is selected. Below the menu is a table with 5 columns and 10 rows of data.

1	1	2	1	9.9
1	2	2	2	11.6
1	1	2	2	12.5
1	1	2	3	14.6
1	2	2	3	14.2
1	2	2	4	16.3
1	1	2	4	16.7
2	2	1	1	7.5

The screenshot shows the 'T-Tests' dialog box in Minitab. The 'Test' is set to 'Two-sample (unpaired)'. The 'Data Set' is 'Wtgain' and the 'Groups' are 'Breed'. The 'Confidence Limit (%)' is set to 95. Under 'Data Arrangement', 'One set with Groups' is selected. Under 'Type of Test', 'Two-sided' is selected. Buttons for 'Run', 'Options...', 'Save...', 'Cancel', and 'Defaults' are visible at the bottom.



# Result

## Two-sample t-test

Variate: Wtgain  
Group factor: Breed

## Test for equality of sample variances

Test statistic  $F = 1.43$  on 15 and 15 d.f.

Probability (under null hypothesis of equal variances) = 0.49

## Summary

Sample	Size	Mean	Variance	Standard deviation	Standard error of mean
1	16	1.856	0.900	0.949	0.2372
2	16	2.481	1.290	1.136	0.2839

Difference of means: -0.625

Standard error of difference: 0.370

95% confidence interval for difference in means: (-1.381, 0.1305)

