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A SINGLE CURRENCY FOR PACIFIC ISLAND COUNTRIES: AN SVAR ANALYSIS

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1. Introduction

Interest in monetary integration of Pacific Island countries[1] (PICs) received a major boost in March 2003 when an Australian Senate Committee (2003) made a recommendation of far reaching nature toward ushering in a Pacific Economic and Political Community. The Senate Committee, which studied Australia's relations with the PICs, suggested adoption of the Australian dollar as the common currency. Earlier, the successful introduction of the euro in Europe, just before the new millennium began was an inspiration to PIC leaders. As a result, two major initiatives were launched in 2002: one aimed at introduction of free trade by 2010 amongst PICs and the other at promoting closer economic relations with possibilities of unhindered trade by 2015 with Australia and New Zealand[2]. Gradual trade liberalisation over the next few years and free trade among PICs in the first instance were considered as stepping stones for promoting the goal of regional economic integration.

Response to the Australian proposal of a single currency, however, was not enthusiastic (Chand 2003), as it was felt that Australia had been too quick to propose a common currency, which is the *nirvana* of political and economic integration. The critics believe that the most essential element required for a currency union, namely a regional political solidarity, which evolved over a 50-year period in Europe, is absent in the South Pacific. Aside from assessing the degree of political commitment, one has also to assess whether there is an economic case in the South Pacific for a single currency. The economic case for a single regional currency rests on the fulfilment of certain pre-requirements, known as optimum currency area (OCA) conditions, which were originally expounded by Mundell (1961). The OCA conditions were subsequently elaborated and updated from time to time by several empirical studies,

[1] The 14 PICs are: Cook Islands, Fiji, Kiribati, Republic of Marshall Islands, Federated States of Micronesia, Nauru, Niue, Palau, Papua New Guinea (PNG), Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu. These 14 PICs and the two metropolitan powers in the region, namely Australia and New Zealand are the members of the Pacific Islands Forum, the major regional organization. All 16 countries are known as Forum Countries .

[2] There were two agreements signed in 2002. One was the Pacific Island Countries Trade Agreement (PICTA), signed by 14 PICs and the other was the Pacific Agreement on Closer Economic Relations (PACER) signed by all 16 Forum countries. Both the agreements received the necessary number of ratifications and became effective in late 2003.

including Ng (2002), Bayoumi, Eichengreen and Mauro (2000), Eichengreen and Bayoumi (1999), International Monetary Fund (1997, 2001) and de Grauwe (1994).

One of the OCA conditions relates to the existence of a large intra-trade volume among the prospective members of a currency union so that there could be immediate and substantial gains flowing out of common currency, mainly in terms of savings in transaction costs as well as arising out of absence of volatility in bilateral exchange rate movements. Further, 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 all the prospective member countries face a similar pattern of shocks. Countries experiencing common external shocks would be better suited to a currency union because it permits the use of union-wide policies to correct any imbalances, including the adjustment of the common currency (Mundell 1961).

The pattern of shocks would determine nature of the cost of surrendering monetary sovereignty, as member countries of a currency union cannot follow independent monetary and exchange rate policies for adjustment. If they face similar shocks, the costs of losing tools of adjustment would be lower than otherwise (Bayoumi, Eichengreen and Mauro 2000; Maskay 2003). Masson and Taylor (1993) observed that while there were many OCA criteria, including openness, intra-trade volume, and labour mobility, the shock-absorption criterion combines the net influence of several traditional criteria pointing to the choice of the optimal exchange rate. This particular property eliminates the problems arising out of conflicting policy prescriptions, which emanate from the application of individual OCA criteria (Maskay 2003). Accordingly, this paper uses the criterion of shock absorption for determining whether PICs could be candidates for a currency union with Australia, adopting the Australian dollar, or for a currency union amongst themselves, keeping Australia out, with a common currency of their own.

The remainder of the paper is organized as follows. The second section provides a brief background of the Pacific island economies discussing their current trade patterns; the third section deals with the methodology employed in the study for measuring the pattern of

underlying disturbances the PICs have been facing and reports the results of the empirical analysis. The fourth and final section presents some conclusions.

