Political Methodology Comprehensive Examination
Department of Political Science, George Washington University
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Instructions: Answer all questions in Part I; choose one question in Part II. You have five hours to complete the exam.

Part I

1. Barack Obama's 7 point victory in the Iowa caucus was described as a "big win." Mitt Romney's 9 point triumph in Michigan was characterized as close as he "edged" McCain. In the 2000 and 2004 primaries (only Democrats in 2004), the average margin of victory was 45.4 points with a standard deviation of 23.6. Treating the pooled 2000 and 2004 results as a normally distributed population, calculate the probability of Obama's and Romney's victory margins. Also calculate the 25th and 75th percentile of electoral victory margins in primaries.

2. Define each of the following as precisely as possible.
   a. random variable
   b. probability function
   c. parameter
   d. estimator
   e. sampling

3. Assume you are evaluating the effectiveness of carrots vs. sticks on compliance in a linear regression model: $compliance_i = \alpha + \beta_c \cdot carrots + \beta_s sticks + u_i$. If carrots and sticks are measured on the same scale, how could you test whether carrots and sticks are equally effective in inducing compliance? If carrots and sticks are *not* measured on the same scale, how could you test whether carrots and sticks are equally effective in inducing compliance?

4. Compare the implications of non-constant variance in linear regression models and simple maximum likelihood models such as binary logit or probit. Are the consequences the same? What solutions are available for the two cases?

5. You are given two Stata data sets, anes2000.dta and anes2004.dta which contains data from the American National Election Study in 2000 and 2004, respectively. You are interested in studying the determinants of the respondents' vote choice between George W. Bush and his Democratic opponents. Your outcome variable is therefore "bush" in the data set, with "income," "religious attendance," and "white" as possible predictors (which you can recode if you would like). A codebook for the variables can by obtained by typing codebook" in the Stata command window.
   Analyze the data. More specifically:

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1. Estimate an appropriate model for 2000 and 2004 using these variables or variables derived from them.

2. Interpret the coefficients after conducting relevant hypothesis tests. Which predictors have signicant effects on the outcome variable, and in what direction? Are the results expected?

3. What difference do you see from 2000 and 2004?

4. Do the predictors explain vote choice well? By what criteria?

5. What assumptions, if any, might these models violate? Please provide relevant diagnostic tests and any appropriate corrective action.

6. Include "income" x "religious attendance" interaction in your models for 2000 and 2004. Interpret the coefficients. Does the coefficient for the interaction have a larger effect on the probability of voting for Bush than "income" and "religious attendance"?

Part II; choose 6 OR 7

6. Game Theory Two states (A and B) are engaged in a dispute over a piece of territory. Prior to the start of the game, A decides to invade and annex the territory, and succeeds in doing so. B now has to decide whether to threaten A with a counterattack or accept the seizure of the territory without resistance. If B decides to threaten a counterattack, A must choose between backing down and withdrawing its troops or to fight in order to keep the territory.

The payoffs for the different possible outcomes of the game are as follows:

a = A's payoff if B lets the land grab stand without issuing any threat
b = A's payoff if B issues a threat and A decides to fight
c = A's payoff if B issues a threat and A backs down (withdraws)

x = B's payoff for letting the land grab stand
y = B's payoff if B issues a threat and A decides to fight
z = B's payoff if B issues a threat and A backs down (withdraws)

1. Draw the extensive form of this game.

2. Derive the equilibrium outcome of the game if $a > b > c$ and $z > x > y$.

3. Now assume there are two types of A, one with low costs for fighting, and one with high costs for fighting. For A's with low costs of fighting (tough types), the payoffs are:

2 if B lets the land grab stand without issuing any threat
-4 if B issues a threat and A decides to fight
-8 if B issues a threat and A backs down.

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For A's with high costs of fighting (bluffing types), the payoffs are:

2 if B lets the land grab stand without issuing any threat
-8 if B issues a threat and A decides to fight
-4 if B issues a threat and A backs down.

Regardless of whether it faces a tough or a bluffing A, B's payoffs are:

-2 if B lets the land grab stand without issuing any threat
-10 if B issues a threat and A decides to fight
1 if B issues a threat and A backs down.

a) What is the equilibrium outcome of the game if A is a tough type?

b) What is the equilibrium outcome of the game if A is a bluffing type?

4.) Now assume that the payoffs are identical to the ones given for question 3.), but that B is uncertain about whether A is a tough or a bluffing type. More specifically, A is a tough type with probability p, and a bluffing type with probability 1-p.

a) How would you model this uncertainty? [provide the extensive form of the game]
b) What are the values of p for which issuing a threat is B's equilibrium choice, given the payoffs described in question 3?

7. Multilevel Modeling

Consider the goal of estimating the probability of voting for a Republican presidential candidate (there are only two candidates running for office) where n individuals are nested within j congressional districts and k states. At the individual level we have a single predictor, income, and at the cd-level we have the cd-level income, and at the state-level we also have a single predictor, state-level income. Formally write out the following multilevel models: [YOUR NOTATION NEEDS TO BE PRECISE.]

1. A varying intercept model.

2. A varying intercept and varying slopes model.

3. A varying intercept and varying slopes model estimating the between group correlation parameter ρ.

Part III

Either submit an empirical research paper along with the exam *or* schedule an oral exam after the written exam.