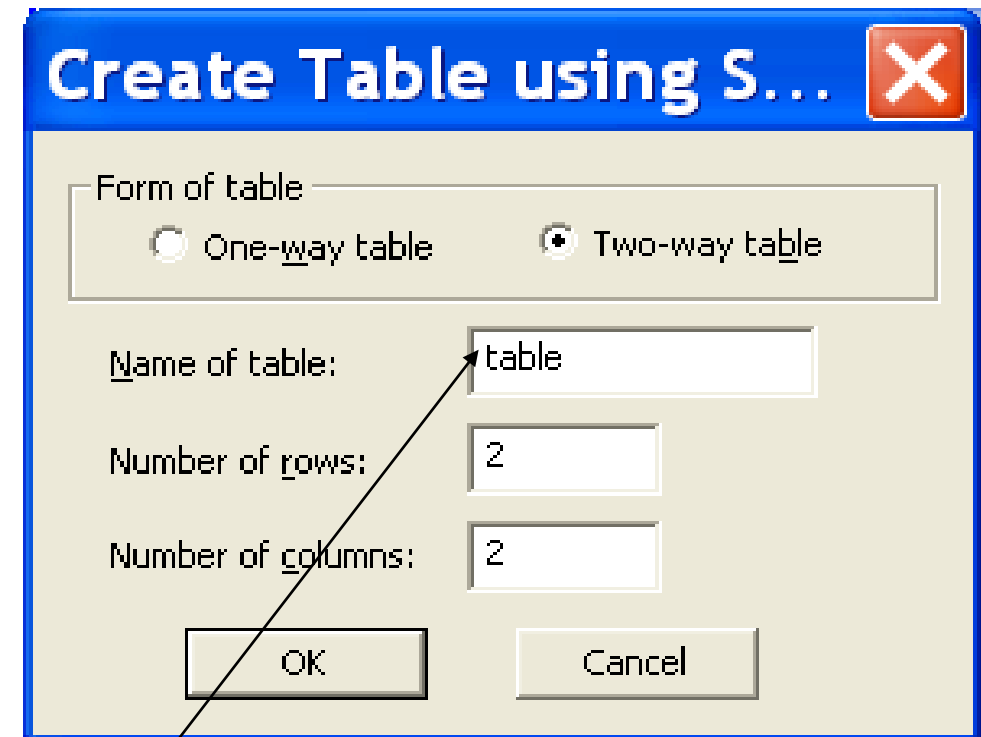
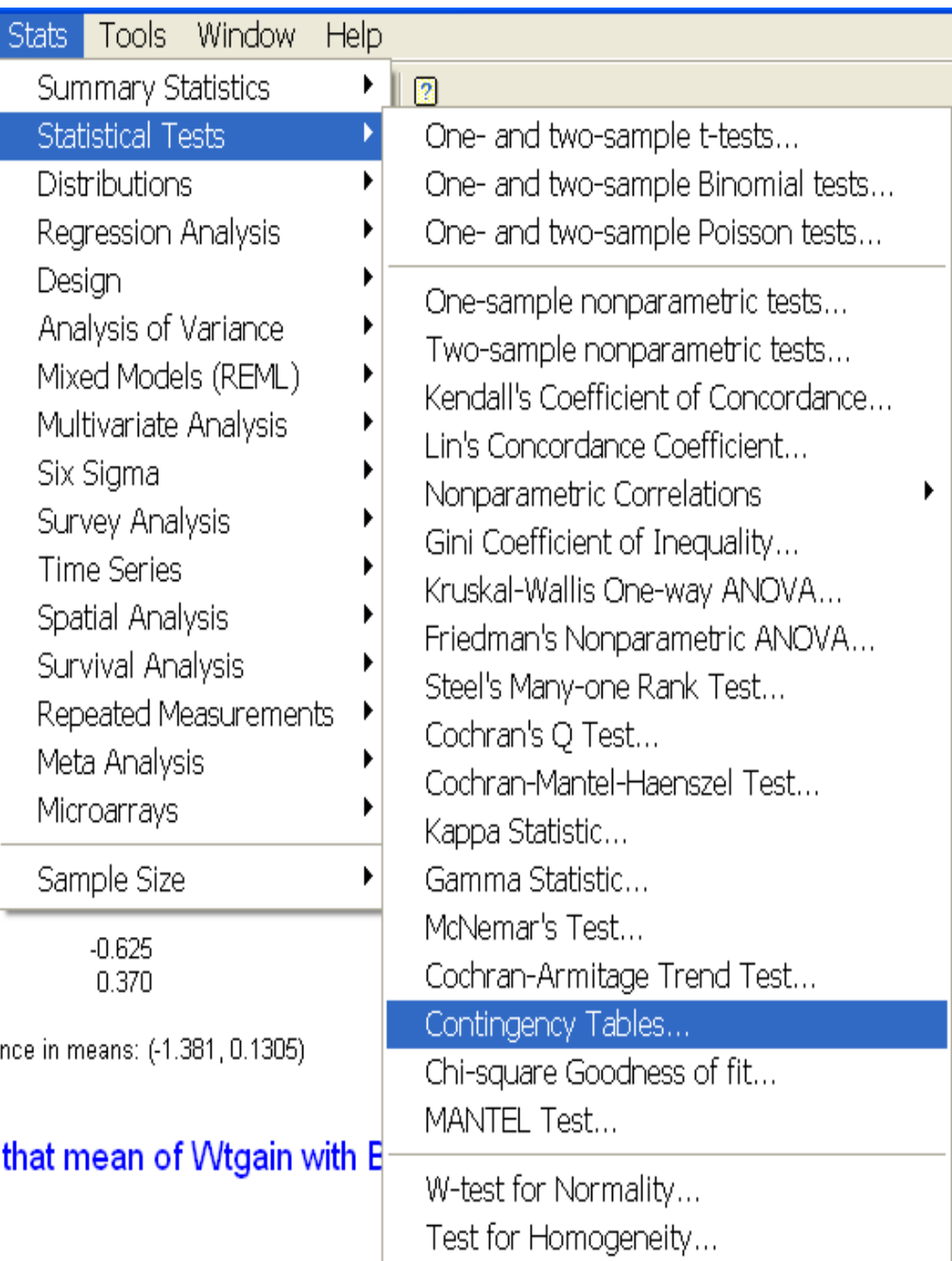
## Test of null hypothesis that mean of Wtgain with Breed = 1 is equal to mean with Breed = 2

Test statistic  $t = -1.69$  on 30 d.f.

