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Determinants of Money Supply in Nepal

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Abstract

Money stock can be estimated with a higher level of accuracy when the policy maker knows the value of reserve money as well as money multiplier. Reserve money is however not purely a policy variable. But, monetary and fiscal authorities can sufficiently influence it by undertaking simultaneous policy actions. In the context of developing countries, there are essentially two main approaches to money stock determination, first is the money multiplier approach and the second one is balance sheet or structural approach. To know whether different factors can influence money supply or not we must identify the relationship between money and other variables. This study tries to analyze the money supply and its determinants during 1974 A.D. to 2006 A.D., especially to analyze the factors determining high-powered money, narrow money and broad money using OLS estimation method. This study concludes that the reserve money is a dominant determinant of both definitions of money supply in Nepal during the sample period. Since reserve money is largely policy determined variable, the monetary authority can regulate the total volume of money stock by means of its proper management.

Introduction

The term 'supply of money' means the total stock of money held by the public in purely liquid form. Thus the cash balances held by the central government, the central bank and the commercial banks do not form money supply because they are not in actual circulation. Emphasizing on the medium of exchange function of money *(Johnson, 1992),* the traditional approach puts currency with public and demand deposits with commercial banks as the money supply. The Chicago School led by Milton Friedman includes currency plus demand deposit plus time deposits in money supply. Gurley and Shaw further widened the scope of money supply by including in its constituents currency plus demand deposits and the time deposits of banks plus the liabilities of non banking intermediaries covering bank deposits, shares, and bonds etc. which are close substitute to money. Similarly, liquidity approach provides wider view of the concept of money supply defining the money supply in terms of general liquidity of the economy. The whole liquidity position that is relevant to spending decisions is considered as money. Thus cash, all kinds of bank deposits, deposits with other

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institutions near money assets and borrowing facilities available to the people all are money supply for them.

In the context of developing countries, there are essentially two main approaches to money stock determination: the *money multiplier approach* and *balance sheet or structural approach* (Hossain, 1993). The money multiplier approach focuses on the relationships between money stock and reserve money, while structural approach analyze individual items in the balance sheet of monetary sectors to explain variations in money stock. The analytical difference in these two may appear to be confined to different points of departure; however, to an extent, it reflects the deeper division between monetarists and non-monetarists too.

There is the debate among the economists about what exactly the level of money supply should be. According to pragmatic approach, the rate of money supply should be equal to growth rate of GDP. However, to cover up the deficiency of the policies of any developing economy, a moderately higher rate of money supply than mentioned above is considered desirable. In this connection, monetary authority is solely responsible to manage money supply in a desirable limit and, of course, it is the core of monetary policy (Upadhya, 1989). As specified by NRB Act 2002, the objectives of monetary policy in Nepal are: (a) maintaining the BOP stability, (b) facilitating sustained economic growth, and (c) securing financial sector stability (Thapa, 2004)

According to Sharma (1987) and Gaudel (2003), like other developing countries, Nepalese Central Monetary Authority has had to face the following limitations in controlling money supply. *Firstly*, foreign exchange is an exogenous and most variable factor. It is not within the immediate control of monetary authority. In other words aid and loan based resources are not long before informative. *Secondly*, the inflationary tendency is normal phenomenon to meet the growing needs of the economy as such. *Thirdly*, higher budgetary deficit remains the compulsory source of government finance for under monetized economy like Nepal though it is inflation friendly. *Fourthly*, the growing capital requirement of banks and financial institutions to promote their business/services could not be undermined. *Finally*, the absence of proper capital and monetary market makes the open market operation less effective. Thus, the controlling of money supply by monetary authority is severely limited in a developing country.

"Money stock can be estimated with a higher level of accuracy when once the policy maker knows the value of reserve money as well as money multiplier. Reserve money is however not purely a policy variable. But, monetary and fiscal authorities can sufficiently influence it by undertaking simultaneous policy actions. Similarly, the commercial bank's and public attitudes are no lesser important in deciding the size and shape of reserve money by way of changing reserves to demand deposit ratio and currency to demand deposit ratio respectively" (Gokbudak, 1995).

