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Modeling Demand for Money in Nepal

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Abstract

In this paper, we estimate money demand functions for Nepal employing Johansen's tri-variate Conintegration method for the period of 1974/75-2009/10. In line with the previous studies, both narrowly defined real money demand (m_1) and broadly defined real money demand (m_2) are found to be a stable and predictable function of real income and interest rate albeit disequilibrium corrects more rapidly in m_1 compared to m_2. We reject the null hypothesis that income elasticity of money in both functions is unitary with satisfying homogeneous postulates. Further, we reject the null hypothesis that long run determinants of m_1 and m_2 are weakly exogenous. Based on these findings, we conclude that money demand functions are useful for conducting monetary policy in Nepal.

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Remarks: The views expressed in this paper are personal and do not necessarily represent the official stance of the Nepal Rastra Bank. Comments are welcome.

Contents

1. Introduction

A reliable and predictable money demand function linking real money balances, real income and interest rates is essential for the formulation of monetary policy strategies especially on monetary targeting framework (Ordonez, 2003). If money demand function becomes unpredictable or fluctuates widely, the transmission mechanism of monetary policy becomes extremely complicated for reducing deviations of inflation from the target and output gap. So, monetary targeting can be a useful device in monetary policy setting only if there exists a predictable correspondence between fluctuations in monetary aggregates and fluctuations of a set of policy objectives (Chen and Wu, 2005).

In Nepal, Nepal Rastra Bank (the central bank of Nepal) considers monetary aggregates as an intermediate target of monetary policy, a prediction of money demand function becomes the central focus of policymakers. Unfortunately, there is a lack of rigorous analysis on this topic with recent updates. The latest estimate is available in Khatiwada (1997) and Pandey (1998), which indicates that the money demand function has not been estimated in Nepal since a long time.

The motivation of this paper has two folds. The first motivation is the quest for estimating a well determined and stable money demand function with extending the latest information available in the dataset after a considerable lapse of time so that the estimated parameters in the previous studies are subject to change. Second, we employ Johansen (Johansen, 1988) cointegrating method to estimate the model over the least square methods and Engle-Granger's techniques in the previous studies. This technique is considered to be more useful for modeling non-stationary variables. It also allows us to impose different restrictions to discover different dimension of inter-linkage of variables.

The main objective of this paper is, therefore, to re-estimate money demand function in Nepal employing Johansen (Johansen, 1988) cointegrating method for the period of 1975 to 2010. The paper is organized as follows. The next section discusses money demand function followed by formulation of econometric methodology in section 3. Section 4 provides time series properties of variables used in the model. We report empirical findings in section 5 and finally summarize the conclusion in the last section.

2. Specification of the Model

Monetary theory considers the demand for money in real term which allows us to investigate the linkage between money demand and the economic activities as the nominal demand does not represent the consumer's preference in general. The theoretical literature such as inventory models, assets theories, and consumer demand theory approach suggests that demand for money is the function of a set of scale variables (eg. real income) and a set of opportunity cost variables like interest rate *albeit* they differ in terms of specification and representation of these variables. Consequently, the empirical literature utilizes these theoretical concepts as the starting point and attempts to model the demand for money so as to represent the functioning of the particular economy.

Consistent with standard monetary theories, a typical money demand function can be considered as (Ericsson, 1998):

$$(M^d / P) = f(Y, \Re) \qquad\qquad (1)$$

Where M^d is the demand for money, P is the price level, Y is the scale variable (income, wealth or expenditure, in real terms); and $\Re$ is a vector of opportunity cost variables. The function f is assumed to be increasing in Y and decreasing in those elements of $\Re$.

On the choice of appropriate scale variable in the demand for money function, the transactions theories include income while the asset theories employ wealth. In both cases, the scale variable is used as a measure of transaction relating to the economic activity. An increase in economic or transactions activity would necessitate a greater demand for money. The transactions motive of cash balance places more emphases on current income while the asset portfolio behavior on wealth. In the empirical estimation, however, the level of income has been widely used to represent the scale variable, mainly because it poses little measurement problem. Since a number of related variables such as GNP, GDP and NNP that move together have also been heavily used as substituting one for another (Laidler, 1993).

