log:  d:univaranal.log
log type:  text
opened on:  16 Feb 2007, 13:51:33

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. PROGRAM: RUNUNIVAR

UNIVARIATE COST AND EFFECT DIFFERENCE TESTS

rununivar evaluates univariate differences in continuous cost and effect variables. Both cost and effect variables must be continuous. The variable representing treatment must be dichotomous (but need not be 0/1)

COMMAND LINE:  rununivar [COSTVAR] [EFFECTVAR] [GROUPVAR] [if]

Arguments (the 3 arguments are all names of variables):
`1'  Name of the cost variable
`2'  Name of the effect variable
`3'  Name of the treatment group (dichotomous variable)

costvar and effectvar should both be continuous (because this program performs tests of continuous variables). groupvar must take on one of two values (although they need not be 0/1). If more than 2 treatment groups exist in the dataset, use the [if] statement to identify the 2 groups you wish to compare

We recommend that you open a log file before running this program. The program respects your [set more] setting. If you want the output of the program to scroll continuously without stopping, use the [set more off] command before running

PROGRAM DESCRIPTION

rununivar performs two-sample statistical tests on the difference in continuous measures of both cost and effect (rununivar is not designed for tests of categorical measures of effect [e.g., dichotomous live/die or cure/no cure variables]). It implements the following commands/tests for both cost and effect:

1. INSPECT THE COST DATA (by use of sum,detail, stratified by treatment group)
2. TEST IF THE SD’S ARE EQUAL (by use of sdtest)
3. DO T-TEST (by use of ttest; equal/unequal variances based on results of sdtest)
4. TEST FOR THE NORMALITY OF THE COST DATA (by use of sktest, stratified by treatment group)
5. DO WILCOXAN RANKSUM TEST (by use of ranksum)
6. DO KOLMOGOROV SMIRNOV TEST (by use of ksmirnov)
7. IDENTIFY TRANSFORMATION TOWARDS NORMAL (by use of ladder, stratified by treatment group)
8. INSPECT THE TRANSFORMED COST DATA (by use of sum,detail, stratified by treatment group)
9. TEST IF THE SD’S OF THE TRANSFORMED COST DATA ARE EQUAL (by use of sdtest)
10. DO T-TEST ON TRANSFORMED COST DATA (by use of ttest; equal/unequal variances based on results of sdtest)
11. TEST FOR NORMALITY OF THE TRANSFORMED COST DATA
12. REPEAT ALL 11 STEPS FOR THE OUTCOME VARIABLE

[Note that in step 7 in which we consider transforming the data, we do not simply take the log transformation, but instead assess which of the 9 transformations evaluated by the `ladder' command makes the data most normal. As noted in the book, problems with retransformation confront most if not all of the ladder transformations.]

SAVED RESULTS

Scalars
r(cdiff)=difference in cost
r(ctttestp)=p-value for parametric test of cost
r(cttll)=parametric lower 95% CL for cost
r(cttul)=parametric upper 95% CL for cost
r(cbsp)=p-value for nonparametric test of cost
r(cbsll)=bootstrap lower 95% CL for cost
r(cbsul)=bootstrap upper 95% CL for cost
r(cwrsp)=p-value for rank-sum test for cost
r(cksp)=p-value for kilmogorov smirnov test for cost
r(ctttp)=p-value for difference in transformed cost
r(chetp)=p-value hettest for cost
r(qdiff)=difference in effect
r(qtttestp)=p-value for parametric test of effect
r(qttll)=parametric lower 95% CL for effect
r(qttul)=parametric upper 95% CL for effect
r(qbsp)=p-value for nonparametric test of effect
r(qbsll)=bootstrap lower 95% CL for effect
r(qbsul)=bootstrap upper 95% CL for effect
r(qwrsp)=p-value for rank-sum test for effect
r(qksp)=p-value for kilmogorov smirnov test for effect
r(qttttp)=p-value for difference in transformed effect
r(qhettetp)=p-value hettest for effect

Macros
r(ctrans)=transformation of cost to normal
r(qtrans)=transformation of effect to normal

EXAMPLES

* Basic command
rununivar cost qaly treat

* Require each observation to contribute measures of both cost and effect

    rununivar cost qaly treat if cost~=.&qaly~=

* Identify 2 of multiple treatment groups

    rununivar cost qaly treat if groupvar==[#]|groupvar==[#]

*** RESERVED SCALAR NAMES ***

In general, running rununivar will leave your dataset and programming environment unchanged. However, due to limitations in running the bootstrap, this program creates 4 scalars that will overwrite similarly named scalars that you may have created:

__hgc00000 __hgc00001 __hge00000 __hge00001

If you have created scalars with these names, running this program will corrupt your scalars.

