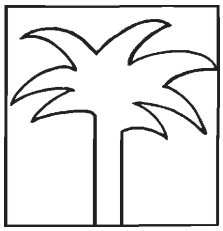

Is the money multiplier relevant in a small, open economy? Empirical evidence from Fiji

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The paper reports the results of a quantitative analysis of the linkages in Fiji between reserve money, known as the monetary base (MB) and the money supply, and tests whether the familiar money multiplier is of any policy relevance to this small country under its fixed exchange rate regime. The paper examines the relationship between monetary aggregates and the monetary base in Fiji. It is established that the conventional money multiplier concept is not empirically valid in the case of a small, open economy with a fixed exchange rate regime.

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The money multiplier, similar to other multipliers in economics, is a number which by itself has no theoretical significance. The money multiplier is a simple description of the relationship between the money supply and the monetary base. The latter consists of currency held by the non-bank public and reserves kept by the commercial banks with the monetary authority in accordance with a statutorily prescribed ratio of total deposits. In deterministic form, the money multiplier model is written as M = mMB, where M is the stock of money, measured by the money aggregate; MB is the monetary base; and m is the money multiplier.

The multiplier m is dependent on various behavioural relationships in an economy, as there are four players in the field: depositors, borrowers, the banks and the monetary authority. The monetarists (for example, Friedman and Schwartz 1963) laid considerable stress on the short-term stability of behavioural relationships, including a predictable velocity of money. They argued

that the multiplier was stable and therefore the impact of changes in the monetary base could be estimated fairly accurately.

However, with the introduction of financial sector reforms in the late 1980s, banks and other economic agents became free to choose their asset-liability portfolio according to market-determined rates of return and relative risks. Consequently, the behavioural relationships behind the money multiplier can no longer be considered constant. All of these relationships are bound to change, as they respond to changes in income, wealth and interest rates. However, it was expected that in the short run the money multiplier could remain constant.

A note of caution, however, has been struck by recent studies of money multiplier processes in Japan (Agung and Ford 1999), the United Kingdom (Ford and Morris 1996) and small island countries such as Jamaica and Barbados (McClean 1998) about the likely two-way causality between the money supply and the monetary base. These studies cast doubts about the usefulness of the money multiplier as a policy tool.

In small, open economies, in order to maintain their fixed exchange rates the central bank must purchase the excess currency coming into the foreign exchange market with foreign currencies or must purchase the foreign exchange with domestic currency, as the balance of payments situation demands. In the process, central banks reduce their overseas reserves and the monetary base by the same amount. The monetary authorities have no discretion to change the monetary base, thus rendering it an endogenous variable.

A long-running debate between McClean (1981, 1985 and 1998) and Bourne (1976, 1981) has focused on the two-way causality between money and the monetary base in money supply processes in the Caribbean. McClean's empirical study (1998) convincingly showed that in Barbados under a fixed exchange rate regime, the monetary base was an endogenous variable. Consequently, the traditional notion of a money multiplier process in Pacific island countries, including Fiji, Samoa, Tonga and Vanuatu, whose individual currencies are pegged to a basket of currencies of major trading partners, needs to be examined.

Empirical analysis and results

Fiji was chosen for this study since time series of quarterly data for broad money (M2) and MB are available on a consistent basis. The study used the quarterly data from the first quarter of 1980 (1980Q1) to the third quarter of 2001 (2001Q3). Ford and Morris (1996) stressed the need for focusing on long-run relationships between monetary aggregates and MB, rather than on testing the stability of the money multiplier. The recommended approach is to examine whether there is cointegration between the two variables. Except as noted below, all empirical analysis was done with *EViews Version 4*.

Unit root tests

As a first step, unit root tests were conducted for the logarithmic values of the real monetary aggregate (LRM2) and real base money (LRMB). Table 1 gives Augmented Dickey Fuller (ADF) test results for the series in levels and in first differences.

In each case the p-values for the test statistics were taken from MacKinnon (1996). The order of the lags for the ADF test equations was determined through use of the Hannan-Quinn Criterion (HQC), which selected zero lags in all cases. The test results for 'Levels' refer to test equations with an intercept but no linear trend, the unit root hypothesis having been previously accepted using the intercept/trend specification of the test equations. In 'first differences', rejection of the unit root hypothesis occurred in test

Table 1 **Unit root tests, 1980Q1–2001Q3**

Series	Levels		First differences	
	ADF(t)	p-value	ADF(t)	p-value
LRM2	–1.17	0.68	–9.35	0.00
LRMB	–1.02	0.74	–10.82	0.00

Source: Authors' calculations.

equations with intercepts only. In summary, these test results indicate that the null hypothesis of a unit root in the levels of LRM2 and LRMB cannot be rejected, but can be rejected for the first differenced form of each series. It can therefore be concluded that each series is nonstationary in levels but stationary in first differenced form.

The next steps are then to test for cointegration between LRMB and LRM2 and, if they are found to be cointegrated, to estimate a Vector Error Correction Model (VECM) that is used to carry out the tests for Granger Causality and (weak) exogeneity (Johansen 1995). The Johansen procedure requires the prior development of a statistically adequate VAR model for the two series, LRMB and LRM2. To accomplish this task the appropriate lag order of the VAR is determined and the resulting estimated model is examined for signs of misspecification. For LRMB and LRM2 a VAR(4) model was estimated initially and, based on the Hannan-Quinn lag length selection criterion and on the results of a Wald test for lag exclusion, a VAR(2) model was estimated for the series LRMB and LRM2 in levels (details are available upon request to the authors).

