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Demo: Detecting Ordinal Associations Using PROC FREQ

Filename: **st107d03.sas**

In this demonstration we use PROC FREQ to test whether an ordinal association exists between Bonus and Fireplaces.

PROC FREQ DATA=*SAS-data-set***;**
TABLES *table-request(s) < / options>***;**
< additional statements >
RUN;

1. Open program st107d03.sas.

```
/*st107d03.sas*/
ods graphics off;
proc freq data=STAT1.ameshousing3;
    tables Fireplaces*Bonus / chisq measures cl;
    format Bonus bonusfmt.;
    title 'Ordinal Association between FIREPLACES and BONUS?';
run;

ods graphics on;
```

   In this step, the TABLES statement specifies a crosstabulation table for Fireplaces by Bonus, as well as three options that generate various measures of association. The CHISQ option produces the Pearson chi-square, the likelihood-ratio chi-square, and the Mantel-Haenszel chi-square. It also produces measures of association based on chi-square statistics, such as the phi coefficient, the contingency coefficient, and Cramer's V. The MEASURES option produces the Spearman correlation statistic along with a few other measures of association. The CL option produces confidence limits for the statistics that the MEASURES option requests.

2. Submit the code.

3. Review the output.

   The first table is the same Fireplaces by Bonus crosstabulation table that was generated in the previous demonstration.

   Let's look at the results of the Mantel-Haenszel chi-square test. Because the p-value is 0.0010, you can conclude at the 0.05 significance level that there is evidence of an ordinal association between Bonus and Fireplaces. There's a significant trend in the likelihood of being bonus eligible as the number of fireplaces increases.

   The last table displays a variety of measures of association, including the Spearman correlation statistic and its 95% confidence limits. The Spearman correlation value of 0.2107 indicates that there's a weak positive ordinal relationship between Fireplaces and Bonus. That is, as Fireplaces levels increase, Bonus tends to increase.

   The ASE is the asymptotic standard error, and is only an appropriate measure of the standard error for relatively large samples.

Because the 95% confidence interval for the Spearman correlation statistic does not contain 0, the relationship is significant at the 0.05 significance level. However, the confidence intervals are valid only if your sample size is large. A general guideline is to have a sample size of at least 25 for each degree of freedom in the Pearson chi-square statistic. Because we have a sample size of 300, our confidence intervals are valid.

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