On the appropriate opportunity cost variables, the transactions theories suggests short-term interest rates such as yields on treasury bills, whereas the asset theories proposes yields on longer-term financial assets (Judd and Scadding, 1982). The opportunity cost of holding money involves two ingredients: the own-rate of money and the rate of return on assets alternative to money and interest rates on both the assets lead disincentive to hold real balance. Therefore, the coefficient of opportunity cost such as saving interest rate is expected to be negative (Katafono, 2001). Alternatively, an idea of using interest rate spread instead of interest rate in level is also in practice especially for analyzing demand for broad money (Tseng and Corker, 1991). It is because the share of interest-bearing portion in broad money has increased in a number of countries implying that broad money is affected by the relative returns rather than the general level of interest rates (Mehra, 1993).

In the Nepalese context, NRB considers monetary aggregates including both narrowly and broadly defined money supply as an intermediate target, understanding money demand functions and their inter-relationship are important for policy purpose. However, there is a lack of systematic and continuous efforts of analyzing money demand function. Poudyal (1987) is probably the first empirical literature which estimates demand for money in Nepal. Using ordinary least square method, he finds that the money demand is a function of real income and interest rate in Nepal. Khatiwada (1997) revisited the empirical work exploring further possibilities of including alternative scale variables like per capital income, agricultural GDP and non agricultural GDP but found a stable money demand as a function of real GDP and interest rate for the period from 1976 to 1996. In that paper, the income elasticity of narrowly defined money and broadly defined money are estimated to be 1.25 and 1.45 respectively and highlights the fact that the income elasticity greater than unity is due to under-monetization of the economy. Pandey (1998) further analyzes the demand for money in Nepal employing Engle and Granger (1987) cointegrating technique and presents the

similar result as in Khatiwada (1997) implying money demand in Nepal is a function of real income and interest rate.

Based on the theoretical model as given by Eq(1) and previous empirical literature, we consider a typical log linear money demand function for Nepal as:

$$m_t = \log(M_t / P_t) = \alpha + \delta \log(y_t) + \beta r_t \quad \text{with } \delta > 0 \text{ and } \beta < 0 \quad (2)$$

where m_t is the real money demand; M_t is the narrowly defined nominal money stock; P_t is the consumer price index, y_t is the real income and r_t is the deposit interest rate; β is the interest rate elasticity and δ is income elasticity of money demand. Theory suggests that money is luxury item if $\delta > 1$.

3. Econometric Methodology

Following Johansen (1988) and Johansen and Jueselius (1990), we employ a tri-variate cointegrated reparameterised vector autoregressive model of order p to investigate the relationship among real money balance (m_t), real output (y_1) and interest rate (r_t) as:

$$\Delta X_t = \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-p} + \mu_t + \varepsilon_t \quad (3)$$

In Eq (3), $X_t [= m_t, y_t, r_t]$ is an 3×1 vector of the first-order integrated [i.e., I(1)] variables, m_t is the real money stock, y_1 is real GDP at constant price and r_t is the annual interest rate of one year fixed deposit. Similarly, μ_t is an $3x1$ vector of deterministic term; ε_t is an $3x1$ vector of normally and independently distributed error terms, i.e., $\varepsilon_t \approx NP(0,\Omega)$; Γ_i are 3×3 coefficient matrix of lag variables, defined as $-\sum_{j=1+1}^{p} A_j$ and finally, Π is an 3×3 long run impact matrix, $-(I - \sum_{i=1}^{p} A_i)$. Where A_i is an $3x3$ matrix of vector autoregressive of order p and I is an $3x3$ identity matrix.

The rank of Π determines the number of cointegrating vectors (r) among the variables in X_t. Given the number of endogenous variables, we expect $0 \le r \le 3$. In the extreme case, if r=0 then we do not find any cointegrating relationships between money demand and it's scale variables. If r=3 there exists a full rank. If Π is of rank r such that $0 < r < 3$ then we can decompose $\Pi = \alpha \beta'$ where α is an $3 \times r$ matrix of error correction coefficients which provide the speed of adjustment towards long run equilibrium and β' is an $3 \times r$ unrestricted cointegrating vectors. Eq(3), then, can be re-written as:

$$\Delta X_t = \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \alpha(\beta' X_{t-p}) + \mu_t + \varepsilon_t \quad (4)$$

Testing number of cointegrating relationships (r) is an important issue in Eq(4). Johansen (1988) proposes two likelihood ratio tests namely eigenvalue $[\lambda_{max}(r/r+1)]$ and trace statistic $[\lambda_{trace}(r/p)]$ tests for the determination of r as follows:

$$\lambda_{trace}(r/p) = -T \sum_{i=r+1}^{p} \log(1-\hat{\lambda}_i) \tag{5}$$

$$\lambda_{max}(r/r+1) = -T \log(1-\hat{\lambda}_{r+1}) \tag{6}$$

Where $\hat{\lambda}$ is computed eigenvalue up to p lags and p is chosen up to the level which removes serial correlation. Eq(5) tests the null hypothesis that there are at most r cointegrating vectors against k where k is number of variables used in the model whereas Eq(6) tests the null hypothesis of r cointegrating vectors against the alternative of $r+1$.

After obtaining number of cointegrating relationships in Eq(4), we impose different restrictions on the dynamic path of adjustment (Γ_i) and cointegrating vectors ($\Pi = \alpha\beta'$). These restrictions can be imposed based on the prior theoretical knowledge or from the data generating process. In our model, we allow data to speak on it (Pasaran and Shin, 1994).

The formal identification of the cointegrating vector and loading factors are the key issues under Johansen approach. The number of restrictions necessary to identify the long run relationship is a direct function of the number of cointegrating vectors as exact identification of the long run coefficients requires $k = r^2$ restrictions. If the number of available restrictions $k < r^2$ the system is under identified and the system is overidentified in other way around. Therefore, the identification of α and β requires r to be known (Greenslade et al., 2002). As per Pasaran and Shin (1996), each vector requires at least r restriction(s) and one of these restrictions should be the normalization restrictions. We follow their procedure.

For illustration purpose, if we assume r=1 and p=1, the cointegrating relationship of money demand without prior theoretical knowledge becomes:

$$\Pi X_{t-1} = \alpha\beta' X_{t-1} = \begin{bmatrix} \alpha_{11} \\ \alpha_{21} \\ \alpha_{31} \end{bmatrix} \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} \end{bmatrix} \begin{bmatrix} m_{t-1} \\ y_{t-1} \\ r_{t-1} \end{bmatrix} \tag{7}$$

Imposing only one restrictions in Eq(7) implies exact identification. β_{11} may be normalized to unity in order to get money demand function. If $\alpha_{i1} = 0$, then the ith variable is weakly exogeneous with respect to the long run parameters. Under this framework, a test of exogeneity is possible imposing restrictions on β_{1i}.

4. The Data Generating Process

As monthly and quarterly GDP series are not available, we are compelled to use annual data for estimating money demand function in Nepal. Our sample period starts from 1974/75 to 2009/10 covering a total of 36 observations, which, we believe, is enough to estimate a tri-variate cointegraion model.

We considered two alternative definitions of money in the model, namely narrowly defined money supply (M_1^S) which consists up currency in circulation and demand deposits and broadly defined money supply (M_2^S) which comprises narrow money (M_1^S) and time deposits of commercial banks, where M_i^S (for i=1 and 2) are the year ending (mid-July) outstanding amounts. We then compute real money holdings as $m_{ti} = \log(M_{ti}^s / P_t)$ for i= 1 and 2 where P_t is the sequence of $\{P_t : t=1\ldots n\}$ national urban consumer price index. Similarly, we use log of real GDP at constant price as a proxy of income variable (y_t) and one year fixed deposit rate (r_t) as proxy of interest rate or opportunity cost of holding money. All data are obtained from the Economic Survey (2000 and 2010) and Quarterly Economic Bulletine (NRB, 2010). Figure 1 plots the variables (m_1, m_2, y_t and r_t) that have been used in the model. As per the expectation, we observe that money supply and real income are upward trended and keeps strong relationship between money and price and income and price while r_t seems to be neither time trended nor stationary.

