List of changes made in the files by *jbcooper@fastmail.net* posted on 3/11/15.

## statistical.cpp

In the T-test function widget it asks for the Type followed by the Mode of the T-test but I found that these are the wrong way round since the results for the paired t-test only agree with Gnumeric if I swap them round. I also looked at the code which confirmed they are the wrong way round and I spotted some bugs in the way the variances are calculated for the unpaired t-test e.g.

varY = calc->div(varY, calc->sub(Value(numX), 1));
Note the variance on Y should divide by the numY, not numX.

I then looked at the code more and I found that I could not really work out what the formulae were doing and they do not seem to fully agree with the published formulae for the un-paired t-test either with equal variance or unequal variance. I found that the results they were giving were approximately the same as with GNUMERIC, EXCEL and LibreOffice but not quite, sometimes differing by a factor of up to 3 or 4. Anyhow, I re-coded the formulae exactly as they are in stats books and the results are now in exact agreement with the other programs (please see screenshots).

## statistical.xml

Revised the description of the TTEST function to be consistent with the formula which the program uses, i.e. type and mode were the wrong way round.

Revised the description of COMBINA to mention that it allows repetition. Previously the description was the same as for COMBIN.

Revised the description of FREQUENCY to say that the function must be entered using 'Ctrl+Alt+Enter' rather than just 'Enter' to generate the table of results correctly.

Revised the description of the RANK function since the 'syntax' for this said 'RSQ' instead.

Same for STEYX function - the 'syntax' said 'SLOPE'.

Revised the description of TREND to say that the function must be entered using 'Ctrl+Alt+Enter' rather than just 'Enter' to generate the results correctly.

Revised the description of TRIMMEAN to explain what the function does and likewise for ZTEST.

Revised description of VARA to say how it is different from VAR. Minor reword to VAR, VARPA and VARIANCE.

## math.xml

Revised the description of TRANSPOSE to say that the function must be entered using 'Ctrl+Alt+Enter' rather than just 'Enter' to generate the results correctly. I think this should be added to other MATH functions that return a matrix.


## Functions to be looked at in future work

GAMMAINV does not seem to work.
GAUSS does not agree with GNUMERIC.
BINO, INVBINO
KURTP does not seem to work.
Check for matrix functions in math needing to mention 'Ctrl+Alt+Enter' in the help.
TREND line allow offset.
ZTEST - not sure this is working.

T-tests in Sheets *before correction* to statistical.cpp

statistical.xls [modified] — Calligra Sheets

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New  Open  Save  Undo Resize Column  Redo  Cut  Copy  Paste

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | T-test | | | | | | | | | | | Paired | 1-tail | 2-tail | | | |
| 2 | 75 | 77 | 80 | 79 | 96 | 78 | 77 | 72 | 98 | 87 | | | 0.05110438 | 0.102208761 | | | |
| 3 | 61 | 55 | 77 | 74 | 83 | 66 | 57 | 96 | 69 | 93 | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | Unpaired | 1-tail equ. var. | 1-tail unequ. var. | 2-tail equ. var. | 2-tail unequ. var. | |
| 6 | 75 | 77 | 80 | 79 | 96 | 78 | 77 | 72 | 98 | 87 | 99 | | 0.03080589 | 0.030202093 | 0.06161178 | 0.060404187 | |
| 7 | 61 | 55 | 77 | 74 | 83 | 66 | 57 | 96 | 69 | 93 | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | Unpaired | 1-tail equ. var. | 1-tail unequ. var. | 2-tail equ. var. | 2-tail unequ. var. | |
| 10 | 57 | 65 | 45 | 79 | 66 | 76 | 69 | 73 | 63 | 84 | | | 4.93E-08 | 5.93E-07 | 9.86E-08 | 0.000001186 | |
| 11 | 33 | 42 | 28 | 26 | 36 | 29 | 24 | 31 | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | |

Cell formatting
Shape handling
Connect shapes

Gnumeric

statistical.xls - Gnumeric

File  Edit  View  Insert  Format  Tools  Statistics  Data  Help

Arial 10

A1    T-test

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | T-test | | | | | | | | | | | Paired | 1-tail | 2-tail | | |
| 2 | 75 | 77 | 80 | 79 | 96 | 78 | 77 | 72 | 98 | 87 | | | 0.051104379533 | 0.1022087590659 | | |
| 3 | 61 | 55 | 77 | 74 | 83 | 66 | 57 | 96 | 69 | 93 | | | | | | |
| 4 | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | Unpaired | 1-tail equ. var. | 1-tail unequ. var. | 2-tail equ. var. | 2-tail unequ. var. |
| 6 | 75 | 77 | 80 | 79 | 96 | 78 | 77 | 72 | 98 | 87 | 99 | | 0.033031465701 | 0.0368277936195 | 0.0660629314 | 0.073655587239 |
| 7 | 61 | 55 | 77 | 74 | 83 | 66 | 57 | 96 | 69 | 93 | | | | | | |
| 8 | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | Unpaired | 1-tail equ. var. | 1-tail unequ. var. | 2-tail equ. var. | 2-tail unequ. var. |
| 10 | 57 | 65 | 45 | 79 | 66 | 76 | 69 | 73 | 63 | 84 | | | 1.79844349E-07 | 2.09652553E-07 | 3.5968870E-07 | 4.19305106E-07 |
| 11 | 33 | 42 | 28 | 26 | 36 | 29 | 24 | 31 | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | |

LibreOffice

statistical.xls - LibreOffice Calc

File  Edit  View  Insert  Format  Tools  Data  Window  Help

Arial  10

A1    T-test

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | T-test | | | | | | | | | | | Paired | 1-tail | 2-tail | | | |
| 2 | 75 | 77 | 80 | 79 | 96 | 78 | 77 | 72 | 98 | 87 | | | 0.0511043805 | 0.1022087609 | | | |
| 3 | 61 | 55 | 77 | 74 | 83 | 66 | 57 | 96 | 69 | 93 | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | Unpaired | 1-tail equ. var. | 1-tail unequ. var. | 2-tail equ. var. | 2-tail unequ. var. | |
| 6 | 75 | 77 | 80 | 79 | 96 | 78 | 77 | 72 | 98 | 87 | 99 | | 0.0330314666 | 0.0368277942 | 0.0660629333 | 0.0736555885 | |
| 7 | 61 | 55 | 77 | 74 | 83 | 66 | 57 | 96 | 69 | 93 | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | Unpaired | 1-tail equ. var. | 1-tail unequ. var. | 2-tail equ. var. | 2-tail unequ. var. | |
| 10 | 57 | 65 | 45 | 79 | 66 | 76 | 69 | 73 | 63 | 84 | | | 1.79844349E-007 | 2.09652553E-007 | 3.5968870E-007 | 4.1930511E-007 | |
| 11 | 33 | 42 | 28 | 26 | 36 | 29 | 24 | 31 | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | | | | |

Sheets, *after corrections* to statistical.cpp

statistical.xls [modified] — Calligra Sheets

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| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | T-test | | | | | | | | | | | Paired | 1-tail | 2-tail | | | |
| 2 | 75 | 77 | 80 | 79 | 96 | 78 | 77 | 72 | 98 | 87 | | | 0.05110438 | 0.102208761 | | | |
| 3 | 61 | 55 | 77 | 74 | 83 | 66 | 57 | 96 | 69 | 93 | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | Unpaired | 1-tail equ. var. | 1-tail unequ. var. | 2-tail equ. var. | 2-tail unequ. var. | |
| 6 | 75 | 77 | 80 | 79 | 96 | 78 | 77 | 72 | 98 | 87 | 99 | | 0.033031466 | 0.036827794 | 0.066062933 | 0.073655588 | |
| 7 | 61 | 55 | 77 | 74 | 83 | 66 | 57 | 96 | 69 | 93 | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | Unpaired | 1-tail equ. var. | 1-tail unequ. var. | 2-tail equ. var. | 2-tail unequ. var. | |
| 10 | 57 | 65 | 45 | 79 | 66 | 76 | 69 | 73 | 63 | 84 | | | 1.8E-07 | 2.1E-07 | 3.6E-07 | 4.19E-07 | |
| 11 | 33 | 42 | 28 | 26 | 36 | 29 | 24 | 31 | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | |