APPLIED STATISTICS INSTRUCTION SHEET

ONE-WAY ANOVA IN SPSS AND PSPP

Instructions

A one-way ANOVA is a form of the general linear model that describes the relationship between a numeric variable and a categorical variable with three or more categories. (If the categorical variable has only two categories, an independent-samples t-test is often preferred.) The path in both SPSS and PSPP is Analyze> Compare Means>One-Way ANOVA.

Instructions for both SPSS and PSPP

- Toggle the numeric variable into the Dependent List box on the upper right-hand side of the dialog box. To run multiple one-way ANOVAs, place more than one dependent variable in the Dependent List.
- Toggle the numeric variable into the Factor box on the lower right-hand side.
- The ANOVA table is generated by default. In SPSS, descriptive statistics for each category can be obtained by clicking Descriptive under the Options button. In PSPP, check the Descriptives option on the dialog box.
- The Homogeneity of Variances can be obtained by selecting the appropriate feature. In SPSS, it is found under the Options button. In PSPP, check the Homogeneity option on the dialog box. The variances are homogeneous if the test has a significance level greater than .05 ($p>.05$), then use the Bonferroni test. The variances are not homogeneous if the test has a significance level less than or equal to .05 ($p\leq.05$).

Additional Feature Available in SPSS Only

- Newer versions of SPSS allow the user to request effect size statistics by checking a box on the main dialog box.
- If the variances are heterogeneous, use the statistic from the Welch test rather than the F-ratio from the ANOVA table in order to determine the statistical significance of the goodness of fit.
- The Post Hoc button allows for the creation of category-by-category comparisons on the value of the numeric variable. If the test for homogeneity indicates equal variables ($p>.05$), then use the Bonferroni test. If the test indicates unequal variables ($p\leq.05$), then use the Games-Howell.

Key Statistics

- A research should report the statistical significance of the goodness of fit, the effect size, and try to identify the cause of any significance or effect.
- Goodness of fit: The ANOVA table provide statistics to interpret the overall fit of the model. If the variances are homogeneous, the Sig. value is related to the F-distribution, from which the statistical significance of the fit of the overall model is determined. The null hypothesis is that F=0. If the variances are not homogeneous, use the Welch test (SPSS only).

- Effect size: The preferred estimate for the effect size is the eta-squared (η^2). Small/weak relationships have an η^2 of at least .0196, medium/moderate relationships have a .13 minimum threshold, and large/strong relationships equal or exceed .26.
- Causes: The one-way ANOVA does not specifically identify the cause of the statistical significance or effect size if it exists. One can determine this by looking at the post-hoc comparison test (SPSS) or manually inspecting differences across categories (PSPP).

Written Interpretation: Written comments should highlight the effect size and any pattern or cause of the relationship with specific statistical significance and effect size numbers put in parentheses. For example: Region has a moderate influence on the violent crime rate ($F(3,46)=3.68$, $p<.05$, $\eta^2=.19$), a relationship driven largely by the difference between the South (Mean=6.01, SD=0.08) and Northeast (Mean=5.53,SD=0.15). If there is no statistical significance or substantive effect, this fact should be stated in the text. Reference to the use of alternative tests due to heterogeneous variances should be mentioned in the Methods section of the paper as part of the Analytic Strategy.