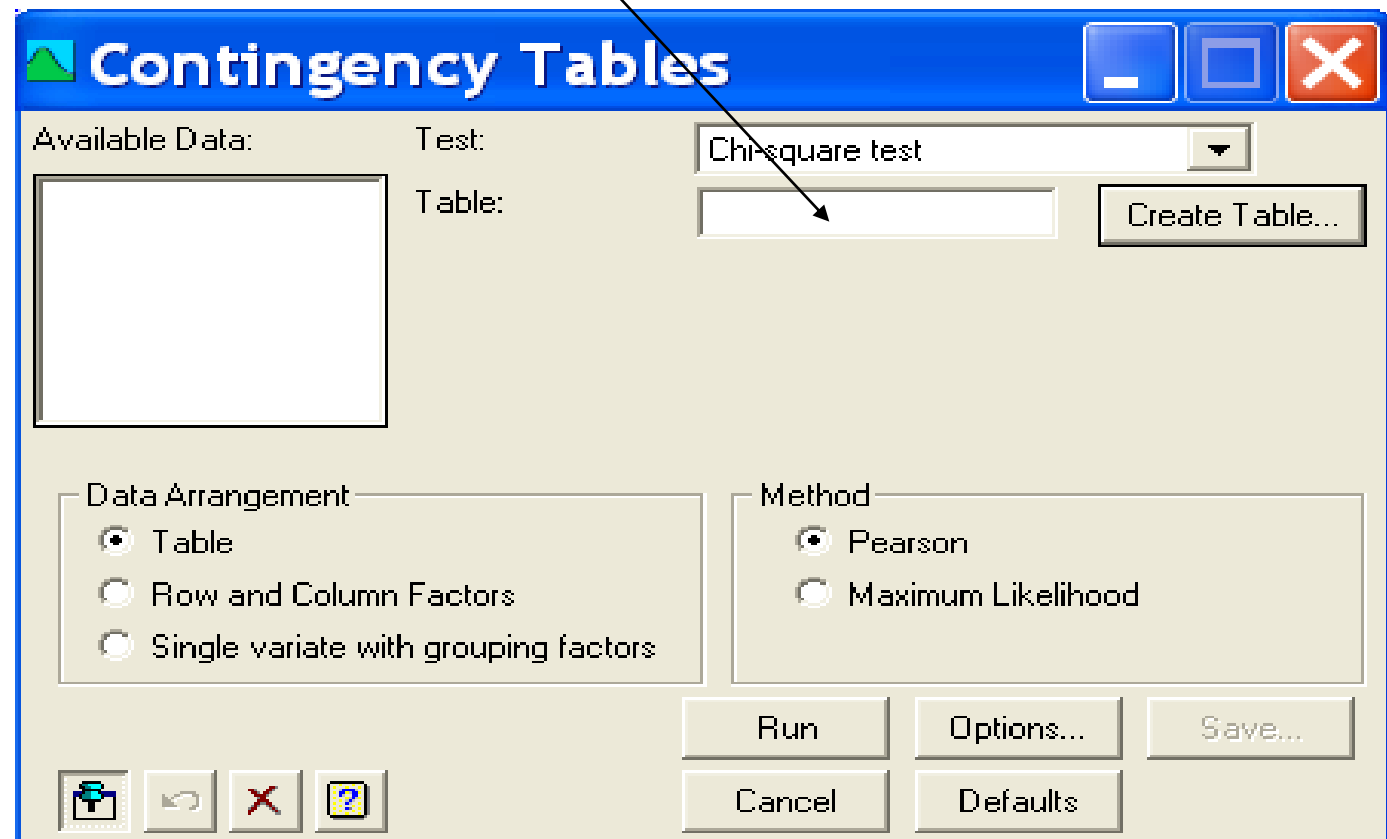
Probability = 0.101

# Chi-square Tests for Two-way Tables

Select **Stats** → **Summary Statistics** → **Summaries of Groups [Tabulation] ... a Summary by Groups**



## Create Tables



that mean of Wtgain with E

# Correlation statistics

Select **Stats** → **Correlations ...**

2450	1.3	11
200	1.9	11
3000	1.8	11
1600	2.6	12
450	1.8	12
2900	1.5	12
300	2.3	12
2250	3.3	12
2800	2.7	12
750	3.9	12

## Correlations

FEC  
Wtgain      -0.3500  
                    FEC      Wtgain

Number of observations: 32

Two-sided test of correlations different from zero probabilities

FEC  
Wtgain      0.0496  
                    FEC      Wtgain

**Correlations**

Available Data: FEC, Group, ID, PCV, Record, Wtat3m, Wtat6m, **Wtgain**

Data: FEC, Wtgain

Weights: [Empty Field]

