

CAN PACIFIC ISLAND COUNTRIES FORM A CURRENCY UNION WITH AUSTRALIA? AN EMPIRICAL STUDY ON INTERDEPENDENCE IN THE PACIFIC REGION

*T.K Jayaraman^{a,§}
Chin-Hong Pua^b*

^a*Economics Department, The University of South Pacific, Suva, Fiji Islands.*

^b*Faculty of Economics and Business, Universiti Malaysia Sarawak, Malaysia.*

Abstract

A suggestion to adopt the Australian dollar as a common currency amongst Pacific island countries (PICs) was mooted by Australia in August 2003 during the Annual Meeting of the Pacific Forum Leaders in Auckland. The Pacific Forum consists of 14 developing island countries and the two developed countries in the region, namely Australia and New Zealand. Just two months before August 2003 Meeting, a Committee of the Australian Senate had recommended a single currency as a possible remedy to meet the deteriorating economic situation in PICs, which was identified to have arisen from poor fiscal discipline and failure to effectively use external aid inflows. The paper examines the feasibility of formation of a currency union by PICs with Australia by resorting to the augmented VAR approach proposed by Toda and Yamamoto (1995) and extended by Rambaldi and Doran (1996) for investigating the presence of a key optimum currency area condition that the prospective members of a currency union should experience synchronized movements in growth rates so that shocks hitting them are less asymmetric. Our findings are that PICS do not have such synchronized movements and therefore, the time is not yet ripe for supporting the suggestion of adopting the Australian dollar as a regional common currency.

Keywords: Common currency area; Pacific island countries; Economic synchronization; Granger non-causality test.

1. Introduction

The idea of a single currency for the Pacific region was floated by Australia at the Annual Pacific Forum Leaders' meeting held in Auckland in August 2003, though it was not officially included in the agenda for formal discussion. The meeting is an annual affair and is attended by the prime ministers and presidents of 14 Pacific island countries¹ (PICs) and prime ministers of Australia and New Zealand, the region's two advanced countries, all of which constitute the Pacific Forum (the Forum), a regional organization established in 1971. As the largest member of the Forum, Australia bears a major proportion of the Forum's administrative costs, besides being a significant provider of foreign aid to PICs.

Evaluation of aid utilization over last two decades by various independent studies including the most recent one by Hughes (2003) led to introduction of many reform measures. These included improvements in aid delivery, in terms of project and program tied aid, discontinuing annual budgetary support as well as aid administration, aimed at institutional strengthening. However, reforms have been slow and proved largely ineffective. Besides the continuing inefficiencies in aid utilization, certain new developments including the perceived terror threat to the region and failure of some island states in

[§] Corresponding author. T.K Jayaraman, Economics Department, The University of South Pacific, Suva, Fiji Islands. Email: jayaraman_tk@usp.ac.fj. Tel: +679323 2178.

¹ The 14 Pacific island countries, which are members of the Pacific Forum along with Australia and New Zealand are: Cook Islands, Fiji, Kiribati, Republic of Marshall Islands, Federated States of Micronesia, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

maintaining peace and order as well as deteriorating economic conditions in the last few years in some of the PICs due to their weak monetary and fiscal discipline and poor governance, have been causing concerns to the aid donors. These concerns prompted an Australian Senate Committee (2003) to come up with a new set of recommendations aiming at setting up a *Pacific Economic and Political Community*. One of the recommendations for promoting regional stability was adopting a common currency, preferably the Australian dollar replacing the existing national currencies.

A common currency represents the ultimate of economic integration of states, without having to surrender their political identity as nations and their sovereignty. Known as currency union, it is a zone of countries or a region, where (i) a single currency circulates; (ii) a single monetary authority operates; (iii) a single exchange rate policy prevails; (iv) the single monetary authority maintains a common pool of reserves; and (v) free trade takes place within the region [(International Monetary Fund (2001), Fabella 2002)]. Such economic integration of states is expected to bring about greater fiscal and monetary discipline, thereby acting as “an agency of restraint” to wayward island governments (Collier 1991).

Currency union would, however, result in gains and losses for each member of the union. If the Australian dollar were adopted as the regional currency, the cost for Australia would be minimal since its central bank, the Reserve Bank of Australia (RBA) would continue with unfettered freedom to pursue its own monetary policy. There would also be substantial benefits to Australia. The benefits would be a rise in its volume of trade, since dollarisation of the region would lead to elimination of transaction costs and volatility in exchange rates between Australia and others in the region. These costs and benefits will have to be weighed against the likely costs that have to be incurred by 14 PICs. These would involve the costs of discontinuing their own independent currencies by replacing them with the Australian dollar and the resultant loss of exchange rate as tool of adjustment as well as the loss of seigniorage revenue from printing their own currencies. Further, all of them have to fall in line with Australian macroeconomic and exchange rate policies.

A common currency entails a single set of economic, monetary, financial and fiscal policies to influence the balance of payments of the region. Such a single set of policies can be justified only when there is a high degree of synchronisation of business cycles for all prospective member countries, which would be reflected in growth rates of their domestic outputs. According to Mundell's seminal contributions (1961), known as optimum currency area (OCA) conditions, countries experiencing common external shocks would be better suited to form a currency union because it permits the use of union-wide policies to correct any macroeconomic imbalances. The OCA conditions have since been elaborated, refined and updated by growing literature on the subject [Bayoumi and Mauro (1999), Eichengreen and Bayoumi (1999), International Monetary Fund (1997)].

