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A Test of the Monetary Approach to the Balance of Payments for Nepal, 1958–1978

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1. INTRODUCTION

Empirical studies of the balance of payments of developing economics are plagued at the outset by insufficient or unreliable data. Traditional approaches to the study of the balance of payments, such as the elasticities and absorption approaches, require accurate data on imports and exports, prices of imports and exports, measures of returns on investments, and/or some national income measure. An approach which has circumvented these data requirements and met with considerable success in explaining movements in the balance of payments of developing economies is the monetary approach to the balance of payments.[1] This approach should not be viewed as contradictory to the elasticities and absorption approaches, but rather as an alternative method of summarizing the same determinants of balance of payments phenomena suggested by the other frameworks.

The monetary approach views the balance of payments as a monetary phenomenon. Disequilibria in the balance of payments are merely the reflection of inequalities between money supply and money demand. The basis of this view and its implications are spelled out in the

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1. Useful introductory surveys of the monetary approach are found in Jacob A Frenkel and Harry J. Johnson, eds., The Monetary Approach to the Balance of Payments. Toronto, Canada: University of Toronto Press (1976). Some of the pioneering studies using the monetary approach are collected in The Monetary Approach to the Balance of Payments, International Monetary Fund, Washington, D.C.: IMF (1977).

ollowing section of this paper. Section 3 presents the formal model used to test the monetary pproach and Section 4 defines the relevant variables empirically. The results of the estimation ased on Nepalese data and tests of the monetary hypothesis are given in Section 5. Section 6 oncludes with some policy implications.

2. THE MONETARY APPROACH TO THE BALANCE OF PAYMENTS

As the name indicates the monetary approach to the balance of payments emphasizes the view that international payments are a monetary phenomenon. Deficits and surpluses in balance of the payments are merely a reflection of disequilibria between money supply and money demand. An excess supply of money shows up as a flow of money abroad or a balance of payments deficit. Conversely, excess money demand causes a flow of funds into the country or a balance-of payments surplus. With balance of payments dificits and surpluses so determined, any macroeconomic event causing money market disequilibrium will likewise affect the balance of payments. Furthermore, balance of payments disequilibria will be eliminated with the termination of the condition of excess money demand or supply.

To understand the reasoning behind the monetary approach, one must recognize its most important divergences with conventional, closed-economy monetarist thinking. The conventional monetarist position views the monetary base and hence the money supply as subject to the control of the central bank and exogenous with respect to other macroeconomy phenomena. The demand for money reacts passively to changes in the exogenously determined money supply, and thus through changes in its arguments (income, interest) affects the level of economic activity. Global monetarism,[2] on the other hand considers the monetary base and money supply to be endogenously determined by the demand for money. The demand for money, determined by (permanent) money income and velocity, brings forth a matching supply of money through the balance of payments. An excess demand for money, for example, is met by a flow of funds from abroad, through the monetary system, increasing the monetary base and the money supply. An excess supply of money is relieved by a flow of funds abroad (a balance of payments deficit) and a consequent shrinking of base money and the money supply.

The mechanism by which such effects are transmitted are particularly obvious and direct in small,open economies with undeveloped financial markets. In open economies the supply

2. This is the term coined by Whitman in her survey of the monetary epproach. See Marina V. N. Whitman, "Global Monetarism and the Monetary Approach to the Balance of Payments," Brookings Papers on Economic Activity, 1975, no. 3, 491—555.

of money is influenced by the accumulation or disaccumulation of foreign assets, with sterilization of these effects severely constrained by restricted financial markets.[3] The monetary authorities are unable to determine the supply of money and are limited to the exercise of control over domestic credit alone. With such effects particularly dominant in small, open economies, it is not surprising that the monetary approach appears to fit the economies at less developed countries more closely than those of developed countries.[4]

A previous study of sources of monetary change in Nepal showed balance of payments phenomena to be dominant in the determination of money supply and monetary base changes during fixed exchange rate periods.[5] With very limited use of traditional policy tools for sterilization of balance of payments surpluses or deficits, changes in central bank holdings of foreign assets have accounted for 63 percent of the variation in changes in the monetary base.[6] Since changes in foreign assets are tied directly to balance of payments disequilibria, the connection between balance of payments deficits and surpluses and the monetary base is clearly strong. Changes in foreign assets are large relative to other assets of the central bank, and the potential for sterilizing open market operations is severely limited by the sparseness of the securities market in Nepal. To view the monetary base and hence the money supply as endogenously determined by balance of payments phenomena should therefore be obvious to those familiar with the financial institutions of Nepal.