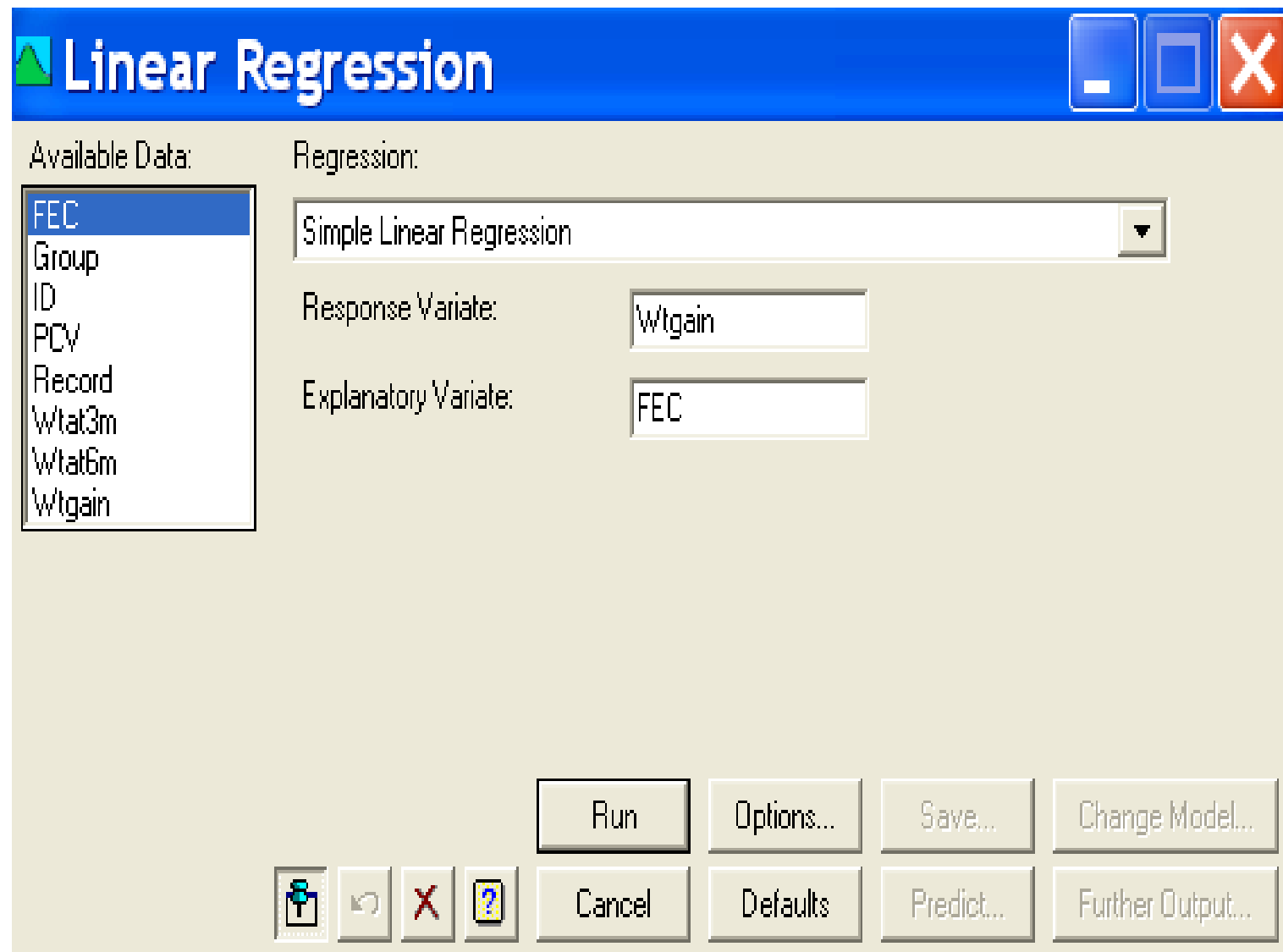
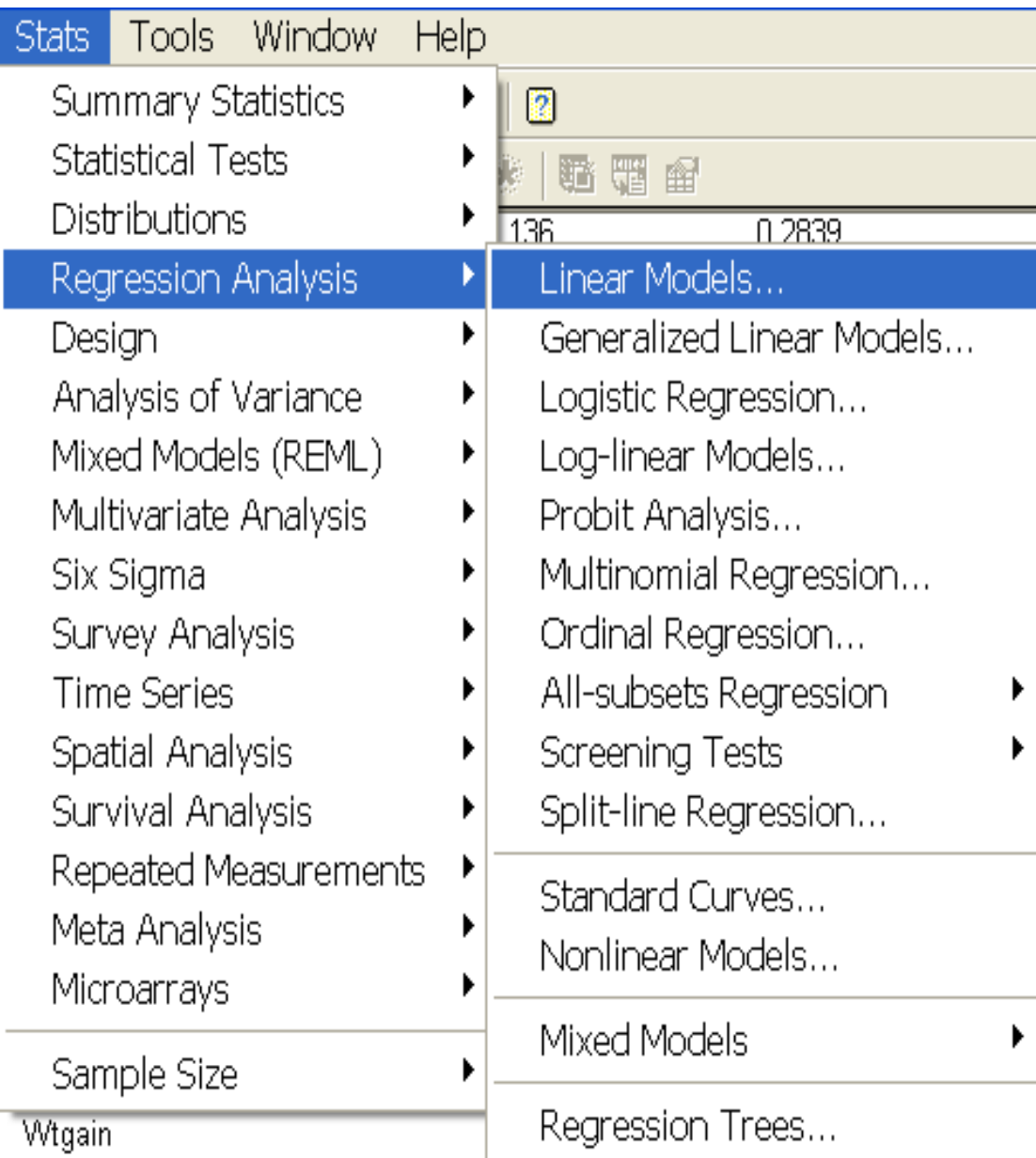
Display:  Correlations     Partial Correlations

