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A MONETARY MODEL OF EXCHANGE MARKET PRESSURE FOR NEPAL

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INTRODUCTION

The monetary approach to Balance of Payments (MABOP) was introduced by Harry G. Johnson. The central preposition of this approach is that the Balance of Payment (BOP) is a monetary phenomena, money is a stock and money stock can be changed either through domestic credit creation/destruction or through international reserve flows.

According to MABOP and exchange rate determination, BOP and exchange rate act as the adjustment mechanism for maintaining equilibrium in the monetary sector, that is, the money in existence equal to the quantity demanded in an open economy.

On the basis of MABOP and exchange rate determination, the monetary model of Exchange Market Pressure (EMP) was developed. EMP is defined as the rate of change in international reserves plus the rate of appreciation of exchange rate. The basic preposition of the model is that any disequilibrium in monetary sector put pressure on the exchange rate which can be dissipated through adjustment in both BOP and exchange rates, that is, the central bank can respond to this pressure (i) by holding the exchange rate fixed (fixed exchange rate system) and changing the international reserves accordingly or (ii) by letting the exchange rate to float (flexible exchange rate system) or (iii) the combination of both (managed float).

The objective of this study is to estimate the monetary model of Exchange Market Pressure for Nepal. Nepal is a small developing country with an open economy, and a fixed exchange rate system. It is surrounded by India on its Eastern, Western and Southern borders. Thus, Nepal fits the specifications of the model of Exchange Market Pressure.

There is a school of thought which proposes that a small open economy with a fixed exchange rate system has no control over its monetary policies. Such a country has the option to either fix the value or the quantity of its money. However, it cannot do both.

The Exchange Market Pressure has to be offset either by changes in official reserves, or by changes in exchange rate, or both. So, for a

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country pursuing a fixed exchange rate system, like Nepal, the Exchange Market Pressure measures the volume of intervention needed or the required changes in the official reserves necessary to maintain the exchange rate at the desired level.

Uddin (1985) looks at the evidences from different Less Developed Countries (LDCs) and concludes that the model based on the monetary approach to BOP cannot explain the reserve movements of India whereas the same approach is useful in analysing the movements of international reserves in the case of Thailand. He thus concludes that whether the monetary approach to BOP is applicable to a particular country or not depends largely upon the economic characteristics of that particular country.

THEORETICAL FORMULATION

The monetary model of Exchange Market Pressure developed by Lance Girton and Don Roper (1977) can be expressed in terms of Nepal and India as:

$r_n + e_n = - d_n + h_i + \beta_n Y_n - \beta_i Y_i + \theta_n - \propto \delta_n$

Where n subscript indicates Nepal and i subscript indicates India.

$r_n = E_n R_n' / H_n$

$d_n = D_n' / H_n$

$h_i = H_i' / H_i$

$Y_j = Y_j' / Y_j$ where j = n, i

$\theta_n = \theta_n = \pi_n - \pi_m + e_{ni} = \pi_n - \pi_i + e_n$

$\pi_n = P_n' / P_n$

$\delta_n = \delta_{ni} = \rho_n' / \rho_i$

where, indicates the time derivative.

- H_j - supply of base money issued by the central bank of country J. where j = n (Nepal), i (India)
- R_n - stock of international reserves held by the authorities in Nepal.
- D_n - base money created by dometic credit expansion in Nepal.
- E_n - parity or Nepalese currency value of primary reserve assets.
- Y_j - real income of country j. where j = n, i
- P_j - price level of country j. where j = n, i
- ρ_j - index of interest rates of country j. where j = n, i
- r_n - real measure of balance of payment of Nepal.
- e_n - rate of appreciation of Nepalese currency in terms of Indian currency.
- d_n - rate of change in D_n with respect to H_n.
- h_j - growth rate of H_j.
- Y_j - growth rate of Y_j.

θ_n - differential inflation rate adjusted for foreign exchange rate changes.
π_n - inflation rate (growth rate of P_n, price level) of Nepal.
δ_n - change in the uncovered interest differential.
$(r_n + e_n)$ - exchange market pressure for Nepal.

India is considered the centre or key currency country. Because h_i is not influenced by the expression $(r_n + e_n)$. it can therefore, be used as an indenpendent variable. If the above equations were estimated, a minus one coefficient in front of d_n would be expected.

