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DECUS NO.

FOCAL8-40

TITLE

SIMPLE CHI-SQUARE TEST

DECUS Program Library Write-up

SIMPLE CHI-SQUARE TEST

PROGRAM USE: OUTPUT

The program will type out the data matrix and cell contents. Each cell will contain two values; O= xxx.xxx and E= xxx.xxx. The "O=" number is the "OBSERVED" value which was typed in by the user. The "E=" value is the expected value calculated by the program. The program will also type out row-sums (RS=) and column sums (CS=), and the grand total (T=). The last line of output will be "X2=" and "DF=". These are the CHI-SQUARE and degrees of freedom.

PROGRAM USE: RESTRICTIONS

Because of the size of teletype paper the number of columns in any matrix is limited. The CHSQR1 program should not be used with input of more than 3 columns. The CHSQR2 program should not be used with input of more than 4 columns. Maximum size of the matrix for CHSQR1 is 12 rows and 3 columns. Maximum size of the matrix for CHSQR2 is 4 columns and 9 rows.

PROGRAM USE: INTERPRETATION

The use and interpretation are as for any simple CHI-SQUARE TEST.

The results have similar accuracy as the previous programs when compared to 7094 programs.

PROGRAM USE: INPUT

When the program is loaded and the system has been started by replying "GO" then the CHI-SQUARE program will ask "R:". The answer it must be given is the number of rows in the data matrix that is to be analyzed. It will next ask "C:". This requires an answer of the number of columns in the data matrix. The program will next ask "S:". This is a request for the sample in the first cell of the matrix, i.e. 1,1. This is the "OBSERVED" value that is available from experimental data. The program will continue to ask "S:" until all possible cells in the matrix have an answer. It will proceed from cell 1,1 to 1,2, to ... 1, N and then will go to cells 2,1, 2,2, ... 2,N until ... N,N is reached. Following this it will calculate the output.

The two programs have number-size differences on input. CHSQR1 is configured to handle decimal numbers of format 8.03 (5 digits before the decimal and 3 after, eight digits long). CHSQR2 is configured to handle numbers up to format 6.03 (3 digits before the decimal and 3 after, six digits long).

```
01.01T %8.03;E
01.02A "R"R;A "C"C;S DF=(R-1)*(C-1);S L=R*C
01.03S I=1;S J=1;S K=1;S RP=0;S RS=0;S CS=0;S T=0;S X2=0
01.04A "S"N(K);S RP=RP+N(K);S CS(J)=CS(J)+N(K);S K=K+1
01.05S J=J+1
01.06I (C-J)1.07,1.04,1.04
01.07S RS(I)=RP;S J=1;S I=I+1;S RP=0
01.08I (R-I)1.09,1.04,1.04
01.09I (L-(K-1))1.10,2.01,2.01
01.10T !!;T "E1";T !!;G 1.01

02.01F J=1,1,R;S T=T+RS(J)
02.02S J=1;S I=1;S K=1
02.03S E(K)=(RS(I)/T)*CS(J);S J=J+1;S K=K+1
02.04I (C-J)2.05,2.03,2.03
02.05S J=1;S I=I+1
02.06I (R-I)2.07,2.03,2.03
02.07I (L-(K-1))2.08,3.01,3.01
02.08T !!;T "E2";T !!

03.01F K=1,1,L;S X2=X2+((N(K)-E(K))+2)/E(K)

04.01T !!;S K=1;S Y=1;S N=1;S I=1;D 8.0;T !
04.02F J=1,1,C;D 6.0
04.03T "*" ;T !;F J=1,1,C;D 5.0
04.04T "*" ;T " " ;T "RS"RS(N);S N=N+1;T !
04.05F J=1,1,C;D 7.0
04.06T "*" ;T !;D 8.0;T !;S I=I+1;I (R-I)4.07,4.02,4.02
04.07T !;F J=1,1,C;D 9.0
04.08T %;T " T";T !!;T "X2"X2;T " " ;T %8.03;T "DF"DF;T !!
04.09A "M?"Z;I (Z-2)4.10,1.01,1.01
04.10Q

05.01T "*" ;T " "

06.01T "*" ;T " " ;T "O"N(K);T " " ;S K=K+1

07.01T "*" ;T " " ;T "E"E(Y);T " " ;S Y=Y+1

08.01F M=1,1,(C*15+1);T "*"

09.01T " " ;T "CS"CS(J);T " "
*
```

C:3
S:123
S:23
S:12
S:2
S:67
S:93
S:24
S:15
S:67

```
*****  
* 0=+ 123.000 * 0=+ 23.000 * 0=+ 12.000 *  
* * * * * RS=+ 158.000  
* E=+ 55.263 * E=+ 38.944 * E=+ 63.793 *  
*****  
* 0=+ 2.000 * 0=+ 67.000 * 0=+ 93.000 *  
* * * * * RS=+ 162.000  
* E=+ 56.662 * E=+ 39.930 * E=+ 65.408 *  
*****  
* 0=+ 24.000 * 0=+ 15.000 * 0=+ 67.000 *  
* * * * * RS=+ 106.000  
* E=+ 37.075 * E=+ 26.127 * E=+ 42.798 *  
*****
```

