

Research Methods and Statistics
Specialty Area Exam
March 22, 2017
Part I: Statistics

Committee: Richard Williams (Chair), Elizabeth McClintock, Sarah Mustillo

You must answer question 1.

1. Suppose that a beginning graduate student asked you about each of the terms listed below. For *four* of the following items, briefly state: (a) what it refers to as you might explain it to the student; (b) where it may apply in sociological analysis; and (c) key references where the student might look to learn more about it.

- a) Statistical Power
- b) BIC statistic
- c) Average Marginal Effects (AMEs)
- d) KHB (Karlson, Holm and Breen) method
- e) Wald test (be sure to indicate how it differs from a likelihood ratio test)
- f) Bonferroni Adjustment
- g) The use of centering with interaction effects
- h) Nonrecursive Model
- i) Arellano-Bond estimator

Now answer either question 2, 3, or 4.

2. Heteroskedasticity is often viewed as a minor issue in statistical analysis, but in some instances it can be very problematic. Explain how (a) in OLS regression, what appears to be heteroskedasticity may actually be a reflection of problems in model specification, and (b) in logistic/ordinal regression, heteroskedasticity can cause parameter estimates to be biased or misleading, particularly when doing group comparisons. Discuss how such problems can be detected and the methods for dealing with them.

3. Answer the following questions about the difference between random and fixed effects models.

- a) Describe the key differences between random and fixed effects models. Be sure to highlight the different assumptions of each model. Also, please describe differences in the estimation and interpretation of the parameters in the two models.
- b) Explain how the two models could be applied to the same data, and yet produce different substantive findings
- c) How should researchers decide whether a random or fixed effects model should be used to analyze his/her data?
- d) Finally, describe the strengths and limitations of random and fixed effects models.

4. Explain what count variables are, and why their use as dependent variables in an OLS regression can be problematic. Then discuss alternative strategies that can be used instead. Explain the rationale for these strategies, the ways in which they are or are not superior to OLS, and how their parameters are interpreted. Be sure to discuss such concepts as Poisson Regression, overdispersion, Negative Binomial Regression, Models for Truncated Counts, Hurdle Models, and anything else you think is especially important to understand. Offer real or hypothetical examples to illustrate your points.

Finally answer either question 5 or 6.

5. In your grant proposal to the National Science Foundation, you said you would use listwise deletion, mean substitution, and/or single imputation to handle missing data in your analysis. The reviewers are not happy. They want you to use more advanced methods, such as multiple imputation or full information maximum likelihood (fiml). Explain the limitations of the methods you originally planned to use. Then discuss one or more of the advanced alternatives you will now employ instead. Be sure to explain how the method works, and what its strengths and weaknesses are.

6. Introductory statistics courses typically assume that models are correctly specified, all assumptions of OLS regression are met, and that there are no problems with the data. In practice, of course, these assumptions are often violated. Discuss in depth *two* of the following. Explain (i) what the problem is (ii) what effects the problem has, e.g. are parameter estimates biased, are standard errors inflated? (iii) means that can be used to detect the problem; these can include both sophisticated statistical techniques and simple visual inspection, and (iv) ways to deal with the problem if it is detected.

- a) Extreme outliers
- b) Nonlinear relationships
- c) Multicollinearity
- d) Omitted and extraneous variables in a model
- e) Random measurement error

End of Statistics Exam

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Part II: Methods

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You must answer question 1.

1. A beginning graduate student has approached you with several questions. Provide her with brief answers to *three* of the following.

a. Thanks to her survey research methods class, the student knew that Hillary Clinton was almost certainly going to be elected 45th president of the United States. Then Donald Trump won. Explain to her the different types of survey error that might account for this. Don't be too generic; if you aren't familiar with the specific arguments that have been made for Clinton's loss, then at least try to speculate on how different types of survey error might have been present.

b. For her Master's thesis, the student (who is heterosexual) wants to do a participant observation study of the transgender community in South Bend. Describe to the student two or three of the major challenges she will have to overcome in order to succeed with this research.

c. Social research often demands the collection of information from respondents on sensitive topics, such as whether or not employers hire undocumented workers, parents abuse their children, and people cheat on their taxes. Choose one or more of these topics. What are some techniques that can be used to increase the likelihood of getting honest answers?

d. Both her statistics and methods instructors keep telling her that correlation does not prove causation. Explain what this means and why it is true.

e. She is confused by the concepts of age, period, and cohort effects. Explain what each is and give an example of how something that appears to be an age effect might actually be a cohort effect instead.