As the focus of this paper is to examine the non-spurious (Granger and Newbold, 1974) long-run cointegrating relationship, it is inevitable to test the time series properties of data more specifically. We use augmented Dickey- Fuller (ADF) and alternatively Phillips-Perron (1988) tests to carry out unit root process of time series variables. Table 1 reports the unit root tests of each variable.

Table 1: ADF and PP Tests

Variables	Augmented Dickey-Fuller (ADF) Test ($p=1$)				Phillips-Perron (PP) Test ($p=1$)			
	Level		First Difference		Level		First Difference	
	Constant	Constant and Trend	Constant	Constant and Trend	Constant	Constant and Trend	Constant	Constant and Trend
m_1	-.475	-3.747	-5.951**	-5.845**	-.503	-3.540	-6.822**	-6.602**
m_2	-1.404	-5.309	-5.517**	-5.375**	-1.380	-6.228	-7.072**	-6.658**
y_t	-.748	-1.310	-6.395**	-6.423**	-0.728	-1.277	-6.467**	-6.423**
r_t	-1.128	-1.766	-4.550**	-4.478*	-1.160	-1.929	-4.422*	-4.403*

*** and * denote rejection of null hypothesis at 1% and 5% respectively.*

Under both testing procedures, we overwhelmingly reject the null hypothesis that all three variables $[m_{ti}, y_t, r_t]$ are level stationary [i.e. I(0)] but do not reject the null hypothesis that they are difference stationary, i.e I(1). The time series properties of data, therefore, justify our motive of employing Johansen's cointegrating method, which requires I(1) variables to be used in the system.

5. Empirical Result

5.1 Cointegration Analysis

After confirming stationary process of the variables, we then proceed to test the number of long-run equilibria among the three variables in Eq. (4). In order to do so, we carry out $\lambda_{trace}(r/p)$ and $\lambda_{max}(r/r+1)$ tests as discussed in Eq(5) and Eq(6) based on a system based cointegration procedure (Johansen, 1992). Choosing lag order (p) of variables $[m_{ti}, y_t, r_t]$ in the vector autoregressive model is crucial at this stage. After observing Sims' Likelihood (LR) test, the Akaike Information Criterion (AIC), and the Ljung–Box statistic for serial correlation, we confirm p=1. It is our best choice and consistent to Persaran and Persaran (1997) for annual data with small sample size.

Table 2 demonstrates the test result of number of cointegrating vectors in each money demand functions. The estimated $\lambda_{max}(r/r+1)$ and $\lambda_{trace}(r/p)$ are reported in column 4 and 8 respectively while the critical values of $\lambda_{max}(r/r+1)$ and $\lambda_{trace}(r/p)$ to test for the presence or absence of long-run equilibria for the system $[m_{ti}, y_t, r_t]$ are reported in column 5 and 9 respectively. The motivation of selecting variables in this particular order corresponds to the standard theory of demand for money.

Table 2: Johansen Maximum Likelihood Procedure (p=1)

Set of Variables	Null Hypothesis	Maximal Eigen Value			Eigen-values	Trace		
		Alternative Hypothesis	Max. Eigen Statistics (λ_{max})	5% Critical Value		Alternative Hypothesis	Trace Statistics (λ_{trace})	5% Critical Value
m_1, y_t, r_t	$r = 0$	$r = 1^*$	22.092	20.97	0.488	$r \geq 1^*$	32.737	29.68
	$r \leq 1$	$r = 2$	10.411	14.07	0.270	$r \geq 2$	10.645	15.41
	$r \leq 2$	$r = 3$	0.2340	3.76	0.007	$r \geq 3$	0.234	3.76
m_2, y_t, r_t	$r = 0$	$r = 1^*$	23.865	20.97	0.514	$r \geq 1^*$	35.209	29.68
	$r \leq 1$	$r = 2$	10.710	14.07	0.277	$r \geq 2$	11.344	15.41
	$r \leq 2$	$r = 3$	0.634	3.76	0.019	$r \geq 3$	0.634	3.76

*Note: r denotes the number of cointegrating vectors. The critical values are from Osterwald-Lenum (1992). *denotes rejection of the hypothesis at 5% significant level.*

