

EXERCISE 3

Use the SAS program NAIRU.SAS to answer the various parts of this exercise. This exercise demonstrates an application of the Delta method to get standard errors of nonlinear functions of parameters. The problem we will be analyzing here is the analysis of the Nonaccelerating Inflation Rate of Unemployment (NAIRU) using logit and probit analysis. See the 1997 Economic Report of the President. The data span is quarterly for the period 1958:2 – 1995:3. The hypothesis to be examined is as follows: The lower the current unemployment rate, the higher the probability that the year-over-year inflation rate one year from now will exceed the current quarter's year-over-year inflation rate. That is, the lower the current unemployment rate the higher the probability that the inflation rate will accelerate over the next four quarters. In the NAIRU.SAS program $y=1$ when the inflation rate accelerates and $y=0$ otherwise. UNEMP is the current unemployment rate in percent. Hand in this homework on Wednesday, September 17, 22.

- a. Use the SAS program NAIRU.SAS to estimate logit and probit models of the relationship between the probability of accelerating inflation and the unemployment rate. For both the logit and probit models report the estimated coefficients and their standard errors assuming $\text{Prob}(y=1)$ is being modeled. (Note: Be sure and report the probit coefficient results so that they are compatible with the logit coefficient results. See my comments in the NAIRU.SAS program.) Is the basic NAIRU hypothesis supported? Explain your answer.
- b. Define the NAIRU rate of unemployment as the unemployment rate that implies $\text{Prob}(y=1) = 0.5$. Solve for the NAIRU rate of unemployment using the logit models results. Solve for the NAIRU rate of unemployment using the probit model results. Do they differ by very much? Explain your answer.
- c. For your own edification use the EVIEWS program to estimate the logit and probit models using this data. (An EVIEWS file that has the necessary data in it is called NAIRU.wf1.) Apart from rounding errors, do you get the same results as when using the NAIRU.SAS program? Report the logit and probit estimates and standard errors you obtain.
- d. There is some question as to whether the economists who did this analysis in the 1997 Economic Report of the President were careful enough or not. In particular, are the observations independently and identically distributed as Maximum Likelihood Estimation requires? Conduct a simple "sign test" on the y values ($1 = +$ and $0 = -$) to determine if the dependent variable values are independent of each other. Report your results.
- e. Another way to examine the issue of the lack of dependence of the logit (probit) dependent variable is to use lagged values of the dependent variables as explanatory variables. Modify either the NAIRU.SAS program or your NAIRU.WF1 program to examine logit and probit models with one and two lags of the dependent variable and examine the significances of the lagged dependent variables. What is your conclusion? Given your results, what do you conclude the NAIRU rate is? Is it different from the value you derived in part b. above?