The available empirical studies have so far focused on Australia and New Zealand [Crossby and Otto (2003), Coleman (1999), Hargraves and McDermott (1999), Grimes, F. Holmes, and Bowden (2000)]. Their findings were, however, not unanimous. While Grimes *et al.* (2000) opined that a common currency for Australia and New Zealand would be beneficial, Crossby and Otto (2003) felt otherwise. A central banker's views were more direct. A former Governor of New Zealand's Reserve Bank (Brash 2000) observed that since there had been a lack of synchronisation of business cycles between Australia and New Zealand during the recent past, a currency union between Australia and New Zealand was not advisable.

There are no such detailed studies on the 14 PICs. The available studies (de Brouwer 2000, Chand 2003) have so far been restricted to certain aspects: current trade volume with possible trade diversion losses and dissimilarity in industrial patterns and movements in real exchange rates and the like. There has been no study on synchronization in movements in gross domestic products of the island countries and Australia and general economic interdependence.

The present paper, which seeks to fill the gap by presenting some preliminary results of such an economic analysis, is organised into three sections. The first section provides a brief background of the Pacific island economies discussing their current trade patterns and their ongoing efforts towards regional integration; the second section outlines the methodology employed and reports the results of the empirical study. The third and final section offers some policy implications and conclusions.

2. Pacific Islands: A Background

The 14 PICs are marked by certain unique characteristics (Urwin 2004). These include: (i) remoteness and insularity; (ii) susceptibility to natural disasters; (iii) small population size; (iv) limited diversification; and (v) openness. Most of the characteristics arise due to countries' geographical location. The PICs are spread over the Pacific Ocean about some 10,000 kilometers (kms) from east to west and 5,000 kms from north to south, with a combined exclusive economic zone (EEZ) of about 20 million sq. km. The total land area is just over 500,000 sq. km of which Papua New Guinea (PNG) accounts for 88%, and Fiji, Solomon Islands and Vanuatu for 11%, with the other 10 countries making up the remaining 1%. The population of PICs is about seven million people, of which over five million are in PNG. At the other end of the scale is Niue, with a population of less than 2000 (Appendix 1).

The geographical characteristics have also resulted in serious constraints to growth and development. Further, despite substantial foreign aid there has been a great variability in economic performance. Poor growth marked by stagnation in per capita incomes over two decades came to be looked upon as a "Pacific Paradox" (World Bank 1993). There have been several years when there was negative economic growth (Appendix 2).

The PICs are open economies. The PICs' trade volumes (exports and imports expressed, as percentages of gross domestic product) are fairly high. In 2000, they ranged from 120 per cent in Kiribati to 68 per cent in Republic of Marshall Islands (RMI). They have to depend upon imports for almost all commodities for basic needs, most of which are sourced from Australia to a considerable extent. Exports are confined to a few items including fish, copra, timber and tourism and remittances from the migrant seafaring men, to finance their imports. While PNG's major exports are gold, petroleum, copper, timber and coffee, Fiji's chief exports are sugar, garments and gold. For smaller island countries, which have negligible manufacturing capacity, reliance on primary exports is much greater (Appendix 3). Thus, PICs are more competitive than complementary to each other.

Intra-PIC trade has been small (Appendix 4). The major intra-regional trading partners are Fiji and PNG because of their significant manufacturing base. Fiji has been exporting to other PICs processed consumer goods such as wheat flour, cooking oil and biscuits in fairly large volumes. On the other hand, Fiji's imports from other PICs are confined to a very small volume of agricultural commodities. PNG exports coffee and other manufactured goods. Thus, among PICs, PNG and Fiji are the only two countries, which are relatively diversified.

Since 1993, the preferential trading arrangements under the Melanesian Spearhead Group (MSG) Agreement, which originally covered PNG, Solomon Islands and Vanuatu and later included Fiji from 1995, did encourage some intra-regional trade, among the four in certain specified commodities, such as coffee, kava and beef. However, because of large increases in imports from the other two MSG countries relative to their exports, Solomon Islands and Vanuatu accumulated sizeable trade deficits with Fiji and PNG. As a result, in 2002, the former two countries sought temporary withdrawal from MSG Trade arrangements. The MSG agreement is presently of relevance only to Fiji and PNG. The exchange rate arrangements of PICs vary, spanning the continuum from the exclusive use of a foreign currency as domestic currency through to a free-floating domestic currency (Appendix 2). Eight PICs, which do not have an independent domestic currency, have adopted the national currencies of Australia, New Zealand or the United States: Kiribati, Nauru and Tuvalu (using the Australian dollar); the Cook Islands and Niue (the New Zealand dollar); and the Federated States of Micronesia (FSM), RMI, and Palau (the United States dollar). Five PICs (Fiji, Samoa, Solomon Islands, Tonga and Vanuatu) have their own currencies, which have been pegged to baskets of currencies whose composition and weights are generally kept confidential. Among the 14 PICs, only PNG has a freely floating exchange rate regime. Rosales (2001) notes that inflation has been higher in PNG and in the dollarised countries. On the other hand, those PICs with independent currencies seemed to have done better on the inflation front. Thus, there is nothing remarkable to commend about any regime in particular.

Although currency reforms including adoption of a common currency among the island countries by replacing the existing currencies with a currency of their own or simply accepting the Australian dollar as their currency have not been given any priority by PICs, they were not lagging behind in their efforts

toward greater integration. The island countries took major steps by signing two agreements in 2001. One signed by all 14 island countries is known as Pacific Island Countries Trade Agreement (PICTA) for ushering in free trade first among the developing PICs (Fiji, PNG, Palau, FSM, Samoa, Solomon Islands, Tonga, Vanuatu) by 2010 and amongst all PICs, including the remaining, known as small and least developed PICs (Cook Islands, Kiribati, Niue, Nauru, RMI, Tuvalu) by 2012. The other is known as Pacific Agreement on Closer Economic Relations (PACER) covering all 14 PICs, and Australia and New Zealand. The PACER visualises a free trade area among all the Pacific Forum Countries, including Australia and New Zealand within eight years once PICTA was in place. After obtaining the necessary minimum number of ratifications by the legislatures of the countries concerned, (six in the case of PICTA; and seven in the case of PACER), the two agreements became effective². These two agreements are expected to speed up the process of trade integration, paving the way for greater economic cooperation in the region.