The balance sheet of the consolidated monetary system[7] distinguishes between foreign and domestic components of the money supply. The fundamental identity of the consolidated monetary sector is:

1. net foreign assets
2. net claims on government and government enterprises

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3. Manvel Guitian, "Credit Versus Money as an Instrument of Control," IMF Staff Papers, 20 (November, 1973).
4. J. Marcus Fleming and Laratte Boissonneault, "Money Supply and Imports," in IMF, The Monetary Approach, 133—146.
5. Robert F. McNown, "International Constraints on Macroeconomic—Policies in Nepal: 1957—1978, The Economic Journal of Nepal, vol. 3, no. 1 (January—March 1980) 37—48.
6. Ibid, p 43.
7. See for example Table 1, "Monetary Survey" in Quarterly Economic Bulletins of the Nepal Rastra Bank, any issue.

3. claims on private sector

+

5. time deposits

4. money supply (M1)

+

6. capital and other items

Corresponding to the narrow definition of the money supply (M1) **net domestic credit** is defined as items 2 plus 3 minus items 5 and 6. If one prefers the broader definition of money (M1 plus time deposits) the corresponding definition of net domestic credit is items 2 plus 3 minus 6. In either case the money supply (M) is simply the sum of net foreign assets (F) and net domestic credit (D):

$$M = F + D$$

With this background on the sources of money supply changes, the transmission mechanism of the monetary approach can be summarized.[8] Beginning from a position of (steady state) equilibrium in money markets and the balance of payments, consider an increase in the (rate of growth of) net domestic credit. Individuals and firms will find themselves to be holding cash balances in excess of their desired holdings. Assuming a generalized portfolio of substitutable assets, including financial as well as non-financial assets, individuals will readjust the composition of their wealth holdings by purchasing financial securities (savings deposits, bonds, equities) and real goods (property, consumer durables, investment goods, etc). Some fraction of this increased spending of goods and sucurities will be directed towards foreign goods and investments, causing an immediate deficit in the balance of payments. In addition, the increased spending on domestic goods raises real income and prices with consequent further deterioration in the balance of payments. Increases in real income cause imports to rise via some mechanism analagous to the Keynesian marginal propensity to import; price level increases reduce the competitive position of domestically produced goods, thus lowering exports and increasing imports. Finally, to the extent that the surplus cash holdings are directed towards domestic securities purchases, the yield on such investments will decline leading to a further flow of investment funds abroad.[9]

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8. Much of this discussion parallels Rudolf B. Rhomberg, "Money, Income and the Foreign Balance," IMF, The Monetary Approach, 166—167.

9. The adjustment mechanism is simplified for countries with primitive financial markets or controls on capital flows. In such cases the full burden of adjustment can fall on the redirection of spending on real goods towards foreign goods.

The balance of payments deficit thus generated carries with it the seed for its correction. The deficit reduces the foreign asset component of the money supply, so that, assuming no further increase in (the rate of growth in) domestic credit, the quantity of money will decline to restore monetary equilibrium. With its reduction will come a decline in net imports and capital outflows in a process which is the reverse of the mechanism just described. As monetary equilibrium is restored, wealth holders are satisfied to hold the existing stock of money, and the balance of payments is also restored to equilibrium.