In the routine running of this program, these four scalars are deleted after the bootstrap is run. If the program terminates early because of an error, these scalars may remain in the workspace. They can be eliminated by:

1. clearing the workspace: (clear)
2. dropping all scalars: (scalar drop _all)
3. dropping the specific scalars:
   scalar drop __hgc00000 __hgc00001 __hge00000 __hge00001
4. ending the session

.use chapter5
.sum

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>id</td>
<td>500</td>
<td>250.5</td>
<td>144.4818</td>
<td>1</td>
<td>500</td>
</tr>
<tr>
<td>treat</td>
<td>500</td>
<td>.5</td>
<td>.5005008</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>cost</td>
<td>500</td>
<td>3027.5</td>
<td>1389.921</td>
<td>315</td>
<td>10499</td>
</tr>
<tr>
<td>qaly</td>
<td>500</td>
<td>.5941654</td>
<td>.2121149</td>
<td>.04798</td>
<td>.95119</td>
</tr>
</tbody>
</table>

.rununivar cost qaly treat

UNIVARIATE ANALYSIS OF COST:  cost

INSPECT THE COST DATA

-> treat = 0
<table>
<thead>
<tr>
<th>Percentiles</th>
<th>Smallest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>622</td>
</tr>
<tr>
<td>5%</td>
<td>899</td>
</tr>
<tr>
<td>10%</td>
<td>1093</td>
</tr>
<tr>
<td>25%</td>
<td>1819</td>
</tr>
<tr>
<td>50%</td>
<td>2825.5</td>
</tr>
<tr>
<td>75%</td>
<td>3752</td>
</tr>
<tr>
<td>90%</td>
<td>4952</td>
</tr>
<tr>
<td>95%</td>
<td>6103</td>
</tr>
<tr>
<td>99%</td>
<td>7540</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentiles</th>
<th>Largest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>681</td>
</tr>
<tr>
<td>5%</td>
<td>899</td>
</tr>
<tr>
<td>10%</td>
<td>1093</td>
</tr>
<tr>
<td>25%</td>
<td>1170</td>
</tr>
<tr>
<td>50%</td>
<td>1170</td>
</tr>
<tr>
<td>75%</td>
<td>6296</td>
</tr>
<tr>
<td>90%</td>
<td>6470</td>
</tr>
<tr>
<td>95%</td>
<td>6520</td>
</tr>
<tr>
<td>99%</td>
<td>10499</td>
</tr>
</tbody>
</table>

Total cost

<table>
<thead>
<tr>
<th>Percentiles</th>
<th>Smallest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>1093</td>
</tr>
<tr>
<td>5%</td>
<td>1426</td>
</tr>
<tr>
<td>10%</td>
<td>1832</td>
</tr>
<tr>
<td>25%</td>
<td>2226</td>
</tr>
<tr>
<td>50%</td>
<td>2900.5</td>
</tr>
<tr>
<td>75%</td>
<td>3604</td>
</tr>
<tr>
<td>90%</td>
<td>5085</td>
</tr>
<tr>
<td>95%</td>
<td>6470</td>
</tr>
<tr>
<td>99%</td>
<td>10499</td>
</tr>
</tbody>
</table>

TEST IF THE SD'S ARE EQUAL

Variance ratio test

<table>
<thead>
<tr>
<th>Group</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>250</td>
<td>3015</td>
<td>100.1052</td>
<td>1582.802</td>
<td>2817.839  3212.161</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>3040</td>
<td>73.91742</td>
<td>1168.737</td>
<td>2994.417  3185.583</td>
</tr>
<tr>
<td>combined</td>
<td>500</td>
<td>3027.5</td>
<td>62.15917</td>
<td>1365946</td>
<td>2905.374  3149.626</td>
</tr>
</tbody>
</table>

ratio = sd(0) / sd(1)    f = 1.8341
Ho: ratio = 1    degrees of freedom = 249, 249
Ha: ratio < 1    Ha: ratio != 1    Ha: ratio > 1
Pr(F < f) = 1.0000    2*Pr(F > f) = 0.0000    Pr(F > f) = 0.0000

