



Tutorials and worked examples for simulation,  
curve fitting, statistical analysis, and plotting.

<https://simfit.org.uk>

<https://simfit.silverfrost.com>

Sometimes data are stored in a matrix such that each row contains values observed within groups that are defined by columns, and where it is wished to test for equality of group means. If normality and identical variance are assumed then systematic  $t$  tests can be performed as long as membership of groups is easy to define and change interactively.

To clarify the situation choose [Statistics] from the main SIMFIT menu followed by [Data exploration] and then [ $t$  tests across rows of a matrix], and browse the default test file `ttest.tf6` which has the following data.

8.8	8.4	7.9	8.7	9.1	9.6	9.9	9.0	11.1	9.6	8.7	10.4	9.5
8.0	7.4	6.9	8.2	9.7	9.1	9.9	7.0	11.1	8.6	9.7	8.4	9.1
20.2	16.8	15.4	17.1	18.1	20.0	7.7	8.9	9.7	9.1	10.6	10.2	10.1
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
7.7	8.9	10.2	8.5	9.1	8.6	18.9	19.2	15.1	19.5	18.9	19.9	19.4
begin{indicators}												
1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1
end{indicators}												

Note that, after the data, the group membership is defined by the sectioning commands

```
begin{indicators} . . . end{indicators}
```

with a 1 if a column belongs to group  $X$ , a -1 if the column belongs to group  $Y$  and a 0 if a column is not to be used. So in this data set the first 6 columns belong to group  $X$  while the next 7 columns belong to group  $Y$  and there are no suppressed columns.

Analysis leads to the following results for the sample means, standard deviations, standard error of the differences,  $t$  values, and  $p$  values, and where a -1 in the significance level column indicates zero sample variance, as with row 4 emphasized in red, so that a  $t$  test cannot be performed.

Variables:  $NX = 6, NY = 7$

$\bar{X}$	std $X$	$\bar{Y}$	std $Y$	se diff	$t$	2-tail $p$
8.7500	0.5822	9.7429	0.8182	0.4009	-2.4765	0.030765
8.2167	1.0420	9.1143	1.3005	0.6621	-1.3558	0.202338
17.933	1.8886	9.4714	0.9878	0.8164	10.365	0.000001
-1.0000	-1.0000	-1.0000	-1.0000	-1.0000	-1.0000	-1.000000
8.8333	0.8238	18.700	1.6258	0.7360	-13.405	0.000000

The type of  $t$  test (i.e. lower, upper, or 2-tail) and partitioning of columns into groups can be done interactively.