The Pakistan Development Review
32: 4 Part II (Winter 1993) pp. 1055–1065

Determinants of Money Multipliers

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In the present day world of fairly well-developed banking systems where money stock in an economy is jointly determined by the policies of the Central Bank, the scheduled banks and the non-bank public, the determination of money stock is an important variable in the formulation of an appropriate monetary policy. In Pakistan however very frequent and significant changes in money supply during the fiscal year suggest strong arbitrariness in the formulation and implementation of the monetary policy.

There are various approaches to the process of money stock determination, one approach is through money multipliers. Changes in money multipliers reflect the portfolio decisions of the commercial banks, non-bank public and the monetary authority. Extensive developments in the theory and applied research in the formulation of money multipliers by Friedman and Schwartz (1960); Brunner and Meltzer (1964); Hosek (1970); Bomhoff (1977) and others have estimated money multipliers for the industrialised economies but with the exception of Hosek they treat the determinants of the money multipliers as exogenous and are taken as given. However the determinants of money multipliers depend on various interest rates and measures of economic activity which are not constant.

In this study we estimate the determinants of the money multipliers firstly because they are not constant, rather they reflect the behavioural response of commercial banks and non-bank public to variations in interest rates. Secondly, they are important because the financial sector in Pakistan over the period of study has been controlled which may affect the determinants of money multipliers contrary to theoretical and empirical expectations as established in the literature, particularly for the advanced industrialised economies.

This study differs from the earlier studies on money stock determination and money multipliers in Pakistan. See Mangla and Ladenson (1978); Hamadani (1976) and Khalid (1980) in that it uses post-1974 data which pertains to present Pakistan only.

METHODOLOGY AND DATA

This study adopts Hosek's model of the determinants of money multipliers which comprises of four ratios:

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$$K = f(y, rTD), \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

where K is defined as ratio of currency in circulation (CC) to demand deposits (DD) CC/DD.

Y is the GNP at current prices and is used as a proxy for permanent income. Alternatively we also use YNA, the non-agricultural GNP. rTD is the commercial bank deposit rate used as a proxy for opportunity cost.

Y is postulated to be positively related to K. rTD is postulated to bear a negative sign.

$$T = f(YNA, rg), \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where T is defined as the ratio of time deposits (TD) to demand deposits (DD) TD/DD.

rg is the government bond rate.

Alternatively we use rTD also.

rg is postulated to bear a negative sign because as the bond rate rises above the commercial bank rate it may shift time deposits to other assets like government banks thus lowering the ratio.

$$R = f(Ms, CR/DT, YNA, rg), \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

where R is defined as the ratio of total reserves (TR) of the banks to total deposits (DT).

Ms is changes in money supply and is postulated to bear a positive sign.

CR/DT is the ratio of credit to total deposits and is postulated to bear a positive sign.

$$B = f(CR/DT, GS, rb), \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

where B is the ratio of borrowing from the State Bank of Pakistan to total deposits (B/DT).

Gs is the government securities held by the commercial banks.

rb is the difference between the commercial banks loan rate and the bank rate.

Alternatively we use Rc, the call money rate also. Gs will bear a positive sign as securities can be used as collateral for borrowing from the State Bank of Pakistan.

rb is expected to be positive, the higher the difference between the two rates, the greater the demand for borrowing from the Central Bank.

All data for this study is taken from the *Monthly Bulletins* of the State Bank of Pakistan. Data for GNP are taken from the Economic Surveys of Pakistan.

RESULTS

The results of the determinants of money multipliers or the ratios reported in Tables 1–4 are evaluated with respect to the postulated signs of their coefficients

Table 1

Results of the Currency Ratio

C	K_{-1}	Y	Y_{NA}	rT_D	t	R^2	R^{-2}	DW	F
0.999 (4.015)	–	–0.0000007 (1.259)	–	–0.041 (2.607)	0.020 (3.583)	0.580	0.490	1.784	6.443
0.916 (13.528)	–	–	–0.000005 (2.228)	–0.027 (1.908)	0.032 (3.838)	0.655	0.581	2.208	8.851
1.055 (3.469)	–0.029 (0.094)	–0.0000007 (1.181)	–	0.045 (2.393)	0.021 (2.721)	0.569	0.426	1.871	3.968

Table 2

Results of the Time-Deposit Ratio

C	T_{-1}	Y	Y_{NA}	rg	rT_D	t	R^2	R^{-2}	DW	F
0.245	–	–	–0.00002	–0.137	–	0.098	0.477	0.365	0.910	4.268
(1.8004)			(3.197)	(1.124)		(2.840)				
0.479	0.658	–0.00003	–	–0.010	–	0.005	0.705	0.607	1.513	7.188
(0.562)	(3.321)	(2.159)		(0.144)		(0.712)				
–0.696	–	–0.00002	–	–0.166	–0.013	–	0.385	0.254	0.984	4.913
(0.714)		(2.231)		(1.689)	(0.454)					
0.382	0.695	–0.000001	–	–	–0.004	–	0.693	0.623	1.605	9.818
(1.853)	(3.906)	(2.137)			(0.224)					