2. Economic Integration Efforts in the Pacific Island Countries

The PICs exhibit unparalleled diversity of culture and language as well as great variation in physical endowments. Land area varies from country to country: 24sq.km in case of Nauru to 462,840sq.km in the case of Papua New Guinea (PNG). So too is population (Table 1), with the most populous nation being PNG (5.1 million) and the least being Niue (2,000). While Kiribati and Tuvalu are atoll countries with poor soils and hence limited agricultural possibilities, PNG, the Solomon Islands, Fiji, Samoa and Tonga have relatively large tracts of fertile land, with substantial agricultural potential.

Open Economies

Despite these variations, the economic challenges faced by all PICs are similar: small domestic markets and remoteness from major markets (Urwin 2004). They have to depend upon imports for almost all basic commodities; and rely upon a very few exports such as fish, copra, timber and tourism, and on remittances from migrant seafaring men, to finance their imports. Almost all PICs depend heavily on foreign aid. Further, being located on the hurricane belt, most of the PICs are prone to annual natural disasters.

Table 1
Key Indicators of Pacific Island Countries

Country	Land Area sq.km	Population ('000) (2002)	Exclusive Economic Zone ('000 sq.km)	Total GDP (US$ mil) (2001)	Per capita GDP (US$) (2001)	Aid per capita (US$) (2000)	Aid as % of GDP (2000)	Human Develpt Index (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

Source: US General Accounting Office (2001)
Australian Agency for International Development (2001)
Asian Development Bank (2003)

The PICs are open economies—in several cases this is not because they have low trade barriers but because they are small and therefore have large import flows. Their trade volumes in commodities (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). Exports of PICs are limited in range. While PNG's major exports are gold, petroleum, copper, timber and coffee, Fiji's main exports are sugar, garments and gold. For smaller island countries, which have negligible manufacturing capacity, reliance on primary exports is much greater. For Samoa, exports are fish, copra and related products; for Tonga squash, fish and root crops; and for Vanuatu, beef, copra and cocoa. Thus, PICs are generally more competitive than complementary to each other.

Intra-regional Trade

Intra-PIC trade has been small (Table 2). The major intra-regional trading partners are Fiji and PNG, understandably because of their significant manufacturing base. Fiji has been exporting to other PICs processed consumer goods in fairly large volumes, such as wheat flour, cooking oil and biscuits. 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, only these two PICs, PNG and Fiji are substantially diversified. In terms of percentages of GDP intra-regional trade volume in 2000 varied from 59 per cent in Tuvalu which imports substantial consumer goods from Fiji, to 0.01 percent in the Federated States of Micronesia (FSM), which imports most of its consumer goods from the United States of America. In terms of percentages of total trade, intra regional imports range from 56 per cent in the case of Tuvalu to 0.02 per cent in the case of FSM.

Table 2

Intra-Regional Exports and Imports of PIC

Countries		Intra-Reg Exports (% of Total Exports)	Imports (% of Total Imports)	Intra-Reg Trade (% of Total Trade)	Intra-Reg Trade (% of GDP)	Exports to Australia (% of Total Exports)	Imports from Australia (% of Total Imports)	Exports to NZ (% of Total Exports)	Imports from NZ (% of Total Imports)	Total Trade (% of GDP)
Cook Is	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
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

Sol. Is.	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

NA: Not available

"-" : negligible

Source: Asian Development Bank (2003)

Current Exchange Rate Regimes

The exchange rate arrangements of PICs vary. They span the continuum from the exclusive use of a foreign currency as legal tender through to an independent and free-floating domestic currency (Table 3). Eight PICs, which do not have an independent domestic currency of their own have adopted the national currencies of Australia, New Zealand or the United States: Kiribati, Nauru and Tuvalu (the Australian dollar); the Cook Islands and Niue (the New Zealand dollar); and FSM, RMI, and Palau (the United States dollar). Five PICs (Fiji, Samoa, Solomon Islands, Tonga and Vanuatu) have their own currencies, pegged to baskets of currencies whose composition and weights are generally kept confidential. PNG, on the other hand, has a freely floating exchange rate regime. Rosales (2001) notes that inflation has been higher in PNG and in those countries that have been dollarised. In fact, the PICs with independent currencies seemed to have done better on the inflation front. Thus, there is nothing remarkable to commend any specific exchange rate regime in particular.