SPECIFICATION OF THE MODEL

The Girton-Roper (G-R) model as applied to Nepal and India, is :

$$r_n + e_n = - d_n + h_i + \beta_n Y_n - \beta_i Y_i + \theta_n - \propto \delta_n$$

where the n subscript indicates Nepal and the i subscript indicates India. Due to the geographical proximity and the relative size of the two countries, the Indian economy plays a dominant role in the Nepalese economy. Thus, India is treated as the center or key currency.

As h_i is not influenced by the expression $(r_n + e_n)$, it can be treated as an independent variable. Hence, the application of the model in the context of Nepal and India is not unjustified.

The change in the uncovered interest differential variable δ_n has been dropped from the model, as in Nepal , the interest rate is not determined by the market forces. The interest rate is fixed by the central bank of Nepal, because a monetary market has not yet been developed in the country.

Therefore, the model to be estimated is :

$$r_n + e_n = \beta_1 + \beta_2 d_n + \beta_3 h_i + \beta_4 Y_n + \beta_5 Y_i + \beta_6 \theta_n$$

In the estimation of this equation, the coefficients β_2 and β_3 are expected to be -1 and +1 respectively and the coefficients β_4, β_5, and β_6 are expected to have positive, negative and positive signs, respectively.

Modeste (1981) used the Connolly and Dantas-Da-Silveria version of the G-R model of EMP to explain the monetary experience of Argentina in the 1970s. He concludes that Argentina alleviated the imbalances in its external sector by combining changes in its reserves with changes in the exchange rate. He also concludes that the monetary model of EMP is superior to those models that emphasize changes only in foreign reserves or the exchange rate but do not include the behavior of monetary authorities as an explanatory variable.

Kim (1985) applied the G-R monetary model of EMP to Korea under

a managed floating exchange rate system for the period from March 1980 to July 1983 and came up with the strong evidence of a negative relationship between the rate of domestic credit creation and rate of change in EMP. The result also shows that the measure of EMP does not depend on its composition between foreign exchanges and foreign reserves. The Korean experience indicates that most EMP is absorbed by adjustment in foreign reserves.

SOURCE OF DATA

The main source of data used in the estimation of the model is the International Financial Statistics Yearbook 1991 (Refer to Appendix).

PRESENTATION OF RESULTS

The estimated equation is :

$$r_n + e_n = \underset{(0.05132)}{0.037942} - \underset{(0.12431)}{1.1051\, d_n} + \underset{(0.29398)}{1.2572\, h_i} - \underset{(0.58003)}{0.83363\, Y_n}$$

$$\underset{(0.51900)}{-0.63682\, Y_i} + \underset{(0.15344)}{0.81326\, \theta_n}$$

$$0.73931 \quad -8.8893 \quad 3.1990 \quad -1.4419 \quad -1.2270 \quad 5.3001$$

$R^2 = 0.871947$ DW = 2. 2262 F(5,22) = 29.9607

$X^2 = 10.832$ LM = 0.515

All the estimated coefficients except the one associated with Y_n have the expected sign and the coefficients for d_n, h_i, and θ_n are significant. However, the coefficients associated with y_n and y_i are not significant at 5 percent significance level. The unexpected sign for the estimated coefficient of y_n may be due to the inconsistency in the measurement of real income (Gross Domestic Product) in Nepal. The value of R^2 and F statistics suggest that the model is quite effective in explaining the variation in the dependent variable. Though, a high value of R^2, like 87 percent is not unusual in time series data, still, this value is quite good for a regression in changes.

The correlations between the explanatory variables are quite low the highest being 0.28190 for the correlation between the explanatory variables y_i and θ_n. There is no other sign of a high degree of multicollinearity between the explanatory variables. Hence, it can be concluded that there is no serious multicollinearity problem present in the model. The White test ($T.R^2 = x^2$) for homoscedasticity gives favorable result. The calculated Chi-square value (10.832) is less than the tabulated value (18.307), hence, do not reject null hypothesis H_0 : homoscedasticity or no heteroscedasticity at 5 percent significance level. Thus, it was

concluded that there is no serious problem of heteroscedasticity in the model.

