Chapter 3

MONEY AND MONEY INCOME - FREEDMAN - MEISELMAN TEST
CHAPTER NO. 3

Money and Money Income - The Friedman - Meiselman Test:

Friedman - Meiselman dual criterion of the definition of money is directly applied to Indian annual data from 1952-53 to 1978-79. The ability to explain nominal national income by the sum of the various monetary aggregates rather than its individual components, has been tested with help of regression analysis.

Friedman - Meiselman (1963) criterion for empirically defining money can be described in the following manner:

"Suppose that the broader definition of money including time deposits has a higher correlation with income than with narrower definition of money, the correlation between time deposits alone and income may then be (1) higher than either (2) lower than one or both, suppose it is higher than either, the higher correlation of the broader than narrow definition with income may reflect simply the inclusion of an item highly correlated with income (i.e. time deposits), rather than the inclusion of a substitute for other items. It may reflect the determination of time deposits by income and not the converse. The appropriate reason for including time deposits is not simply that they are highly correlated with income but are too close substitutes for other monetary items and therefore it is preferable to treat them as if they were
perfect substitutes than to omit them. And therefore the EM criterion whether time deposits are sufficiently close substitutes for other items is that if income is highly correlated with their sum than with each components separately. For considering the lead-lag problem not only the current period nominal money and nominal income have been regressed, but also the previous year's monetary aggregates and the current year's nominal national income have been regressed. As the time series data may appear in the regions in which shifts neither disappear immediately nor last for ever, we have estimated the serial correlation coefficient ($\rho$) and adopted an auto-regressive transformation procedure.

* The use of an autoregressive technique is based upon the assumption, "... the shift in any period is the sum of two parts, one of which is a constant multiple of the previous period's shift, the other being a random disturbance. ... In other words, the shifts are assumed to be generated by a linear first-order difference equation with an observable random disturbance" (Christ - 1966)

\[
(1) \quad x_t = \alpha + \beta_1 x_t + u_t \\
(2) \quad x_t - \rho x_{t-1} = \alpha(1-\rho) + \beta_1 (x_t - \rho x_{t-1}) + u_t - \rho u_{t-1}
\]

$\rho$ is the serial correlation coefficient of equation (1). Once equation (1) is estimated the $\rho$ is substituted into equation (1). Then equation (2) is estimated through OLS. Then with the parameters in the (2) equation, the equation (1) is estimated again with untransformed data. There (1) again $\rho$ is estimated. This process goes on until we get a converging $\rho$ value.
The other existing studies for the Indian economy give inconclusive evidences. Bhattacharya (1975) has for the period 1949-50 to 1967-68 estimated the following relation (OLS)

\[
Y^d = f(M) R^2 = 0.980
\]

\[
Y^d = f(M + TD) R^2 = 0.973
\]

\[
Y^d = f(M + TD + SD) R^2 = 0.968
\]

\[
Y^d = f(TD) R^2 = 0.913
\]

\[Y^d \text{ is monetized disposable income, } M \text{ is narrow money supply i.e. currency + demand deposits, TD is time deposits and SD is saving deposits. From the } R^2 \text{ criterion it is clear that } M \text{-narrow money is more closely related to monetized disposable income. But no test for auto-correlation has been conducted and serial correlation is not been removed from the data.}
\]

Bhattacharya (1975) has also estimated another equation

\[
Y^d = -0.968 + 3.753 M + 0.214 TD
\]

\[
(4.099) \quad (0.210)
\]

\[
F^2 = 0.977 \quad d = 3.284
\]

If time deposits, (TD) are perfectly substitutable of money, \( M \), then the ratio of the coefficient of (TD) to that of \( M \) must be equal to one.
If this ratio is relatively small (i.e. close to zero) TD is not a substitute to money. And his result has showed that the coefficient of TD is not significantly different from zero. Bhattacharya’s conclusion is that the definition of money in India should include only currency and demand deposits, because TD is not a close substitute of money.

Subrahmanyan (1977) has also attempted to relate the National product (Y) with some of explanatory variables for the period 1948 - 1968.

