## Interrater Agreement Using SAS

In this document I explain how to use SAS to obtain interrater agreement indices. The data for these examples are taken from Table 9.1 in the book (p. 211) and are in the SAS dataset "**rater.sas7bdat**"

For interrater agreement, SAS will calculate Cohen's kappa and will produce tables such as that shown in Table 9.2 in the book.

I discuss two ways to obtain values of nominal agreement using SAS.

The first way is to obtain a crosstabulation table for the ratings from the two raters of interest. Then simply count the numbers on the diagonal of the table and divide by the total to obtain the nominal agreement index.

The second way is to use a data step to calculate agreement between pairs of raters and then use **proc means** to obtain the mean of these agreements. This mean is the nominal agreement.

## Nominal Agreement

The first way of obtaining values of nominal agreement is to use **proc freq** to obtain the necessary table using the basic syntax below. Only two variables at a time can be analyzed. Here, I have chosen to assess the agreement between raters 1 and 2.

### *Calculating agreement using proc freq*

```
proc freq data = rater;
   tables rater1 * rater2/nopercent nocol norow;
   run;
```

The options **nopercent, nocol, and norow** suppress the printing of overall, column, and row percentages in the output table.

The syntax above will produce the following table.

| Table of rater1 by rater2 | | | | | | |
|---|---|---|---|---|---|---|
| rater1 | rater2 | | | | | |
| Frequency | 1 | 2 | 3 | 4 | 5 | Total |
| 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 2 | 1 | 1 | 0 | 0 | 0 | 2 |
| 3 | 0 | 1 | 2 | 0 | 0 | 3 |
| 4 | 0 | 0 | 1 | 1 | 0 | 2 |
| 5 | 0 | 0 | 0 | 0 | 2 | 2 |
| Total | 2 | 2 | 3 | 1 | 2 | 10 |

This table is that same as Table 9.2 in the book. I have highlighted the values in the table that indicate exact agreement; these appear on the diagonal. Nominal agreement is simply the sum of these agreements divided by the total number of people being rated (10, highlighted in aqua).

This is equal to:

$$P_O = \frac{1}{N}\sum_{i}^{C} n_{ii} = \frac{1}{10}(1 + 1 + 2 + 1 + 2) = \frac{1}{10}(7) = .7$$

$P_0$ is the nominal agreement, $N$ is the number of people being rated, $C$ is the number of rating categories, and $n_{ii}$ represents the number on the diagonal of the matrix.

### Calculating agreement using a data step

To calculate agreement between two raters, use the syntax below.

```
data rater2; set rater;
   count = 0;
   if (rater1=rater2) then count=1;
run;
```

The variable "**count**" is initialized with a value of 0 for all cases. The **if** subcommand changes the value of **count** to 1 if the scores of rater1 and rater2 are equal (i.e., if the two raters assign the same score). The variable **count** is computed for each person in the dataset.

The mean of **count** is the mean of these agreements, or the value of nominal agreement. Use **proc means** to obtain this value.

**proc means data=**rater2 **mean;**
**variable** count**;**
**run;**

This will yield the table below.

| Analysis Variable : count |
| --- |
| Mean |
| 0.7000000 |

The value of .7000 under "mean" is the value for nominal agreement. Note that this is the same value obtained by counting the entries on the diagonal and dividing by the total number of ratings.

## Cohen's Kappa

Values of Cohen's kappa can be obtained from **proc surveyfreq** using the syntax below:

**proc surveyfreq data=**rate**r varmethod = jackknife;**
 **tables** rater1 * rater2**/noprint kappa;**
**run;**

The subcommand **varmethod=jackknife** must be used to obtain values of kappa. The subcommand **noprint** suppresses printing of the crosstabulation tables, resulting in the output below:

| Simple Kappa Coefficient | | | |
| --- | --- | --- | --- |
| Estimate | Standard Error | 95% Confidence Limits | |
| 0.6203 | 0.2013 | 0.1649 | 1.0000 |
| Sample Size = 10 | | | |

The value of kappa is .620, as calculated in the book on page 214.