

CURRENCY SUBSTITUTION AND THE DEMAND FOR MONEY
IN LESS DEVELOPED COUNTRIES: AN APPLICATION TO THE CARIBBEAN

1. Introduction

Interest in currency substitution revived among economists when industrial countries failed to attain the expected stability of money growth under the flexible exchange rate regime. Calvo and Rodriguez (1977), Brillembourg and Schadler (1979), Girton and Roper (1981), Bordo and Choudhri (1982), Batten and Hafer (1985), among others, were motivated to explore how switching between financial assets denominated in various currencies makes monetary policies interdependent. They discussed whether and under what conditions monetary policy becomes impotent, whether currency substitution has lasting effects on the relation between money, growth and inflation and whether the theoretical effects have proved significant.

The flight of capital from Latin American countries in particular has created a slightly different focus, on asymmetrical currency substitution, where there is no foreign demand for the home currency. Ortiz (1983), Ramirez-Rojas (1985) and Fasana-Filho (1986) investigated countries such as Argentina and Mexico where capital movements have assumed large and highly variable proportions. However, there are strong incentives for currency substitution in all the open economies of the Caribbean and Latin America. They all require a variety of essential imports for sustained growth and improved economic well-being.

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by

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Their trade relationships are heavily biased towards the US so that the terms of trade in US dollars is a crucial measure of their command over real goods and services. Assets denominated in US dollars therefore become the best hedge against threats of declining purchasing power. The incentive to hold US dollars is reinforced by the emergence of increasingly efficient mechanisms, formal and informal, legal and illegal, to make US dollars available throughout the Western Hemisphere.

This behaviour provides a strong case for including a motive to hold US dollars in all attempts to measure the demand for money in countries of Latin America and the Caribbean. Currency substitution can have a significant impact on the character of monetary and fiscal policy, on foreign reserve accumulation, exchange and interest rates, the country's debt servicing capacity and on investment in the economy.

This paper seeks to assess the statistical significance of currency substitution in two Caribbean economies - Barbados and Jamaica. A model of the demand for money and interest bearing deposits is presented in Section 2. The explanatory variables, which all feature in previous models of a symmetrical currency substitution, include income, local and foreign interest rates and domestic and foreign rates of inflation. Empirical results are presented in Section 3.

Model

The model depicts a hybrid of inventory asset theories of money encompassing the notion that economic agents allocate their wealth among a portfolio of assets but maintain an inventory of money to facilitate transactions and to avoid the costs of transfer between money and other assets. Two basic alternative specifications are proposed,

$$TSD = a_0 + a_1Y + a_2d_1 [r - p^e] + a_3 d_2 [r - (r_f + x^e)] \quad (1a)$$

$$TSD = b_0 + b_1Y + b_2p^e + b_3 [r - r_f] + b_4x^e \quad (1b)$$

where TSD is the nominal stock of time and savings deposits, y is real income, p^e is the expected price level, r is the domestic interest rate, r_f is a foreign interest rate and x^e is the expected exchange rate. D_1 and d_2 are dummies reflecting transactions costs. The differences between (1a) and (1b) are explained below.

Time and savings deposits are accumulated out of income in order to provide for contingencies, as a store of value, as a source of future income and to build up to the purchase price of some tangible assets. Our scale variable is the volume of transactions since we agree with Laidler (1977) that nominal income is inappropriate as an explanatory variable especially during periods of rapid inflation.

This relationship is affected by the opportunity cost of interest-bearing deposits. For wealth holders in the Caribbean there are two alternatives of comparable risk that may offer a competitive rate of return: durable consumer goods (especially real estate) and foreign financial assets. There are some corporate shares, government bonds, credit union shares and other instruments available, but they total less than five percent of estimated financial assets in all Caribbean countries where there is no compulsory financing of government. Including a wider menu of choices would complicate the tests which follow without adding much to the explanation.

The return on consumer durables is the appreciation in their value which inflation may bring. Holdings of interest bearing deposits, from a given income stream, will vary with the expected rate of inflation, compared with the interest rate on deposits. However, there are transactions costs in switching from financial to real assets - fees, service charges and taxes - as well as the loss of liquidity. These costs set a threshold for the differential between inflation and deposit interest rates. Below that threshold the advantage of switching from deposits to tangible assets or vice versa is not sufficiently great to compensate for the costs. Deposit holding depends on the variable $d_1[r - p^e]$ where d_1 is a dummy variable whose value is zero wherever the value inside the square brackets is below the threshold. In equation (1b) the expected depreciation on the real asset is modelled independently. This is justified where price expectations are mild and individuals hold large deposit balances to finance future transactions.

Because of exchange control fees, and service charges on foreign currency transactions domestic deposit rates will usually diverge from foreign rates. However, if the gap between the rates becomes large enough to compensate for the charges and the exchange rate risk wealth shifts in the direction of the greater return. A second threshold may be identified, beyond which the differential between local rates and foreign rates (r_f) provides a change in local deposit holding. The local investor's return on his foreign funds depends on his expectation about the exchange rate. The effect of currency substitution on the holding of interest-bearing deposits is therefore given by $D_2[r - (r_f + x^e)]$ in equation (1a). Alternatively, the interest rate differential and exchange rate expectations may be modelled as separate arguments, as shown in (1b).

