Lecture 2-25-09

The book "Lessons from the Great Depression" by Peter Tenin (1991 MIT Press) uses a multiple regression to question economic arguments advanced by (Milton) Freidman and Schwartz (1963). The two had argued that banking events FS1 (October 1930) and FS2 (March 1931) initiated drops in the money supply M2.

Tenin works with monthly M2 data from January 1930 through August 1931. He selects dependent and independent variables as follows:

y = log (M2 at end of month) - log(M2 at beginning of month)

x_1 = 0 for a month before October 1930 (denoted 30.10)

= 1 for a month on or later than October 1930

x_2 = 0 for a month before March 1931 (denoted 31.03)

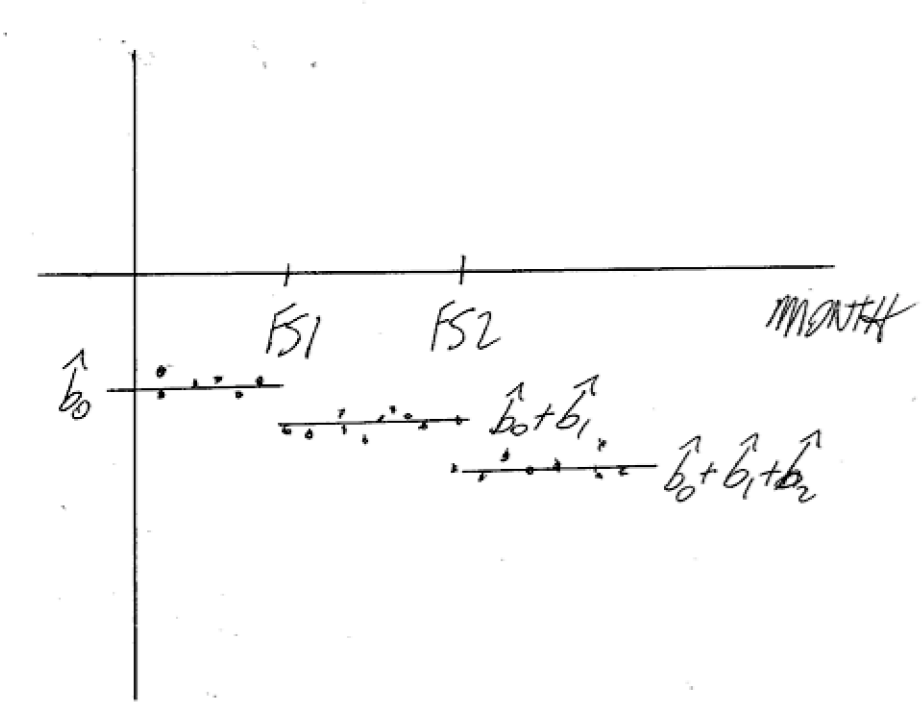
= 1 for a month on or later than March 1931

Variables taking only the 0 or 1 values are called "dummy" variables. they act to split the data into groups or intervals.

The regression model is

$y = b_0 + b_1 x_1 + b_2 x_2 +$ error

Here is a sketch of how the data might look and how the regression will look. It will fit lines through the periods between banking events. This sketch is hypothetical but it is the idea behind the model.



I've attached copies of part of Tenin's comments. He fits regression to the 20 months finding estimated regression coefficients (below them, in parentheses, are their respective estimated standard errors).

$\hat{b}_0$ = -0.0019	$\hat{b}_1$ = -0.0032	$\hat{b}_2$ = -0.0041
(0.0026)	(0.0044)	(0.0048)

None of the estimated coefficients $\hat{b}$ is more than one estimated sd from 0.0. Tenin argues that this should be interpreted as **providing evidence** that such small departures from 0.0 could easily be produced by errors alone, even if the (hypothetical) underlying coefficients b_0, b_1, b_2 of the model **are equal to** 0.0.

Some important points.

1. For the data gathered January 1931 what are the values of the independent variables? Ans. {1, 0, 1}

1 for the constant term
1 for x_1 because January 1931 is not before FS1.
0 for x_2 because January 1931 is before FS2.

2. Tenin holds the view that -0.0019 is not a large departure from 0.0 considering that the estimated sd of $\hat{b}_0$ is 0.0026 IN THE FIT OF THIS MODEL. If the model were correct and if $\hat{b}_0$ were approximately normal distributed then the fact that $\hat{b}_0$ is less than one estimated sd from 0.0 would be convincing. It is not clear that $\hat{b}_0$ is approximately normal distributed, nor is it clear the model itself is correct. We are not gven R (at least not in the appendix) so we are unable to judge the closeness of the model to the data.