Table 3

Results of the Excess-Reserve Ratio

C	E_{-1}	ΔM_s	CR/DT	Y	YNA	IG	rTD	R^2	R^{-2}	DW	F
3.244 (8.704)	–0.898 (6.065)	–0.00002 (3.311)	–0.0004 (0.923)	0.00004 (1.218)	–	–0.226 (7.245)	–	0.889	0.823	1.721	13.372
3.166 (6.465)	–0.879 (5.322)	–0.00003 (2.425)	–0.0005 (0.989)	–	0.000009 (0.329)	–0.218 (5.066)	–	0.874	0.799	1.546	11.591
2.575 (6.930)	–0.750 (4.731)	–0.00004 (3.435)	–0.0006 (1.259)	–	0.000005 (6.118)	–0.163 (5.339)	–	0.838	0.764	1.926	11.392
0.797 (4.768)	–0.400 (1.638)	–0.00002 (1.455)	–0.000008 (0.009)	–	0.000005 (2.788)	–	0.630 (1.439)	0.630	0.511	0.988	2.229

Table 4

Determinants of the Borrowing Ratio

C	B_{-1}	CR/DT	GS	rb	RC	t	R^2	R^{-2}	DW	F
0.216	–	0.0007	–0.0000007	–	–0.006	–	0.150	0.031	1.576	0.826
(2.969)		(0.954)	(0.919)		(0.862)					
0.281	–	0.0002	–0.00000003	–	–0.008	0.005	0.278	0.055	1.904	1.250
(3.486)		(0.299)	(0.327)		(1.143)	(1.514)				
0.195	–	0.0005	–0.0000004	–0.021	–	–	0.129	0.056	1.433	0.696
(3.009)		(0.727)	(0.5803)	(0.629)						
0.183	0.273	0.0002	0.00005	–	–0.004	–0.003	0.237	0.109	1.635	0.683
(1.154)	(0.904)	(0.256)	(0.046)		(0.468)	(0.522)				

and the structural constraints on the financial sector.

1. Currency Ratio

Among the determinants of the currency ratio while *rTD* bears the correct negative sign and is highly significant the coefficient of *YNA* is also negative. It implies that the demand for currency increases less than the increase in demand deposits.

2. Time Deposit Ratio

For this ratio the signs of *Y* and *YNA* are contrary to theoretical expectations. Their coefficients are highly significant but negative. This implies that time deposits increase by less than demand deposits. However this outcome is confirmed by the financial statistics of Pakistan over the period of study that the demand deposits increased by more than time deposits.

Secondly *rg* bears the correct sing but is insignificant. This is again a structural problem of the financial sector of Pakistan. This insignificance is not surprising because of the lack of a developed bond market in Pakistan.

3. Excess Reserve Ratio

Among the determinants of the excess reserve ratio *YNA* and rg bear the correct signs and are highly significant. The outcome for *YNA* implies that increases in non-agricultural income leads to increases in demand deposits so the excess reserve ratio is affected. The significance of *rg* confirms the use of this variable as a proxy for the interest rate in this ratio. It implies that in the long-run portfolio holders may consider the substitution between time deposits and government securities.

TR/DT and *Ms* bear incorrect signs and are insignificant. This is explained by the credit restrictions in the financial structure of Pakistan over the period of study. Due to credit restrictions the banks were not interested in increasing time or demand deposits and were neither compelled to maintain reserves strictly in proportion as implied by *TR/DT*.

4. The Borrowing Ratio

The very insignificant coefficients of the borrowing ratio do not imply that this ratio is not regulated by purely economic factors. These results are due to the problem of excess liquidity with the commercial banks and restrictions on credit expansion.

These results confirm that the determinants of money multipliers are responsive to interest rates and economic activity variables as much as the financial structure of Pakistan permits. They reflect the behavioural response of commercial banks and non-bank public to variations in interest rates and Central Bank's

monetary policy. Therefore the relationships between the determinants of money multipliers and interest rates can be used to study the effect of multipliers on the monetary policy in the past and also predict money multipliers to help develop a rational monetary policy in the future. Therefore, we estimate the money multipliers for the post-1974 period using Hosek's formulation:

$$M = \frac{1 + K + T}{(r + TR - B)(1+T) + K} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

where r is the ratio of required reserves to total deposits. It is 5 percent for both demand and time liabilities throughout the period 1974–1991.

