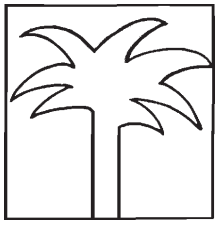

Impact of financial sector reforms and stability of money demand in Samoa

T.K. Jayaraman and B.D. Ward

Samoa has been implementing financial sector reforms sector since 1998. This paper undertakes an econometric investigation of the impact of these reforms on demand for money by fitting both short-run and long-run demand for money equations. Tests do not provide strong evidence that reforms affected the stability of the money demand function.

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Financial sector reforms in the Pacific island countries are of recent origin. Fiji was the first in the region to introduce reforms in the financial sector as part of overall liberalisation of its economy in 1988 soon after its first military coup (Elek, Hill and Tabor 1993), whereas Samoa began its reform process only from 1998. Simultaneously, the pace of implementation of structural adjustment reforms was also stepped up in Samoa. Measures were introduced in the late 1980s with assistance from the IMF, but were interrupted by two cyclones, Ofa in 1990 and Val in 1991, and the taro leaf blight in 1995–96. The structural reforms were aimed at correcting budgetary imbalances and downsizing the public sector through privatisation of many non-viable state-owned enterprises (Sialaoa 2001).

An evaluation of the wide ranging reforms (Asian Development Bank 2000) has shown that Samoa has achieved positive growth when other Pacific island countries have been experiencing three years of negative growth rates. This has been hailed as a rare occurrence by past standards (Vaai 1999). Real output grew 7.3 per cent in 2000, 3.1 per cent in 1999 and 2.5 per cent in 1998. Efficient and speedy implementation of reforms has also earned Samoa the epithet 'the darling of the international agencies' (Cuthbertson 1999).

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Financial sector reforms have had many positive impacts on the economy. These include increasing the financial deepening of the economy, reducing intermediation costs, reducing interest rates, and increasing the availability of domestic credit for private sector activities (Jayaraman 2001). As reforms facilitate the emergence of assets displaying greater substitutability in investment and liquidity, the monetary authority has to assess the validity of the monetary instruments and check whether they have to revise their money targeting strategy. Thus, it is of interest to determine whether the demand function for money in Samoa has remained stable despite the reforms. If stable, policymakers can be assured that there is potential for achieving price stability by controlling growth in the appropriate monetary aggregate.

Financial sector reforms in Samoa

Trade plays an important role in the Samoan economy with exports and imports together forming about 65 per cent of GNP and remittances 22 per cent of GNP (Table 1).

The financial sector in Samoa comprises the Central Bank of Samoa, which is the monetary authority established in 1984 under the Central Bank Act of 1994, three commercial banks (two foreign-owned and one domestic) and seven non-bank financial institutions. The powers of the Central Bank of Samoa have been strengthened by the Financial Institutions Act 1996, particularly in relation to regulation and supervision of financial institutions in order to maintain monetary and economic stability.

Before 1 January 1998, the financial sector was controlled by the monetary authority in several ways (Table 2). Direct controls on interest rates and credit were inplace, and inhibited competition in the sector and monetary policy implementation (Randeni 1995). Specifically, the quantitative specifications of the instruments for controlling money supply acted through controls on the level and cost of credit, minimum liquid asset requirements and statutory reserve deposit ratios and ceilings on lending and deposit rates.

A formula for linking the level of credit to deposit expansion was in existence until 1995, when it was replaced with a simple credit growth rate target. Interest rates were tightly regulated; lending rates were fixed at a maximum of 15 per cent on all loans, while

Table 1 **Samoa: general indicators**

Land area ('000 square kilometres)	2.8
Land under agriculture (per cent of land area)	43.1
Population in 1999	168,000
Population density (per square kilometre)	59.0
Annual population growth rate (per cent)	2.1
Life expectancy (years)z	
Male	70.0
Female	74.0
Exports (per cent of GNP)[a]	63.1
Imports (per cent of GNP)[a]	67.8
Remittances (per cent of GNP)[a]	22.2
Per capita GNP, 1998 (US$)	1,070.00

[a] Average of figures for 1994–98
Source: Asian Development Bank, 2000. *Key Indicators of Developing Asian and Pacific Countries*, XXVII, Asian Development Bank, Manila.