The variation in money multiplier which links money supply to reserve money is however small and easy to predict. The short run change in money supply is attributed by a change in money multiplier and reserve money. Money multiplier, though has a smaller effect to

the money supply process, is also based on the psychological behaviors of commercial banks and private non-bank to hold excess reserve and cash respectively. To know whether different factors can influence money supply or not we must identify the relationship between money and other variables like market rate of interest, rediscount rate, time deposit rate, level of income, required reserve rates, inflation and reserve money etc. If the relationship exists we will also be able to forecast the growth with stability. This study analyzes the money supply and its determinants during 1974 A.D. to 2006 A.D., especially to analyze the factors determining high-powered money, narrow money and broad money.

RESEARCH METHODOLOGY:

High Powered Money (H) or Reserved Money (RM):

According to Sharma (1987), there are a couple of determinants of high powered money through whose regulation the NRB can exert a direct pressure on money supply. Given the balance of payment and the monetary deficit of the government, NRB can control credit supply (a source of MS) to banking and private sectors, not only to regulate its volume and distribution sector wise, but also to offset the adverse effects, if, which are felt exogenously. As complementary factor, the offsetting role of money multiplier in the effect of reserve money also serves as a very important mechanism to keep the growth of money supply always to suit the needs of the domestic economy. Sharma concluded that the only autonomous source of high powered money in Nepal could be the NRB credit to commercial banks and private sector. The NFAM are endogenously determined by the balance of payments while the fiscal deficit of the government is out of central bank control. Therefore, the only policy variable left with NRB is the credit to commercial banks and the private sector.

In its simplest form Gupta (1972), Sharma (1987), Upadhya (1989) and Poudel (1991) the money multiplier is based on the following equation.

$$MS = m.\ H \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where, MS = Money Supply, m = Money Multiplier and H = High Powered Money

Equation (i) above states that money stock is simply a multiple of the high powered money (H). If the multiplier (m) is numerically a constant, variations in money supply would arise entirely on account of changes in reserve money. More refined version of this approach is:

$$MS = m\ (\ldots)\ H \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Wherein the money multiplier *(m)* is treated not as a constant but as a function of a few unspecified variables, i.e., the money multiplier *(m)* systematically responds to a set of impulses. In this general formulation, the money multiplier approach suggests that determinants of the money stock can be classified into two broad groups (i) those that affect the high powered money (H) and (ii) those that affect the money multiplier (m).

Broadly speaking, the Reserve Money (RM) is the total of existing assets, which

either are or potentially could be used as reserves by the banking sector. RM includes Currency Held by the Public (CC), Cash Held by the Commercial Bank in their vault (CIV), Commercial Banks' Balance (DB) with Nepal Rastra Bank and Other Deposits (OD) held at NRB. Symbolically,

$$RM = CC + CIV + DB + OD \quad \ldots\ldots\ldots\ldots \quad (3)$$

Beside the banks actual reserves, the currency held by the general public is also included in the reserve money because it could be easily transferred by them to the banks in exchange for bank deposits, in which case, the banks reserves would increase equivalently. The reserve money is also called the monetary base or the high-powered money, essentially because bank deposits (which are a major component of money stock) are some multiple of the bank reserves through the familiar process of multiple deposit creation. Accordingly, an increase in reserve money has potential, *ceteris paribus,* to bring about a multiple increase in bank deposits *(hence in money stock).* Generally, CIV and DB are clubbed together as reserve money of commercial banks (RCB), and then we can write equation (3) as: (Upadhya; 1989).

$$RM = CC + RCB + OD \quad \ldots\ldots\ldots\ldots \quad \ldots\ldots\ldots\ldots \quad (4)$$

Narrow Money Supply (M1):

Narrow Money (M1) consists of currency held by the public (CC), demand deposits held at commercial banks (DDC) and other deposits (OD) held at the NRB. Symbolically;

$$M1 = CC+DDC+OD \quad \ldots\ldots\ldots\ldots \quad (5)$$

However, for the computation of the monetary survey, DDC and OD are taken together as Demand Deposits (DD) at the banking sector. But there is a distinction between the demand deposits held at commercial banks and other deposits held at NRB in the sense that former helps to manufacture money in terms secondary deposit creation from such deposits the later does not. The latter is the mere balances held at the NRB by other than commercial banks. This is the reason why OD is also treated as a part of RM (reserve money following the aggregation of DDC and OD we can rewrite equation (5) as:

$$M1 = CC+DD \quad \ldots\ldots\ldots\ldots \quad (6)$$

Broad Money Supply (M2)