The actual and estimated values for money multipliers based on the values of the determinants of the money multipliers are reported in Table 5.

Table 5

Estimates of the Actual and Predicted Money Multipliers

Period	Actual (m)	Predicted (m)
1975	1.8053	1.5838
1976	1.9870	1.8540
1977	1.8730	1.8301
1978	1.7180	1.8177
1979	1.7639	1.7941
1980	1.8396	1.8732
1981	1.7822	1.6814
1982	1.7079	1.7583
1983	1.6055	1.6771
1984	1.7167	1.6805
1985	1.6891	1.6668
1986	1.7249	1.6769
1987	1.5257	1.6100
1988	1.5486	1.6213
1989	1.5380	1.6297
1990	1.5989	1.6465
1991	1.5235	1.5464

It will be seen from Table 5 that even with considerable structural constraints on the financial sector of Pakistan the money multipliers estimated from actual and estimated values move very close.

We estimate the predictive power of the money multipliers by estimating the percentage variation from the Root Mean Square Error (RMSE) as follows:

$$RMSE = \sqrt{1/T(\hat{m} - m)^2}$$

where T is the total number of observations and m and m are the estimated and actual values of the multipliers estimated by the four ratios.

The RMSE is divided by the mean of the series of the actual multiplier i.e. $\frac{9.953}{1.7} \times 100 = 5.8$.

Now given that Ms = m.H. (Money supply = the multiplier multiplied by the high-powered money stock) the percent variation implies that given the values of multipliers and high-powered money which is controlled by the government, we can predict the stock of money at any point with the error margin of 5 to 6 percent.

CONCLUSIONS

The results of the study show that although some results on the determinants of money multipliers are not compatible with theoretical expectations which are based on the highly developed financial structures of the advanced economies they are compatible with the structural developments in the financial sector of the Pakistani economy. Furthermore, the results show, quite clearly, that the size of the money stock can be predicted with the monetary base as the control variable, if the multiplier is predicted after taking into account the determinants on the various components of multipliers which are not constant and hence should be used effectively in the formulation of the monetary policy in Pakistan of which money stock is the major component.

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Comments on "Determinants of Money Multipliers"

In discussing the role of money in Pakistan we are, in the first place, implicitly assuming that the State Bank of Pakistan can determine the growth of the money supply. The debate between the monetarists and the non-monetarists indicates that this assumption needs careful understanding. The monetarists argue that monetary authorities can control money supply whereas the others argue that the stock of money is simultaneously determined along with the variables of the financial and the real sectors of the economy.

If that is so it then seems that the stock of money is not only controlled by the monetary authorities but also depends on the behaviour of the public in the real and financial sectors, which cannot be controlled by the monetary authorities.

The monetarists agree to the above statement but their argument is that the behaviour of the public and the banking system is stable and can be predicted. It is this belief underlying the argument that the monetarists suggest that the stock of money can be controlled by the authorities concerned. Consequently it is made clear to us that the issue between the monetarists and the non-monetarists needs empirical investigation.

Given the model $M = mH$ and the debate between the monetarists and non-monetarists, three questions need clarification:

(a) Whether all the variables (ratios) determining the size of the m multiplier are controllable or not?
(b) Whether the functions 1–4 explaining these variables (ratios) are fairly stable and can be predicted?
(c) Whether the source of H can be controlled by the monetary authorities?

It is suggested that Equations 1 and 3 regarding the currency deposit ratio and excess reserves may be estimated with the following specification:

1. $K = f$ (interest rates, average consumption, income distribution and seasonal changes).
2. $E = f$ (market interest rates, discount rates, required reserves uncertainty of deposits and withdrawals and government regulations).

Furthermore, empirical evidence suggests that these ratios are unstable in the short run. So far as the source of the monetary base or high-powered money is concerned, it includes the Central Bank's credit to the government, the commercial banks and its net foreign assets. It is known that the Central Bank's credit to the government is largely determined by the budget deficit, which the Central Bank cannot control fully. Credit provided to the commercial banks is mainly controlled

through monetary policy. Finally, foreign asset holding of the central bank is determined by the trade and payments balance, over which the central bank has limited direct control.

Thus far, it is clear from the above discussion that if we suggest that the monetary authorities can control the stock of money it simply implies that the authorities can influence the variables determining the money multiplier, budget deficits and trade balances etc. In less developed countries the story is far from what is implied above. Underdeveloped economies have little control over the stock of money because the monetary authorities can exercise their power in a limited manner.

So far as the econometric problems are concerned, it is noted that with lagged dependent variables in the regression equations, two difficulties may arise:

1. With no autocorrelation problem, results are biased particularly with the small sample size.
2. With the presence of autocorrelation the results are biased and inconsistent. Variances are large so the results reported cannot be taken seriously.

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