However, as noted earlier, adopting a common currency will bring about gains to PICs through elimination of currency conversion costs thereby reducing currency transaction costs on products and services as well as costs associated with exchange rate fluctuations. The theory of OCA indicates that gains would be greater, the greater the volume of intra-trade. Since PICs trade a great deal with Australia, gains from adopting the Australian dollar would be substantial. Studies (de Brouwer 2000, Jayaraman 2003) showed that a currency union between PICs without Australia would not result in as much gains as would result from a larger sized union with Australia. However, there are uncertainties regarding the sharing of seignorage revenue with Australia. Further, there are no indications as to whether the Reserve Bank of Australia would be prepared to act as a lender of last resort to commercial banks in crises in PICs (Jayaraman 2004).

Table 3

Growth Rates, Fiscal and External Current Account Balances and Inflation

Category	**Average GDP** Growth Rate (%) (1995-1999)	2000	2001	2002	2003	**Average Overall Fiscal Balance** (% of GDP) (1995-1999)	2000	2001	2002	2003	**Inflation (%)** Average (1995-1999)	2000	2001	2002	2003
A. Countries with no separate legal tender															
Cook Is	-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

Source: Rosales (2001), Asian Development Bank, (2003)
United Nations, ESCAP (2004)

Nature of Shocks

PICs in the process of forming a currency union either amongst themselves or with Australia have to surrender their monetary sovereignty as they have to abide by a common set of monetary policies. This requires the presence of a high degree of similarity in the shocks they have been experiencing (Mundell, 1961). Countries experiencing common external shocks would be better suited to a currency union because it permits the use of union-wide policies to correct any imbalances, including the adjustment of the common currency. Since the currency union would have a single monetary policy, the more asymmetric the external shocks, the greater would be the risk to the stability of the union. Countries are less likely to face large asymmetric terms of trade shocks if they have similar structures (Masson and Pattillo 2001a, 2001b).

Most of the adverse effects of asymmetric shocks, including increases in unemployment and declines in income, would be reduced if there were downward flexibility in prices and wages (Soltwedel, Dohse and Krieger-Boden 2000). In the absence of such downward flexibility, the presence of considerable mobility of labor between member countries would be a great help. Additionally, if the currency union builds in some provision for a mechanism of fiscal transfer to redistribute income or compensate for differences in unemployment between member countries, the asymmetry of shocks will be less of a problem (Masson and Pattillo 2001a, 2001b; de Brouwer 2000; McKinnon 1963; Kenen 1969).

While the possibilities of downward price and wage flexibility, migration from PICs to Australia and fiscal transfers are all uncertain at this stage, it is at least worthwhile to check whether the PICs and the two advanced countries of the region, namely Australia and New Zealand, have been experiencing symmetrical shocks so as to emerge as candidate countries for a forming currency union. The next section deals with the question in detail.

3. Empirical Analysis and Results

As Bayoumi and Ostry (1997) observe, there is a limitation to the analysis through correlations of output growth across countries because of its failure to make any distinction between the underlying disturbances themselves. For distinguishing temporary from permanent shocks affecting a given group of countries across different regions in Europe, the Americas and East Asia, Bayoumi and Eichengreen (1993, 1994) employed Vector AutoRegression (VAR) models with restrictions on long run parameters, on the lines of Blanchard and Quah (1989).

Model

Following the aforementioned studies, we employ three-variable Structural VAR (SVAR)[3] open economy models to investigate the nature of shocks affecting the 6 PICs together with Australia and New Zealand. The three variables are growth in world output (y^*), growth in domestic output (y) and price inflation (p), all of which are expressed in annual values. The standard aggregate demand and supply framework with an upward–sloping short-run aggregate supply curve, a downward-sloping aggregate demand curve and a vertical long- run supply curve provides the basis for our study. The SVAR models developed below impose restrictions on the long run impulse responses of the variables to a shock to the structural innovations.