Test correlations against 0:  Two-sided,  One-sided (y < 0),  One-sided (y > 0)

Buttons: Run, Defaults, Cancel, Save...

# Regression Analysis

Select **Stats** → **Regression Analysis** → **Linear Models ...**



# Regression Analysis

```
64 FIT [PRINT=model,summary,estimates; CONSTANT=estimate; FPROB=yes; TPROB=yes] FEC
```

---

## Regression analysis

Response variate: Wtgain  
Fitted terms: Constant, FEC

## Summary of analysis

Source	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	4.41	4.405	4.19	0.050
Residual	30	31.56	1.052		
Total	31	35.97	1.160		

Percentage variance accounted for 9.3  
Standard error of observations is estimated to be 1.03.

*Message: the following units have high leverage.*

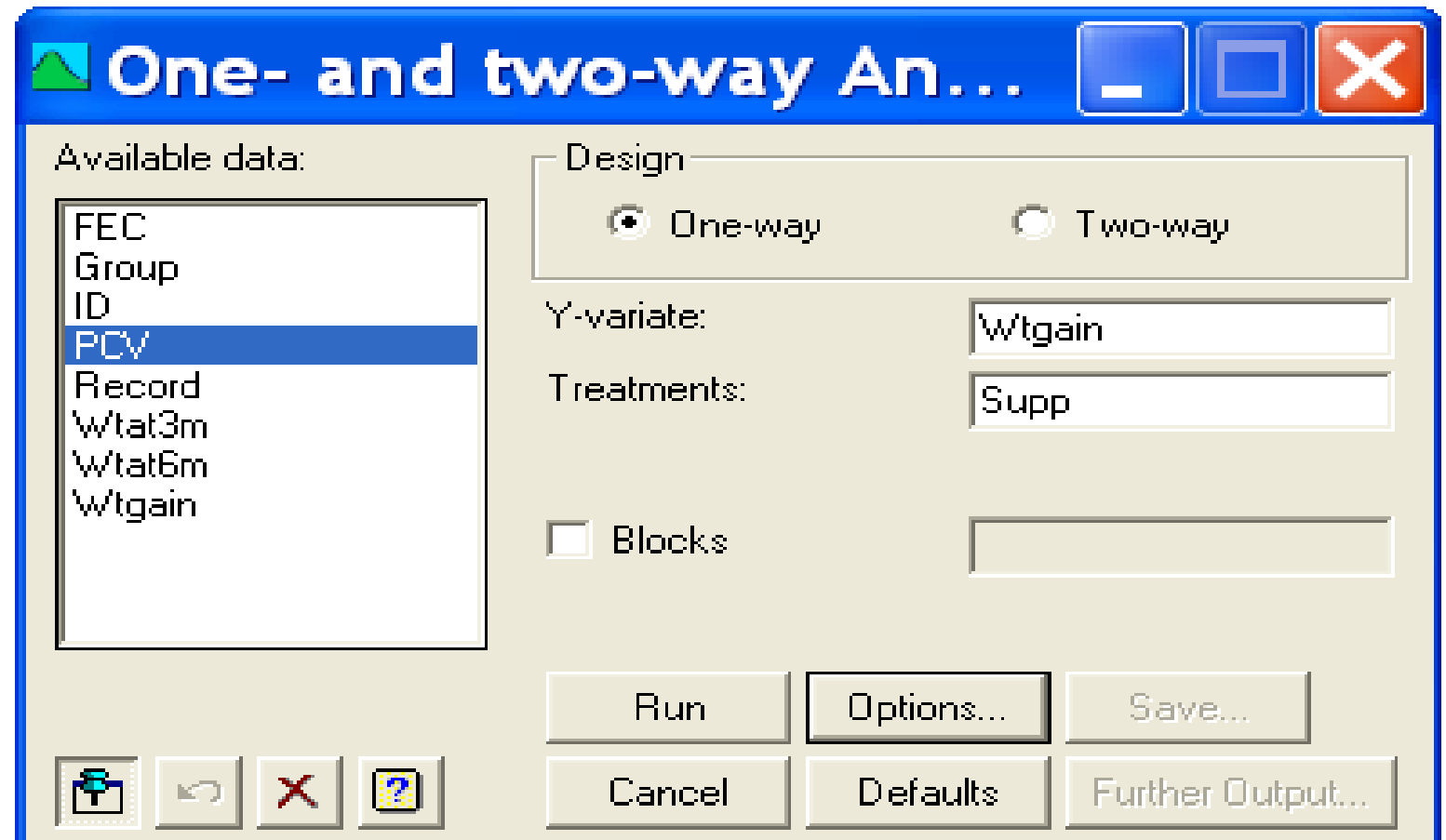
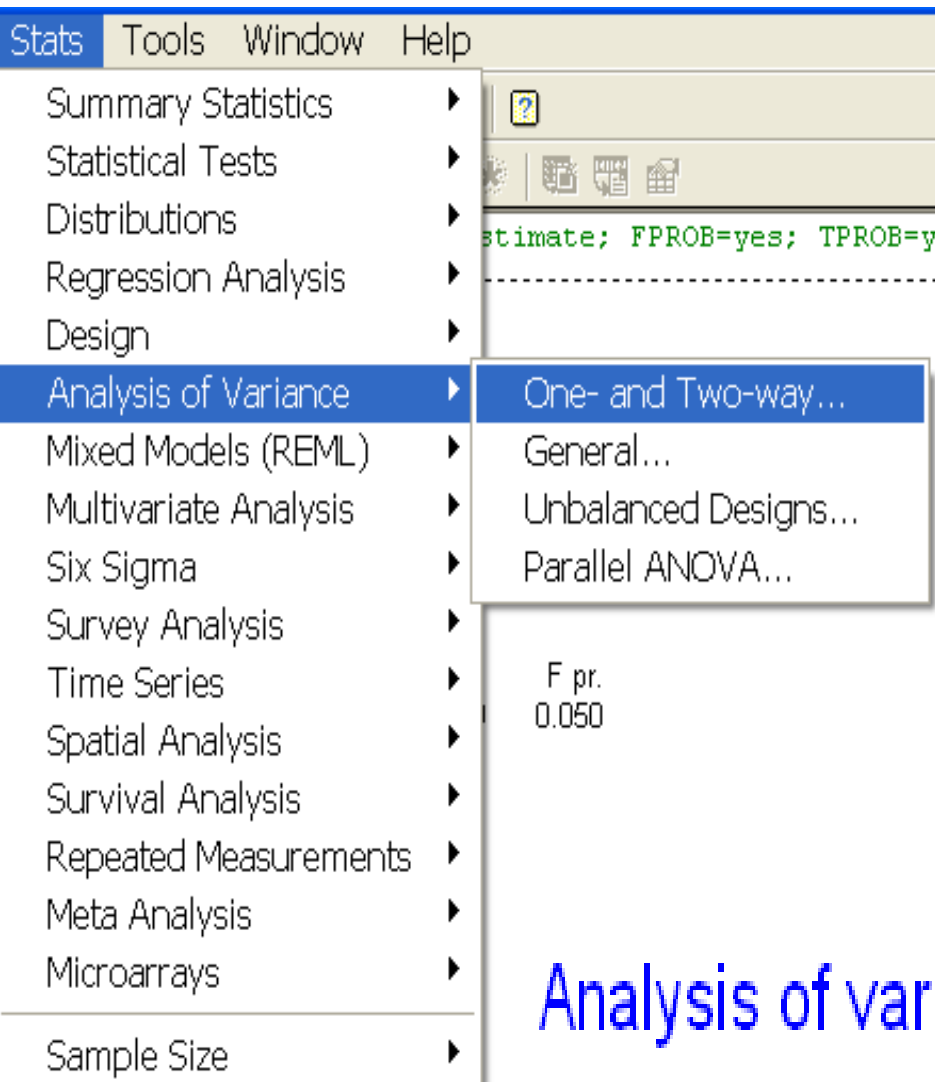
Unit	Response	Leverage
1	0.90	0.285
4	2.30	0.165
5	0.70	0.135
16	1.00	0.198

