A SAMPLE OF SIZE 100 IS LARGE?

James D. Hamilton reports from a rather complicated non-linear estimation procedure that the estimated probability of moving from an expansion to a contraction in one quarter is .9049 with an "asymptotic standard error" of .03740. He estimates 9 free parameters. The sample size is not clearly reported, but there are about 130 quarterly observations of which about 100 are estimated to be during expansions.

The expected duration of an expansion in quarters is the inverse of one minus the probability of entering a contraction, or about 2.5 years. The "asymptotic standard error" may be calculated to be approximately one year. Since there roughly 90 degrees of freedom, the t-distribution and normal distribution yield approximately the same "95 percent confidence interval" of 1-4 years.

Hamilton also reports his best guess that expansion turned into contractions 7 times in 25 years. Assume that this is correct, and that his Markov model of transition is correct. Then using the Poisson probability density, we can calculate that if the

mean time to event in years is	the percent probability of 7 events in 25 years is
1.5	0.4%
2	3%
2.5	9%
3	13%
4	14%
5	10%
6	7%
7	4%

Using this table, we can clearly rule out the lower end of Hamilton's confidence interval, since even if the mean time is 1.5 years Hamilton's data is remarkably improbable. Of course, his interval may reflect the uncertainty in the statement "expansions ended 7 times in 25 years." However, the upper end of the confidence interval is far too optimistic. Even five-year mean expansions would be more likely to explain his data than Hamilton's 2.5 year mean expansions. Indeed, if we adopt the point of view that 5% is an appreciable probability, we see that seven year mean expansions produce an appreciable probability of explaining the data. From an economic point of view, a more sensible "confidence interval" to report would be two to seven years: parameters in this range yield an appreciable chance of explaining the data, parameters outside of this range do not. "Asymptotic theory" with a sample size of 100 observations, leads use to a range of one to four years, which is highly misleading. . .

Let's put the econ back in econometrics, part 2.

References:

James D. Hamilton [1989], "A New Approach to the Economic Analysis of Nonstationary Time Series and the Business Cycle," *Econometrica*, 57, 357-384