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Response of Money Stock to its Demand

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Abstract
It is interesting to find out as to what is the position of supply of money in India as compared to its demand. Some believe that our supply of money is more than the demand for it and that explains the persistent inflation in the economy. The demand for money is modeled based on the Keynesian theory of demand for money where it is based on national income and interest rate. The money stock data of broad money (M3) has been taken for the years 1996 to 2005. The Keynesian model of demand for money tells us that RBI has been conservative in its money supply as the same is systematically lesser than the desired demand for money.

Keywords and Phrases: Keynes' theory of Money Supply, Real Income, Interest Rate

Introduction

1. Keynes' Model of Money Supply

The effort is to model the adjustment of the actual value of money demanded in the Indian economy to its optimal or desired value. We can do this by assuming that the change in actual Money demand over two consecutive time periods (Mt –Mt-1) will be equal to a proportion of the optimal change (Mt^{*}-$Mt\text{-}1^{*}$)
We can therefore write
$(M_t - M_{t-1}) = \lambda (M_t^{*} - M_{t-1})$
Where λ is the adjustment coefficient, which takes values from 0 to 1, and 1/ λ denotes the speed of adjustment.
The optimal or desired value of money is given to us by the Keynesian money demand function which says that demand for real money depends on real national income and interest rate. We define it in terms of a power function as following

$$M_t^{*} = aY_t^{b_1} R_t^{b_2} e_t^{u_t} \qquad (1)$$

where, M_t^{*} is the optimal money demand at time t

Y_t is the real national income at time t

R_t is the interest rate and u_t is the error term

b_1, and b_2 are the constants to be estimated.
Taking logarithm of the above equation we get

$$\ln M_t^{*} = \ln a + b_1 \ln Y_t + b_2 \ln R_t + u_t \qquad (2)$$

In terms of money demand, we can state our hypothesis as the following
$(Mt/\ Mt\text{-}1) = (\ Mt^{*}/\ Mt\text{-}1)^{\lambda}$
If we take log, we will get the following

$$\ln M_t - \ln M_{t-1} = \lambda\left(\ln M_t^{*} - \ln M_{t-1}\right) \qquad (3)$$

Substituting (2) into (3), we get,

$$\ln M_t - \ln M_{t-1} = \lambda\left(\ln a + b_1 \ln Y_t + b_2 \ln R_t + u_t - \ln M_{t-1}\right)$$
$$\text{or} \qquad \ln M_t = \lambda \ln a + \lambda b_1 \ln Y_t + \lambda b_2 \ln R_t + \lambda u_t + (1-\lambda)\ln M_{t-1} \tag{4}$$

or $$\boxed{\ln M_t = \gamma_1 + \gamma_2 \ln Y_t + \gamma_3 \ln R_t + \gamma_4 \ln M_{t-1} + v_t}$$

2. Research Methodology

We wish to obtain Ordinary Least Square (OLS) results for the above equation using data from the Indian economy. For this purpose, we have taken quarterly data of the following:

1. Gross Domestic Product (GDP) at factor cost and at current prices (Source: Reserve Bank of India(RBI))
2. Whole sale price Index monthly average which was converted into quarterly average. (Source: Office of Economic Advisor , Ministry of Commerce and Industry, Government of India)
3. Monthly stock of Broad money again converted into quarterly average. (Source: Reserve Bank of India)
4. 15 – 91 days yield of SGL transactions reported monthly converted into quarterly average. (Source: RBI, India)
5. The Money stock and GDP were divided by quarterly WPI indices to get the real variables.

The data covers the period 1996-97 to 2005-06. The EViews Version 6 was used to carry out analysis

2.1 OLS Estimation for Money Supply using Interest Rate and National Real Income as Predictors

The following results were obtained on running a OLS on equation (4)

Dependent Variable: Log of Real M3

Method: Least Squares

Sample (adjusted): 2 36

Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-.09	0.1471	-0.1480	0.88
Log of GDP REAL	0.09026	0.027176	2.907962	0.0067
LOG INTE	-.013763	0.011073	-1.242940	0.2232
Log of (Mt-1)	0.938271	0.019822	47.33457	0.0000

R-squared	0.997468	Mean dependent var	9.125828
Adjusted R-squared	0.997223	S.D. dependent var	0.251483
S.E. of regression	0.013251	Akaike info criterion	-5.702204
Sum squared resid	0.005444	Schwarz criterion	-5.524450
Log likelihood	103.7886	F-statistic	4071.415
Durbin-Watson stat	1.823665	Prob(F-statistic)	0.000000

As can be seen from the above table, interest rate does not come across as a significant contributor (p value of 0.2232) to the process of money demand. We removed this variable and run the OLS again and the following results were obtained.