DO T-TEST

Two-sample t test with unequal variances

<table>
<thead>
<tr>
<th>Group</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>250</td>
<td>3015</td>
<td>100.1052</td>
<td>1582.802</td>
<td>2817.839  3212.161</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>3040</td>
<td>73.91742</td>
<td>1168.737</td>
<td>2994.417  3185.583</td>
</tr>
</tbody>
</table>
TEST FOR THE NORMALITY OF THE COST DATA

Treatment group 0

Skewness/Kurtosis tests for Normality

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pr(Skewness)</th>
<th>Pr(Kurtosis)</th>
<th>adj chi2(2)</th>
<th>Prob&gt;chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost</td>
<td>0.000</td>
<td>0.000</td>
<td>37.08</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Treatment group 1

Skewness/Kurtosis tests for Normality

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pr(Skewness)</th>
<th>Pr(Kurtosis)</th>
<th>adj chi2(2)</th>
<th>Prob&gt;chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost</td>
<td>0.000</td>
<td>0.000</td>
<td>73.47</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

DO WILCOXON RANKSUM TEST & KS TEST

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

<table>
<thead>
<tr>
<th>treat</th>
<th>obs</th>
<th>rank sum</th>
<th>expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>250</td>
<td>61183.5</td>
<td>62625</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>64066.5</td>
<td>62625</td>
</tr>
<tr>
<td>combined</td>
<td>500</td>
<td>125250</td>
<td>125250</td>
</tr>
</tbody>
</table>

unadjusted variance 2609375.00
adjustment for ties -3.51
adjusted variance 2609371.49

Ho: cost(treat==0) = cost(treat==1)
z = -0.892
Prob > |z| = 0.3722

Two-sample Kolmogorov-Smirnov test for equality of distribution functions:

<table>
<thead>
<tr>
<th>Smaller group</th>
<th>D</th>
<th>P-value</th>
<th>Corrected</th>
</tr>
</thead>
<tbody>
<tr>
<td>0:</td>
<td>0.1640</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>1:</td>
<td>-0.0640</td>
<td>0.359</td>
<td></td>
</tr>
<tr>
<td>Combined K-S:</td>
<td>0.1640</td>
<td>0.002</td>
<td>0.002</td>
</tr>
</tbody>
</table>
IDENTIFY TRANSFORMATION TOWARDS NORMAL

Treatment group 0

<table>
<thead>
<tr>
<th>Transformation</th>
<th>formula</th>
<th>chi2(2)</th>
<th>P(chi2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>cubic</td>
<td>cost^3</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>square</td>
<td>cost^2</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>raw</td>
<td>cost</td>
<td>37.08</td>
<td>0.000</td>
</tr>
<tr>
<td>square-root</td>
<td>sqrt(cost)</td>
<td>1.92</td>
<td>0.383</td>
</tr>
<tr>
<td>log</td>
<td>log(cost)</td>
<td>13.07</td>
<td>0.001</td>
</tr>
<tr>
<td>reciprocal root</td>
<td>1/sqrt(cost)</td>
<td>64.92</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal</td>
<td>1/cost</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal square</td>
<td>1/(cost^2)</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal cubic</td>
<td>1/(cost^3)</td>
<td>.</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Treatment group 1

<table>
<thead>
<tr>
<th>Transformation</th>
<th>formula</th>
<th>chi2(2)</th>
<th>P(chi2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>cubic</td>
<td>cost^3</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>square</td>
<td>cost^2</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>raw</td>
<td>cost</td>
<td>73.47</td>
<td>0.000</td>
</tr>
<tr>
<td>square-root</td>
<td>sqrt(cost)</td>
<td>18.65</td>
<td>0.000</td>
</tr>
<tr>
<td>log</td>
<td>log(cost)</td>
<td>8.70</td>
<td>0.013</td>
</tr>
<tr>
<td>reciprocal root</td>
<td>1/sqrt(cost)</td>
<td>46.39</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal</td>
<td>1/cost</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal square</td>
<td>1/(cost^2)</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal cubic</td>
<td>1/(cost^3)</td>
<td>.</td>
<td>0.000</td>
</tr>
</tbody>
</table>