The Durbin-Watson Statistic (2.2262) reported in the summary statistic falls in the inconclusive region so the Langrange Multiplier (LM) test for the absence of autocorrelation was performed. The calculated F statistic (0.515) *is less* than the tabulated value (4.35) hence, the null hypothesis H_0 : no autocorrelation was not rejected at 5 percent significance level. Therefore, it can be concluded that no serious autocorrelation is present in the model. The results of the tests of the various econometric problem mentioned above do not indicate the presence of any of such problems. Thus there is no need to take any corrective actions. The joint hypothesis test $H_0 : \beta_2 = -1, \beta_3 = 1$ (where β_2 and β_3 are the coefficients of the variables d_n and h_i respectively) against the two tail alternative was not rejected at 5 percent significance level as the calculated F statistic (0.045) is less than the tabulated value.

The presence of e_n on both the left hand side as a component of dependent variable and on the right hand side as a component of the variable θ_n may have introduced a simultaneity problem in the model. To circumvent this problem, another regression was run with the variable θ_n redefined as $(\pi_n - \pi_i)$, the differential inflation rate. The estimated equation then was:

$r_n + e_n =$	0.0065613	$-1.2235\, d_n$	$+ 1.4782\, h_i$	$-1.4179\, Y_n$
	(0.08030)	(0.19240)	(0.66471)	(0.88562)
	0.08171	-6.3589	2.2239	-1.6010
	-0.016141	$Y_i +$	$0.11503\, \theta_n$	
	(0.77041)	(0.47360)		
	-0.020952	0.24288		
$R^2 =$	0.709222	DW = 2.5297	F (5,22)	= 10.7318

There were no major changes in the estimated equation. All of the summary statistics except the coefficient on the variable q_n which was highly significant in the previous model is not significant in this model. The results of tests of econometric problems and of statistical hypotheses remain unchanged.

POLICY IMPLICATION AND CONCLUSION

An expansionary Monetary Policy of Nepal leading to an increase in domestic component of the monetary base will exert downward pressure on the dependent variable, Exchange Market Pressure. This will have to be offset either by depreciating the currency or by decreasing the international reserves by an equal amount. In order to maintain the Fixed Exchange Rate, the monetary authorities are left with only one option--

decrease in the international reserves, the international component of the monetary base. A decrease in international reserves will, in turn, lead to a decrease in the base money, and thus offset the increase in the base money caused by the increase in the domestic component of the base money resulting from the expansionary monetary policy of the Nepalese monetary authorities. Thus any change in domestic component of the monetary base is offset by an equal and opposite change in the international component of the monetary base.

Hence, the Nepalese monetary authority had three options. It can either fix the value of the Nepalese Rupees (maintain fixed exchange rate system) and lose control over the supply of Nepalese Rupees (ineffective monetary policy), or fix the quantity of money (effective monetary police) and let the exchange rate to fluctuate, or it can institute some combination of options one and two.

An increase in the base money of India causes an increase in the money supply of India, and lead to an equivalent increase in the international reserves of Nepal. This is due to the inflow of India Rupees which result in excess holdings of Indian Rupees which are being exchanged for Nepalese Rupees. This increase in the international reserves, the international component of the monetary base of Nepal, leads to the increase in the money supply in Nepal under the Fixed Exchange Rate System. If the demand for money is not also increased at the same time, then the increased money supply puts upward pressure on the price level of Nepal, thus creating inflationary pressure in Nepal. Again, to prevent this, the exchange rate must be allowed to change.

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Appendix

- H_n - Reserve Money (Millions of Nepalese Rupees) (14)
- R_n - Foreign Assets (Milions of Nepalese Rupees) (11)
- D_n - (Reserve Money (H_n) - Foreign Assets (R_n)) ((14) - (11))
- E_n - Par or Central Rate/Market Rate (Nepalese Rupees per US Dollar) (de)
- Y_n - Gross Domestic Production 1985 Prices (Millions of Nepalese Rupees) (99b.p)
- P_n - GDP Deflator (1985=100) (Millions of Nepalese Rupees) (99bip)
- H_I - Reserve Money (Billions of Indian Rupees)
- E_I - Par or Central Rate/Market Rate (Indian Rupees per US Dollar)
- Y_I - Gross Domestic Production 1985 Prices (Billions of Indian Rupees)
- P_I - GDP Deflator (1985=100) (Billions of Indian Rupees)