2.2 OLS Estimation for Money Supply using National Real Income as the Predictor

Dependent Variable: LM3_P
Method: Least Squares
Sample (adjusted): 2 36
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.130055	0.119691	-1.086595	0.2853
LGDP_P	0.074619	0.027172	2.746192	0.0098
LM3_P(-1)	0.951143	0.017045	55.80087	0.0000

R-squared	0.997342	Mean dependent var	9.125828
Adjusted R-squared	0.997176	S.D. dependent var	0.251483
S.E. of regression	0.013364	Akaike info criterion	-5.710713
Sum squared resid	0.005715	Schwarz criterion	-5.577398
Log likelihood	102.9375	F-statistic	6004.111
Durbin-Watson stat	1.789556	Prob(F-statistic)	0.000000

The R square in both the cases are quite high and this may be because we are using one period lagged dependent variable as one of the explanatory variable. Yet the second model gives all significant factors.

3. Data Analysis and Interpretation

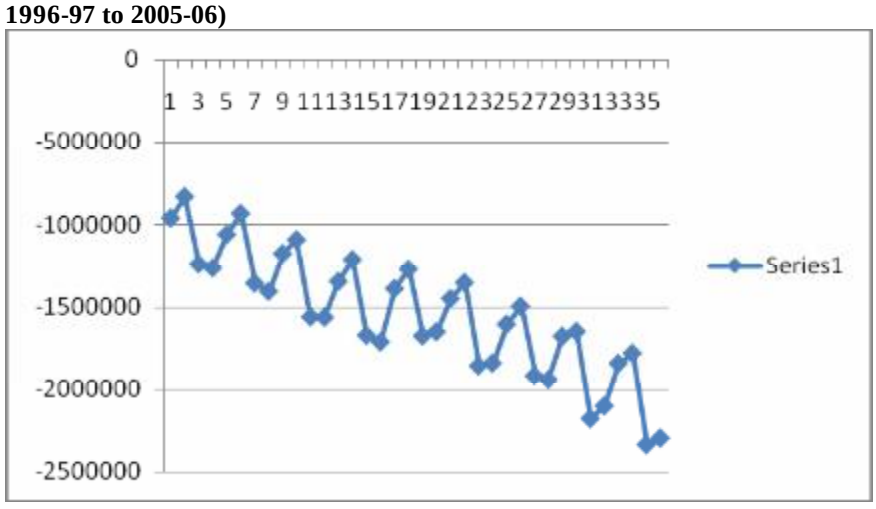
From the obtained results we can obtain an estimate for the adjustment coefficient as we defined in our equation (4), by using the fact that $\gamma_4 = 1 - \lambda$. So, we have $\lambda=1 - 0.951 = 0.049$. This tells us that 4.9% of the difference between the desired and actual demand for money is eliminated in each quarter or 19.6% of the difference is eliminated each year.

The above equation gives us an idea of the short run demand for money. Accordingly, the above table tells us that the short run income elasticity of demand for money for the Indian economy is 0.07. This number represents the elasticity for a quarter. Accordingly, for the year, it will become 0.07x4= 0.28. Dividing the coefficients of our long run demand for money equation with the value of adjustment parameter, we obtain the following:

Ln Mt* = -2.654183+1.5228366lnYt+ut

If we model the desired demand for money every quarter based on the above model and then compare it with actual level of money stock, we see that the difference between the desired money stock and actual money stock has systematically grown.

Figure 1: Optimal Versus Actual Value of Money Stock based on the Model (in Rs Crore 1996-97 to 2005-06)



The difference has been modeled in this graph. As can be seen the difference exhibits a definite downward trend and it also shows seasonality, i.e., every 2nd quarter the difference narrows whereas every first quarter, the difference widens.
This seems to suggest that RBI has been following progressively a contractionary policy in the sense that the actual money stock is less than the desired money stock and the difference seems to increase over a period of time.

4. Managerial Perspective

The stance of the monetary policy always confuses the managers at the micro level. The direction which the interest rates are going to take depends upon the monetary flow and this in turn depends upon the central bank's outlook of the economy. Under such situations whether to go ahead with a project or not is a major managerial dilemma. This paper seeks to inform them albeit partially that RBI's stand is conservative when it comes to money supply. Hence, this can always be factored into the decision to estimate the extent of change in interest rate.

5. Conclusion and Recommendation

Looking at our two models of OLS, we see that when we drop interest rate variable, the adjusted R squared component comes down. However, all the factors have now become significant.
This seems to indicate that the modeling of demand for money in the Indian economy is dependent on more variables than simply national income. It needs to be explored since with financial sector liberalization, the impact of interest rate on money demand will become a significant factor as has been the experience of developed countries.
However, if demand for money is dependent on national income alone, then it definitely proves that RBI has been following a contractionary monetary policy.

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