INSPECT THE TRANSFORMED COST DATA

-> treat = 0

<table>
<thead>
<tr>
<th>sqrt(cost)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentiles</td>
</tr>
<tr>
<td>1%</td>
</tr>
<tr>
<td>5%</td>
</tr>
<tr>
<td>10%</td>
</tr>
<tr>
<td>25%</td>
</tr>
<tr>
<td>50%</td>
</tr>
<tr>
<td>75%</td>
</tr>
<tr>
<td>90%</td>
</tr>
<tr>
<td>95%</td>
</tr>
<tr>
<td>99%</td>
</tr>
</tbody>
</table>

-> treat = 1

<table>
<thead>
<tr>
<th>sqrt(cost)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentiles</td>
</tr>
<tr>
<td>1%</td>
</tr>
<tr>
<td>5%</td>
</tr>
<tr>
<td>10%</td>
</tr>
<tr>
<td>25%</td>
</tr>
</tbody>
</table>
TEST IF THE SD'S OF THE TRANSFORMED COST DATA ARE EQUAL

Variance ratio test

<table>
<thead>
<tr>
<th>Group</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>250</td>
<td>53.02489</td>
<td>.9037197</td>
<td>14.28906</td>
<td>51.24498  54.8048</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>54.19748</td>
<td>.6420133</td>
<td>10.15112</td>
<td>52.93301  55.46195</td>
</tr>
<tr>
<td>combined</td>
<td>500</td>
<td>53.61119</td>
<td>.5543426</td>
<td>12.39548</td>
<td>52.52205  54.70032</td>
</tr>
</tbody>
</table>

ratio = sd(0) / sd(1)  
\[ f = 1.9814 \]

Ho: ratio = 1  
Ha: ratio < 1  
Ha: ratio != 1  
Ha: ratio > 1

Pr(F < f) = 1.0000  
2*Pr(F > f) = 0.0000  
Pr(F > f) = 0.0000

DO T-TEST ON TRANSFORMED COST DATA

Two-sample t test with unequal variances

<table>
<thead>
<tr>
<th>Group</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>250</td>
<td>53.02489</td>
<td>.9037197</td>
<td>14.28906</td>
<td>51.24498  54.8048</td>
</tr>
<tr>
<td>1</td>
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<td>54.19748</td>
<td>.6420133</td>
<td>10.15112</td>
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<tr>
<td>combined</td>
<td>500</td>
<td>53.61119</td>
<td>.5543426</td>
<td>12.39548</td>
<td>52.52205  54.70032</td>
</tr>
<tr>
<td>diff</td>
<td>500</td>
<td>-1.1725</td>
<td>1.108553</td>
<td>-3.35118</td>
<td>1.006006</td>
</tr>
</tbody>
</table>

diff = mean(0) - mean(1)  
\[ t = -1.0578 \]

Ho: diff = 0  
Ha: diff < 0  
Ha: diff != 0  
Ha: diff > 0

Pr(T < t) = 0.1454  
Pr(|T| > |t|) = 0.2907  
Pr(T > t) = 0.8546

TEST FOR NORMALITY OF THE TRANSFORMED COST DATA

Treatment group 0

Skewness/Kurtosis tests for Normality

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pr(Skewness)</th>
<th>Pr(Kurtosis)</th>
<th>adj chi2(2)</th>
<th>Prob&gt;chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>000017</em></td>
<td>0.189</td>
<td>0.671</td>
<td>1.92</td>
<td>0.3829</td>
</tr>
</tbody>
</table>

Treatment group 1

Skewness/Kurtosis tests for Normality

| Variable | Pr(Skewness) | Pr(Kurtosis) | adj chi2(2) | Prob>chi2 |
UNIVARIATE ANALYSIS OF EFFECT: qaly