3. Placing the estimated sd (of an estimate) in parentheses near the estimate is a quite common practice. We will adopt this practice.

4. M1: currency in circulation + checkable deposits (checking deposits, officially called demand deposits, and other deposits that work like checking deposits) + traveler's checks. M1 represents the assets that strictly conform to the definition of money: assets that can be used to pay for a good or service or to repay debt.

M2: M1 + savings deposits, time deposits less than $100,000 and money market deposit accounts for individuals. M2 represents money and "close substitutes" for money.[9] M2 is a key economic indicator used to forecast inflation.[10]

You need not know this but it helps when thinking about the example.
1930 M1 = 45.7 billion M2 = 25.8 billion

Appendix B: Underlying Regressions

LESSONS FROM THE GREAT DEPRESSION
PETER TEMIN 1991
MIT PRESS.

Milton Friedman 1963
Ben Bernanke 1983

M2 = MONEY SUPPLY

They chose to use dependent variable $y = \log M2 - \log M2$ at END OF MONTH or AT FIRST OF MONTH

This appendix reports the regressions underlying the discussion of Friedman and Schwartz's (1963) first banking crisis in the text. They argued that the rate of growth of the money supply was decreased at that time. Bernanke (1983) added that the "cost of credit intermediation" rose. These claims are tested in turn.

Table B.1 reports regressions on the monthly rate of growth of M2. It is hypothesized that the rate was a constant except for the effects of the monetary events noted by Friedman and Schwartz. Dummies were introduced at the dates noted by them. (Moving the dates by a month or so does not affect the results.) Once set to one, the dummies stay there, so each dummy captures the change from the preceding period, not from the base period.

The first regression starts after the stock-market crash and ends before Britain went off gold. It is confined to the first phase of the Depression. The dummies test for changes in the rate of growth of the money stock at the first two of Friedman and Schwartz's banking crises. They have the right sign, but they are not significantly different from zero. There was enough variation in the monthly rate of growth of the money stock that the rates following the crises could not be distinguished from those before. We

Table B.1
Regressions on the monthly growth rate of M2

Period	30.01–31.08	30.01–32.12	28.01–32.12	24.01–32.12
C	−0.0019	−0.0019	0.0001	0.0024
	(0.0026)	(0.0028)	(0.0023)	(0.0012)
FS1	−0.0032	−0.0032	−0.0052	−0.0075
	(0.0044)	(0.0046)	(0.0063)	(0.0049)
FS2	−0.0041	−0.0041	−0.0041	−0.0041
	(0.0048)	(0.0050)	(0.0079)	(0.0064)
FS3		−0.0123	−0.0123	−0.0123
		(0.0046)	(0.0073)	(0.0059)
FS4		0.0160	0.0160	0.0160
		(0.0042)	(0.0066)	(0.0053)

Source: Friedman and Schwartz (1963).
Notes: The dependent variable is the change in the log of M2. The independent variables are dummies that change from zero to one at the dates given by Friedman and Schwartz for the banking events: 30.10, 31.03, 31.09, 32.04. Standard errors are in parentheses.

CIRCLED DATA IS FOR MODEL $y = b_0 + b_1 x_1 + b_2 x_2$ + ERROR
$\hat{b}_0 = -0.0019$ EST SD OF $\hat{b}_0 = 0.0026$. THIS CONCLUDES THERE IS NO EVIDENCE b_0 DIFFERS FROM 0.
LIKEWISE $\hat{b}_1 = -.0032$, EST SD OF $\hat{b}_1 = .0044$.
ETC.

can reject the hypothesis that the rate of change of the money stock changed at these dates.

The remaining regressions in table B.1 examine longer time periods to ensure that this result does not derive from the shortness of the first phase of the Depression. The second regression extends the period forward, looking at both the first and second phases of the Depression. The results are striking. The coefficients of the first two dummies are exactly the same as before; the standard error of the coefficients, scarcely different. Their lack of significance is confirmed.

The third and fourth dummies show that this finding is not due to noise in the money stock but rather to the small effect of the first two banking crises. When Britain went off gold in September 1931, the rate of growth of the money stock fell sharply. The change shows up as a significant coefficient on the third dummy. When the Federal Reserve