Starting with the null hypothesis of no cointegration $(r = 0)$ for narrowly defined money demand function $[m_1, y_t, r_t]$, we reject the null hypothesis of r=0 at 5% level in favour of at least one cointegrating relationship (r=1) using both $\lambda_{max}(r/r+1)$ and $\lambda_{trace}(r/p)$ statistic. Both tests, however, accept the null hypothesis that $r \leq 1$. The same feature repeats while testing the number of cointegrating relationship for broadly defined money demand function $[m_2, y_t, r_t]$. We conclude that there exits an unique (r=1) cointegrating relationship in both money demand functions.

The cointegrating test allows us to normalize real money balance (m_i, for i=1 and 2) in each equation. Table 3 reports the cointegrating vectors. We find that β_{1i} (for i=1 to 2),

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the coefficients of real income and interest rate, are significant at 5% level with positive sign for income elasticity of money and negative sign for interest rate elasticity for both m_1 and m_2 model. In line with the previous literature, y_t and r_t elasticities of m_2 seem to be more responsive than m_1 (see Khatiwada, 1997 for example). The income elasticity of money exceeding one may imply that the income variable is capturing an unexplained trend effect of a high correlation between changes in income and the process of financial innovation (Ebrill, 1989).

Monetary theory, however, does not clearly indicate about the size of β_{12} and their possible implications. The quantity theory of money (Friedman, 1956) predicts β_{12} to be unity while it is considered to be $1/2$ in the transaction model of Baumol (1952) and Tobin (1956). Miller and Orr (1966) consider β_{12} to be $1/3$ in the precautionary money demand model.

Table 3: Cointegrating Vectors Normalized on m_1 and m_2

Equation	m_1	m_2	β_{12} (Coefficient of y_t)	β_{13} (Coefficient of r_t)
1.	1.000	-	-1.265 [0.048]*	0.023 [0.006]*
2.	-	1.000	-1.653 [0.049]*	0.033 [0.006]*

Note: Standard errors in []. The asterisks (*) indicates that the coefficient is significant at 5 percent level.

In order to address this issue we impose a restrictions whether β_{12}=1 in both money demand models. As shown in the last column of Table 4, we reject the null hypothesis that β_{12}=1 against an alternative of $\beta_{12} \neq 1$ in both m_1 and m_2 models. We also attempt to test whether β_{12} does not carry any economic meaning, i.e. β_{12}=0 but we reject the null hypothesis against nonzero (Column 3, Table 4). We conclude that money demand in both m_1 and m_2 cointegrating relationships seem to be a rising function of real income (β_{12}>0). Further, income elasticites exceeding one may imply that money is a luxury good (Poudyal, 1987) and velocity is declining in the long run.

In our model, the error correction coefficient (α_{i1}) is negative and significant at 1% level for both m_1 and m_2, implies that the dynamic stability condition satisfies in both models. The constant term is significant but some of the Γ_1's are insignificant (Table 5).

Table 4: Restriction on β_{12}

Equation	Model	$\chi^2(1)$ with zero restriction	$\chi^2(1)$ with unity restriction
1.	m_1, y_t, r_t	11.03[0.00]*	10.71 [0.00]*
2.	m_2, y_t, r_t	13.13[0.00]*	12.94 [0.00]*

*Note: Standard errors in []. The asterisks * indicates that the coefficient is significant at 1 percent level.*

The estimated loading factor for m_1 model, which is -0.46, implies that about 46% of total disequilibrium corrects next period. Hence it takes about two years to return to a long-run equilibrium once any shock is created in the system. However, we find relatively a small adjustment coefficient (-0.40) for m_2 model which indicates that money demand adjusts slowly when shocks arise.

Literature explores several reasons for attaining a slow speed of adjustment in the money demand function. The speed at which portfolio adjustment takes place depends on two types of costs - cost of moving to the new equilibrium and the cost of being out of equilibrium. The adjustment takes slowly if the cost of being out of equilibrium is lower or adjustment cost is higher (Thornton, 1983). In addition, the reason of low speed of adjustment may be the saving behaviour of the household sector. If precautionary savings depends on the long run consideration of future income and interest rates then we expect a slow adjustment in money demand (Cuthbertson and Taylor, 1990).