The first step in this modelling framework is to formulate and estimate the reduced form VAR models:

$$X_t = \Phi_1 X_{t-1} + \Phi_2 X_{t-2} + ... + \Phi_p X_{t-p} + \varepsilon_t = \Phi(L) X_t + \varepsilon_t \qquad (1)$$

where X_t is a covariance stationary vector process containing *n* endogenous variables, the Φ_i are (*n* x *n*) matrices of reduced form parameters, ε_t is a vector white noise process with $E(\varepsilon_t) = 0$, $E(\varepsilon_t \varepsilon_t') = \Sigma_\varepsilon$ and $E(\varepsilon_s \varepsilon_t') = 0 \; \forall s \neq t$ and $\Phi(L)$ is a polynomial matrix of lag length p.

[3] A complete exposition of SVAR modeling procedures is given in Amisano and Giannini (1997); more concise summaries are in Lutkepohl and Kratzig (2004, Chapter 4) and Enders (2004, Chapter 5).

Moreover, as the process X_t is considered stationary (see Table A1 in the Appendix for results of unit root tests), we may conveniently analyse the effects of shocks in the variables of the system most easily by inverting (1) into its Wold moving average form:

$$X_t = A(L)\varepsilon_t = (I_n - \Phi(L))^{-1}\varepsilon_t \qquad (2)$$

The elements of A represent the impulse responses of the components of X_t to shocks to the ε_t innovations. In the case of $X_t \sim I(0)$ the effects of the shocks are transitory and tend toward zero over time, whereas the accumulated responses give the total long run effects of a shock. However, because the contemporaneous relations between the variables are not modelled explicitly we can expect the reduced form innovations (ε_t) to be contemporaneously correlated with each other, hence they are not structural innovations. The SVAR models in this study focus on structural moving average representations:

$$X_t = B(L)u_t \qquad (3)$$

where B(L) is a polynomial matrix in L, the Bs are matrices of structural coefficients at the respective lags, and u_t is a vector of serially and contemporaneously uncorrelated, normalised structural shocks with $E(u_t u_t') = I_n$ and $CC' = \Sigma_e$. Writing the vector of reduced form innovations as a linear combination of the structural innovations, i.e. $\varepsilon_t = Cu_t \quad (\Rightarrow u_t = C^{-1}\varepsilon_t)$, we have the relationships[4]:

$$X_t = A(L)Cu_t = B(L)u_t \Rightarrow A(L)C = B(L) \qquad (4)$$

These relations enable us to identify the structural innovations from their reduced form counterparts in the VAR model. Consequently, given knowledge of the elements in the matrix C, the structural form (3) can be recovered from the estimates of the reduced form representation in (1). In practice, this identification is achieved by imposing restrictions of the long run impulse response coefficients. This has the advantage (over short run restrictions) in that economic theory usually provides more guidance about long run relationships than about short run dynamics.

[4] This is an example of the C-model presented in Amisano and Giannini (1977, pp.17).

In this paper we impose zero restrictions on the elements of the C matrix such that some structural shocks do not have long run effects for some of the variables. In order to identify our VAR models, each having n = 3 endogenous variables, we need to impose $(3^2-3)/2 = 3$ restrictions on the structural model in (3). Combining (3) and (4), the moving average form of the SVAR models can be expressed as:

$$X_t = X_t = A(L)Cu_t \tag{5}$$

which, for the present case, can be written out as:

$$\begin{bmatrix} y_t^* \\ y_t \\ p_t \end{bmatrix} = A(L)\sum_{i=0}^{\infty} \begin{bmatrix} c_{11} & c_{12} & c_{13} \\ c_{21} & c_{22} & c_{23} \\ c_{31} & c_{32} & c_{33} \end{bmatrix} \begin{bmatrix} u_{e,t-i} \\ u_{s,t-i} \\ u_{d,t-i} \end{bmatrix} \tag{6}$$

where y_t^*, y_t, p_t are, respectively, the growth rate in real world output, growth in real domestic output and domestic inflation. That is, each variable in the model is the annual change in the logarithm level of the underlying variable.