We hold no firm conviction about the formation of expectations and we have therefore tested a variety of ways of representing the unobservable expected values of prices and exchange rates. They include naive assumptions that lagged values may represent expectations, simple adaptive expectations (in one case with accelerated rates of decay for more distant experience), and expectations based on the speed and acceleration of previous changes (McClelland and Barker, 1985). The McClelland-Barker formula is given as

$$p^e = p_t + dp^t + ad^2p_t \quad (2)$$

We experimented with values of $a = 1$ and $a = 0.5$.

The formation of exchange rate expectations under fixed exchange rates is difficult. If the transfer of funds is costless and markets are well informed the differential between local and foreign inflation may prove a reliable indicator of exchange rate movements. This indicator may be taken as a measure of the unobservable expected exchange rate (see Ortiz). The differential may also be an effective proxy when it becomes very large, and purchasing power parity may usefully be regarded as a long-run tendency.

However, domestic interest rates which are substantially higher than those abroad may offset adverse price differentials, at least in the short run. The exchange rate then fails to conform to the tendency indicated by price differentials, and expectations may be disappointed. The interest rate differential may be a more useful short run indicator of the net demand for foreign exchange and the expected exchange rate. Markets tend to be more sensitive to interest differentials than to price differentials, perhaps because the price effects do not show up immediately and in the mean time other policy and structural changes cloud their impact in the exchange rate. There usually remains a gap between domestic and foreign rates, reflecting the costs of currency transfer, which may include the costs of evading exchange controls. The interest differential is therefore not a fully adequate proxy for the expected exchange rate.

Probably the best approach - not adopted in this paper - would be to develop a structural model which makes exchange rate movement endogenous. It would test for the factors influencing exchange rate expectations and the way actual behaviour responds to changing expectations. A structural system might also account for the probable effects of the demand for money on the exchange rate, avoiding simultaneity bias to which a single equation estimate might be susceptible. Unfortunately, a model of this kind is not to hand, and its construction would require investigation of fiscal policy, economic structure and the timing of responses on the current and capital accounts. Instead we offer a model which makes none of the pure market assumptions, and we experiment with reduced forms which might reflect different ways of forming expectations. Other questions of policy and structure cannot be managed within the confines of this paper.

The demand for current accounts and currency is related to the level of transactions, which is usually assumed to have a direct relationship with income levels, since there are no good measures of transactions. The demand will increase to accommodate expected inflation. Demand falls if the returns on alternative financial assets rise sufficiently to compensate for the risk of their illiquidity. The alternatives are to hold domestic interest-bearing deposits yielding r percent, or to hold foreign financial assets expected to yield $r_f + x^e$, less the costs of transferring funds abroad and other transactions charges. The

opportunity cost of holding cash may therefore be expressed as $\max [r, r_f + x^e - t_1]$ where t_1 represent transaction costs. The demand for currency and current accounts is given by

$$(3) \quad MO = c_0 + c_1 Y + c_2 P^e + c_3 \max [r, r_f + x^e - t_1]$$

As for time and savings deposits, a number of alternative expectations formations are explored.

Empirical Results

The models were tested using ordinary least squares estimates for Barbados and Jamaica for the period 1964-84. Both countries are tourism oriented, conducting most of their trade in goods and services in the US dollar. Traditionally, they have both pegged their exchange rates, initially to the pound sterling and since the mid-1970s to the US dollar. Jamaica's declining economic fortunes have precluded a stable exchange rate as the authorities altered the peg so as to garner foreign exchange to finance official transactions. Barbados has also experienced periodic difficulties but has maintained the pegged value of its currency throughout.

The results for equation (1a) are reported in Table 1. The expected price variable with $a = 1$ performs consistently better than the other options and we report these results only. The expected exchange rate changes are measured by the price differential between domestic and foreign prices.

The results for both countries suffer from serial correlation and show no evidence of currency substitution. Modelling the interest rate and price expectations separately suggests that there is currency substitution, but serial correlation persists. The coefficient on the price expectations variable indicates that individuals do not generally substitute into real assets as P^e rises.

In Table II the results for equation II and some variations on the original model are reported. The pure model (2a.1) is serially correlated for both countries but the Barbados results improve when the interest rate differential ($r - r_f$) is decomposed into its level (r, r_f), log form ($\ln R, \ln R_f$) or is modelled as the difference of the logs ($\ln R - \ln R_f$). In all cases the coefficient on the expected exchange rate is small and significant.

The Jamaican results are less encouraging than for Barbados. Serial correlation persists in each equation despite changes in formulation. The results when corrected for autocorrelation yield an insignificant coefficient on the income variable and a small significant coefficient on the expected exchange rate variable. These results are not immediately intuitive in light of the Jamaican experience.

The results for the demand for money equation (Table 111) represent a variant of equation 3. Currency substitution appears significant for both countries but the coefficient for Jamaica is smaller than for Barbados, an implausible occurrence.