Based on the foregoing, the indications are clear. Intra-regional trade among the island countries is of low volume. The PICs and the two advanced countries in the region on the other hand are not similarly placed. Adoption of a single currency, which results in loss of an adjustment tool to correct balance of payments problems, depends on how far the countries themselves are interdependent. A study of growth in gross domestic products of the prospective member countries would reveal how far their growth is influenced by each other. A high degree of correlation and interdependence would be an essential ingredient for economic integration, as a common set of policies is the hallmark of such integration. The next section deals with these aspects in so far they relate to the Pacific Forum countries.

3. Methodology and Empirical Findings

Most of the PICs became independent in the 1980s. Further, many of their economic databases suffer from inadequacies due to weak human resources. For these reasons, there is a lack of reliable, time series of gross domestic product on a fairly long period. Our analysis is therefore confined, besides Australia and New Zealand, only to four major PICs: Fiji, PNG, Samoa and Solomon Islands, which have databases for a relatively longer period (1970-2003). The relevant data were taken from the *International Financial Statistics* (IMF 2003) and *Asian Development Bank's Key Indicators* (ADB 2003).

Before proceeding to undertake the empirical analysis for testing economic interdependence in terms of causality in GDP growth rates of the candidate countries, a simple correlation analysis was conducted. The results are presented in Table 1. Out of 15 correlation coefficients, only those coefficients of correlations with positive sign are relevant. Among the positive 12 coefficients, only four are significant, the level of significance chosen being at 5% level³. It is of interest to note that the association of growth rates of Australia and New Zealand, though positive, is not statistically significant. Only the coefficients of correlation between growth rates of Australia and Fiji, Australia and Samoa and the Solomon Islands are significant. The other statistically significant coefficient of correlation is the one between the growth rate of Fiji and the Solomon Islands. The conclusion is that there is no coherent pattern of association amongst the candidate countries, indicating weak economic interdependence.

² The PACER became effective on October 3, 2002, as it required only six ratifications. Both Australia and New Zealand and four other PICs ratified to make it effective earlier than PICTA. They were followed by two other PICs. The PICTA became effective on April 13, 2003 immediately after the minimum seven ratifications were obtained. Subsequently two more PICs ratified. As of May 2004, five PICs have not ratified both PICTA and PACER. These PICs are RMI, FSM, Palau, Tuvalu and Vanuatu.

³ The statistic used for testing the correlation coefficient whether it is significantly different from zero is $\ln[(1+r)/(1-r)]/2$, where r is the sample correlation coefficient. It has an asymptotically normal distribution with a variance of $(N-3)$, where N is the number of observations. Using the level of significance, $\alpha = 0.05$, the rejection region is $Z = 0.5(N-3)^{1/2} \{\ln[(1+r)/(1-r)]\} > 1.96$ (Romano 1970: 156-170). If $N = 34$, r should be 0.3832.

Table 1
Correlation Matrix of Variables

Countries	Australia	Fiji	New Zealand	Papua New Guinea	Samoa	Solomon Islands
Australia	1.0000	0.4409**	0.3668	-0.1144	0.5183**	0.3806**
Fiji		1.0000	0.2571	0.0326	0.2867	0.3938**
New Zealand			1.0000	-0.0197	0.2226	-0.0080
Papua New Guinea				1.0000	0.0070	0.1956
Samoa					1.0000	0.1296
Solomon Islands						1.0000

Note: Asterisk (**) indicates level of significance at 5% level.

A more rigorous methodology employed to test the economic interdependence amongst the countries, is the Granger non-causality test by resorting to the augmented VAR procedure, on the lines suggested by Toda and Yamamoto (1995), which was subsequently extended by Rambaldi and Doran (1996). The Toda-Yamamoto causality procedure has been labeled as the long-run causality test and the estimation procedure requires that the variables be in levels. This technique utilizes a Modified Wald (MWALD) test for testing linear restriction on the parameters of a VAR system. This test has an asymptotic χ^2 distribution when a VAR ($k+d_{\max}$) is estimated, where d_{\max} is the maximum order of integration suspected to occur in the system, and k is the number of lag length in the VAR system. Therefore, to perform Granger non-causality test, it is required to determine the maximum number of unit root in the data (d_{\max}), and the optimal lag length (k), in order to estimate ($k+d_{\max}$) order of VAR formulated in levels (Appendix A).

Before employing the Toda-Yamamoto methodology, the variables, which are growth rates, are tested for unit roots. The Augmented Dickey-Fuller (ADF) (Said and Dickey, 1984) test results reveal that all variables in levels are stationary, that is, all are I(0). The results of ADF test are reported in Table 2. In addition, the Phillip-Perron (1988) (PP) and Kwiatkowski *et al.* (1992) (KPSS) unit root tests are also used to check for the order of integration, nevertheless, the same results have been obtained. It is also confirmed that d_{\max} is 0

Table 2
Results of Unit Root Test in Level Form

Variables	ADF	PP	KPSS
yAUS	-5.156(1)***	-7.488(10)***	0.080(4)
yFIJI	-7.203(0)***	-7.260(1)***	0.131(2)
yNZ	-5.106(0)***	-5.083(2)***	0.063(2)
yPNG	-4.989(0)***	-4.954(5)***	0.072(4)
ySAO	-4.281(0)***	-4.278(1)***	0.121(2)
ySOL	-6.826(0)***	-9.288(9)***	0.102(6)
	Critical Values		
1%	-4.273	-4.263	0.216
5%	-3.558	-3.553	0.146

Notes: yAUS, yFIJI, yNZ, yPNG, ySAO and ySOL denote the growth rates of real GDP of Australia, Fiji, New Zealand, Papua New Guinea, Samoa and Solomon Islands, respectively. The optimal lag lengths for ADF test were selected based on Schwarz Information Criterion (SIC), while the optimal lag lengths for PP and KPSS tests were chosen based on the automatic selection procedure of Newey-West for Bartlett kernel. Asterisks (***) and (**) indicate significant at 1% and 5% level, respectively.