Table 5: Short Run Dynamics

Independent Variables	m_1 model	m_2 model
Loading factor (α)	**-0.464 [0.193]***	**-0.396 [0.160]***
$\Delta m_{1,t-1}$	0.185 [0.223]	-
$\Delta m_{2,t-1}$	-	0.232[0.168]***
Δy_{t-1}	-0.474 [0.384]	-0.268 [0.321]
Δr_{t-1}	0.014 [0.013]	0.017 [0.010] ***
c	0.079 [0.019]*	0.081 [0.020]*

*Note: Standard errors in []. The asterisks *,** and *** indicate that the coefficient is significant at 1 percent, 5 percent and 10 percent level, respectively.*

5.2   Weak Exogeneity Tests

The weak exogenous character of parameters of the conditioned model may be tested within the system. As we discussed earlier, the variable is said to be weakly exogenous if a corresponding parameter of the loading vector α_{i1} is not significantly different than zero. Weakly exogeneity is considered to be a necessary condition for an appropriate conditional single equation framework (Hendry and Ericsson, 1991).

Table 6 presents the weak exogeneity test. In both m_1 and m_2 models, we firmly reject the null hypothesis that each of $\alpha_{i1} = 0$ (for i=1 to 3) against the alternative hypothesis of $\alpha_{i1} \neq 0$ at 5% significant level. Therefore, the estimates of m_1 and m_2 models can not be proceeded efficiently by conditioning only on income and interest rate variables.

Table 6: Restriction on loading vector

Model	$\chi^2(1)$ with zero restriction		
m_1, y_t, r_t	6.103 [0.013] *	1.881 [0.017]*	8.990 [0.000] *
m_2, y_t, r_t	6.193 [0.020] *	5.415 [0.019]*	5.563 [0.018]*

*Note: p value in []. * implies significant at 5% level.*

5.3 Stability Tests

Monetary policy framework under monetary targeting assumes that money demand function is stable. As discussed, monetary policy using unstable money demand function cannot stabilize the goal variables such as inflation and income effectively (Ericsson, 1998). One of the reasons for adopting inflation targeting by a large number of central banks around the globe since early 1990s was due mainly to failure of monetary targeting as a result of unstable money demand function attributable to financial innovations (Subramanian, 1999 and Taylor 1987).

We carefully investigate whether money demand functions are stable in Nepal. Some of the investigations on exogeneity test, loading factors and cointegrating relationship in the previous section suggest that both the models are stable. We further systematically investigate model stability employing CUSUM (cumulative sum of recursive residuals) tests and parameter stability by the recursive estimatations of the same models; and plot them to see whether recursive parameters remain within the targeted bands (Enders, 2004).

Figure 2 plots result from CUSUM test, which suggests that parameter constancy are not rejected at 5% confidence bounds using recursive residuals. Similarly, figure 3 shows the fact that coefficients are stable along with their respective long run elasticities when estimated recursively, which all implies that both models are stable.

5.4 Alternative Specifications

A number of alternative specifications and variables have been tested in order to verify the robustness of the estimated models in the previous sections. We first test the homogeneity postulates of estimated models as theory suggests that the price elasticity of nominal money demand should not be significantly different than one in order to validate the estimated coefficients of corresponding real money demand function (see also Khatiwada, 1997). For this reason, we run Eq(4) using nominal variables with price as additional variable in the system, i.e., $[M_1, Y_t, r_t, P_t]$ and $[M_2, Y_t, r_t, P_t]$. The empirical result shows that there is only one cointegrating vector (r=1) in each money demand functions. The normalized vectors of both estimates are presented in Table 7. In both models, we do not reject the null hypothesis that the long run coefficient of $\log(CPI)_t$ is significantly different from 1. These estimates, therefore, suggest that the homogeneous postulate satisfies in both models.