Conclusion

Casual observation suggests that there is a strong incentive for economic agents in small open economies like Barbados and Jamaica to increase their demand for foreign currencies as the relative opportunity costs of holding domestic currency rises. Tests of this phenomenon remain inconclusive, perhaps due to the difficulty in measuring exchange rate expectations where the authorities commit themselves to maintaining a fixed exchange rate.

BIBLIOGRAPHY

- Batten, D.S and Hafer, R.W., "Money, Income and Currency Substitution: Evidence from Three Countries", Review of Federal Reserve Bank of St. Louis, May 1985.
- Bordo, H.D. and Choudhri, E.U., "Currency Substitution and the Demand for Money: Some Evidence for Canada", JMCB Vol 14, No.1, 1982.
- Brillembourg A. and Schadler S., "A Model of Currency Substitution in Exchange Rate Determination 1973-78", IMF Staff Papers Vol 26 No.3, Sept. 1979.
- Calvo G. and Rodriguez C., "A Model of Exchange Rate Determination under Currency Substitution and Rational Expectations", Journal of Political Economy Vol 85 No.3, June 1977.
- Fasana Filho, "Currency Substitution and the Demand for Money: The Argentina Case", Review of World Economics 1986 (2).
- Girton L. and Roper "Theory and Implications of Currency Substitution", JMCB Vol 13, February 1981.
- Laidler D.E.W., The Demand for Money, 1977.
- McClean, A. Wendell, "Some Evidence on the Demand for Money in a Small Open Economy: Barbados", Mimeo, U.W.I. 1980.
- Ortiz G., "Currency Substitution in Mexico: The Dollarization Problem", JMCB Vol XV #2, May 1983.
- Ramirez-Rojas C., "Currency Substitution in Argentina, Mexico and Uruguay", IMF Staff Papers, September 1985.

Table I

C	lnY	lnPe	R	R-pe	[R-(Rf+xe)]	R ²	D.W
<u>BARBADOS</u>							
la.1	-29.1 (-13.7)	2.96 (16.2)		-0.28 (2.49)	0.01 (1.20)	93.1	1.31
la.2	-10.9 (5.71)	1.12 (5.98)	0.79 (10.43)	0.04 (2.07)	0.02 (4.51)	98.7	1.62
<u>JAMAICA</u>							
la.1	-24.0 (-2.09)	3.51 (2.58)		-0.03 (-0.08)	-0.04 (-1.59)	44.0	0.26
la.2	-11.2 (-5.99)	1.61 (7.21)	1.04 (13.5)	0.03 (1.62)	0.03 (5.80)	98.5	1.00

Table 2a

C	lnY	lnPe	R	lnR	Rf	lnRf	R-Rf	lnR-lnRf	xe	Rf+xe	R ²	D.W
<u>BARBADOS</u>												
1b.1	-12.4 (7.6)	1.26 (7.83)	0.82 (10.3)				0.04 (2.94)		-0.02 (4.15)		98.8	1.28
1b.2	-11.9 (8.49)	1.22 (8.70)	0.83 (12.1)					0.39 (4.11)	-0.02 (-5.25)		99.1	1.70
1b.3	-11.5 (-7.3)	1.17 (7.46)	0.83 (11.2)		-0.04 (3.28)				-0.02 (-4.84)		98.9	1.93
1b.4	-11.5 (7.39)	1.17 (7.50)	0.83 (12.0)					-0.36 (3.44)	-0.02 (-5.12)		99.0	1.90
1b.5	-11.4 (6.91)	1.17 (7.13)	0.78 (11.0)		0.06 (2.91)				0.02 (-4.65)		98.8	1.76

Table 2b

C	lnY	lnPe	R	lnR	Rf	lnRf	R-Rf	lnR-lnRf	x ^e	Rf+x ^e	R ²	D.W
<u>JAMAICA</u>												
1b.1	-13.0 (7.24)	1.78 (8.26)	1.12 (26.8)				0.02 (1.64)		-0.01 (2.96)		98.4	0.87
1b.2	-11.9 (6.18)	1.67 (7.28)	1.14 (25.1)					0.08 (0.85)	-0.03 (-5.71)		98.4	0.76
1b.3	-11.9 (6.54)	1.68 (7.80)	1.13 (12.8)	0.02 (1.31)	0.02 (1.56)				-0.03 (-6.27)		98.6	0.97
1b.4	-13.4 (5.22)	1.86 (5.96)	1.22 (11.5)	-0.05 (-0.31)		-0.15 (1.23)			-0.03 (-5.74)		98.4	0.79
1b.5	-12.1 (6.77)	1.70 (8.04)	1.15 (14.5)	0.02 (1.26)						-0.03 (6.34)	98.7	0.94

Table 3

	C	lny	lnPe	x ^e	r ²	D.W.
<u>BARBADOS</u>	-6.12 (-1.29)	0.69 (1.54)	0.75 (5.43)	-0.02 (-3.94)	98.1	1.82
<u>JAMAICA</u>	-11.3 (-3.34)	1.54 (3.89)	1.09 (20.3)	-0.01 (-3.63)	99.1	1.79