For the augmented VAR analysis, the optimal lag length (k) was determined on the basis of AIC Criterion is 3. So we use VAR(3) model, since the lag will be equal to $0+k = 3$. Rambaldi and Doran (1996) show that Toda-Yamamoto's Granger non-causality test can be easily constructed using a Seemingly Unrelated Regression (SUR). Accordingly, we estimate a system of VAR(3) as follows

$$\begin{bmatrix} yAUS_t \\ yFIJI_t \\ yNZ_t \\ yPNG_t \\ ySAO_t \\ ySOL_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} yAUS_{t-1} \\ yFIJI_{t-1} \\ yNZ_{t-1} \\ yPNG_{t-1} \\ ySAO_{t-1} \\ ySOL_{t-1} \end{bmatrix} + A_2 \begin{bmatrix} yAUS_{t-2} \\ yFIJI_{t-2} \\ yNZ_{t-2} \\ yPNG_{t-2} \\ ySAO_{t-2} \\ ySOL_{t-2} \end{bmatrix} + A_3 \begin{bmatrix} yAUS_{t-3} \\ yFIJI_{t-3} \\ yNZ_{t-3} \\ yPNG_{t-3} \\ ySAO_{t-3} \\ ySOL_{t-3} \end{bmatrix} + A_4 \begin{bmatrix} e_{AUS} \\ e_{FIJI} \\ e_{NZ} \\ e_{PNG} \\ e_{SAO} \\ e_{SOL} \end{bmatrix} \quad (1)$$

where,

- $yAUS_t$: real GDP growth rate of Australia at time t;
 $yFIJI_t$: real GDP growth rate of Fiji at time t;
 yNZ_t : real GDP growth rate of New Zealand at time t;
 $yPNG_t$: real GDP growth rate of Papua New Guinea at time t;
 $ySAO_t$: real GDP growth rate of Samoa at time t;
 $ySOL_t$: real GDP growth rate of Solomon Islands at time t;
 e : error term;
 A_0 : an identity matrix;
 A_1, A_2, A_3, A_4 : are six times six matrices of coefficients

To test the null hypothesis of Granger non-causality from $yFIJI_t$ to $yAUS_t$, we test $H_0 : a_{12}^1 = a_{12}^2 = 0$,

where a_{12}^i are coefficients of $yFIJI_{t-1}$ and $yFIJI_{t-2}$ in the first equation of the system stated above. A causal relationship run from $yFIJI_t$ to $yAUS_t$ can be established through rejecting the null of $yFIJI_{t-1}$ and $yFIJI_{t-2}$ are jointly equal to zero. This requires finding the significance of the MWALD statistic for the group of the lagged independent variables identified above. Similar testing procedure can be used to examine the nature of causal linkages between the remaining variables in the VAR system.

Table 3
Result of a Augmented VAR(3) Toda-Yamamoto Granger Non-Causality Test

		yAUS	yFIJI	yNZ	yPNG	ySAO	ySOL
yAUS	MWald test	3.389	17.942	5.046	11.894	9.828	3.628
	p-value	0.184	0.000***	0.080*	0.003***	0.007***	0.163
yFIJI	MWald test	0.970	3.423	4.122	7.506	3.297	2.734
	p-value	0.616	0.181	0.127	0.023**	0.192	0.255
yNZ	MWald test	2.564	3.970	2.158	0.571	5.860	8.557
	p-value	0.277	0.137	0.340	0.752	0.053*	0.014**
yPNG	MWald test	7.605	8.227	14.491	0.124	12.437	7.238
	p-value	0.022**	0.016**	0.001***	0.940	0.002***	0.027**
ySAO	MWald test	0.413	23.902	1.994	2.932	5.347	3.657
	p-value	0.813	0.000***	0.369	0.231	0.069*	0.161
ySOL	MWald test	19.564	3.372	2.357	3.177	5.554	0.023
	p-value	0.000***	0.185	0.308	0.204	0.062*	0.988

Notes: The vertical axis denotes explained variable while the horizontal shows the explanatory variable. Augmented VAR(3) is used as the lag length for VAR system, $k = 3$, and assuming the maximum order of integration suspected to occur in the system, $d_{\max} = 0$. Asterisks (***), (**) and (*) denote significant at 1%, 5% and 10% levels respectively.

Table 3 shows the results of an augmented VAR(3) Toda-Yamamoto Granger non-causality test. One-way direction causality is detected running from growth rates of Fiji, NZ and Samoa to that of Australia. In the case of Fiji, the growth rate of PNG Granger causes the growth rate of Fiji. In regard to New Zealand's growth, rate, the relationship runs from the growth rates of Samoa and the Solomon Islands PNG's growth rate is Granger caused by growth rates of all countries. In the case of Samoa, only Fiji's growth rate Granger causes its growth rate. As regards Solomon Islands' growth rate, we find it is Granger caused by the growth rates of Australia and Samoa.

The bi-directional causality exists only between two sets of countries: between growth rates of Australia and PNG; and between those of Fiji and PNG. Trade relations are strong between PNG and Australia, which partly explain the bi-directional causality between their growth rates. The same argument is applicable to Fiji and PNG. However, the overall results imply that the bi-directional causal relationships are not pronounced. The inference is that the island economies and the economies of two advanced countries in the region are not interdependent to the extent one would require for pushing the currency union idea at this stage.