This view has a number of interesting implications for the sources of balance of payments disequilibria and their elimination. First of all it follows from previous discussion that any change which alters monetary equilibrium also affects the balance of payments. For example any change affecting the arguments of the money demand function (income, interst, price levels) will also have a balance of payments effects. Paradoxically (from the Keynesian point of view) increase in income or prices and reductions in interest rates all lead to an excess demand for money and a consequent balance of payments **surplus**.On the supply side changes in net domestic credit not accompanied by equal changes in money demand will cause a corresponding balance of payments disequilibrium. However, whether initiated by changes on the demand or supply side, any such disequilibrium is necessarily temporary and self-correcting, unless the return to equilibrium is frustrated by policies tending to maintain monetary disequilibrium. An excess supply of money, for example, leads to a balance of payment deficit and consequent reduction in net foreign assets. This in ture means a reduction of money supply according to identity (1), unless the reduction in F is offset (sterilized) by increases in domestic credit. The balance of payments deficit can only persist if the decline in net foreign assets is counter balanced by continued increases in net domestic credit.

The analysis of monetary and balance of payments changes under flexible exchange rates or under discretionary adjustments in pegged exchange rates requires one further departure fr m conventional monetarist views. The monetary approach to the balance of payments (at least in its purest form) takes the domestic price level to be determined world price levels and the exchange rate. Again the argument may be more clear for a small, open economy such as Nepal's. Price changes in the rest of the world (particularly in India in Nepal's situation) become transmitted directly to the domestic economy. Such price effects have been demonstrated empirically by Pant, who finds a low (.12) but statistically significant elasticity of the Nepalese Price level with respect to Indian prices.[10]

10 Hom M. Pant, "An Econometric Analysis of the General Level of Prices in Nepal, The Economic Journal of Nepal. Vol. 1, No. 4 (October—December, 1978), 68—89.

Under the extreme assumption of perfect openness, the domestic price level is fully determined by world prices as (2) $P = xP_f$

Where P is the domestic price level, P_f is the index of world prices and x is the exchange rate (in units of domestic currency per unit of foreign currency). As x is defined here an **increase** in x corresponds to a **depreciation** of this domestic currency. From equation (2) an increase in the domestic price level may occur as the result of (a) increased world prices or (b) depreciation of the domestic currency.

A change in the price level affects the balance of payments through the money demand function. If the demand for money depends upon income (y), the price level (P), and velocity (1/2), as in the quantity equation.

(3) $L = k P y,$

Then a change in P leads to a proportionate change in money demand. The resulting excess supply or demand of money has balance of payments effects identical to those described previously. For example, a devaluation, from equation (2), leads to an equal percentage increase in the price level and, by (3), a proportionate increase in money demand. The resulting excess demand for money causes funds to be drawn from abroad and generates a balance of payments surplus. According to the monetary approach, therefore, a devaluation unambiguously improves the balance of payments. This surplus persists until the resulting increase in foreign assets and the supply of money restores money market equilibrium. A devaluation can fail to improve the balance of payments only if it is accompained by an increase in domestic credit sufficient to meet the additional demand for money which stems from the devaluation.

A modification of the extrems openness assumption (2) changes the magnitude but not the direction of these effects. If we boldly darw a distinction between traded and non-traded goods, the domestic price level becomes a weighted average of traded and non-traded goods prices,[11]

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11. The distinction here is not between goods which actually cross international borders (imports and exports) and those which are produced and consumed domestically, but rather between goods which are potentially tradable or reasonable substitutes for imports and exports and those which are not potentially tradable. The distinction necessarily becomes fuzzy, as, for example, when changing relative prices transform a purely domestic industry into one which sells internationally.

$$P = W_N \cdot P_N + W_T \cdot P_T$$

Where P_N and P_T are the prices of non-traded and traded goods respectively and W_N and W_T are the relative fractions of non-traded and traded goods in gross domestic expenditures (GDE). According to this distinction only the prices of traded goods are determined in world markets

$$P_T = x. P_f$$

So the equation for the price level becomes

$$(2) \quad P = W_N \cdot P_N + W_T \cdot x. P_f$$

A devaluation (increase in x) still increases the domestic price level, with consequent effects on money demand and the balance of payments, but by a less than proportionate amount.