INSPECT THE EFFECT DATA

-> treat = 0

<table>
<thead>
<tr>
<th>Percentiles</th>
<th>Smallest</th>
<th>QALYs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>0.0861</td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td>0.16518</td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td>0.268535</td>
<td></td>
</tr>
<tr>
<td>25%</td>
<td>0.41286</td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td>0.63118</td>
<td>Mean</td>
</tr>
<tr>
<td>75%</td>
<td>0.74512</td>
<td></td>
</tr>
<tr>
<td>90%</td>
<td>0.834055</td>
<td>Variance</td>
</tr>
<tr>
<td>95%</td>
<td>0.86954</td>
<td>Skewness</td>
</tr>
<tr>
<td>99%</td>
<td>0.93039</td>
<td>Kurtosis</td>
</tr>
</tbody>
</table>

Obs 250
Sum of Wgt. 250

-> treat = 1

<table>
<thead>
<tr>
<th>Percentiles</th>
<th>Smallest</th>
<th>QALYs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>0.15776</td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td>0.2283</td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td>0.333105</td>
<td></td>
</tr>
<tr>
<td>25%</td>
<td>0.46083</td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td>0.655935</td>
<td>Mean</td>
</tr>
<tr>
<td>75%</td>
<td>0.79328</td>
<td></td>
</tr>
<tr>
<td>90%</td>
<td>0.856215</td>
<td>Variance</td>
</tr>
<tr>
<td>95%</td>
<td>0.89281</td>
<td>Skewness</td>
</tr>
<tr>
<td>99%</td>
<td>0.94304</td>
<td>Kurtosis</td>
</tr>
</tbody>
</table>

Obs 250
Sum of Wgt. 250

TEST IF THE SD'S ARE EQUAL

Variance ratio test

<table>
<thead>
<tr>
<th>Group</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>250</td>
<td>0.5729359</td>
<td>0.013736</td>
<td>0.2171849</td>
<td>0.5458824, 0.5999894</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>0.615395</td>
<td>0.0129756</td>
<td>0.2051629</td>
<td>0.589839, 0.640951</td>
</tr>
<tr>
<td>combined</td>
<td>500</td>
<td>0.5941654</td>
<td>0.0094861</td>
<td>0.2121149</td>
<td>0.5755279, 0.612803</td>
</tr>
</tbody>
</table>

ratio = sd(0) / sd(1)  \( f = 1.1206 \)
Ho: ratio = 1  degrees of freedom = 249, 249
Ha: ratio < 1  Ha: ratio != 1  Ha: ratio > 1
Pr(F < f) = 0.8153         2*Pr(F > f) = 0.3695           Pr(F > f) = 0.1847

DO T-TEST

Two-sample t test with equal variances

<table>
<thead>
<tr>
<th>Group</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>250</td>
<td>.5729</td>
<td>.013736</td>
<td>.2171849</td>
<td>.545824   .5999894</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>.6154</td>
<td>.012976</td>
<td>.2051629</td>
<td>.589839   .640951</td>
</tr>
<tr>
<td>combined</td>
<td>500</td>
<td>.5942</td>
<td>.009486</td>
<td>.2121149</td>
<td>.5755279  .612803</td>
</tr>
<tr>
<td>diff</td>
<td></td>
<td>-.0425</td>
<td>.018896</td>
<td>-.079584</td>
<td>-.0053341</td>
</tr>
</tbody>
</table>

diff = mean(0) - mean(1) t = -2.2470
Ho: diff = 0        degrees of freedom = 498
Ha: diff < 0        Ha: diff != 0        Ha: diff > 0
Pr(T < t) = 0.0125  Pr(|T| > |t|) = 0.0251  Pr(T > t) = 0.9875

TEST FOR THE NORMALITY OF THE EFFECT DATA

Treatment group 0

Skewness/Kurtosis tests for Normality

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pr(Skewness)</th>
<th>Pr(Kurtosis)</th>
<th>adj chi2(2)</th>
<th>Prob&gt;chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td>qaly</td>
<td>0.005</td>
<td>0.000</td>
<td>17.94</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