Now answer either question 2, 3, or 4.

2. In summer 2015 the social sciences were rocked by attacks on the ethics and quality of its research. Critics claimed that Alice Goffman had lied and/or committed severe ethical breeches in her study "On the Run," and further complained that her results were not verifiable. Michael Lacour was found to have falsified the data for a major study on the effect of direct contact on support for gay equality. Yet another study found that most of the major findings for 100 Psychology studies could not be replicated. Do you feel there is a crisis in ethics and/or replicability of social science research and findings? Elaborate on the above examples or give others that you think are relevant. What, if anything, can be done to address these problems?

3. Choose a social problem that you think is of great national interest and importance. Explain the limitations of quantitative studies for studying this topic. Then answer the following.

a. Discuss how you would go about doing a qualitative study on this subject. What sorts of cases would you examine, and what methods would you use? How would you go about forming and/or testing your theory? If you are aware of other qualitative studies in this area, explain how your study would be significantly different.

b. Discuss the strengths and weaknesses of your approach. In your discussion, you may want to cover such topics as:

- 1) The generalizability of findings
- 2) Potential pitfalls you, as a qualitative researcher, need to be aware of
- 3) The depth and nature of understanding that can be gained with your approach
- 4) The amount and kind of information that can be collected

4. Choose a concept of theoretical and/or substantive interest to you. Discuss why this concept is worth measuring. Assume that no satisfactory measure of this concept currently exists. Explain why this concept is not easily measured. Then discuss the steps you would follow in developing a valid and reliable measure of this concept. Give at least a few examples of the types of questions that would be incorporated into any scales you constructed. (You needn't discuss every method for developing scales or determining validity and reliability; just discuss those methods which you think are most relevant for your concept.)

Finally answer either question 5 or 6.

5. You have developed a well-deserved reputation in experimental design. A foundation has commissioned you to design two or more experimental studies with public policy implications for dealing with a major social problem of your choice. While the experiments should all deal with the same problem, their approaches should be radically different from each other. For example, some studies could be lab experiments while others are field experiments; one study might use a quasi-experimental design while another is a true experiment; one study might use small convenience samples while another involves thousands of subjects nationwide; one study might use subjects as their own controls while another involves multiple-group comparisons; the operationalization and measurement of the same concepts could dramatically differ between the experiments.

(a) Describe the substantive problem, including the general issue(s) you wish to address, the variables involved in your studies, and any other substantive or methodological information that will inform the reader about the projects that you are visualizing.

(b) Describe each of your designs and the rationale behind them. Discuss how well your experiments deal with threats to internal and external validity, and the possible tradeoffs between internal and external validity that are made. (Be sure that any threats and any other technical terms you discuss are clearly defined for the reader.) Note how the nature of each design is related to how you operationalize and measure your dependent and independent

variables, e.g. a true experiment done in the lab might permit or require a different operationalization of concepts than a quasi-experiment done in the field.

(c) Note any practical problems that may keep you from conducting the experiment as you wish. For example, to what extent can you guarantee that subjects will participate? Are there dangers that your experiments might become contaminated in some ways? Will you be able to measure everything that you want to measure?

6. Notre Dame is commissioning a study on changing attitudes of and towards women since the school first started admitting female undergraduates in 1972. It is soliciting proposals for either (a) a qualitative analysis based on interviews with dozens of students (both men and women) who have attended Notre Dame over the last 40+ years, or (b) a content analysis based on published documents, such as student newspapers and yearbooks. Describe to Notre Dame officials

- a) how the study would be conducted. Include information on how individuals or documents would be chosen, and how their verbal or written comments would be collected, coded and analyzed
- b) the strengths and weaknesses of the strategy
- c) the types of findings that might result and how they would be interpreted. You might give hypothetical examples of the kinds of statements you would receive or find and what these statements could imply about changing attitudes.

End of Methods Exam