4. Summary and Conclusions

This paper examined the feasibility of a common currency for the Pacific region comprising 14 Pacific island countries and two developed countries, namely Australia and New Zealand, thus constituting the Pacific Forum. A single currency, either through launching a new currency or adopting the currency of a major partner country, here Australia requires fulfillment of the well known OCA conditions. One of the OCA conditions is the requirement of synchronization of growth rates in the candidate countries so that the adoption of union wide policies by a common monetary authority would be considered more appropriate.

In the absence of pronounced bi-directional causality in growth rates of the six selected PICs, it would not be expedient for them to adopt union wide, uniform macroeconomic policies. The policy conclusion emerging from the empirical study is that PICs, either with Australia and New Zealand or exclusively on their own, without involving Australia and New Zealand, are not presently suitable candidates for a currency union.

Since most of the literature on OCA conditions-relating to similarity in economic structures, growth rates, and adjustment policies, were written in the context of European economic integration. It is now increasingly argued that these OCA conditions do not have much predictive power when applied to actual exchange rate regimes (Masson and Pattillo, 2001; Frankel and Rose, 1998). This is based on a strong belief that OCA criteria are to some extent endogenous and that monetary union either in the form of locking one's exchange rate into the major partner's or through adoption of a common currency might help the countries becoming more symmetric in the long run and would also expand intra-union trade.

Despite asymmetric growth rates, the 14 PICs and the region's two advanced countries closely trade-integrated. The PIC trade is dominated by Australia and New Zealand. Further, PICs have been the recipients of substantial annual official development assistance flows over several decades. Thus, there is a high degree of dependence as well. Therefore, in the event of a currency union with a common currency or adoption of the Australian dollar, the loss to PICs of their monetary and exchange rate policies, as stabilization tools can be compensated by appropriate mechanisms. These mechanisms include flexibility in prices and wages, mobility in labor and other factors of production or fiscal transfers. The political thinking as reflected in the Senate Committee's recommendation in favor of an eventual Pacific Economic and Political Community (2003) indicates an optimistic atmosphere that current aid flows, which amount to fiscal transfers would be significantly increased; and that there could be relaxation in Australian and New Zealand immigration laws to facilitate seasonal employment for Pacific islanders in agriculture and other selected spheres of economic activities. Such shifts in policy preferences on the lines indicated above would make OCA properties satisfied *ex post* even if they were not fully satisfied *ex ante*, as currency union would bring about further closer trade and investment integration in the region.

References

- Asian Development Bank (ADB). (2003). *Key Indicators of Asian and Pacific Developing Countries 2003*. Asian Development Bank, Manila.
- Australian Agency for International Development (AusAID). (2001). *Pacific: Program Profiles: 2000–01*. Canberra: Australian Government Overseas Aid Program.

- Australian Senate Committee Report. (2003). *A Pacific Engaged: Australia's Relations with Papua New Guinea and the Island States of the Southwest Pacific*. Canberra: Commonwealth of Australia.
- Bayoumi T. and Mauro, P. (1999). *The Suitability of ASEAN for a Regional Currency Arrangement*, IMF Working Paper WP/99/162. Washington, D.C.: International Monetary Fund.
- Bayoumi, T. and Ostry, J.D. (1997). Macroeconomic Shocks and Trade Flows within Sub-Saharan Africa: Implications for Optimum Currency Arrangements. *Journal of African Economies*, 6(4), 412-444.
- Brash, D. (2000). *The Pros and Cons of Currency Union: A Reserve Bank Perspective*, An address to the Auckland Rotary Club, 22 May 2000. <http://www.rbnz.govt.nz/speeches/0091114.html>
- Chand, S. (2003). An Assessment of the Proposal for a Pacific Economic and Social Community. *Pacific Economic Bulletin*, 18(2), 117-124.
- Coleman, A. (1999). Economic Integration and Monetary Union. *New Zealand Treasury Working Paper 99/6*. Wellington: Government of New Zealand Treasury.
- Collier, P. (1991). Africa's External Economic Relations 1960-90. *African Affairs*, 90 (July), 339-356.
- Crossby, M. and Otto, G. (2003). An Australia and New Zealand Currency Union. University of Melbourne. <http://www.economics.unimelb.edu.au/mcrosby/ANZ.PDF>
- de Brouwer, G. (2000). Should Pacific Island countries Adopt the Australian dollar? *Pacific Economic Bulletin*, 15(2), 161-9.
- Eichengreen, B. and Bayoumi, T. (1999). Is Asia an Optimum area? Can it Become One? In S. Collignon, J. Pisani-Ferry and Y.C. Park (eds.) *Exchange Rate Policies in Emerging Asian Countries*. London: Routledge.
- Fabella, R. (2002). Monetary Cooperation in East Asia. *Economics and Research Department Working Paper No.13*. Manila: Asian Development Bank.
- Frankel, J.A. and Rose, A.K. (2000). *Estimating the Effect of Currency Unions in Trade and Output*, National Bureau of Economic Research Working Paper (NBER) No.7857. Cambridge, Mass: NBER.
- Grimes, A., Holmes, F. and Bowden, R. (2000). *An Anzac Dollar? Currency Union and Business Development*. Wellington, New Zealand: Institute of Policy Studies.
- Hargreaves, D. and McDermott, J. (1999). Issues relating to Optimal Currency Areas: Theory and Implications for New Zealand. *Reserve Bank of New Zealand Bulletin*, 62, 16-29.
- Hughes, H. (2003). *Aid has Failed in the Pacific*, Issue Analysis No.33. Sydney: The Centre for Independent Studies.
- International Monetary Fund (IMF). (1997). *Optimum Currency Areas: New Analytical and Policy Developments*. Washington, DC: IMF.
- International Monetary Fund (IMF). (2001). International Experience with Common Currency Arrangements. *Paper presented at the Seminar on Common Currency Arrangements and the Exchange Rate Mechanism in ASEAN*, August 6-7, Kuala Lumpur.
- International Monetary Fund (IMF). (2003). *International Financial Statistics Yearbook 2003*. Washington, DC: Canberra.
- Kwiatkowski, D., Phillips, P.C.B., Schmidt, P. and Shin, Y. (1992). Testing the null hypothesis stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root? *Journal of Econometrics*, 54, 159-178.
- Masson, P. and Pattillo, C. (2001). Monetary Union in West Africa (ECOWAS): Is It Desirable and How Could It Be Achieved. *Occasional Paper No.204*, IMF. Washington, DC.: IMF.
- Mundell, R. (1961). A theory of optimum currency areas. *American Economic Review*, 51: 657-64.
- Phillips P.C.B. and Perron, P. (1988). Testing for unit root in time series regression, *Biometrika*, 75, 335-346.
- Rambaldi, A.N. and Doran, H.E. (1996). *Testing for granger non-causality in cointegrated systems made easy*. Working papers in econometrics and applied statistics, Department of Econometrics, University of New England: Armidale NSW.
- Romano, A. (1970). *Applied Statistics for Science and Industry*. Boston: Allyn and Bacon Inc.
- Rosales, J.R. (2001). Macroeconomic Policy and Financial Sector Stability in Pacific Island Countries. *Paper presented at the Conference on Financial Sector Stability and Development*, Apia, 2-21 February.
- Said, D.E. and Dickey, D.A. (1984). Testing for unit root in autoregressive moving average models of unknown order. *Biometrika*, 71, 599-607.
- Toda, H.Y. and Yamamoto, T. (1995). Statistical inference in vector autoregressions with possible near integrated processes. *Journal of Econometrics*, 66: 225-250.