Broad Money (M2) is broader monetary aggregates compiled in Nepal. Besides M1 it includes time deposits (TD) held at commercial banks. TD on the other hand consists of savings deposits, fixed deposits and margins deposits with commercial banks. Symbolically, M2 can be written as:

$$M2=M1+TD \quad \ldots\ldots\ldots\ldots \quad (7)$$

Method of Estimation

Sharma (1987) estimated semi-log linear and double log- linear models for1965-1982 sample period examining the relationship of money with other economic variables and the efficiency of domestic control measures in the face of openness of her economy. Paudel (1991) studied money multiplier and money base approach to money supply in Nepalese context for the period Mid-July 1980 to Mid-April 1989 using log linear models. Khatiwada (1994) studied the sources of change in the stock of money during the period of 1965 to 1990 using annual data. He specifies narrow money as function of high powered money in level and first difference of the level.

High Powered Money (H), Narrow Money Supply (M1) and Broad Money Supply (M2) are the Dependent Variables. Where as Net Foreign Assets (NFA), Government Deficit (GD), Government Expenditure (GE), Nominal GDP (Y), High Powered Money (H) and Total Number of Branches of Commercial Banks (BO) are the explanatory variables. The OLS estimation method is used to estimate the parameters using secondary data covering the time period 1974 AD to 2006AD. Augmented Dickey-Fuller test for unit root and co-integration test, Prais-Winsten and Cochrane-Orcutt method to correct the autocorrelation if found after testing by using DW test, JB-test for normality test, VIF to test the multicollinearity and BP-CW test to test the heteroskedasticity are performed. Z-test for testing the over all goodness of the model, t-test for testing individual coefficients and R^2 to test the explanatory power of independent variables considered on respective models are reported. And, robust standard errors are reported to avoid the problem of heteroskedasticity, if any.

- To see the strength of domestic H generation mechanism from demand side, equation (i) is estimated. Where, dln stands for change in natural log of respective vatiables.
  $dlnH_t = \ln \beta_0 + \beta_1 dlnGD_t + e_t$ ..... (i)
- To see the joint effect of both fiscal and monetary variables on the determination of high powered money, equation (ii) is estimated.
  $dlnH_t = \ln \beta_0 + \beta_1 dlnNFAt + \beta_2 dlnGE_t + e_t$ ..... (ii)
- To analyze the narrow money supply (M1), equations (iii) and (iv) are estimated.
  Supply Side: $dln\, Ml_t = \ln \beta_0 + \beta_1 dlnH_t + e_t$ ..... (iii)
  Demand Side: $dln\, Ml_t = \ln \beta_0 + \beta_1 dlnY_t + \beta_2 lnGE_t + b_3 lnBO_t + e_t$ ..... (iv)
- To see the impact of different variables on broad money supply (M2), equation (v) is estimated.
  $dlnm2_t = \ln \beta_0 + \beta_1 dlnY_t + \beta_2 dlnBO_t + e_t$ ..... (v)

EMPIRICAL ANALYSIS

High Powered Money (H) and Determinants:

$$\mathbf{dlnH_t = 0.14 + 0.07\ dlnGD_t}$$

P>|t| (0.000) (0.095)

P>|t| (0.000) (0.142) (Robust)

R^2 = 0.0933 F = 2.9 DW = 2.00972 JB = 0.32 BP-CW = 0.09

The simple regression of High Powered Money (H) on Government Deficit (GD) is shown above. It shows that the Government Deficit (GD) has positive significant role on the determination of high powered money (H) at 10 percent significant level. That is, one percentage change in growth rate of GD causes 0.07 percent positive change in growth rate of H; *ceteris paribus*. Coefficient of Determination (R^2) is quite low. The residuals are more or less normally distributed and are not serially correlated. Overall significance of the model is good at 10 percent level of significant. The elasticity coefficient is significant at 15 percent level of significant, even if robust standard error is reported to avoid the heteroskedasticity. The dependent and independent variable used in above equation are co integrated even at 1 percent level of significant (Appendix 1).