Table 2 **Important milestones in financial reforms in Samoa**

Year	Domestic sector reform	External sector reform
1998	Deregulation of interest rates, effective 1 January	
	Removal of ceilings on interest rates on deposits and lending	
	Auction of Central Bank of Samoa's own securities	
1999	Legislation and regulations relating to financial institutions' prudential requirements were updated	Commercial banks were given greater freedom in offering forward cover
	Commercial banks' Liquid Assets Requirements (LAR) ratio was eliminated effective 1 April	Ceiling on holdings of foreign exchange was replaced by a net position in managing foreign exchange risk
	Statutory Reserve Deposit (SRD) ratio was removed: effective June 1999, SRD ratio was reduced to 4.8 per cent of average total commercial bank deposits	1 per cent foreign exchange levy was abolished
	Capital adequacy ratio of 15 per cent of risk weighted assets remained	CBS approval requirement for importation of cars was removed
	Off-site supervision by CBS and on-site examination in conjunction with external auditors	Import entries no longer require CBS certification
	Commercial banks have been given full authority	No limits on commercial bank authority to make advanced payments overseas for bonafide reasons
	Legislation proposed to bring major non-bank financial institutions (National Provident Fund and Development Bank of Samoa) and other non-bank financial institutions under supervision of CBS	Delegated authority to commercial banks to give $700 per day or $7000 per person per trip to make payments for all other overseas commitments which previously required CBS approval
	Approval required from CBS for borrowing from overseas	Full current account convertibility
	More private operators have been registered as Foreign Exchange dealers promoting competition at the retail level and broaden money transfer work	
2000	Money Laundering Prevention Act 2000 came into effect from June 2000.	
	Off-site supervision of licensed banks supplemented by on-site examination	
	Extension of supervisory role of CBS	
	Insurance companies included	

Source: Central Bank of Samoa, *Annual Report*, Central Bank of Samoa, Apia, various issues.

Table 3 **Samoa: current status of reforms**

Monetary policy	
Reserve requirements	SRD ratio is 4.8 per cent of commercial bank's deposits. It has remained the same since June 1998. The commercial bank reserves with CBS are not remunerated.
Interest rate	No control on lending or deposit rates effective 1 January 1998 and no credit ceilings on bank lending There is no link between yield rate of CBS securities and short term rate and commercial bank lending and deposit rates The commercial banks' average lending rate is 12.3 per cent, which declined from 12.5 per cent a year ago, and the average deposit rate is 4.4 per cent as against 5 per cent last year
Open market operations	Effective 1 January 1998, weekly auction of CBS 91-day and effective 1 July 1998, 182-day CBS securities along a path consistent with macroeconomic targets The average yield on a 182-day CBS security is 7.1 per cent as compared to last year rate of 7 per cent The average yield on a 91-day CBS security is 6.03 per cent as against last year rate of 6.36 per cent
Domestic debt management	At the end of June 2000, there were WS$29 million of CBS securities, with a weighted average interest rate of 5.85 per cent and 6.35 per cent interest rate for 91-day and 182-day issues respectively.
Licensing, prudential norms and so on	There are presently three commercial banks licensed. The capital weighted adequacy risk assets ratio requirement Samoa's Financial Institutions Act of 1998 has guidelines pertaining to licensing, capital requirements, and limits on lending to parties and on risks to single borrowers Amendments in the Act enable flexibility to issue prudential regulations in line with international standards Risk weighted capital adequacy ratio is 15 per cent Regular reporting system for monitoring and evaluating the overall policies and performance of commercial banks is in place Banks are monitored for compliance with the terms of license and with prudential standards, such as capital adequacy limits and credit exposures Off-site supervision consists of analysis of monthly reports submitted by banks On-site supervision is carried out. All non-bank financial institutions including National Provident and Development Bank of Samoa have been brought under supervision of CBS
External sector and exchange rate	Samoa has a fixed exchange rate regime. Exchange control policy changes have been announced for increasing delegated limits to commercial banks in regard to emigration allowances, pre-payment of import bills, payment of merchandise goods, insurance premiums, pensions, travel funds, credit card facility, advance import payments and other remittances including gifts, education allowances etc. Full current account convertibility of tala. Exchange controls only relate to capital account.

Source: Central Bank of Samoa, *Annual Report*, Central Bank of Samoa, Apia, various issues.

the lowest deposit rate was set at 7.5 per cent. Interest rates on term deposits ranged from 10 per cent for a three-month deposit to 15 per cent for a 24-month deposit. As part of cyclone rehabilitation efforts in 1991, the maximum lending rate was reduced to 12 per cent on all loans. Interest rates were also re-set, with 3 per cent on savings deposits, 5.5 per cent on three-month term deposit and 7.5 per cent on 24-month term deposits. These rates were in effect until 1 January 1998, when liberalisation of the financial sector began.