The coefficients of correlation are follows.

\[
\begin{align*}
R (Y, C) &= 0.979 \\
R (Y, D) &= 0.985 \\
R (Y, TD) &= 0.971 \\
R (Y, M_1) &= 0.990 \\
R (Y, M_2) &= 0.989
\end{align*}
\]

where \( R \) = correlation at the third decimal level. The authors have concluded that \( M_1 \) (narrowly defined money) is more appropriate definition of money as obviously, \( M_1 \) - the narrow definition of money is more closely related to gross national product. But choosing the equation on the basis of such slight differences, does not have much meaning. This may be mainly because of the trend elements present in all the equations. No attempt has been made in the above study to report the autocorrelation and estimate it removing serial correlation.
We have estimated and reported below the OLS equations with the net nominal national income as the dependent variable, taking various monetary aggregates for the current period as the independent variables. We have reported the same equation with changing parameters after correcting for autocorrelation. In another set of equations related to the net nominal national income of the current period is the previous year's monetary aggregates. Regression exercises are done correcting serial correlation.

The equation No. 1:1, 2:1 etc. refers to the parameters not corrected for autocorrelation. Equations 1:2, 2:2 etc. give parameters corrected for autocorrelation. All equations are in linear form, 't' values are given in bracket.

Notations: C = currency, D = Demand deposits,
\( M_1 \) = narrowly defined defined money supply, \( TD \) = time deposits, \( M_2 \) = Broadly defined money i.e. \( M_1 + \) time deposits. \( NY \) = Net nominal national income. All variables are in nominal terms. They are annual observations from 1952-53 to 1978-79. Equations marked (*) indicate that they have been corrected for autocorrelation. In some cases, such equations have not been reported because the procedure for removing autocorrelation did not converge.

\[ NY_t = 3137 + 4.01 \, C_t \quad R^2 = 0.788 \]

\((1.05) \quad (9.25)\)

\[ = D.W \, = \, 2.113\]
1.2* (After correction of autocorrelation)

\[ NY_t = 0.409.9 + 4.65 D_t \quad R^2 = 0.768 \]

\[(0.17) \quad (12.60)\]

2.1 \[ NY_t = 5382 + 10.40 D_t \quad R^2 = 0.960 \]

\[(6.49) \quad (32.44) \quad D.W = 1.379\]

2.2* \[ NY_t = 8294 + 9.14 D_t \quad R^2 = 0.964 \]

\[(3.22) \quad (12.84)\]

3.1 \[ NY_t = 422 + 5.12 M_t^1 \quad R^2 = 0.9893 \]

\[(0.61) \quad (46.08) \quad D.W = 1.793\]

3.2* \[ NY_t = 261 + 5.07 M_t^1 \quad R^2 = 0.9892 \]

\[(0.27) \quad (35.21)\]

4.1 \[ NY_t = 8205 + 6.89 TD_t \quad R^2 = 0.960 \]

\[(7.73) \quad (23.45) \quad D.W = 1.184\]

5.1 \[ NY_t = 1649 + 2.91 M_t^2 \quad R^2 = 0.682 \]

\[(2.25) \quad (13.12) \quad D.W = 1.873\]

6.1 \[ NY_t = 6448 + 11.05 C_t-1 \quad R^2 = 0.9913 \]

\[(8.96) \quad (5.13) \quad D.W = 0.938\]

6.2* \[ NY_t = 6945 + 11.19 D_t-1 \quad R^2 = 0.9912 \]

\[(5.14) \quad (30.69)\]

7.1 \[ NY_t = 5366 + 10.40 D_{t-1} \quad R^2 = 0.979 \]