- United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). (2004). *Economic and Social Survey 2004*. Bangkok: UNESCAP.
- United States General Accounting Office (USGAO). (2001). *Foreign Assistance: Lessons Learned from Donors' Experiences in the Pacific Region*. Washington D.C.: USGAO.
- World Bank. (1993). *Pacific Island Economies toward Efficient and Sustainable Growth*, Volume on An Overview. Washington D.C.: World Bank.

Appendix A

A Brief Note on Toda -Yamamoto Methodology

The Toda and Yamamoto (1995) methodology is a modified version of the Granger causality test. It was devised with a view to overcoming the problem of invalid asymptotic critical, when causality tests are performed in respect of non-stationary series. According to Toda and Yamamoto (1995), even if the series are nonstationary, a vector autoregressive (VAR) model in levels can be resorted to, estimated and standard Wald test can be applied.

The Toda and Yamamoto methodology requires the determination of the d_{\max} , that is the maximal order of integration of the series in the model and to intentionally over-fit the causality test underlying the model with additional d_{\max} lags so that the VAR order would be $p = k + d$, where k is the optimal lag order (Seabra and Flach, 2005).

In a simple two-variable model given below, the augmented Granger causality test could be done as by using the seemingly unrelated regressions (SUR) technique. Rambaldi and Doran (1996) has shown when SUR procedure is followed, the Wald tests prove more efficient.

$$X_t = \sum_{i=1}^{k+d} \alpha_{1i} X_{t-i} + \sum_{i=1}^{k+d} \beta_{1i} Y_{t-i} + u_{1t} \quad (1)$$

$$Y_t = \sum_{i=1}^{k+d} \alpha_{2i} Y_{t-i} + \sum_{i=1}^{k+d} \beta_{2i} X_{t-i} + u_{2t} \quad (2)$$

where

- X and Y are the variables,
- k is the optimal lag order,
- d is the maximal order of integration of the series in the system; and
- u_1 and u_2 are the white noise.

Conventional Wald tests are then applied to the first k coefficient matrices using the standard statistics. The hypothesis set can be drawn as follows: (i) in equation (1), Y Granger causes X, if it is not true that $\beta_1 = 0$ and (ii) in equation (2), X Granger causes Y if it is not true that $\beta_2 = 0$.

The lag selection procedure is a crucial step for the augmented Granger causality test, when theory and statistical results indicate a small number of lags in the VAR component. To choose the optimum lag length, either Schwartz or AIC selection criterion is followed.

Appendix 1
Key Indicators of Pacific Island Countries

Country	Land Area sq.km	Population (‘000) (2002)	Exclusive Economic Zone (‘000 sq.km)	Total GDP (US\$ million) (2002)	Per capita GDP (US\$) (2001)	Aid per capita (US\$) (2000)	Aid as % of GDP (2000)	Human Development Index (HDI) (1999)	Global HDI Rank (1999)
Cook Islands	240	19	1,830	51	2,651	420	15.9	0.822	62
Fiji	18,272	799	1,260	1,605	2,008	46	2.3	0.667	101
Kiribati	690	85	3,550	45	530	203	38.4	0.515	129
Marshall Islands	170	51	2,131	102	2,008	1,438	49.3	0.563	121
Micronesia	701	114	2,978	213	1,864	1,010	54.1	0.569	120
Nauru	24	12	320	81	7,017	183	2.6	0.663	103
Niue	259	2	390	7	4,773	2,720	58.6	0.774	70
Palau	487	19	601	129	6,989	2,168	31.1	0.861	46
Papua New Guinea	3,120,000	5,099	468	4,232	830	82	8.5	0.314	164
Samoa	2,857	175	120	177	1,004	208	20.6	0.590	117
Solomon Islands	28,446	418	1,630	300	720	102	14.4	0.371	147
Tonga	699	98	700	173	1,763	252	14.3	0.647	107
Tuvalu	26	11	757	4	345	471	130.0	0.583	118
Vanuatu	12,189	183	680	241	1,319	223	16.8	0.425	140

Sources: US General Accounting Office (2001), Australian Agency for International Development (2001) and Asian Development Bank (2003).