The Samoan tala is pegged to a trade-weighted basket comprising the United States, Australian, Fiji and New Zealand dollars, the euro and the yen. On 1 May 1997, the weighting of the currencies was amended to reflect the level of trade, travel and remittances with other countries. The fixed trade weights are now adjusted on an annual basis to accommodate the most recent two years' balance of payments adjustments. The Central Bank of Samoa also enjoys some discretion in adjusting the band around the trade-weighted index.

Reforms and progress

Some of the more important financial sector reforms in Samoa include

- the removal of credit ceilings and interest rate controls from 1 January 1998
- the lowering of the liquid assets requirement from 25 per cent to 20 per cent of deposits in January 1998, and the further reduction of the requirement by one percentage point per month thereafter until its total elimination in September 1999
- permitting banks to make forward exchange contracts from July 1998
- removal of the levy of 1 per cent on foreign exchange sales on 1 January 1999
- introduction of central bank bills through regular auction for mopping up excess liquidity (this has now become the chief monetary policy instrument)
- encouragement of entry of new banks
- giving the Central Bank of Samoa supervision and regulatory control of bank and non-bank financial institutions (Table 3).

The implementation of reforms in the financial sector was in keeping with the economic development strategy, formulated in 1996 in response to a decade of poor growth, low productivity in agriculture and manufacturing activities. The updated version of the *Statement of Economic Strategy* (Samoa 2000) continues the thrust announced in May 1998. The strategy spells out broad macroeconomic policies, including

- sound fiscal policies, with the budget deficit not to exceed 1 per cent of GDP
- a public sector focus on human development, health and infrastructure
- corporatisation or privatisation of public enterprises
- tax reforms and broadening of the tax base
- continuing financial sector liberalisation to mobilise savings and improve intermediation between providers and users of capital.

Substantial progress in implementation of the economic strategy together with financial sector reforms is reflected in the data relating to growth. Key economic indicators (Table 4) show that, along with positive economic growth rates, fiscal deficits are small and inflation is low.

Monetary policy

Along with prudent fiscal policies directed towards keeping budget deficits low, the monetary policy objectives of Central Bank of Samoa have been geared to

- keeping the rate of inflation under 3 per cent per annum
- maintaining a stable exchange rate
- keeping net foreign assets at about six months' worth of imports

- allowing the private sector access to sufficient loanable funds for its own development (Central Bank of Samoa 2000).

From January 1998, the implementation of monetary policy switched from direct controls to indirect controls. Open-market operations in central bank securities issued under the Central Bank of Samoa Act became the main monetary policy instrument. Two types of securities, 91-day and 182-day, are now offered through a tendering process. A liquidity forecasting framework has been developed by the Bank which targets the banks' free reserves, and liquidity is managed around this target. This mechanism minimises the volatility in reserves and in turn minimises interest rate volatility. A statutory reserve requirement is also in force, serving as a back-up policy instrument. It is currently set at 4.8 per cent of commercial banks' deposit liabilities (Central Bank of Samoa 2000).

During the period 1986–90, narrow money (M1), quasi-money (savings and time deposits) and broad money (M2) have been around 10 per cent, 18 per cent and 28 per cent of GDP respectively (Table 5). Since the general economic liberalisation measures and, in particular, after the financial sector reforms, there have been noticeable increases in quasi-money and M2. While M1 as a percentage of GDP hovered around 10 per cent, quasi-money and M2 as proportions of GDP rose to 25 per cent and 37 per cent in 2000, indicating growth in the financialisation of savings. Domestic financial liberalisation and other reform measures, including the privatisation of state enterprises, as well as the opening up of the external sector, have led to opportunities for investing in an increased number of domestic financial assets as well as improved access to external financial assets, besides the conventional long-term bank deposits. Given all these changes, the question arises whether the money demand function has remained stable.

Modeling money demand in Samoa

The modeling methodology used here has been influenced by past studies on demand for money in developing countries, including the Pacific island countries (such as Sriram

Table 4 **Samoa: key macroeconomic indicators, 1991–99**

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Real GDP growth rate(per cent)	-2.4	-2.3	2.4	-0.1	6.9	6.2	1.6	2.6	5.2
Fiscal balance, including grants (per cent of GDP)	-18.2	-22.7	-22.8	-7.7	-2.8	0.9	1.1	1.1	-1.5
Grants (per cent of GDP)	20.0	11.0	14.4	11.3	16.9	15.0	10.8	11.2	10.2
Growth in broad money (per cent)	-0.1	0.8	2.3	13.0	21.8	5.1	13.3	4.9	9.1
Inflation (per cent)	-1.3	9.0	1.7	12.1	-2.9	5.4	6.9	2.2	1.5
Current account balance (per cent of GDP)	-17.2	-26.3	-24.3	2.0	4.5	5.1	8.4	10.3	8.0
External debt (per cent of GNP)	94.4	77.8	125.5	90.6	86.9	94.7	81.1	102.1	n.a.
Debt service (per cent of exports)	7.0	5.5	6.9	7.3	4.3	4.1	3.9	3.9	n.a.