## Estimates of parameters

Parameter	estimate	s.e.	t(30)	t pr.
Constant	2.565	0.265	9.67	<.001
FEC	-0.000224	0.000109	-2.05	0.050

# Analysis of Variance

Select **Stats** → **Analysis of Variance ...**



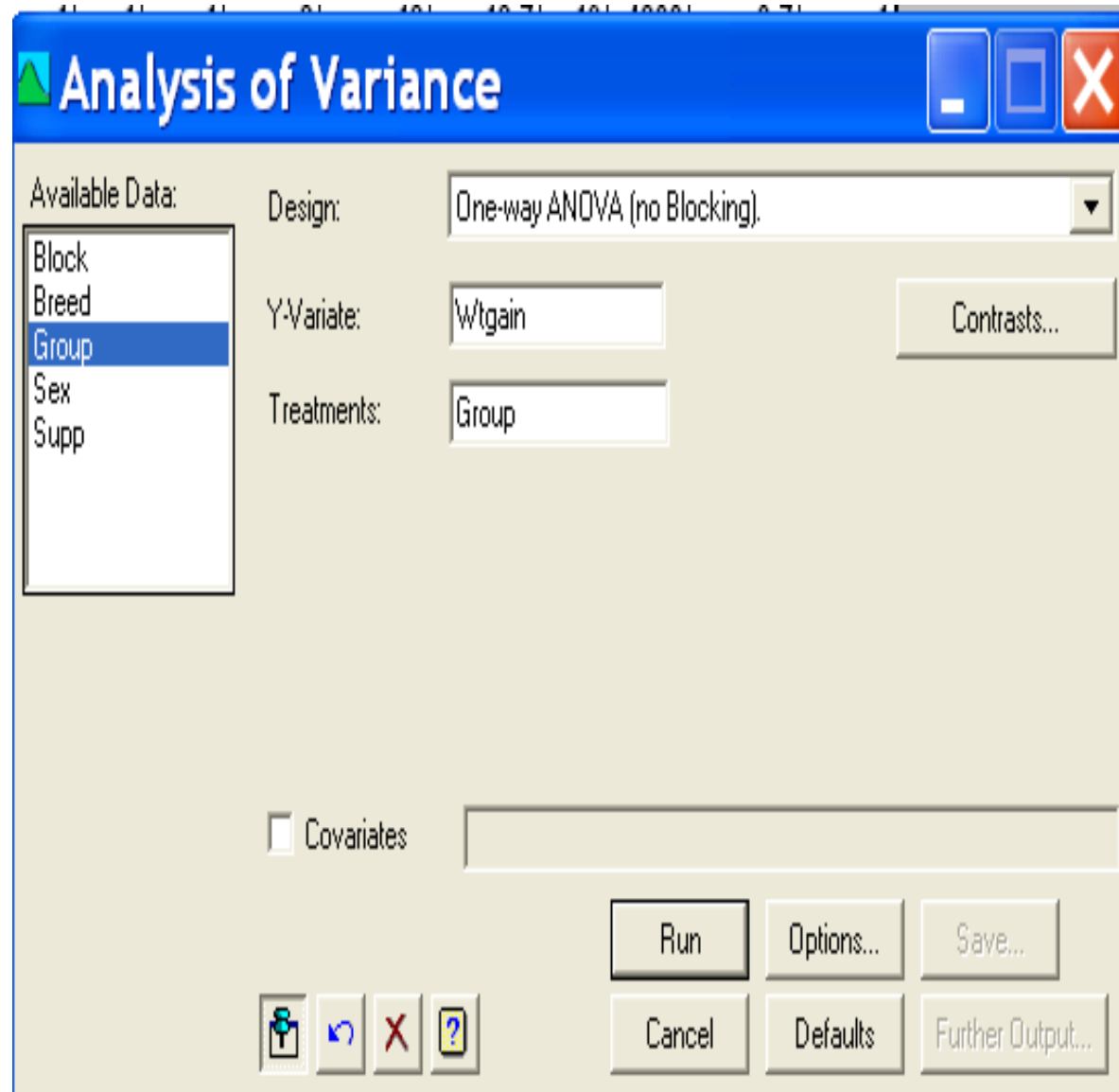
## Analysis of variance

Variate: Wtgain

Source of variation	d.f.	s.s.	m.s.	v.r.	F pr.
Supp	1	18.6050	18.6050	32.14	<.001
Residual	30	17.3637	0.5788		
Total	31	35.9687			

# Analysis of Variance

Select **Stats** → **Analysis of Variance** → **General ...**



Row	T	_Rows_	1	2	3	4
1		Contrast 1	1	0	0	0
2		Contrast 2	0	0	0	0
3		Contrast 3	0	0	0	0

# Learning by yourself

Use the tutorial (see below) for guidance