Treatment group 1

Skewness/Kurtosis tests for Normality

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pr(Skewness)</th>
<th>Pr(Kurtosis)</th>
<th>adj chi2(2)</th>
<th>Prob&gt;chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td>qaly</td>
<td>0.008</td>
<td>0.000</td>
<td>22.14</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

DO WILCOXON RANKSUM TEST & KS TEST

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

<table>
<thead>
<tr>
<th>treat</th>
<th>obs</th>
<th>rank sum</th>
<th>expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>250</td>
<td>59181</td>
<td>62625</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>66069</td>
<td>62625</td>
</tr>
<tr>
<td>combined</td>
<td>500</td>
<td>125250</td>
<td>125250</td>
</tr>
</tbody>
</table>

unadjusted variance 2609375.00
adjustment for ties -0.38
adjusted variance 2609374.62

Ho: qaly(treat==0) = qaly(treat==1)
z = -2.132
Prob > |z| = 0.0330
Two-sample Kolmogorov-Smirnov test for equality of distribution functions:

<table>
<thead>
<tr>
<th>Smaller group</th>
<th>D</th>
<th>P-value</th>
<th>Corrected</th>
</tr>
</thead>
<tbody>
<tr>
<td>0:</td>
<td>0.1120</td>
<td>0.043</td>
<td></td>
</tr>
<tr>
<td>1:</td>
<td>-0.0040</td>
<td>0.996</td>
<td></td>
</tr>
<tr>
<td>Combined K-S:</td>
<td>0.1120</td>
<td>0.087</td>
<td>0.071</td>
</tr>
</tbody>
</table>

IDENTIFY TRANSFORMATION TOWARDS NORMAL

Treatment group 0

<table>
<thead>
<tr>
<th>Transformation</th>
<th>formula</th>
<th>chi2(2)</th>
<th>P(chi2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>cubic</td>
<td>qaly^3</td>
<td>17.49</td>
<td>0.000</td>
</tr>
<tr>
<td>square</td>
<td>qaly^2</td>
<td>46.47</td>
<td>0.000</td>
</tr>
<tr>
<td>raw</td>
<td>qaly</td>
<td>17.94</td>
<td>0.000</td>
</tr>
<tr>
<td>square-root</td>
<td>sqrt(qaly)</td>
<td>22.76</td>
<td>0.000</td>
</tr>
<tr>
<td>log</td>
<td>log(qaly)</td>
<td>63.01</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal root</td>
<td>1/sqrt(qaly)</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal</td>
<td>1/qaly</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal square</td>
<td>1/(qaly^2)</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal cubic</td>
<td>1/(qaly^3)</td>
<td>.</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Treatment group 1

<table>
<thead>
<tr>
<th>Transformation</th>
<th>formula</th>
<th>chi2(2)</th>
<th>P(chi2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>cubic</td>
<td>qaly^3</td>
<td>36.73</td>
<td>0.000</td>
</tr>
<tr>
<td>square</td>
<td>qaly^2</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>raw</td>
<td>qaly</td>
<td>22.14</td>
<td>0.000</td>
</tr>
<tr>
<td>square-root</td>
<td>sqrt(qaly)</td>
<td>17.38</td>
<td>0.000</td>
</tr>
<tr>
<td>log</td>
<td>log(qaly)</td>
<td>39.84</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal root</td>
<td>1/sqrt(qaly)</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal</td>
<td>1/qaly</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal square</td>
<td>1/(qaly^2)</td>
<td>.</td>
<td>0.000</td>
</tr>
<tr>
<td>reciprocal cubic</td>
<td>1/(qaly^3)</td>
<td>.</td>
<td>0.000</td>
</tr>
</tbody>
</table>