Can Pacific Island Countries Form a Currency Union with Australia? An Empirical Study on Interdependence in the Pacific Region

Appendix 2

Growth Rates, Fiscal and External Current Account Balances and Inflation

Category	Average GDP Growth Rate (%)					Average Overall Fiscal Balance (% of GDP)					Inflation (%)				
	1995-1999	2000	2001	2002	2003	1995-1999	2000	2001	2002	2003	1995-1999	2000	2001	2002	2003
A. Countries with no separate legal tender															
Cook Islands	-1.2	7.9	5.1	2.2	1.8	-4.2	-1.9	1.5	0.2	-3.2	0.1	1.7	9.5	3.9	2.4
Kiribati	4.3	1.6	1.8	0.9	2.5	-3.4	-26.4	7.6	21.4	-13.4	2	0.4	6	3.2	2
Marshall Islands	-5.1	-3.1	1.6	3.8	NA	11.8	8.7	2.2	14.8	14.1	4.9	1.6	1.7	2	2.5
Micronesia	-0.5	4.4	1.1	0.8	NA	-0.9	-6.9	-6.2	2.5	1.9	5.6	2.1	1.3	-0.2	-0.2
Nauru	NA	NA	NA	NA	NA	-41.8	NA	NA	NA	NA	8.9	NA	NA	NA	NA
Niue	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palau	4.7	NA	NA	NA	NA	17.5	NA	NA	NA	NA	3.5	NA	NA	NA	NA
Tuvalu	5.3	3	4	2	2	4.1	15.4	-54.3	76.5	-16.3	2.8	5.3	1.8	2.6	2.6
B. Countries with currencies pegged to a basket															
Fiji	2.1	-3.2	3	4.1	5	-3.5	-3.4	-6.6	-5.6	-6.1	3.2	1.1	4.3	0.8	4.1
Samoa	4.7	6.9	6.2	1.8	3.5	1.1	-0.7	-2.7	-2.1	-0.6	2.2	1	3.8	8.1	0.1
Solomon Islands	2.3	-14.3	-9	-2	-1.9	-3.4	-4.2	-11.5	-11.1	0.9	9.8	7.3	6.8	7.3	8.3
Tonga	2.3	6.5	0.5	1.6	1.9	-1.2	0.5	-0.9	-1.6	-3.1	3.3	5.3	6.9	10.4	11.1
Vanuatu	1.7	2.7	-2.1	-2.8	1	4.7	-6.8	-3.7	-3.2	-1.1	2.5	2.5	3.7	2	3
C. Countries with flexible exchange rate															
Papua New Guinea	0.2	-1.2	-2.3	-0.8	2	-2.1	-2	-3.6	-4.1	-1.7	12.9	15.6	9.3	11.8	11.8

Sources: Rosales (2001), Asian Development Bank (2003) and United Nations ESCAP (2004).

Appendix 3**Main Merchandise Exports and Tourism Earnings of PICs (Average of 1996-1999)**

Countries	Main Merchandise Exports (% of Total Merchandise Exports)	Tourism Earnings (% of Exports of Goods & Services)
Fiji	Sugar	27.1
	Garments	23.1
Kiribati	Copra	52.1
	Seaweed	7.8
Marshall Islands	Fish	66.1
	Coconut oil	12.1
Micronesia	Fish	88.1
	Garments	6.2
PNG	Gold	30.1
	Copper	19.4
	Crude Oil	18
Samoa	Coconut oil	28.1
	Copra	15.9
Solomon Islands	Timber	51.1
	Palm Oil	11.1
Tonga	Squash	44.4
	Fish	19.6
Vanuatu	Copra	40.2
	Beef	12.1

Source: Asian Development Bank (2003).

Can Pacific Island Countries Form a Currency Union with Australia? An Empirical Study on Interdependence in the Pacific Region

