Using SAS to obtain probability values for F-, t- and $\chi^2$-statistics

Most statistics packages now output the probability values for the observed F-, t- and $\chi^2$-values. Statisticians like to see these values reported, instead of the old-fashioned $\alpha$-levels (.10, .05, .01 etc.) as they provide more information. For instance, a reader can choose a different $\alpha$-level than the author did. Occasionally these observed values must be calculated by hand. The associated probability values can be obtained by simple SAS programs.

An example program for F-values is:

```
TITLE 'EXAMPLE PROGRAM FOR CALCULATION OF PROBABILITIES OF OBSERVED F-VALUES';
DATA FVALUES;
  INPUT F NDF DDF;
  PROB = 1 - PROBF(F,NDF,DDF);
CARDS;
0.28 1 304
4.42 1 304
2.75 1 304
3.92 1 120
6.85 1 120
2.96 6 120
RUN;
PROC PRINT SPLIT = '_';
  LABEL F = 'F-VALUE'
  NDF = 'NUMERATOR_DF'
  DDF = 'DENOMINATOR_DF'
  PROB = 'PROB > F';
RUN;
```

This program has the following output:

```
EXAMPLE PROGRAM FOR CALCULATION OF PROBABILITIES OF OBSERVED F-VALUES

<table>
<thead>
<tr>
<th>OBS</th>
<th>F-VALUE</th>
<th>NUMERATOR DF</th>
<th>DENOMINATOR DF</th>
<th>PROB &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.28</td>
<td>1</td>
<td>304</td>
<td>0.59709</td>
</tr>
<tr>
<td>2</td>
<td>4.42</td>
<td>1</td>
<td>304</td>
<td>0.03634</td>
</tr>
<tr>
<td>3</td>
<td>2.75</td>
<td>1</td>
<td>304</td>
<td>0.09829</td>
</tr>
<tr>
<td>4</td>
<td>3.92</td>
<td>1</td>
<td>120</td>
<td>0.05000</td>
</tr>
<tr>
<td>5</td>
<td>6.85</td>
<td>1</td>
<td>120</td>
<td>0.01000</td>
</tr>
<tr>
<td>6</td>
<td>2.96</td>
<td>6</td>
<td>120</td>
<td>0.00991</td>
</tr>
</tbody>
</table>
```
An example program for $\chi^2$-values is:

```sas
TITLE 'EXAMPLE PROGRAM FOR CALCULATION OF PROBABILITIES OF OBSERVED CHI-SQUARED VALUES';
DATA CHISQ;
   INPUT CHISQ DF;
   PROB = 1 - PROBCHI(CHISQ,DF);
CARDS;
16.92 9
37.57 20
9.39 18
40.26 30
RUN;
PROC PRINT SPLIT='_';
   LABEL CHISQ = 'CHI-SQUARE_VALUE'
   DF = 'DEGREES OF_FREEDOM'
   PROB = 'PROB > CHISQ';
RUN;
```

With the following output:

<table>
<thead>
<tr>
<th>OBS</th>
<th>CHI-SQUARE VALUE</th>
<th>DEGREES OF FREEDOM</th>
<th>PROB &gt; CHISQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16.92</td>
<td>9</td>
<td>0.04998</td>
</tr>
<tr>
<td>2</td>
<td>37.57</td>
<td>20</td>
<td>0.00999</td>
</tr>
<tr>
<td>3</td>
<td>9.39</td>
<td>18</td>
<td>0.95001</td>
</tr>
<tr>
<td>4</td>
<td>40.26</td>
<td>30</td>
<td>0.09993</td>
</tr>
</tbody>
</table>

The above program can easily be adapted for the t-statistic by changing the PROBCHI function to PROBT. The functions PROBF, PROBCHI and PROBT are described in the BASICS guides for Version 5.0 and the Language Guides for Version 6.03.

**OBVIOUS INDICATORS OF NON-SIGNIFICANCE:**

- F-statistic: values less than 1
- t-statistic: values with an absolute value less than 1
- $\chi^2$-statistic: values less than the degrees of freedom.

CONTACT: Wendy Bergerud
387-5676