Source: Asian Development Bank, 2000. *Reforms in the Pacific,* Asian Development Bank, Manila.

Table 5 **Samoa: monetary statistics, 1991–2000** (per cent of GDP)

Average	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	(1986–90)
Currency	3.4	3.8	3.1	3.5	3.4	4.4	3.8	4.0	3.8	4.1	3.7
Demand deposits	6.4	7.9	6.5	7.0	6.1	7.9	7.2	7.1	6.3	6.6	8.3
Narrow money	9.9	11.8	9.7	10.6	9.5	12.3	11.0	11.0	10.1	10.4	12.1
Quasi-money	18.0	20.8	20.7	18.3	18.3	21.7	21.5	21.7	22.6	24.0	25.4
Broad money	27.9	32.5	30.4	28.9	27.7	34.0	32.5	32.7	32.7	35.5	37.5

Source: Central Bank of Samoa, *Quarterly Review*, Central Bank of Samoa, Apia, various issues.

1999a, 1999b; Jayaraman and Ward 2000; Dekle and Pradhan 1997; Tseng and Corker 1991). An updated review of the literature (Sriram 1999a) shows that early efforts in modeling the demand function of money were based on micro-foundations which relied on cash-in-advance or money-in-utility approaches in which either permanent income, disposable income or consumption were used as a proxy. However, since the Samoan database is inadequate, simpler models were sought along the lines of studies conducted in other developing countries with similar kinds of data deficiencies.

Following the procedures adopted in various studies (Sriram 2001; Deadman 1995; Dickey, Jansen and Thornton 1994; Ghatak 1995; Goldfield and Sichel 1990; and Hendry and Ericsson 1991, and various empirical studies on Asia and Africa, notably Sriram 1999a, 1999b, 2001; Tseng and Corker 1991; Dekle and Pradhan 1997), the demand for money is hypothesised to be a function of a scale variable (measured or permanent income) and other variables such as interest rate. It is also assumed that economic agents do not suffer from any money illusion and that the money demand function is homogenous of degree one with respect to income.

For the purposes of empirical investigation, appropriate variables have been sought to represent money as the dependent variable and income and other independent variables. In the context of financial reforms, including the deregulation of interest rates and the emergence of financial assets, as well as increased substitutability between different forms of assets, the distinction between narrow and broad money aggregates becomes blurred. Consequently, there is a possibility of greater volatility in the narrow aggregate. For these reasons, a broader definition of money was considered more appropriate by Tseng and Corker (1991) and Sriram (2001).

In keeping with the theory of demand, in which the dependent variable, the monetary aggregate M1 or M2, is expressed in real terms, the real interest rate (a representative nominal interest rate minus annual inflation) would be one of the candidate explanatory variables. In general, it is postulated that changes in the real interest rate would inversely affect demand for money and a rise in the real interest rate would induce a shift from non-interest earning cash and money assets to interest-earning deposits, including saving and time deposits, as well as other financial assets.

In addition to income and interest rates, greater importance is now attached to the influence of changes in the real exchange rate on money demand in open economies. It is held that, if money holders expect a depreciation of the domestic currency in the near future, they will prefer to increase their holdings of foreign currencies and hence the

demand for domestic currency will decline (Bahmani-Oskooee and Malixi 1991). On the other hand, it might be argued that when the domestic currency depreciates the value of domestic securities held by foreigners declines; the value of foreign securities held by domestic residents increases; and this results in an increase in the domestic monetary base. This, in turn, leads to a decrease in domestic interest rates and an increase in the quantity of money demanded (Arango and Nadiri 1981). Thus, there is the possibility of obtaining both negative and positive relationships between expected changes in the exchange rate and money demanded (Tan 1997).

It might also be argued that with an expected real depreciation, given the uncovered interest parity condition, domestic interest rates would also rise; and, in that case, the inclusion of interest rates in the functional relationship along with the real exchange rate would not be appropriate on the grounds that changes in the interest rate would also reflect movements in the real exchange rate. This argument is valid as long as we have the following conditions: there is capital mobility with no capital controls, and domestic and foreign currency denominated deposits are perfect substitutes (Mishkin 2000). These conditions are not realised in Samoa.