3. A FORMAL MODEL

The theory sketched above may be cast into a form suitable for estimation and testing.[12] Equations (1), (2') (or (2)) and (3) form the foundations of this model :

$$(1) \quad M = F + D$$

$$(2) \quad P = x. P_f$$

$$(3) \quad L = k P y$$

Add to these an equilibrium equation

$$(4) \quad M = L$$

to complete the model. The four equations may be consolidated to yield

$$F + D = M + L = k P y = k x P_f . y$$

or $$F + D = k x P_f . y.$$

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12. This derivation follows the presentation of Michael Connolly and Dean Taylor, "Testing the Monetary Approach to Devaluation in Developing Countries," Journal of Political Economy, 84 (August, 1976), 849—860.

Assuming k to be constant and evaluating the total differential,

$$dF + dD = k P_f y\, dx + kxy\, dP_f + kxP_f\, dy$$

shows the relation between the changes in all variables.

Divide both sides of this equation by $M = k \times P_f y$:

$$\frac{dF + dD}{M} = \frac{dx}{x} + \frac{d P_f}{P_f} + \frac{dy}{y}$$

So that the right hand side variables are all in percentage changes. Now assume that permanent income (y) and world prices (P_f) grow at a constant rate totalling 9:

$$\frac{d P_f}{P} + \frac{d y}{y} = 9.$$

Then the model becomes

$$\frac{dF}{M} = \frac{dx}{x} + 9 - \frac{d D}{M}.$$

Finally recognizing the change in net foreign assets (dF) is identically equal to the surplus (if positive) or deficit (if negative) on the balance of payments, represnted by B, we have a model of the balance of payments as determined by exchange rate changes and domestic credit creation:

$$(5)\quad \frac{B}{M} = 9 + \frac{dx}{x} - \frac{dD}{M}.$$

The same derivation using (2') in place of (2) yields

$$(5')\quad \frac{B}{M} = 9' + \frac{dx}{x} - \frac{dD}{M}$$

Where

$$9' = \frac{dy}{y} + \frac{dP_f}{P_f}$$

and

$$\beta = \frac{W_T P_T}{W_N P_N + W_T P_T};$$

that is, β is the fraction of nominal GDE which is accounted for by the value of traded goods. The coefficient on $\frac{dD}{M}$ remains equal to minus one.

A test of the monetary approach is immediately suggested by equations (5) and (5'). For both versions a regression of the variable β/M on percentage changes in the exchange rate ($\frac{dx}{x}$) and the ratio of changes in net domestic credit to the money supply ($\frac{dD}{M}$) should yield a coefficient of minus one on the latter variable ($\frac{dD}{M}$). This same regression should show a coefficient on $\frac{dx}{x}$ equal to plus one under the perfect openness variation, or equal to some positive fraction under the less extreme version. This positive fraction is equal to share of GDE accounted for by traded goods, a value which is generally unmeasurable. However, we may have some idea of a reasonable range of values for this fraction. Furthermore the definition of 9', the intercept, offers an additional check on the coefficient of $\frac{dx}{x}$, which must greatly exceed the intercept although the latter is also a fractional value.

To summarize, the testable implications of the monetary approach to the balance of payments based on the equation

$$(6) \qquad \frac{B}{M} = \alpha + \beta \frac{dx}{x} + \gamma \frac{dD}{M}$$

are

Perfect Openness Version:

$\gamma = -1$

$\beta = 1$

$\alpha =$ a small positive fraction equal to the rate of growth in permanent income plus the growth rate of world prices.

Partially Open Economy Version:

$\gamma = -1$

$0 < \alpha < \beta < 1$

β = The share of GDE accounted for by traded goods

$\prec$ = a small positive fraction which is less than the sum of permanent income and world price growth rates. These statements will be formalized as hypothesis tests in Section 5.

4. VARIABLE DEFINITIONS AND DATA SOURCES

The test of the monetary approach to the balance of payments for Nepal is based on the estimation of equation (6). Both M1 and M2 versions are estimated, with corresponding definitions of domestic credit. The dominance of India in Nepal's foreign trade permits the use of exclusively Indian variables in the definitions of rest-of-world variables.

