USP 634 Spring 2018
Assignment 3: Hypothesis testing (chi-square; ANOVA)
Due on Sunday, May 27th

The objectives of the assignment are to conduct and interpret hypothesis testing with chi-square and ANOVA tests.

1. A planner suspects her board is biased against affordable housing projects for fiscal zoning reasons. In recent years, the board has been unwilling to approve zoning variances for residential projects yet has been fairly lenient in approving variances for commercial and industrial projects. To test her hunch, she compiles data on board actions on zoning variance requests over the past three years, producing the contingency table shown below. Use the 5-step hypothesis testing process to test (at the 1% significance level) whether project approval is independent of type of land use. (10 pts)

Action on Zoning Variance Request	Land Use Category		
	Residential	Commercial	Industrial
Approve	20	150	130
Deny	90	25	27

2. A stratified random sample of people was asked about their race/ethnicity and their attitude to multifamily housing development in their neighborhoods. The findings were as follows:

	African-American	Hispanic	Caucasian
Approve MFH development	35	20	50
Disapprove MFH development	19	8	75

(A) Without carrying out a formal test of association, does race/ethnicity appear to be associated with one's attitude toward multifamily housing development? Why? (5 pts)

(B) Carry out a test of *statistical significance* at the 95% level using Chi-squared and explain the results. (10 pts)

(C) Give two different stories explaining the association--one that is causal, and one that not causal. (5 pts)

3. Using your own data set, test a hypothesis involving a bivariate relationship between two categorical variables, one of which is measured on a nominal scale while the other is either nominal or ordinal. First formulate a hypothesis and build a two-way table. According to your hypothesis, identify which is the dependent (response) variable and which is the independent (explanatory) variable. Interpret your table first with a descriptive statistic and conduct hypothesis testing for independence between the two variables following the 5-step hypothesis testing process. Interpret your hypothesis testing results, describe and discuss your findings.

Describe and discuss your findings

Note: You can recode a ratio-scale variable to an ordinal variable if your data set doesn't have categorical variables of interest. (20 pts)

4. A random survey of 32 suburban office complexes in a city produced the following data. The dependent variable (e.g., the ratio-scale values) represents FAR, or floor-to-area ratio (building area divided by land area). The independent variable expresses four classes of office space: AAA; AA; A; and B. Class AAA normally features 20,000+ sq. ft. floor plan, fiber optics, and ultra-modern designs. At the other extreme, class B represents older buildings in less desirable locations and with fewer modern amenities.

FAR by Class of Office Space

AAA	AA	A	B
2.5	2.2	1.3	0.3
4.0	3.1	1.9	0.8
5.1	2.8	2.2	0.3
4.8	2.1	1.8	1.0
2.0	2.2	1.3	0.7
4.7	3.0	2.2	1.1
3.9	2.8	1.5	0.3
3.7	2.3	1.7	0.2

Carry out the following tests and evaluations. To get full credit you must show all your work (20 points):

(A) Use the 5-step hypothesis testing process to see if there's a significant difference in suburban office densities among classes of buildings. Test for independence at the 5% significance level.

(B) Using the words "increase", "decrease", or "no effect", state for each of the following what effect the changes described will have on the probability of finding a significant difference among groups when using ANOVA:

(i) The standard deviation within each group is increased (without changing their means).

(ii) The differences in group means are widened (while the variance within each category remains the same).

(iii) The group means and variations (between and within) of your samples remain the same, but your sample size doubles.

(iv) You change the significance level from .05 to .01.

5. Using your own data set and test a hypothesis with ANOVA. First select (or create by recoding) a nominal variable (assumed to be V1) with more than two categories (but not too

many, number of categories <= 5), then choose a continuous (or an ordinal variable with Likert scale if no continuous variable is available in your dataset, assumed to be V2). Then formulate a hypothesis to see if there's a significant difference in V2 among categories in V1, conduct an ANOVA test of your hypothesis following the 5-step hypothesis testing process, interpret your hypothesis testing results, describe and discuss your findings. (20 points)