PS 699, Problem Set 10: Binary Dependent-Variable Models

This problem set uses Paul Huth's "Extended Deterrence" data set. The data code the particulars of 58 historical cases of attempted extended deterrence. Loosely, attempted extended deterrence is when one country publicly vows to defend another in the face of a threat from a third so as to get the threatener to back down. The threatener is also called the attacker, the extended-deterrence attempter is also called the defender. The threatened party is called the protégé. A pair of archetypical examples would be the US attempts to deter North Korea from threatening South Korea (that's failure in the 1950s and success in the 1980s). US is defender, North Korea is threatener or attacker, South Korea is protégé.

Specifically, we will be using the variables:

det_suc : (dependent variable) coded 1 if attempted extended deterrence succeeds
imbalfor : the immediate balance of forces (*i.e.*, relative military might in the area, defender relative to attacker)
stbalfor : the short-term balance of forces (*i.e.*, relative military might of defender, in area or not)
ltbalfor : the long-term balance of forces (*i.e.*, a measure of relative military might defender could eventually bring to
bear if confrontation went to protracted war--*e.g.*, economic capacity)
nuke : coded 1 if defender has nuclear capacity, 0 otherwise
alliance : coded 1 if there is an explicit military alliance between defender and protégé
arms_xfr : measures arms imports by protégé from defender
for_trde : measures protégé's share of defender's foreign trade

1. Using logit, estimate a model predicting the probability of deterrence success (given deterrence attempted) as a function of the other 7 variables. Print out your results.

2. Which independent variables make extended-deterrence success more likely? Which make it less likely? For which is it relatively uncertain? Summarize these answers in a bullet outline; example bullet-entry:

- An immediate balance-of-forces favoring the defender increases the likelihood of extended-deterrence success, *ceteris paribus*. This effect is among the substantively largest of the independent variables and is the most statistically significant as well.

3. Test the hypothesis that short-term balance-of-forces and long-term balance-of-forces adds nothing to the model's predictive power.

4. Drop long-term balance-of-forces from the model and re-estimate. Print it out.

5. In the model just estimated, how much does acquiring nuclear capacity increase a defender's probability of succeeding at attempted deterrence?
   a) Answer first using the derivative method. Leave your answer as a formula.
   b) Evaluate that formula at the sample mean of all independent variables.
   c) Fixing other variables at their sample means, answer using the difference method

6. Fixing all other independent variables to their means, offer a graph showing the predicted probability of deterrence success (y-axis) as the protégé's share of defender's trade goes from 0 to 10 (%, approximately the sample range of for_trde) (x-axis).

7. Re-estimate the model of #4 by Probit. Do any of the hypothesis tests on the individual coefficients change noticeably? The coefficients change, but do the estimated effects? To explore the latter, re-answer 5a, 5b, and 5c for this probit model.