In (5) C is a 3×3 matrix representing the accumulated long-run response of the variables to the structural shocks ($u_{e,t}, u_{s,t}, u_{d,t}$), which are interpreted as independent external, supply and demand shocks, respectively. The long-run identifying restrictions are specified in terms of the elements of the C matrix. The focus in this study is on the long run responses of domestic growth and inflation to external supply shocks. The external shocks, which are assumed to be a combination of both external demand shocks and external supply shocks, stem from movements in the world business cycles and are outside the control of the domestic economies. Hence we have three long run restrictions, giving the *C* matrix as follows:

$$C = \begin{bmatrix} c_{11} & 0 & 0 \\ c_{21} & c_{22} & 0 \\ c_{31} & c_{32} & c_{33} \end{bmatrix}$$

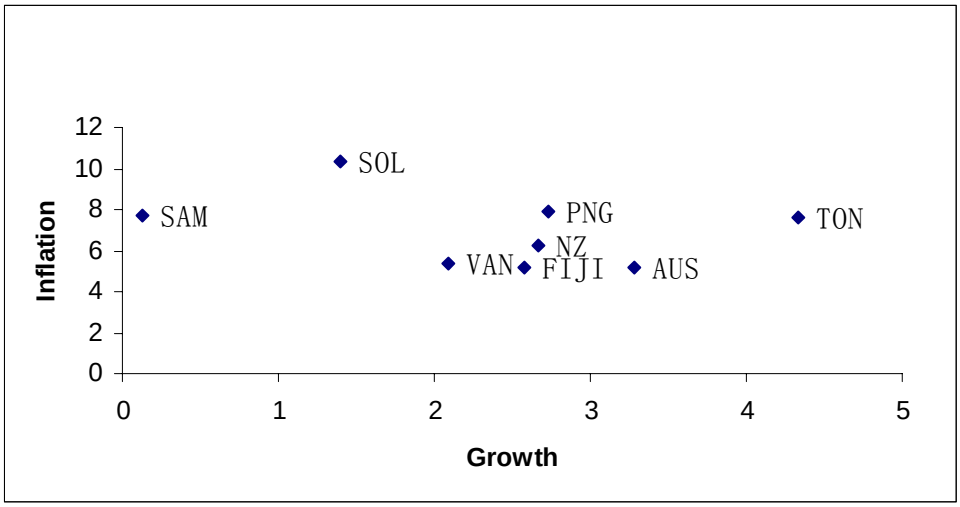
In practice, once the reduced form VAR in (1) is estimated, then equations (2)-(6) are used to recover the structural shocks, u_t. The results are presented below.

Data and Facts

Among the 14 Pacific Island Countries, national income data on a consistent time series basis are available only for 6 PICs (Fiji, Papua New Guinea(PNG), Samoa(SAM), the Solomon Islands(SOL), Tonga(TON) and Vanuatu(VAN)). The two major countries are Australia (AUS), New Zealand (NZ). Annual data for the three series for the period 1979-2003 are used for estimation[5].

We first examine some descriptive statistics on output growth and inflation of the PICs. As shown in Figure 1, Australia, New Zealand and Fiji showed fairly low inflation with annual rates around 5.5 percent on average. By contrast, in the Solomon Island countries, average inflation was relatively higher that exceeded 10 percent during examine period. The rest of three PICs, namely, PNG, Samoa, and Vanuatu appear similar inflation rates with around 7.8 percent. As for the real output performance, the growth rate in Tonga was on average the highest. Not surprisingly, Australia exhibits a relatively steady high growth rate of 3.28 percent. However, Samoa had hardly developed during 1979 to 2003. By looking at the descriptive statistics on output and inflation of each country, we have had a brief view on every economic status.

Figure 1
Growth and Inflation (1979-2003)



Next, we examine the correlation of real GDP growth and inflation for the 6 PICs and two major countries. The results are shown in Table 4.

[5] (It is observed there are some data missing for some countries so that the effective data ranges are as follows: The longest common span is 1984-2001. AUS & NZ: 1979 – 2003; FIJI:1979 – 2002; Tonga & PNG & Samoa: 1979 – 2001; the Solomons Islands: 1981 – 2001;and Vanuatu: 1984 – 2001.