\[(6.41) \quad (32.36) \quad D.W = 1.369\]
In equation 3.1.1 and 1.2 when currency alone is used, $R^2$ is relatively less than other equations. In equation 1.0.2, 1.1 and 2.2 when demand deposit alone is used, $R^2$ has risen, but D.W statistics shows that there is autocorrelation which is probably because another important explanatory variable - currency is left out. So there may be an error of specification. When narrowly defined money (M_2) is employed as the explanatory variable equations 3.1 and 3.2 perform better both in terms of $R^2$ and D.W. As time deposit alone is used in equation 4.1.1, D.W. statistics drops down which means there is autocorrelation.
In equation 5.1 when broader definition of money is used, R^2 has relatively fallen. In equations 6 to 10 when the previous year’s monetary aggregate is used as the explanatory variable, the same pattern of earlier results is seen and also the R^2 has relatively increased in all equations as compared to equations from 1 to 5. From these results, broadly, we may interpret that narrowly defined monetary aggregate (i.e. currency + demand deposits,) is more closely related to nominal national income than other monetary aggregate. Also, a lag effect of money supply on nominal income cannot be ruled out as equations with lagged money supply perform better than equation without a lag. Moreover there is not much difference in R^2 values between different equations. Therefore in order to avoid drastic conclusions about the appropriate definition of money supply from such minor statistical differences in terms of R^2, we adopt also a different test of appropriate definition of money, given by Laukas (1968) which is worked out below in equations 11 and 12.

11.1 \[ NY_t = -2249 + 6.26 M_t + 1.58 TD_t \quad R^2 = 0.9903 \]
\[ (1.05) \quad (8.32) \quad (1.54) \quad D.W = 1.499 \]

11.2* \[ NY_t = -3818 + 7.20 M_t - 2.89 TD_t \quad R^2 = 0.9896 \]
\[ (1.82) \quad (6.93) \quad (2.12) \]

12.1 \[ NY_t = -3275 + 7.09 M_{t-1} - 1.79 TD_{t-1} \quad R^2 = 0.9943 \]
\[ (2.70) \quad (9.36) \quad (1.01) \quad D.W = 1.7660 \]
The equations (11) and (12) are meant to test a slightly different version of the method of selecting the moneyness proposed by Laumas (1968). He has suggested a technique given by the following model.

\[ \triangle Y = f(\triangle M^1, \triangle TD) = \alpha + \beta_1 \triangle M^1 + \beta_2 \triangle TD + U \]

The moneyness of an asset is measured by the ratio $\beta_2 / \beta_1$. If that is higher i.e. nearer to one, the time deposit should be included in the definition of money. As we are correcting for serial correlation through Cochrane-OrCutt method, we have taken equations only in level and not in first difference form.

In our case even after correcting for autocorrelation, the coefficient of time deposits is less and paradoxically negative. And from this test the narrow money $M^2_2$ only passes the test of moneyness. From equation 12, another finding which emerges is that, with lag effect of one year, the equation improves both in terms of $R^2$ and D.W. And so one year lag effect of the nominal money on nominal income is evident.

The results of the equations from 1 to 10 also show that $M^2_2$ i.e. the narrow definition of money including currency and demand deposits has the highest correlation with nominal national income.
The M - M dual criterion is fully satisfied in the case of the narrow definition of money supply in India. Another important conclusion which emerges from the result is that there may be a one-year lag between the money supply proper, i.e., the narrow definition and the nominal national income, and so in the formulation of monetary policy this lag effect has to be considered. To prove or disprove the money supply and prices correlation by just running the correlation analysis between current year money and prices as attempted by some researchers is perhaps too naive and inadequate. One plausible reason why the explanatory power of money defined in a broad sense ($M_2$) is slightly less than $M_1$ may be that as real income grows the demand for an asset from the saving side like time deposits grows in India; whereas money supply, i.e., the narrow definition of money is mostly demand for transaction purposes and substitution also is mostly between currency and demand deposits. It has the highest correlation with nominal national income both in current period and as well as with one period lag.

In modern quantity theory approach, it should be possible to identify a subset of liquid financial assets with high degree of substitutability among themselves but with a much lower degree of substitutability with other alternative financial assets. In Keynesian system, as people treat all liquid assets as close substitutes for each other, it is
extremely difficult to attach any useful meaning to that subset of such assets which may be arbitrarily defined as money. In India, it has been possible to identify here the narrow definition of money as a subset which can be called money demand for transaction purposes. But this narrow money has less interest elasticity unlike the broader money definition which we shall see in our subsequent chapter on demand for money. And the result regarding the narrow definition of money is different from the results that Friedman - Meiselman have got for the U.S. economy in which they found that the broader definition of money including time deposits satisfy their dual criterion for being money.