Table 7: Nominal cointegrating vectors

Model	$\log(M1)_t$	$\log(NGDP)_t$	$\log(CPI)_t$	r_t
$[M_1, Y_t, r_t, P_t]$	1.000	-0.26 [0.21]	-1.22 [0.30]	0.07 [0.01]
$[M_2, Y_t, r_t, P_t]$	1.000	-0.46 [0.19]	-1.39 [0.43]	0.09 [0.03]

Note: Standard Error in []

Similarly, we use saving deposit rates and two years fixed deposit rate as an alternative to one year fixed deposit rate (r_t) used in the model. While saving rates is found to be significant but do not improve the overall performance of both models. We also estimate the same model using real GDP per capita instead of Real GDP but do not get the better result. Including real exchange rate could be the better proxy explaining open economy effect but this variable also appeared to be insignificant. Estimates from all alternative specifications are not presented in this paper to save the space but available on request from the authors.

6. Summary and Conclusion

This paper estimates the money demand function in Nepal using Johansen's cointegrating approach for the period of 1975-2010. We estimate narrowly defined and broadly defined real money balances and found them a stable and predictable function of real income and interest rate. Further, we find that disequilibrium corrects more rapidly in m_1 model compared to m_2. However, we reject the null hypothesis that money demand is weakly exogeneous but accept the homogeneous postulates of proportional relationship between money and price. A possible policy implication of our finding is that Nepal Rastra Bank can continue monetary targeting in the conduct of monetary policy for stabilizing income and price in Nepal.

Of course, we do not reject possibilities of improving our estimates. Estimating money demand function using quarterly or monthly time series data may generate different results. Further, it will be interesting to estimate money demand function including asset price movement or open economic effect. Similarly, it will be interesting to test whether money demand function is nonlinear and whether the size of disequilibrium matters in the adjustment process (Chen and Wu, 2005).

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Figure 1: Plot of time series variables (1975 to 2010)
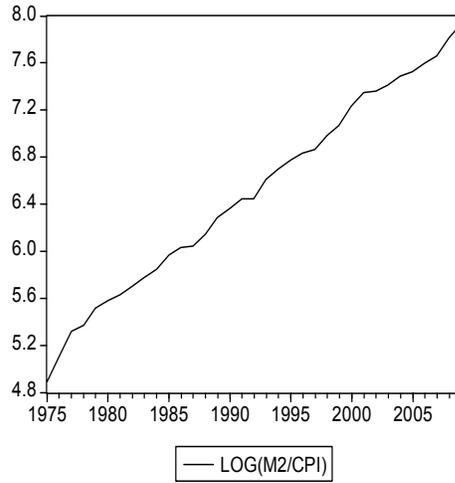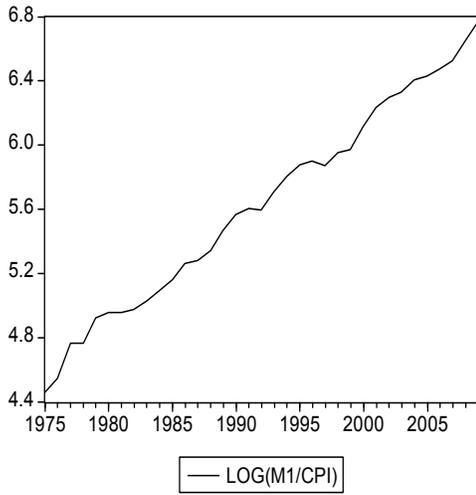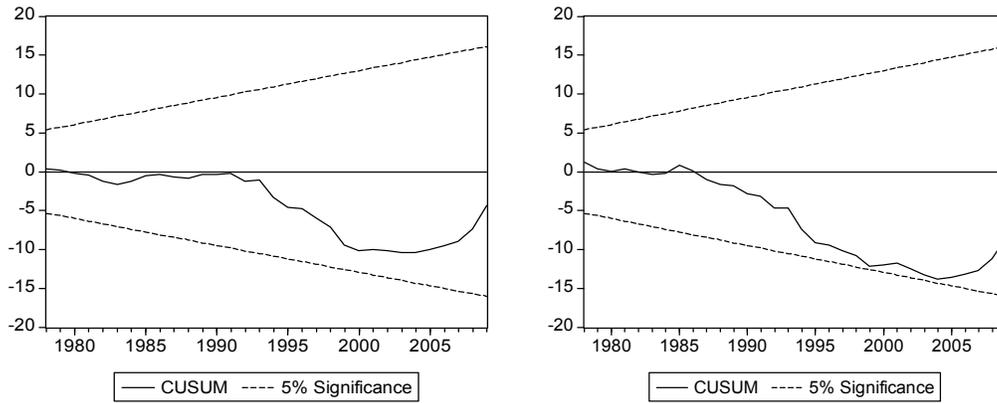