$\mathbf{dlnH_t = 0.10 + 0.09\ dlnNFAt + 0.27\ dlnGE_t}$

P>|t| (0.000) (0.059) (0.055) (Robust)

Adjusted-R^2 =0.22 F=3.16 DW=1.85 JB=1.70 BP-CW =0.49 VIF=1.02

According to the simple regression results above, Net Foreign Asset (NFA) and Government Expenditure (GE) both have positive significant role to determine the high powered money at 6 percentage level of significant. That is, one percentage change in the growth rate of NFA results 0.09 percentage positive change in the growth rate of high powered money; *ceteris paribus*. Similarly, one percentage change in the growth rate of GE results 0.27 percentage positive change in the growth rate of high powered money, *ceteris paribus*. 22 percent variation in H is due to the variation in the independent variables chosen here. Residuals are more or less normally distributed and are not serially correlated. Overall significance of the model is good at 5 percent level of significant. We don't have sufficient evidence at hand to believe that there is perfect multicollinearity among the explanatory variables chosen. We fail to accept the null hypothesis even at 10 percent level of significant that there is constant variance of error term for all values of explanatory variables. Therefore, the robust standard errors are reported. The dependent and independent variable used in above equation are co integrated even at 1 percent level of significant (Appendix 1).

Narrow Money Supply (M1) and Its Determinants:

$\mathbf{dlnM1_t = 0.01 + 0.97\ dlnH_t}$

P>|t| (0.640) (0.000)

R^2 = 0.49 F = 28.75 DW = 1.94 JB = 0.46 BP-CW = 2.01

The regression results show that High Powered Money (H) has statistically significant positive role to determine Narrow Money Supply (M1) even at 1 percent level of significant. That is, one percentage change in growth rate of H results 0.97 percent positive change in growth rate of M1 during the sample period, *ceteris paribus*. About 49 percent variation in M1 is due to the variation in H. Residuals are more or less normally distributed and are not serially correlated even at 1 percent level of significant. Overall significance of the model is good even at 1 percent level of significant. We have sufficient evidence at hand to accept the null hypothesis that there is constant variance of error terms foe all values of explanatory variable at 10 percent level of significance. The dependent and independent variable used in above equation are co integrated even at 1 percent level of significant (Appendix 1).

$$\mathbf{dlnM1_t = -0.46 - 0.18dlnY_t - 0.04lnGE_t + 0.18lnBO_t}$$

P>|t| (0.115) (0.416) (0.008) (0.020)

Adjusted-R^2=0.27 F=3.31 DW=1.94 JB=1.77 BP-CW =5.04 VIF=1.32

According to the regression results above, GDP and Government Expenditure (GE) both are negatively associated M1. That is, *ceteris paribus,* one percentage change in the growth rate of GDP results 0.18 percentage negative change in the growth rate of M1, though insignificant it supports the theory. Similarly, one percentage change in the GE results 0.04 percentage negative change in the growth rate of M1at 10 percent level of significance, *ceteris paribus*. Whereas, 1 percent change in total number of bank branches with in the whole economy results 0.81 percent positive change in growth rate of M1at 2 percent level of significance, *ceteris paribus*. 27 percent variation in M1 is due to the variation in the independent variables chosen here. Residuals are normally distributed and are not serially correlated at 5 percent level of significant. Overall significance of the model is good at 5 percent level of significant. We don't have sufficient evidence at hand to believe that there is perfect multicollinearity among the explanatory variables chosen. We accept the null hypothesis at 5 percent level of significant that there is constant variance of error terms for all values of explanatory variables. The dependent and independent variable used in above equation are co integrated even at 1 percent level of significant (Appendix 1).

Broad Money Supply (M2) and Its Determinants:

$$\mathbf{dlnm2_t = 0.13 + 0.28\ dlnY_t + 0.16\ dlnBO_t}$$

P>|t| (0.000) (0.069) (0.098)

P>|t| (0.000) (0.167) (0.185) (Robust)