INSPECT THE TRANSFORMED DATA

```
-> treat = 0

qaly

<table>
<thead>
<tr>
<th>Percentiles</th>
<th>Smallest</th>
<th>Smallest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>.0861</td>
<td>.04798</td>
</tr>
<tr>
<td>5%</td>
<td>.16518</td>
<td>.08147</td>
</tr>
<tr>
<td>10%</td>
<td>.268535</td>
<td>.0861</td>
</tr>
<tr>
<td>25%</td>
<td>.41286</td>
<td>.09659</td>
</tr>
<tr>
<td>50%</td>
<td>.63118</td>
<td></td>
</tr>
<tr>
<td>75%</td>
<td>.74512</td>
<td>.91366</td>
</tr>
<tr>
<td>90%</td>
<td>.834055</td>
<td>.93039</td>
</tr>
<tr>
<td>95%</td>
<td>.86954</td>
<td>.9318</td>
</tr>
<tr>
<td>99%</td>
<td>.93039</td>
<td>.95119</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```
-> treat = 1

galy

<table>
<thead>
<tr>
<th>Percentiles</th>
<th>Smallest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>.15776</td>
</tr>
<tr>
<td>5%</td>
<td>.2283</td>
</tr>
<tr>
<td>10%</td>
<td>.333105</td>
</tr>
<tr>
<td>25%</td>
<td>.46083</td>
</tr>
<tr>
<td>50%</td>
<td>.655935</td>
</tr>
<tr>
<td>75%</td>
<td>.79328</td>
</tr>
<tr>
<td>90%</td>
<td>.856215</td>
</tr>
<tr>
<td>95%</td>
<td>.892811</td>
</tr>
<tr>
<td>99%</td>
<td>.94304</td>
</tr>
</tbody>
</table>

Percentiles

<table>
<thead>
<tr>
<th>Largest</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obs</td>
<td>Sum of Wgt.</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
</tr>
</tbody>
</table>

Mean .615395

Largest .94877

Skewness -.4158588

Kurtosis 2.172398

TEST IF THE SD'S OF THE TRANSFORMED EFFECT DATA ARE EQUAL

Variance ratio test

<table>
<thead>
<tr>
<th>Group</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
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</thead>
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<tr>
<td>0</td>
<td>250</td>
<td>.5729359</td>
<td>.013736</td>
<td>.2171849</td>
<td>.5458824  - .5999894</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>.615395</td>
<td>.0129756</td>
<td>.2051629</td>
<td>.589839   - .640951</td>
</tr>
<tr>
<td>combined</td>
<td>500</td>
<td>.5941654</td>
<td>.0094861</td>
<td>.2121149</td>
<td>.5755279  - .612803</td>
</tr>
</tbody>
</table>

ratio = sd(0) / sd(1)  
Ho: ratio = 1  
Ha: ratio < 1  
Pr(F < f) = 0.8153  
2*Pr(F > f) = 0.3695  
Pr(F > f) = 0.1847

DO T-TEST ON TRANSFORMED EFFECT DATA

Two-sample t test with equal variances

<table>
<thead>
<tr>
<th>Group</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
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<tbody>
<tr>
<td>0</td>
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<td>.2171849</td>
<td>.5458824  - .5999894</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>.615395</td>
<td>.0129756</td>
<td>.2051629</td>
<td>.589839   - .640951</td>
</tr>
<tr>
<td>combined</td>
<td>500</td>
<td>.5941654</td>
<td>.0094861</td>
<td>.2121149</td>
<td>.5755279  - .612803</td>
</tr>
</tbody>
</table>

diff | -.0424591 | .0188956 | -.079584 | -.0053341 |

diff = mean(0) - mean(1)  
Ho: diff = 0  
t = -2.2470  
degrees of freedom = 498

Ha: diff < 0  
Pr(T < t) = 0.0125

Ha: diff != 0  
Pr(|T| > |t|) = 0.0251

Ha: diff > 0  
Pr(T > t) = 0.9875

TEST FOR NORMALITY OF THE TRANSFORMED EFFECT DATA

Skewness/Kurtosis tests for Normality
Variable | Pr(Skewness) | Pr(Kurtosis) | adj chi2(2) | Prob>chi2
----------+----------------+----------------+----------------+----------------
__000018 | 0.005          | 0.000          | 17.94        | 0.0001

Treatment group 1

Skewness/Kurtosis tests for Normality

Variable | Pr(Skewness) | Pr(Kurtosis) | adj chi2(2) | Prob>chi2
----------+----------------+----------------+----------------+----------------