Appendix 4
Intra-Regional Exports and Imports of PICs

Countries		Intra-Reg Exports (% of Total)	Intra-Reg Imports (% of Total)	Intra-Reg Trade (% of Total)	Intra-Reg Trade (% of GDP)	Exports to Australia (% of Total)	Imports from Australia (% of Total)	Exports to NZ (% of Total)	Imports from NZ (% of Total)	Total Trade (% of GDP)
Cook Islands	Average of 1994-1997	-	10.26	9.52	4.9	21.07	7.19	25.51	70.94	51.43
	1998	-	11.76	10.83	5.6	28.3	9.75	10.4	68.2	52.45
	1999	-	10.44	9.82	5.2	9.32	8.2	25.2	68.94	54.85
	2000	-	18.49	15.68	12.03	33.91	5.97	25.13	60.58	76.73
	2001	-	11.12	9.74	6.77	29.12	6.1	8.2	74.83	74.4
	2002	-	6.2	5.6	3.41	22.08	6.85	13.9	79.07	61.5
Fiji	Average of 1994-1997	0.31	0.07	0.38	0.505	26.67	39.86	6.99	15.50	76.87
	1998	4.73	0.12	2.13	0.73	33.79	44.84	4.31	15.11	86.84
	1999	6.84	0.1	2.81	0.64	33.02	41.09	4.47	13.10	90.62
	2000	7.11	0.14	3.35	0.94	25.67	48.71	3.53	13.04	89.62
	2001	8.33	-	3.7	0.07	19.74	44.26	3.46	14.88	82.5
	2002	7.21	-	3.02	0.06	19.43	37.31	3.76	17.15	89.26
Kiribati	Average of 1994-1997	-	7.8	5.15	11.67	3.02	18.11	-	3.94	88.78
	1998	-	10.01	8.7	17.06	4.05	21.82	-	1.69	102.74
	1999	-	14	11.37	16.31	2.59	33.08	-	3.02	98.02
	2000	-	14.21	10.7	22.26	0.24	34.12	-	4.75	80.98
	2001	-	20.8	11.87	21.53	0.39	37.16	-	2.91	91.87
	2002	-	12.67	9.14	20.69	0.38	26.6	-	3.58	124.74
RMI	Average of 1994-1997	-	0.97	0.71	0.46	-	1.31	-	1.01	83.41
	1998	-	0.78	0.7	0.35	-	2.01	-	0.71	67.93
	1999	-	1.16	1.02	0.5	-	1.42	-	0.85	68.94
	2000	-	1.25	1.05	0.54	-	1.46	-	0.89	68.33
	2001	-	NA	NA	NA	NA	NA	NA	NA	61.3
	2002	-	NA	NA	NA	NA	NA	NA	NA	67.62
FSM	Average of 1994-1997	0.01	-	0.01	0.01	NA	2.62	-	-	65.61
	1998	0.19	-	0.02	0.01	NA	4.02	-	-	64.71
	1999	0.2	-	0.02	0.01	NA	19.79	-	-	64.39
	2000	NA	NA	NA	NA	NA	NA	NA	-	73.07
	2001	NA	NA	NA	NA	NA	NA	NA	NA	53.05
	2002	NA	NA	NA	NA	NA	NA	NA	NA	52.01
PNG	Average of 1994-1997	0.03	0.03	0.06	0.11	27.68	51.43	1.39	4.01	88.89
	1998	0.21	0.24	0.45	0.21	18.72	52.41	0.69	4.12	94.70
	1999	0.18	0.30	0.44	0.23	26.29	53.01	0.16	4.1	114.12
	2000	0.21	0.36	0.57	0.29	29.98	49.54	0.73	3.8	116.45
	2001	0.1	0.21	0.25	0.2	24.62	51.29	1.35	4.02	94.42
	2002	0.10	0.13	0.31	0.18	23.74	49.26	1.32	4.4	95.81

Appendix 4
Intra-Regional Exports and Imports of PICs (Continued)

Countries		Intra-Reg Exports (% of Total)	Intra-Reg Imports (% of Total)	Intra-Reg Trade (% of Total)	Intra-Reg Trade (% of GDP)	Exports to Australia (% of Total)	Imports from Australia (% of Total)	Exports to NZ (% of Total)	Imports from NZ (% of Total)	Total Trade (% of GDP)
Samoa	Average of 1994-1997	-	10.49	7.70	6.50	84.18	19.18	6.17	35.15	47.89
	1998	-	18.08	11.9	11.6	48.96	16.23	2.74	22.59	51.74
	1999	-	16.67	12.27	11.52	58.95	14.59	3.68	23.01	57.34
	2000	-	9.48	13.02	9.48	57.36	27.31	2.37	13.89	38.69
	2001	-	12.6	9.98	13.64	60.98	13.12	1.42	17.32	59.9
	2002	-	20.33	14.17	13.43	59.5	15.75	2.05	4.25	56.2
Soloman Islands	Average of 1994-1997	0.38	0.66	1.04	1.92	1.38	40.92	0.26	7.43	94.27
	1998	1.07	4.3	5.1	2.66	1.97	42.96	0.35	5.26	108.46
	1999	1.29	3.7	4.36	2.81	1.34	38.53	0.47	6.29	110.78
	2000	2.1	6.1	8.2	3.7	2.79	27.5	0.74	5.63	85.89
	2001	-	7.46	4.4	NA	1.69	29.27	0.28	5.0	NA
	2002	-	9.1	5.10	NA	0.88	31.31	0.25	5.02	NA
Tonga	Average of 1994-1997	3.08	7.65	6.97	3.76	4.72	33.56	9.66	38.47	51.67
	1998	6.12	7.41	7.26	4.04	4.53	24.68	13.98	36.17	52.4
	1999	2.0	9.96	8.79	4.98	3.21	19.98	8.74	37.22	65.7
	2000	1.65	12.2	9.73	6.65	1.98	10.27	3.68	23.99	79.2
	2001	2.55	19.73	17.1	12.98	1.56	11.24	4.41	33.21	102.9
	2002	2.14	21.42	17.0	13.61	1.44	13.2	3.55	30.83	133.7
Tuvalu	Average of 1994-1997	1.04	30.49	45.5	29.23	-	39.41	-	6.31	81.63
	1998	1.61	59.81	58.39	41.24	-	20.21	-	6.31	70.06
	1999	5.14	63.84	57.18	45.67	-	18.1	-	5.27	79.87
	2000	11.39	58.58	56.01	58.77	-	19.57	-	4.57	104.93
	2001	13.92	65.19	62.48	69.7	-	16.28	-	7.68	52.10
	2002	9.16	54.32	51.1	NA	-	12.9	-	5.21	NA
Vanuatu	Average of 1994-1997	0.01	0.93	0.94	2.67	4.05	21	0.47	5.19	85.58
	1998	1.41	5.67	7.08	3.92	0.60	21.67	0.39	4.76	92.32
	1999	1.19	4.12	5.31	3.98	0.68	17.95	0.44	4.13	122.87
	2000	4.84	8.55	13.39	5.75	0.54	25.08	0.44	6.93	79.24
	2001	-	4.72	3.17	3.58	3.01	25.37	1.12	6.57	53.72
	2002	-	7.11	1.88	4.13	3.20	23.48	0.64	10.69	52.41

Notes: NA: not available, "-": negligible
Source: Asian Development Bank (2003).