For the purpose of estimation the following variable definitions are employed:

x = Nepalese rupee-Indian rupee excange rate (Nepalese rupee per Indian rupee), average of rates over each year;

F = net foreign assets of the monetary sector, end of year

B = dF = year to year changes in net foreign assets

M = (a) Currency plus demand deposits (M1), end of year.

(b) M1 plus time deposits (M2), end of year.

D = (a) Domestic credit net of time deposits, other liabilities and capital of monetary sector.

(b) Domestic credit net of capital and other liabilities.

$\frac{dD}{M}$ = year to year changes in net domestic credit divided by the corresponding definition of M for the end of the previous year

$\frac{B}{M}$ = B as defined above divided by the appropriate definition of M for the end of the previous year.

From the basic identity of the monetary system

$$M = F + D$$

The domestic credit variable can be most easily defined by substracting net foreign assets from the appropriate definition of M. All data for the estimation are taken from the International

Financial Statistics of the IMF. Estimates for both M1 and M2 equations are based on 21 annual observations from 1958 to 1978.

5. ESTIMATION AND RESULTS:

The ordinary least squares estimated of equation (6) based on both M1 and M2 definitions of the money supply are:

M1

$$\frac{B}{M} = \underset{(.0245)}{.1641} - \underset{(.2032)}{.8593}\,\frac{dD}{M} + \underset{(.3278)}{.3951}\,\frac{dx}{x} \qquad R^2 = .6563$$

M2

$$\frac{B}{M} = \underset{(.0206)}{.1807} - \underset{(.1714)}{.8652}\,\frac{dD}{M} + \underset{(.2413)}{.4596}\,\frac{dx}{x} \qquad R^2 = .7162$$

Numbers in parentheses are standard errors.

Both regressions are successful in terms of signs of the estimated parameters and overall explanatory power. The intercept and coefficient on the exchange rate are positive and the coefficient on the domestic credit variable is negative, as expected. Between 65 and 72 percent of the variation in the balance of payments – money supply ratio is explained by the regressions. In both regressions the coefficient on the domestic credit variable in within one standard error of minus one. The hypothesis that this coefficient equals minus one cannot be rejected at any reasonable significance lavel.

Other aspects of the estimates are not in overwhelming support of the monetary hypothesis, or at least with the strong, perfect openness, version. The coefficient on the exchange rate variable is not close to one. Even with the large standard error on this coefficient in the M1 regression, the hypothesis that the coefficient equals unity must be rejected at the. 05 significance level (one-tailed test). Furthermore, this coefficient fails the usual significance test (of a non-zero value) of any reasonable significance level.

The M2 regression is somewhat more promising in this regard. The coefficient on $\frac{dx}{x}$

s significantly different than zero of the 5 percent significance level (one-tailed test), but again it is clearly different than one. The perfectly open version of the monetary hypothesis would have to be rejected. The estimated coefficient on $\frac{dx}{x}$ suggests a 46% share of GDE attributable to tradable goods, which is not unreasonable. Given this the estimated intercept is apparently too high. With a $2\frac{1}{2}$ percent annual growth rate in GDP over the past 14 years and a world (Indian) inflation rate of 6.3 percent per annum, we would expect the intercept to equal approximately .054 (.025 + (.4596) (.063)).

An alternative interpretation of the intercept, 9', can reconcile these results. The simple money demand function upon which equatien (6) is based explains money demand solely in terms of income, the price level and (constant) velocity. Secular growth in the quantity of money demanded, represented by 9', is therefore the result of only income and (foreign) price increases. However, in an economy which is still in the early stages of financial developmenet, a major source of growth in money demand stems from the increase in the size of the monetized sector. Therefore, the secular growth rate in money demand, 9', should include this growth in the degree of monetization as well as income and price level growth rates. Conceivably this could bring the theoretical value for 9' close to the estimated values of .16 or .18 for the Ml and M2 equations respectively.

Of the testable implications of the monetary approach set out in Section 4, there is at least partial support for the most important hypothesis. For both regressions the coefficient on the domestic credit variable is not significantly different than minus one. The coefficient on the exchange rate variable is a positive fraction of reasonable magnitude and statistically significant in the M2 regression. The intercept of both equations is somewhat too large, but is still a small positive fraction. Since the money demand function on which the derivation of (5) was based is a particularly crude quantity theory equation, small departures from the anticipated values of the intercept term should not be surprising. On the contrary, it is remarkable how well the simple equation (6) can explain variations in the balance of payments-money supply ratio.