Accordingly, a static equilibrium version of the money demand function can be expressed as

$$LRM2_t = \beta_1 + \beta_2 LRGDP_t + \beta_3 RL_t + \beta_4 LREER_t + v_1 \quad (1)$$

where LRM2 = logarithm of broad money supply in constant prices; LRGDP = logarithm of GDP in constant prices; RL = real interest rate (lending) in per cent; LREER = logarithm of real effective exchange rate index.

A description of the data set and its sources is given in the Appendix.

Empirical modeling strategy

Equation 1 depicts the hypothesised money demand function in a long-run equilibrium state. However, as the data relating to the variables proposed to be employed in the estimation of the money demand function are all on a time-series basis, the least-squares estimates could be subject to spurious regression errors. Hence, it is considered essential to check whether these time series are non-stationary and, if so, whether they are all integrated of the same order and are cointegrated as well. If this is the case, the appropriate model specification is that of an Error Correction Model (ECM). Accordingly, Dickey–Fuller unit root tests, which have become a standard application in all time-series analysis (Ghatak 1995), were first conducted for each series, both in levels and in first differences (Table 6).[1]

The order of the lags for the ADF test equations was determined through use of the Hannan-Quinn criterion (H-Q). The test results for 'Levels' refer to test equations with an intercept but not a trend, the intercept and trend specification having been previously accepted. In 'first differences', rejection of the unit root hypothesis occurred in test equations having intercepts and linear trend terms. All tests were carried out using the 5 per cent significance level.

These tests show that the hypothesis of a unit root in the levels of LRM2, LRGDP, RL and LREER cannot be rejected at the 5 per cent significance level, but can be rejected for the first differenced form of these four series. In the traditional Engle–Granger two-step approach to testing for cointegration, the residuals from the OLS regression of the equilibrium model given in Equation 1 are tested for a unit root, the rejection of which indicates cointegration of the series. In this paper, however, we follow the more modern approach promulgated in Ericsson and MacKinnon (1999), Hendry (1995) and Hendry and Ericsson (1991). That is, we first

Table 6 **Augmented Dickey–Fuller unit root tests**

Series	Levels			First differences		
	Lags	ADF(t)	5 per cent c.v.	Lags	ADF(t)	5 per cent c.v.
LRM2	4	0.206	-2.914	3	-3.506	-3.493
LRGDP	1	0.499	-2.914	-	-5.276	-3.493
RL	2	-1.651	-2.914	1	-6.566	-3.493
LREER	-	-1.489	-2.914	-	-7.43	-3.493

Source: Authors' calculations.

estimate (using OLS) a dynamic short-run adjustment specification from which we derive the long-run equilibrium coefficients and the associated error correction model (ECM). The test for cointegration then involves a test on the coefficient of the lagged error correction term in the ECM. As the ratio between this coefficient and its estimated standard error does not have Student's t-distribution under the null hypothesis of 'no cointegration', special critical values are required and have been tabulated in Ericsson and MacKinnon (1999).

A general specification of the dynamic adjustment model used here (an auto regressive distributed lag, denoted as ARDL) is

$$LRM2_t = \mu + \sum_{i=1}^{p1} \alpha_i LRM2_{t-1} + \sum_{i=0}^{p2} \delta_{1i} LRGDP_{t-i} + \sum_{i=0}^{p3} \delta_{2i} RL_{t-i} + \sum_{i=0}^{p4} \delta_{3i} LREER_{t-i} + u_t \quad (2)$$

where the lag lengths (p1=1, p2=2, p3=p4=0) were chosen with the H-Q selection criterion. Table 7 displays the results obtained.

None of the diagnostic tests indicate any specification errors in the ARFL(1,2,0,0) dynamic model. The coefficients all have plausible signs and magnitudes and are statistically significant. Hence we proceed to solve for the implied long-run equilibrium coefficients and the error correction representation.

The derived long-run equilibrium solution to Equation 2 is given by

$$LRM2_t^* = \hat{\phi}_0 + \hat{\phi}_1 LRGDP_t + \hat{\phi}_2 RL_t + \hat{\phi}_3 LREER_t$$

where the long-run equilibrium coefficients are computed from the following relations

$$\hat{\phi}_0 = \frac{\hat{\mu}}{(1-\hat{\alpha})}; \hat{\phi}_1 = \frac{\left(\hat{\delta}_{10} + \hat{\delta}_{11} + \hat{\delta}_{12}\right)}{(1-\hat{\alpha})}$$

$$\hat{\phi}_2 = \frac{\hat{\delta}_{20}}{(1-\hat{\alpha})}; \hat{\phi}_3 = \frac{\hat{\delta}_{30}}{(1-\hat{\alpha})}$$

Using Microfit, the results shown in Table 8 and Table 9 were obtained.

All the long-run equilibrium coefficients are correctly signed, of sensible magnitudes, and are statistically significant even at less than a 1 per cent significance level. As expected, long-run money demand has a positive relationship with real income, and negative relationships with the lending rate of interest and the real exchange rate. The estimated long-run income elasticity of demand for money (0.965) is close to unity and a t-test would not reject the unitary null hypothesis at conventional significance levels. On the whole, these results do not differ substantially from those obtained by Jayaraman and Ward (2000) for Fiji using a similar modelling strategy.

Quarterly estimates of the long-run equilibrium demand for M2 $(LRM2_t^*)$ and the corresponding error correction term (ECM_t) are computed as follows

$$LRM2_t^* = \sum_{j=1}^{4} \hat{\phi}_j X_{jt}, \text{ where}$$

$$X_{1t} = 1, X_{2t} = LRGDP_t, \text{etc}$$

and $ECM_t = LRM2_t - LRM2_t^*$

In the presence of cointegration, the computed ECM term should display the characteristics of a stationary series, namely it should frequently cross its (zero) mean value (see Figure 1).

In Figure 1, negative values for the ECM term indicate that the actual level of the M2 money supply was below its estimated long-run equilibrium value and conversely for positive values. The graph shows that, since 1998, the actual level of M2 was below its long-run equilibrium level but that movement toward equilibrium was clearly observable.

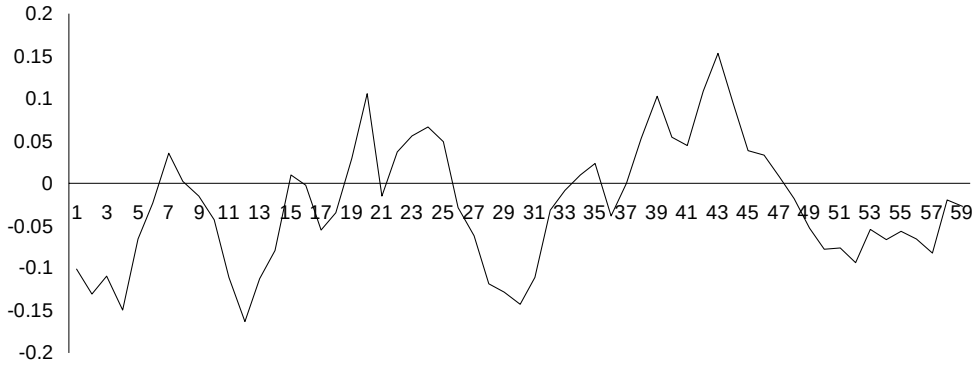
Turning to the statistical analysis of cointegration, the Representation Theorem of Engle and Granger (1987) states that the existence of a valid error correction model (ECM) implies cointegration. A parsimonious ECM representation of the adjustment process for the four series of interest is

$$\Delta LRM2_t = \gamma_1 \Delta LRGDP_t + \gamma_2 \Delta RL_t + \gamma_3 \Delta LREER_t + \lambda ECM_{t-1} + \varepsilon_t \quad (3)$$

For Equation 3 to qualify as a valid ECM, it must be the case that $(-1 < \lambda < 0)$. Hence Equation 3 is estimated with OLS regression, and the t-statistic for $\hat{\lambda}$ is used to test the null hypothesis of no cointegration. That is, we test whether the long-run coefficients in Table 8 represent a valid cointegrating vector by estimating Equation 3 with OLS and then testing $\hat{\lambda}$ for statistical significance using the p-values provided by Ericsson and MacKinnon (1999). The results are shown in Table 9.

Each of the short-run coefficients in the estimated ECM has a plausible sign, reasonable magnitude and is statistically significant. The 'R-squared' value of 0.5685 is fairly high given that the dependent variable is in first-differenced form. None of the diagnostic tests suggest any specification problems with this ECM. The value of the

Figure 1 **Error correction term**



Source: Authors' calculations.

error correction coefficient, $\hat{\lambda} \approx -0.25$, clearly lies in the required range ($-1 < \hat{\lambda} < 0$). This is a fairly large value indicating rather quick 'correction' of money demand to lagged disequilibrium.

The formal ECM test for cointegration is carried out by comparing the p-value for the 'T-ratio' statistic for $\hat{\lambda}$ to the chosen significance level of 0.05. According to the Ericsson and MacKinnon (1999) program, for a 'T-ratio' of –4.2256 the p-value is 0.000, indicating a clear rejection of the 'no cointegration' null hypothesis. The outcomes given above indicate that the derived error correction model can be interpreted in an economically meaningful way and can be used for testing hypotheses of interest, including tests for structural instability in the parameters.

It was pointed out earlier that the usefulness of the estimated money demand model for forecasting and policy analysis requires that the parameters be constant over time and across regimes, with the regimes here defined as 1986Q1–1997Q4 and 1998Q1–2000Q4. Two tests for the structural stability of the estimated parsimonious model are carried out, namely both versions of the Chow test as well as the CUSUMSQ test. The results of both sets of tests are reported in Table 10.

The null hypothesis of structural stability across the pre-reform and post-reform periods is not rejected by either of the Chow tests. Moreover, the CUSUMSQ test results provide confirmatory evidence that the parameters of the money demand function are stable over the sample period given that the plot of the cumulative squared recursive residuals does not exceed its 5 per cent confidence bounds at any point (Figure 2).

Table 7 **Auto regressive distributed lag estimates (OLS)**

ARDL (1,2,0,0) selected based on Hannan-Quinn Criterion

Dependent variable is LRM2, 56 sample observations 1987Q1 to 200Q4

Regressor	Coefficient	Standard error	T-Ratio[Prob]
LRM2(-1)	0.72556	0.076748	9.4538 [0.000]
LRGDP	1.0953	0.15698	6.9776 [0.000]
LRGDP(-1)	-1.1876	0.26507	-4.4804 [0.000]
LRGDP(-2)	0.35715	0.15920	2.2435 [0.029]
RL	-0.011529	0.0039795	-2.8971 [0.006]
LREER	-0.35833	0.10320	-3.4723 [0.001]
C	1.5473	0.48263	3.2059 [0.002]
R-squared	0.97279	R-bar-squared	0.96946
S.E. of regression	0.035198	F-stat.	F(6,49) 291.9731 [0.000]
Mean of dependent variable	0.38778	Standard deviation of dependent variable	0.20140
Residual sum of squares	0.060704	Equation log-likelihood	111.6980
DW-statistic	1.6037	Durbin's h-statistic	1.8113 [0.070]

Diagnostic tests

Test statistics	* LM version	* F version
A: Serial correlation	CHSQ(2)= 2.4868 [0.288]	F(2,49)= 1.0975 [0.342]
B: Functional form	CHSQ(1)= 0.0915 [0.762]	F(1,48)= .078531 [0.781]
C: Normality	CHSQ(2)= 1.3205 [0.517]	n.a.
D: Heteroscedasticity	CHSQ(1)= 1.9778 [0.160]	F(1,54)= 1.9770 [0.165]

Source: Authors' calculations.

Table 8 **Estimated long run coefficients using the ARDL approach**

Dependent variable is LRM2: 56 observations 1987Q1 to 2000Q4

Regressor	Coefficient	Standard error	T-ratio[Prob]
LRGDP	0.96509	0.12042	8.0141 [0.000]
RL	-0.042009	0.012167	-3.4528 [0.001]
LREER	-1.3057	0.48075	-2.7159 [0.009]
C	5.6379	2.2048	2.5570 [0.014]

Source: Authors' calculations.

Table 9 **OLS estimation of parsimonious error correction model**

Dependent variable is DLRM2: 59 observations 1986Q2 to 2000Q4

Regressor	Coefficient	Standard error	T-ratio[Prob]
DLRGDP	0.86638	0.1594	5.4340 [0.000]
DRL	-0.01523	0.0074	-2.0655 [0.044]
DLREER	-0.56956	0.1887	-3.0180 [0.004]
ECM(-1)	-0.24974	0.0591	-4.2256 [0.000]

R-squared	0.56850	R-bar-squared	0.5449
S.E. of regression	0.035504	F-stat. F(3,55)	24.1546 [0.000]
Mean of dependent variable	0.017189	Standard deviation of dependent variable	0.0526
Residual sum of squares	0.069330	Equation log-likelihood	115.3020
DW-statistic	1.6711		

Diagnostic tests

* Test statistics	* LM version	* F version
* A: Serial correlation	CHSQ(2)= 1.8236[.402]	F(2,53)= 0.8452[.435]
* B: Functional form	CHSQ(1)= 0.3758[.540]	F(1,54)= 0.3462[.559]
* C: Normality	CHSQ(2)= 0.8008[.670]	n.a.
* D: Heteroscedasticity	CHSQ(1)= 3.4524[.063]	F(1,57)= 3.5427[.065]

Source: Authors' calculations.

Table 10 **Chow tests for structural break**

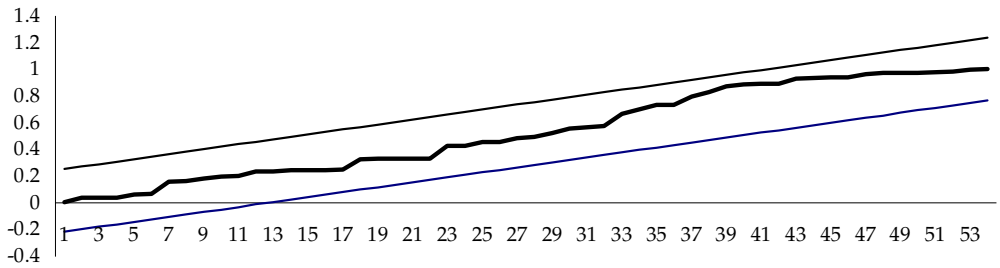
A: Chow test	CHSQ(4) = 1.5086[.825]	F(4,51) 0.3771[.824]
B: Predictive failure	CHSQ(12) = 5.3924[.944]	F(12,43) 0.4493[.933]

A: Test of stability of the regression coefficients (Chow's first test)

B: Test of adequacy of predictions (Chow's second test)

Source: Authors' calculations.

Figure 2 **CUSUMSQ with 5 per cent bounds**



Source: Authors' calculations.

Summary and conclusions

Samoa has been implementing financial sector reforms since 1998. Interest rates are no longer regulated by the monetary authorities; they are left to determination by market forces. In addition, there is much less reliance on direct controls than before. Liquidity management is now handled by indirect open market operations in securities issued by the central bank. Liberalisation measures have led to increased financialisation of savings in terms of quasi-money, as reflected in the level of broad money M2 relative to GDP.

Econometric exercises were undertaken to fit a demand function for money. Because of the improved availability of assets displaying greater substitutability of investment and liquidity, a broader definition of money was employed. Further, the openness of the economy was duly recognised. Accordingly, while M2 in real terms was the dependent variable, the independent variables included real income, the real interest rate and the real exchange rate. The analysis utilised quarterly data from a 15-year period (1986–2000).

Unit root tests revealed that all the variables were integrated of the same order. The cointegration methodology was adopted to determine whether there was any long-term relationship between real money and the independent variables. The tests found that real demand for money in log form, real income and the real exchange rate index in log form and the real interest rate in levels were cointegrated. The estimated long-run elasticities were found to be statistically significant at the one per cent level.

Samoa's long-term income elasticity of demand was found to be close to unity. In regard to the real interest rate, the estimated coefficient was negative and significant at the one per cent level. The results confirmed that a rise in the opportunity cost of holding money leads to a fall in money holdings. Regarding the real exchange rate, the sign of the coefficient was negative and significant, confirming expectations that a fall in the value of domestic currency would lead to a preference for foreign currency holdings and a decrease in the demand for money. Money demand was found to adjust to disequilibria fairly quickly; on average, disequilibria would be corrected within about four quarters.

Tests for stability of the demand function across two periods, the periods before and after financial sector reforms, show that there were no structural breaks. This indicates that the financial reforms, which were initiated

in 1998, have yet to impact the economy fully. The period of study is confined to only three years after 1998. Financial sector reforms need at least five years for the full effects to be felt. There have been favourable changes in some indicators, such as an increase in the financial deepening of the economy, a reduction in intermediation costs, a fall in interest rates and an increase in domestic credit for private sectors. There has, however, not been any noticeable emergence of financial assets displaying greater substitutability of investment and liquidity, which would have cast doubts on the advisability of monetary targeting. The absence of a structural break indicates that there is still a potential in the near term for achieving price stability by controlling the growth of the money supply.

Appendix

Samoa's data relating to money supply (M2), consumer price index, interest rate and exchange rate are available on a quarterly basis for 1987Q1 to 2000Q4 from DataStream. Consistent with other empirical studies on developing economies (Tseng and Corker 1991), it was decided to employ measured income as a scale variable in the place of permanent income. However, as the country's GDP data are only available on an annual basis, quarterly data for real GDP were interpolated from the annual data using the cubic spline function available in RATS v5.0. All series used in the econometric analysis are quarterly, seasonally unadjusted. The computer program used for estimating the parameters was Microfit 4.0.

Note

[1] These tests, along with all other empirical analysis, were carried out in Microfit version 4.0 (Pesaran and Pesaran 1997).

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