Estimating the Demand Function for Money

Consider the following linear money demand function

$$\ln \frac{M_t}{P_t} = \gamma_0 + \gamma_1 \ln y_t + \gamma_2 \ln R_t + \varepsilon_t. \tag{1}$$

Lieberman (1980) estimated a money demand function using U.S. annual data 1897-1958 (Figures in parentheses are standard deviations):

$$\ln \frac{M_t}{P_t} = \underset{(1.00)}{8.4} + \underset{(0.077)}{0.27} \ln y_t - \underset{(0.095)}{0.32} \ln R_t,$$

where M=currency + demand deposits, $P = CPI$, $y =$ real net national product (exclude intermediate transactions), $R =$ 20-year corporate bond yield. The fitted residual deviation is SE=0.04. Also, M and y are measured per member of the population and the estimates are adjusted for serial correlation. The estimated value of γ_1 is smaller than most studies suggest and that of γ_2 is larger.

In working with post-war data, it has been standard to use quarterly observations. This gives researchers more data points to learn something from short-lived episodes. However,one disadvantage is that it needs to take account of sluggish adjustments by money holders to changes in determinants of money demand function (the other problem is to adjust for seasonality). One way to handle this problem is to assume that agents behave as if they change their money demand by partially adjusting the difference between the previous periods money holding m_{t-1}(real money balance) and the desired money holding m_t^*. Thus, the actual values of money demand are related to the desired m_t^* by the partial adjustment formula

$$\ln m_t - \ln m_{t-1} = \lambda(\ln m_t^* - \ln m_{t-1}), \tag{2}$$

where λ is the speed of adjustment. Assume that m_t^* is given by the (1). Plug (1) into (2),

$$\ln m_t = \lambda\gamma_0 + \lambda\gamma_1 \ln y_t + \lambda\gamma_2 \ln R_t + (1-\lambda)\ln m_{t-1} + \lambda\varepsilon_t.$$

The other problem is that the parameters may not remain the same over time, especially as innovations and technological improvements are made. A very simple way to handle this is to add a time trend $\lambda\gamma_3 t$, whose coefficient should be negative. Due to the usual problem of high serial correlation in residual errors, let's take first difference

$$\triangle \ln m_t = \lambda\gamma_1 \triangle \ln y_t + \lambda\gamma_2 \triangle \ln R_t + (1-\lambda)\triangle \ln m_{t-1} + \lambda\gamma_3 + \lambda\triangle\varepsilon_t,$$

where $\triangle \ln m_t = \ln m_t - \ln m_{t-1}$. McCallum estimated the equation using data 1952.2-1979.4:

$$\triangle \ln m_t = \underset{(0.061)}{0.247}\triangle \ln y_t - \underset{(0.004)}{0.01} \triangle \ln R_t + \underset{(0.005)}{0.463}\triangle \ln m_{t-1} - \underset{(0.0007)}{0.0015},$$

where $m = M1/GDP$ deflator, $y =$ real GNP (exclude intermediate transactions), $R =$ 90-day T-bill rate, $SE = 0.0055$. The figures suggest that money demand is less responsive to movements in output and interest rate than most economists would expect.