Cointegration tests

It was shown in Table 1 that LRMB and LRM2 are integrated series that may also be cointegrated (Table 1). If so, a channel of

Table 2 **Johansen trace test for cointegration**

Sample (adjusted): 1980Q3–2001Q3
Included observations: 85 after adjusting endpoints
Trend assumption: No deterministic trend (restricted constant)—that is, Model 2
Series: LRMB, LRM2
Lags interval (in first differences): 1 to 1

Unrestricted cointegration rank test

Hypothesised no. of CE(s)	Eigenvalue	Trace statistic	10 per cent critical value	5 per cent critical value
None	0.147524	18.70962[a]	17.794	19.96
At most 1	0.058709	5.14273	7.503	9.24

[a] denotes rejection of the hypothesis at the 10 per cent (5 per cent) level
Note: Trace test indicates cointegration rank of r=1 at 10 per cent significance level.
Source: Authors' calculations.

causal influence may exist between the series, namely a long-run error correction process. To investigate this possibility it is necessary to test for cointegration, construct an error correction model (ECM) and then test again for Granger causality. For these tasks Johansen's multivariate cointegration procedures were used, the details of which are given in Johansen (1995). Given that the two variables are integrated, the maximum cointegration rank is 1; a rank of zero indicates the absence of cointegration. The cointegration rank can vary, however, with the specification of the deterministic terms (constant and trend) in the VEC model. Hence the 'Pantula principle' was employed to determine this specification (Pantula 1989). Using the *Cats in Rats* software (Hansen and Juselius 1995), Model 2 (no trend term, intercept restricted to the cointegration space) was found to be the most consistent with the sample data.

Using Model 2, the results for Johansen's trace test are given in Table 2, which indicates that LRMB and LRM2 are cointegrated with a rank of 1. That is, the test finds one statistically significant (at 10 per cent) cointegrating vector linking the two series in a long-run equilibrium relationship.

Continuing to use Johansen's maximum likelihood procedures, the parameters of the long-run cointegrating equation are estimated, along with all the other parameters, in a vector error correction (VEC) representation of the cointegrated VAR(2) model. The maximum likelihood results for LRMB and LRM2 are displayed in Table 3.

The results in Table 3 suggest rejection of the null hypothesis that LRM2 is 'weakly exogenous' for the cointegration parameters using t-stat = –3.03227, and rejection of the null hypothesis that LRMB is 'weakly exogenous' for the cointegration parameters using t–stat = –3.29011. Taken together, these

Table 3 **Vector error correction model results**

Vector error correction estimates
Sample (adjusted): 1980Q3–2001Q3

Cointegrating equation			CointEq1	Standard error	t-statistic
LRMB(-1)			1.000000		
LRM2(-1)			–0.609038	0.13755	–4.42779
C			0.733655	0.32366	2.26677
Error correction	D(LRMB)	Standard error	t-statistic	D(LRM2)	Standard error	t-statistic
CointEq1	–0.303561	0.09226	–3.29011	–0.081404	0.02685	–3.03227
D(LRMB(–1))	–0.037071	0.12665	–0.29270	0.064832	0.03685	1.75927
D(LRM2(–1))	–0.138671	0.40880	–0.33922	–0.111896	0.11895	–0.94074
R-squared	0.148135			0.071184		
Standard error equation	0.111700			0.032501		
F-statistic	7.129693			3.142214		

Source: Authors' calculations.

Table 4 **Tests of weak exogeneity**

Test for weak exogeneity: LR Test CHISQ(r)

r	DGF	CHISQ 10 per cent	LRM2	LRMB
1	1	2.71	5.67	6.59

Note: The tests of the nulls of 'weak exogeneity' are rejected (at 10 per cent) for both series, which is suggestive of bi-directional Granger Causality.
Source: Authors' calculations.

test outcomes indicate that neither variable has 'temporal precedence' over the other, evidence of bi-directional causality between the two. As a check on these results a chi-square test of weak exogeneity was also carried out. The *Eviews* results of bi-directional causality are confirmed (Table 4).

Summary and conclusions

This paper examined the relationship between monetary aggregates and the monetary base in Fiji. Although the empirical analysis shows that there is a cointegrating vector providing a long run linkage between the two, the relationship is bi-directional. The conclusion is that the money multiplier is not policy relevant for the Pacific island countries. The finding stems from the fact that under a fixed exchange rate system, changes in the net foreign reserves become a major source of changes in the money supply; implying that the scope for an independent monetary policy in such regimes is limited (Hossain and Chowdhury 1996:139). It also indicates the presence of the well-known 'trilemma' of simultaneously achieving exchange rate stability and domestic output and price stability.

However, Fiji, which has its currency pegged to a basket of currencies of its five major trading partners (Australia, the European Union, New Zealand, the United States of America and Japan), has not yet liberalised its external accounts. Fiji continues to be insulated by capital controls, both in the best of times as well as in the worst of times. The two military coups of 1987 and the civilian coup of 2000, and periods in between the two sets of coups, have witnessed the imposition of severe controls on capital movements as well as restriction on current account movements and periodical relaxation and re-imposition depending upon the degrees of lingering political and economic uncertainties.

As observed by Khatkhate and Short (1980), capital controls can enhance the effectiveness of monetary policy. Immediately after the 1987 coups, Fiji's central bank introduced its own paper, known as Reserve Bank Notes (Reserve Bank of Fiji 1990), for conducting open market operations targeting monetary aggregates. Noting Fiji's record of low inflation and exchange rate stability, Rumbaugh (1997) of the IMF observed that because of existing capital controls, the Reserve Bank of Fiji has been able to implement a more independent monetary policy than would be possible otherwise. It appears that capital controls could continue to be in place for a while despite the ongoing reforms in the domestic financial sector. A recent empirical study of the demand for money in Fiji (Jayaraman and Ward 2000), established the stability of the money demand function, and has recommended continuance of M2 targeting.

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