Panel A: Real money supply (M1)

Panel B: Real money supply (M2)
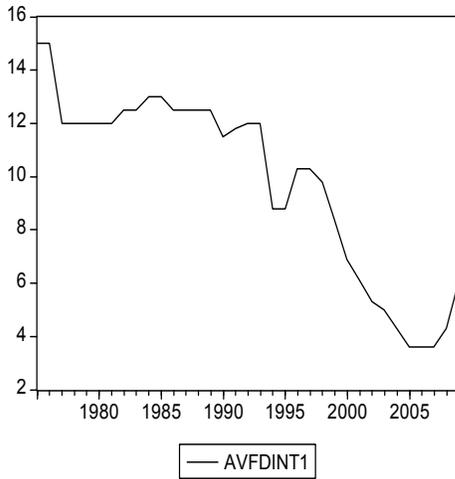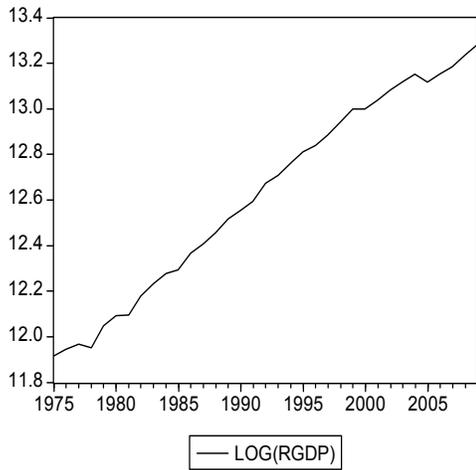
Panel C: Real income

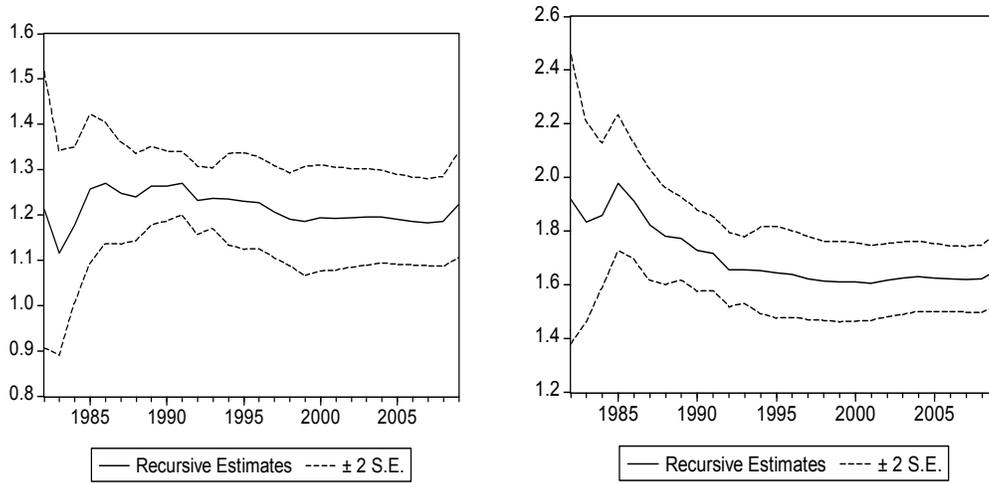Panel D: Interest rate (one year fixed
deposit rate)

Figure 2: CUSUM (cumulative sum of residuals) of the model

Panel A: CUSUM of M1 Money Demand Function

Panel B: CUSUM of M2 Money Demand Function

Figure 3: Plots of recursive estimate of income elasticity of money demand

Panel A: Recursive Estimates Income Elasticity of M1 Money Demand

Panel B: Recursive Estimates of Income Elasticity of M2 Money Demand