6. POLICY IMPLICATIONS AND CONCLUSIONS

The estimates of Section 5 are largely consistent with the views of the monetary approach to the balance of payments. Such statistical support carries several important implications for balance of payments and exchange rate policy.

First of all, the monetary approach emphasizes that the balance of payments is a monetary phenomenon. Microeconomic policies ostensibly designed to correct potential or real balance of Payments disequilibria are therefore either unnecessary or ineffective. Such policies include import quotas and tariffs, dual exchange regimes, and export promotion activities. According to the monelary approach, adjustments in the rate of expansion in domestic credit are always sufficient to correct any undesired disequilibrium in the balance of payments.

In addition any disequilibrium in the balance of payments is self correcting, as the implied increase or decrease in foreign assets restores monetary equilibrium. Microeconomic balance of payments policies will have definite effects on resource allocation and distribution, but only in so far as these policies affect the supply or demand for money can they have a lasting impact on the balance of payments.

Secondly, the results of Section 5 imply that a devaluation will temporarily correct a balance of Payments deficit, but only if it is not accompanied by an excessive expansion in domestic credit. A deficit which is brought on by excessive domestic credit expansion cannot be permanently cured by devaluation unless the credit expansion is brought under control. A one-time devaluation has only a one-time effect of the balance of payments by shifting the money demand function. This may be a reasonable policy if other political constraints rule out a severe reduction in domestic credit expansion. However to be successful the devaluation must be accompanied by some tempering of the growth in domestic credit.

Thirdly, in offering evidence which is contrary to the perfectly open economy version of the monetary hypothesis, the estimates of Section 5 indicate that fluctuating exchange rates have important but not proportional effects on the domestic price level. The coefficient on the exchange rate variable is an indirect estimate of the extent to which international price effects are passed on to the domestic price level. The coefficient in the M2 equation. for example, indicates that a 10% devaluation will raise the domestic price level by 4.6%. This is clearly important in any decision to revise exchange rates, and in consideration of a move towards floating exchange rates.

Finally the overriding implication of the monetary approach is that the only appropriate policy tool for dealing with balance of payments disequilibria is the control of the growth in net domestic credit. The estimates indicate that there is a one-for-one relation between net domestic credit increases and the loss of foreign assets. Not only is domestic credit control a means for correcting balance of payments deficits, it is the only tool with long term effects.

APPENDIX

List of Data Used in Regression Analysis

YEAR	B/M1	B/M2	dD/M1	dD/M2	dx/x
1958	.4088	.3578	−.2203	−.1892	0.555
1959	.2362	.2103	−.0888	−.0376	.0821
1960	.3328	.2899	.0361	.0818	.0500
1961	.2415	.2099	−.0143	.0129	.0159
1962	−.0121	−.0105	.0313	.0511	0
1963	.4173	.3566	−.1272	−.1001	0
1964	.3503	.3074	−.0622	−.0582	0
1965	.1994	.1804	.0718	.0748	0
1966	−.2538	−.2326	.3056	.2906	−.2514
1967	.2702	.2461	−.2200	−.1639	−.1057
1968	.3573	.3160	−.2370	−.1223	.2603
1969	.3931	.3261	−.1521	−.0416	0
1970	.0250	.0201	−.0794	−.0107	0
1971	.1463	.1099	−.0246	.0808	−.0001
1972	.1388	.0982	−.0657	.0684	−.0122
1973	.2673	.1740	.0280	.1124	.0195
1974	−.0915	−.0600	.2745	.2311	−.0411
1975	.0823	.0545	−.0485	.0645	.0167
1976	.3011	.1842	−.0744	.1051	.0580
1977	.1066	.0620	.0748	.1479	.0253
1978	−.0047	−.0027	.1432	.1994	.0310

The notation corresponds to that of equation (6). The empirical definitions of each variable are given in section 4.