Adjusted-R^2 =0.16 F=2.65 DW=1.55 JB=0.23 BP-CW =0.18
VIF=1.00

The regression results of the overall period show that the nominal GDP (Y) and total numbers of Commercial Banks (BO) have positive significance role to determine Broad Money Supply (M2). It means, *other things remaining the same*, one percent change in

growth rate of Y results 0.28 percent positive change in growth rate of M2 at 10 percent level of significant. Similarly, 1 percentage change in growth rate of total number of bank branches results 0.16 percent positive change in M2 at 6 percent level of significant, *ceteris paribus*. Coefficient of Determination is quite low. The error terms are more or less normally distributed and are no serially correlated at 5 percent level of significant. Over all goodness of the model is fit at 10 percent level of significant. We don't have sufficient evidence at hand to believe that there is perfect multicollinearity among the explanatory variables chosen. We fail to accept the null hypothesis even at 10 percent level of significant that there is constant variance of error term for all values of explanatory variables. Therefore, the robust standard errors are reported. We found that even if the coefficients are significant at twenty percent level of significant, *ceteris paribus*. The dependent and independent variable used in above equation are co integrated even at 1 percent level of significant (Appendix 1).

Conclusions:

The reserve money is a dominant determinant of both definitions of money supply in Nepal during the sample period. Since reserve money is largely policy determined variable, the monetary authority can regulate the total volume of money stock by means of its proper management. In recent times (Sharma , 1987), the increasing trend of net foreign assets, which reflects the outcome the economic policy here and there, is endogenous source of change in reserve money, may arise some difficulties to control reserve money in appropriate direction. In the past, net credit to the government had played a crucial role to make changes in reserve money but in the recent times its share to reserve money is declining and also in this connection the government of Nepal has initiated to close the doors for borrowing from the central bank as well.

The analysis of the sources of reserve money indicates that the monetary authority does not have full control over the reserve money. In this regard, controlling of money supply through multiplier is essential. The components of money multiplier are currency ratio, time deposit ratio, other deposit ratio and required reserve ratio. The currency and time deposit ratios are ultimately determined by extension on bank branches interest rates banking habits of the people etc. and these factors have a significant impact on money multiplier, so, regulating these factors, we can make changes on the total volume of money stock on desired direction. Likewise, the drastic change on required reserve ratio can also regulate the total money supply in an economy. However, this policy is not applicable in case of increasing excess reserve position of commercial banks.

The various empirical results have shown that reserve money management is more important to control the total volume of money stock in an economy. The GD remains the vital determinant of H generation from demand side. The NFA and GE are major dominant determinants of H generation from monetary and fiscal variable side respectively. From supply side, narrow money is determined significantly by H. From demand side BO plays significantly role to control the volume of narrow money. Broad money supply is determined by Y and BO positively.

APPENDIX 1

Dickey-Fuller test statistics for equatin (i) :

variable	h	gd	lnh	lngd	dlnh	dlngd	e
z(t)	6.510	-0.082	-1.828	-2.856	-5.517	-4.965	-6.070
p(z)	1.000	0.951	0.367	0.051	0.000	0.000	0.000

Dickey-Fuller test statistics for equation (ii):

variables	h	lnh	dlnh	nfa	lnnfa	dlnnfa	ge	lnge	dlnge	e
z(t)	6.510	-1.828	-5.517	3.696	-0.359	-4.740	5.395	-3.594	-4.136	-7.499
p(z)	1.000	0.367	0.000	1.000	0.917	0.000	1.000	0.006	0.001	0.000

Dickey-Fuller test statistics for equation (iii):

variable	h	lnh	dlnh	m1	lnm1	dlnm1	e
z(t)	6.510	-1.828	-5.517	11.049	-1.726	-5.347	-9.693
p(z)	1.000	0.367	0.000	1.000	0.418	0.000	0.000

Dickey-Fuller test statistics for equation (iv):

variables	dlnm1	gdp	lngdp	dlngdp	bo	lnbo	dpnbo	ge	lnge	dlnge	e
z(t)	-5.347	8.777	-0.573	-3.659	-1.937	-4.166	-4.485	5.395	-3.594	-4.136	-6.307
p(z)	0.0000	1.000	0.877	0.005	0.315	0.001	0.001	1.000	0.006	0.001	0.000

Dickey-Fuller test statistics for equation (v):

variables	m2	lnm2	dlnm2	gdp	lngdp	dlngdp	bo	lnbo	dlnbo	e
z(t)	9.941	-3.133	-3.433	8.777	-0.573	-3.659	-1.937	-4.166	-4.485	-4.135
p(z)	1.000	0.024	0.010	1.000	0.877	0.005	0.315	0.001	0.001	0.001

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