__000018 | 0.008          | 0.000          | 22.14        | 0.0000

RUN BOOTSTRAP, 2000 iterations

(bootstrap: bscande cost qaly treat)

Summarize bootstrap replicates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost0</td>
<td>2000</td>
<td>3018.494</td>
<td>98.70323</td>
<td>2649.732</td>
<td>3346.248</td>
</tr>
<tr>
<td>cost1</td>
<td>2000</td>
<td>3042.268</td>
<td>75.0312</td>
<td>2781.556</td>
<td>3334.656</td>
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<tr>
<td>cdiff</td>
<td>2000</td>
<td>23.77417</td>
<td>127.0981</td>
<td>-388.5801</td>
<td>472.7639</td>
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<tr>
<td>eff0</td>
<td>2000</td>
<td>.5730548</td>
<td>.0134217</td>
<td>.5291615</td>
<td>.6202776</td>
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<tr>
<td>eff1</td>
<td>2000</td>
<td>.6151467</td>
<td>.0128799</td>
<td>.5733691</td>
<td>.6575605</td>
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<tr>
<td>ediff</td>
<td>2000</td>
<td>.0420919</td>
<td>.0182357</td>
<td>-.0314032</td>
<td>.1012923</td>
</tr>
</tbody>
</table>

Bootstrap Results for cost

Nonparametric 2-tailed p-value for the difference in cost

.86

Nonparametric 95% CI

-218 to 275

Parametric 2-tailed p-value for the difference in cost

.8442

Parametric 95% CI

-225 to 275

Bootstrap Results for qaly

Nonparametric 2-tailed p-value for the difference in qaly

.029

Nonparametric 95% CI

.0067 to .0771
Parametric 2-tailed p-value for the difference in qaly

.0202

Parametric 95% CI

.0067 to .0783

<table>
<thead>
<tr>
<th>SUMMARY TABLE</th>
<th>P-value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIFFERENCE IN ARITHMETIC MEAN COST:</td>
<td>25.00</td>
<td>SE: 124.44</td>
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<td>COST VARIABLE:</td>
<td>cost</td>
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<tr>
<td>t-test, difference in means:</td>
<td>0.8409</td>
<td>-220 to 270</td>
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<tr>
<td>nonparametric BS, diff in means:</td>
<td>0.8600</td>
<td>-218 to 275</td>
</tr>
<tr>
<td>Wilcoxon rank-sum:</td>
<td>0.3722</td>
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<tr>
<td>Kolmogorov-Smirnov:</td>
<td>0.0017</td>
<td></td>
</tr>
<tr>
<td>transformation to normal</td>
<td>Sqrt</td>
<td></td>
</tr>
<tr>
<td>t-test, transformed variable:</td>
<td>0.2907</td>
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<tr>
<td>test for heteroscedasticity:</td>
<td>0.0000</td>
<td></td>
</tr>
</tbody>
</table>

DIFFERENCE IN ARITHMETIC MEAN EFFECT: 0.04250 SE: 0.018900

EFFECT VARIABLE: qaly

| t-test, difference in means:               | 0.0251  | .0053 to .0796 |
| nonparametric BS, diff in means:           | 0.0290  | .0067 to .0771 |
| Wilcoxon rank-sum:                         | 0.0330  |          |
| Kolmogorov-Smirnov:                        | 0.0710  |          |
| transformation to normal                   | Raw     |          |
| t-test, transformed variable:              | 0.0251  |          |
| test for heteroscedasticity:               | 0.3684  |          |

.r return list

.scalars:
r(cdiff) = 25  
r(ctttestp) = .8409000000000001
r(cttll) = -220
r(cttul) = 270
r(cbsp) = .86
r(cbsll) = -218
r(cbsul) = 275
r(cwrspp) = .3722
r(cksp) = .0017
r(crttpp) = .2907
r(chetp) = 0
r(gdiff) = .0425
r(qtttestp) = .0251
r(qttll) = .0053
r(qttul) = .0796
r(qbsp) = .029
r(qbsll) = .0067
r(qbsul) = .0771
r(qwrsp) = .033  
r(qksp) = .071  
r(qtttp) = .0251  
r(qhetp) = .3684

macros:
    r(ctrans) : "Sqrt"
    r(qtrans) : "Raw"

.set more on

.log close
    log: d:univaranal.log
    log type: text

------------------------------------------------------------------