CS=+ 149.000 CS=+ 105.000 CS=+ 172.000 T=+0.426000E+03

X2=+0.237365E+03 DF=+ 4.000

M?:

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```
01.01T %6.03;E
01.02A "R"R;A "C"C;S DF=(R-1)*(C-1);S L=R*C
01.03S I=1;S J=1;S K=1;S RP=0;S RS=0;S CS=0;S T=0;S X2=0
01.04A "S"N(K);S RP=RP+N(K);S CS(J)=CS(J)+N(K);S K=K+1
01.05S J=J+1
01.06I (C-J)1.07,1.04,1.04
01.07S RS(I)=RP;S J=1;S I=I+1;S RP=0
01.08I (R-I)1.09,1.04,1.04
01.09I (L-(K-1))1.10,2.01,2.01
01.10T !!;T "E1";T !!;G 1.01

02.01F J=1,1,R;S T=T+RS(J)
02.02S J=1;S I=1;S K=1
02.03S E(K)=(RS(I)/T)*CS(J);S J=J+1;S K=K+1
02.04I (C-J)2.05,2.03,2.03
02.05S J=1;S I=I+1
02.06I (R-I)2.07,2.03,2.03
02.07I (L-(K-1))2.08,3.01,3.01
02.08T !!;T "E2";T !!

03.01F K=1,1,L;S X2=X2+((N(K)-E(K))+2)/E(K)

04.01T !!;S K=1;S Y=1;S N=1;S I=1;D 8.0;T !
04.02F J=1,1,C;D 6.0
04.03T "";T !;F J=1,1,C;D 5.0
04.04T "";T " ";T "RS"RS(N);S N=N+1;T !
04.05F J=1,1,C;D 7.0
04.06T "";T !;D 8.0;T !;S I=I+1;I (R-I)4.07,4.02,4.02
04.07T !;F J=1,1,C;D 9.0
04.08T %;T " T";T !!;T "X2"X2;T " ";T %6.03;T "DF"DF;T !!
04.09A "M?"Z;I (Z-2)4.10,1.01,1.01
04.10Q

05.01T "";T " "

06.01T "";T " ";T "O"N(K);T " ";S K=K+1

07.01T "";T " ";T "E"E(Y);T " ";S Y=Y+1

08.01F M=1,1,(C*13+1);T "- "

09.01T " ";T "CS"CS(J);T " "
*
```

R:5
C:2
S:12
S:2
S:13
S:3
S:14
S:4
S:13
S:2
S:15
S:3

```
*****  
* O=+ 12.000 * O=+ 2.000 *  
* * * RS=+ 14.000  
* E=+ 11.580 * E=+ 2.420 *  
*****  
* O=+ 13.000 * O=+ 3.000 *  
* * * RS=+ 16.000  
* E=+ 13.235 * E=+ 2.765 *  
*****  
* O=+ 14.000 * O=+ 4.000 *  
* * * RS=+ 18.000  
* E=+ 14.889 * E=+ 3.111 *  
*****  
* O=+ 13.000 * O=+ 2.000 *  
* * * RS=+ 15.000  
* E=+ 12.407 * E=+ 2.593 *  
*****  
* O=+ 15.000 * O=+ 3.000 *  
* * * RS=+ 18.000  
* E=+ 14.889 * E=+ 3.111 *  
*****
```

CS=+ 67.000 CS=+ 14.000 T=+0.810000E+02

X2=+0.587669E+00 DF=+ 4.000

M?:

G
 R:4
 C:4
 S:12
 S:103
 S:13
 S:104
 S:14
 S:105
 S:15
 S:106
 S:16
 S:107
 S:17
 S:108
 S:18
 S:109
 S:10
 S:101

' O=+ 12.000 '	' O=+103.000 '	' O=+ 13.000 '	' O=+104.000 '	
' E=+ 14.530 '	' E=+102.681 '	' E=+ 13.319 '	' E=+101.470 '	RS=+232.000
' O=+ 14.000 '	' O=+105.000 '	' O=+ 15.000 '	' O=+106.000 '	
' E=+ 15.031 '	' E=+106.221 '	' E=+ 13.779 '	' E=+104.969 '	RS=+240.000
' O=+ 16.000 '	' O=+107.000 '	' O=+ 17.000 '	' O=+108.000 '	
' E=+ 15.532 '	' E=+109.762 '	' E=+ 14.238 '	' E=+108.468 '	RS=+248.000
' O=+ 18.000 '	' O=+109.000 '	' O=+ 10.000 '	' O=+101.000 '	
' E=+ 14.906 '	' E=+105.336 '	' E=+ 13.664 '	' E=+104.094 '	RS=+238.000
CS=+ 60.000	CS=+424.000	CS=+ 55.000	CS=+419.000	T=+0.958000E+03
X2=+0.318098E+01	DF=+ 9.000			

M?:

