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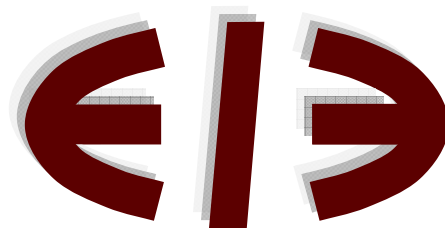## Economics and Econometrics Research Institute

Panel Data Estimates of the Demand for Money in the Pacific Island Countries

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Abstract

The Pedroni (2000) panel cointegration method is used to estimate the cointegrating equations for the demand for narrow money for a panel of five Pacific Island Countries (Fiji, Samoa, Solomons, Vanuatu and Papua New Guinea) for the period 1975-2007. The effects of financial reforms are analyzed with estimates from sub-sample periods. Our results suggest that there is a unique cointegrated long run relationship between real narrow money, real income and nominal rate of interest. The major finding is that the money demand function has been stable and financial reforms are yet to have any significant effects in the Pacific Island Countries.

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1. Introduction

The stability of the demand for money function is vital because it has implications for the implementation of monetary policy. According to Poole (1970), rate of interest should be targeted if the LM curve is unstable and money supply if the IS curve is unstable. Since the instability in the demand for money is a major factor causing instability in the LM, it is vital to test the stability of the money demand function. In other words, money supply is to be targeted if the demand for money is stable. There are few studies that have examined the stability of the money demand in the Pacific Island Countries (henceforth PICs), however, none have used the panel cointegration techniques. Some of these studies include Katafono (2001), Jayaraman and Ward (2003), Rao and Singh (2005), Rao and Kumar (2007), Kumar and Manoka (2008) and Singh and Kumar (2009a and b). These studies have utilized the time series techniques and their central focus has been on Fiji. With the exception to Katafono (2001), others have supported the stability in the money demand functions in the PICs. For a comprehensive review of these studies, see Singh and Kumar (2009a).

The objective of this paper is to estimate the money demand relationship for five PICs with the Pedroni (2000) panel Fully Modified Ordinary Least Squares (FMOLS) technique. Most importantly, it is worth examining whether the financial reforms implemented in the PICs during the mid to late 1980s had any significant effects on their demand for money functions. To the best of our knowledge, this is the first paper to examine this issue for the PICs within a panel data framework. Our data is from 1975 to 2007 for Fiji, Samoa, Solomons, Vanuatu, and Papua New Guinea (PNG). Section 2 provides the specification of the demand for money and briefly discusses the data. Empirical results are detailed in Section 3. Section 4 concludes.

2. Specification and Data

The standard specification for the demand for money in many cointegration studies is[1]:

$$\ln M_{it} = \alpha_i + \beta_{it} \ln Y_{it} + \gamma_{it} R_{it} + \varepsilon_{it} \qquad (1)$$

where $\ln M$ is the log of real money *(M1)*, $\ln Y$ is the log of real *GDP* and R is the nominal short term rate of interest (1-3 year savings deposit rate).

Our panel data consists of five PICs $(N = 1....5)$ for the period 1975 to 2007 $(T = 1.....33)$. The selected countries are Fiji, Samoa, Solomons, Vanuatu and PNG. We started through testing for the presence of unit roots in the three variables, namely $\ln M$, $\ln Y$ and R using the panel unit root tests of Levin, Lin and Chu (2002, LLC), Breitung (2000), Im, Pesaran and Shin (2003, IPS), ADF Fisher χ^2 (ADF), PP Fisher χ^2 (PP), and Hadri (2000). The panel unit root test results are given in Table 1.

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[1] We have ignored the inflation rate because unit root tests showed that inflation is a stationary variable. The exchange rate is also ignored and foreign exchange holding is not a practical option in many PICs.

Table 1. Panel Unit Root Tests 1975-2007

Series	LLC	Breitung	IPS	ADF	PP	Hadri
$\ln M$	-0.336 (0.87)	-3.006 (0.56)	1.065 (0.45)	8.965 (0.27)	2.753 (0.02)*	9.523 (0.00)*
$\ln Y$	-1.288 (0.98)	-4.112 (0.62)	-1.335 (0.93)	3.224 (0.11)	27.847 (0.31)	6.045 (0.00)*
R	-1.736 (0.36)	-0.946 (0.46)	0.112 (0.72)	1.083 (0.34)	7.294 (0.45)	0.375 (0.00)*
$\Delta \ln M$	-12.740 (0.00)*	-19.018 (0.00)*	-1.140 (0.00)*	2.373 (0.00)*	8.028 (0.00)*	8.233 (0.00)*
$\Delta \ln Y$	-9.836 (0.00)*	-10.736 (0.00)*	-11.012 (0.00)*	2.527 (0.00)*	15.828 (0.00)*	1.003 (0.00)*
ΔR	-4.617 (0.00)*	1.626 (0.00)*	0.823 (0.00)*	5.264 (0.00)*	17.932 (0.00)*	4.025 (0.00)*

Notes: Probability values are reported in the parentheses. * denotes the rejection of the null at the 5% level.

For the variable $\ln M$, the LLC, Breitung, IPS and ADF tests in which the null is that the variable is non-stationary is not rejected at the 5% level. However, in the PP test in which the null is the same accept the null at only the 1% level. In the Hadri test the null is that the variable is stationary and it is rejected at the 5% level. For the variables $\ln Y$ and R, all the tests show that they are non-stationary at the 5% level. Alternatively, with the exception of the Hadri test, all other tests show that the first differences of $\ln M$, $\ln Y$ and R are stationary. Therefore, it is reasonable to conclude that these variables are by and large *I(1)* in their levels.

3. Empirical Results

We have estimated equation (1) for the entire sample period (1975-2007) and sub-sample periods (1975-1989 and 1990-2007). We have selected 1990 as the break date because financial reforms were implemented in the PICs in late 1980s and early 1990s.[2] If financial reforms have been effective, it is to be expected that there would be a structural break in the cointegrating equation after the mid 1980s. From the demand for money perspective there should be some improved economies of scale meaning that the income elasticity should show a decline and an improvement in the responsiveness of money demand to changes in the rate of interest because of more market based interest rate policies and improved capital mobility.

The results of the panel cointegration tests are reported in Table 2. In the fixed effects model, the majority of the cointegration tests show that there is cointegration between $\ln M$, $\ln Y$ and R at the 5% level. Only the Panel σ - test statistics in the fixed effects model is insignificant at the 5% level. All the cointegration tests for the random effects model reject the null of no cointegration, except Group σ - statistics in the sub-sample periods. Nonetheless we can infer that $\ln M$, $\ln Y$ and R are cointegrated.

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[2] We also attempted to use break dates as 1985 and 1988 but 1990 appeared to give the robust results. The results for 1985 and 1988 are not reported to conserve space.

Table 2. Panel Cointegration Tests

Test Statistic	Fixed Effects Model			Random Effects Model		
	1975-2007	1975-1989	1990-2007	1975-2007	1975-1989	1990-2007
Panel v - statistic	2.465*	3.925*	3.721*	4.737*	3.882*	2.806*
Panel σ - statistic	-1.003	0.116	1.207	-2.488*	2.201*	7.004*
Panel $\rho\rho$ - statistic	-2.393*	2.091*	10.762*	-3.007*	2.112*	3.150*
Panel ADF-statistic	-10.837*	2.342*	2.226*	-6.165*	18.732*	2.312*
Group σ - statistic	-13.009*	9.726*	3.244*	-5.054*	1.013	0.956
Group $\rho\rho$ - statistic	-2.627*	5.006*	3.245*	-9.036*	4.544*	2.110*
Group ADF- statistic	-4.974*	4.276*	3.828*	-4.945*	8.920*	5.673*

Notes: The test statistics are distributed as $N(0,1)$. * denotes significance at 5% level.

The results for the panel long run estimators using panel *FMOLS* are reported in Table 3. The income elasticity of the money demand is around unity and the semi-interest rate elasticity is around -0.02. Estimates for the sub-samples with 1990 as the break date show that there are no significant variations in the income and semi-interest rate elasticities. On the basis of these results we infer that there is no structural break and instability in the demand for money in our panel of five PICs. If the long run demand for money for the individual countries shows instability, for which there is no evidence as yet, financial reforms are not a major cause for such instability. This conclusion is consistent with Singh and Kumar's (2009b) findings that money demand functions have been fairly stable in the PICs and with the other recent findings of Rao and Kumar's (2009) and Bahmani-Oskooee and Rehman's (2005) for Asian developing countries. This implies that using the interest rate as the monetary policy instrument by the central banks of PICs is somewhat premature, inappropriate and may actually accentuate economic instability.

Table 3: Estimates of the Cointegration Coefficients

	Fixed Effects Model			Random Effects Model		
	1975-2007	1975-1989	1990-2007	1975-2007	1975-1989	1990-2007
ln$Y$	0.954	1.034	0.975	1.005	1.059	0.977
	(10.72)*	(2.15)*	(5.54)*	(5.92)*	(4.87)*	(15.97)*
R	-0.017	-0.020	-0.024	-0.025	-0.019	-0.022
	(7.65)*	(8.06)*	(4.25)*	(9.53)*	(3.05)*	(10.53)*

Notes: The t-ratios are in the parentheses and * indicates significance at 5% level.

4. Conclusion

In this paper, we have estimated the demand for real narrow money for five PICs (Fiji, Samoa, Solomons, Vanuatu and PNG) with the Pedroni (2000) panel cointegration technique. Estimates for the entire sample period of 1975 to 2007 showed that income elasticity of demand for narrow money is about unity and demand for money responds negatively to variations in the short term rate of interest, albeit by a small amount. This framework is extended to test if the financial reforms in these countries have had any significant effects. Our sub-sample estimates show that reforms do not seem to have had any significant effects so far. An implication of our results is that financial reforms are not a major contributor to the instability in the demand for money. Further, there is no evidence to say that the long run demand for money has become unstable because cointegration tests for the sub-samples reject the null of no cointegration. Therefore,

central banks of the PICs should use money supply as their monetary policy instrument to achieve their policy targets like a moderate inflation rates and overall economic stability.

References

Bahmani-Oskooee, M. and Rehman, H. (2005) 'Stability of the money demand function in Asian developing countries,' *Applied Economics*, 37, 773-792.

Breitung, J. (2000) 'The local power of some unit root tests for panel data, in Baltagi, B. (ed*),' Advances in Econometrics: Non-stationary panels, panel cointegration, and dynamic panels*, JAI Press, Amsterdam, 161-178.

Hadri, K. (2000) 'Testing for stationarity in heterogeneous panel data,' *Econometric Journal*, 3**,** 148-161.

Im, K.S., Pesaran, M.H. and Shin, Y. (2003) 'Testing for unit roots in heterogeneous panels,' *Journal of Econometrics*, 115**,** 53-74.

Jayaraman, T.K. and Ward, B.D. (2003) 'Impact of financial sector reforms and stability of money demand functions in Samoa,' in Jayaraman, T.K., *Issues in Monetary Economics of the South Pacific Island Countries*, Suva: The University of the South Pacific.

Katafono, R. (2001) 'Demand for money in Fiji,' *Staff Working paper (03/2001).* Suva: The Reserve Bank of Fiji.

Kumar, S. and Manoka, B. (2008) 'Testing the stability of demand for money in Tonga,' *The Empirical Economics Letters*, 7, 835-843.

Levin, A., Lin, C.F. and Chu, C. (2002) 'Unit root tests in panel data: asymptotic and finite sample properties,' *Journal of Econometrics*, 108, 1-24.

Pedroni, P. (2000) 'Fully-Modified OLS for heterogeneous cointegrated Panels,' *Advances in Econometrics,* 15: 93-130. Reprinted in *Recent Developments in Panel Econometrics,* Baltagi, B. (ed.) London, 2003: Edward Elgar.

Poole, W. (1970) 'The optimal choice of monetary policy instruments in a simple macro model,' *Quarterly Journal of Economics*, 84, pp.192-216.

Rao, B.B. and Kumar, S. (2007) 'Structural breaks, demand for money and monetary policy in Fiji,' *Pacific Economic Bulletin*, 22, 54-62.

----------------------------(2009) 'Panel data approach to the demand for money and the effects of financial reforms in the Asian countries,' *Economic Modelling*, 26, 1012-1017.

Rao, B.B and Singh (2005) 'Cointegration and error correction approach to the demand for money in Fiji,' *Pacific Economic Bulletin*, (June), 72-86.

Singh, R. and Kumar, S. (2009a) 'Application of the alternative techniques to estimate demand for money in developing countries,' forthcoming in the *Journal of Developing Areas.*

-------------------------- (2009b) 'Some empirical evidence on the demand for money in the Pacific Island countries,' forthcoming in *Studies in Economics and Finance*.