Table 4
Correlation of Real GDP Growth and Inflation for PICs

a. Correlation of Real GDP Growth Series

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.000							
NZ	0.355	1.000						
Fiji	0.331	0.067	1.000					
PNG	-0.148	0.199	0.068	1.000				
Samoa	0.501*	0.279	0.193	-0.184	1.000			
Solomons	0.112	0.055	0.283	0.136	-0.214	1.000		
Tonga	-0.343	-0.228	-0.204	-0.298	-0.311	-0.049	1.000	
Vanuatu	0.084	-0.173	-0.018	-0.184	-0.241	0.339	0.112	1.000

* Indicates statistical significance at 5%.

b. Correlation of Inflation Series

	AUS	**NZ**	**Fiji**	**PNG**	**Samoa**	**Solomons**	**Tonga**	**Vanuatu**
AUS	1.000							
NZ	0.883*	1.000						
Fiji	0.576*	0.533*	1.000					
PNG	-0.223	-0.342	-0.192	1.000				
Samoa	0.606*	0.634*	0.651*	-0.286	1.000			
Solomons	0.224	0.293	0.423	-0.258	0.219	1.000		
Tonga	0.574*	0.580*	0.412	-0.024	0.472	0.269	1.000	
Vanuatu	0.499*	0.566*	0.628*	-0.193	0.418	0.569*	0.323	1.000

* Indicates statistical significance at 5%.

Table 4a shows that only the output growth rates of Australia and Samoa are statistically significant correlated.[2] The degree of correlation of growth in Australia with other countries is relatively weaker. Those of Tonga and Vanuatu are negatively correlated with most of the other countries. Besides those, growth in PNG is negatively correlated with those of Australia and Samoa. For inflation, the correlation coefficients relating to inflation shown in

[2] The test statistic is calculated in the form of $t(r) = \left(r\sqrt{n-2}\right) / \left(\sqrt{1-r^2}\right)$ (Mendenhall, Wackerly and Scheaffer (1996, pp.512-13)), where r is the estimated correlation coefficient, and n is the number of observations (Appendix, Table 1). The critical value is 2.131451 at 5 per cent significance level with degrees of freedom of 15 in all cases.

Table 4b indicate somewhat stronger relations than for growth. The inflation levels of Australia and New Zealand are significantly correlated with each other and with most of the other PICs, while that of Fiji is correlated with that of Samoa and Vanuatu. As for the rest of the PICs, only inflation in the Solomon Islands is significant correlated with Vanuatu. Inflation in PNG is negatively correlated with the rest of the countries. In total, 13 of the 25 correlation coefficients are statistically significant at 5%.

On the whole, however, the low and generally insignificant correlations for real GDP growth rates and negative correlations suggest that there is no coherent pattern of relationship, rendering the case for monetary union among PICs weak.

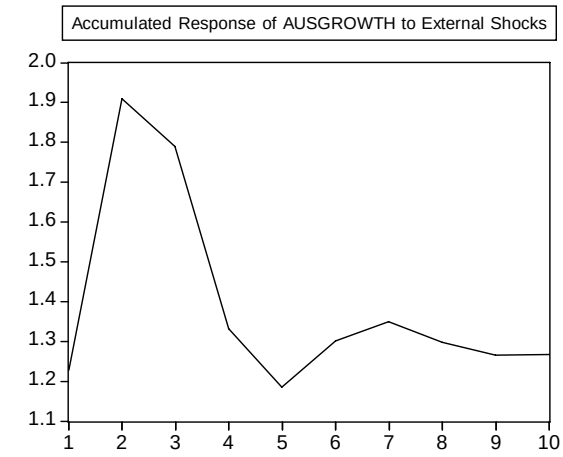
Demand and Supply Shocks for Each Country

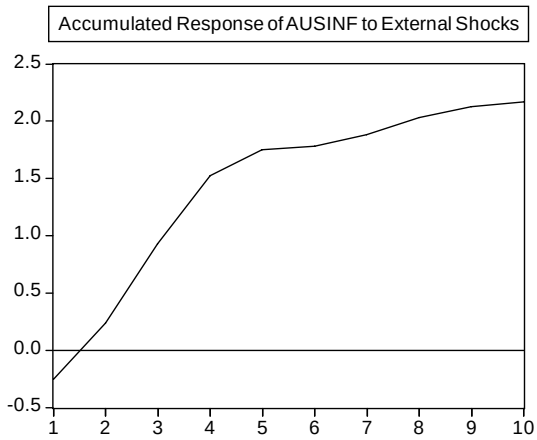
We have presented the methodology used to recover the supply and demand shocks by applying a Structural Vector Autoregressive (SVAR) model with three variables, growth in world output, growth in domestic output and prices inflation. The aggregate demand and supply shocks exert different effects on the economy.

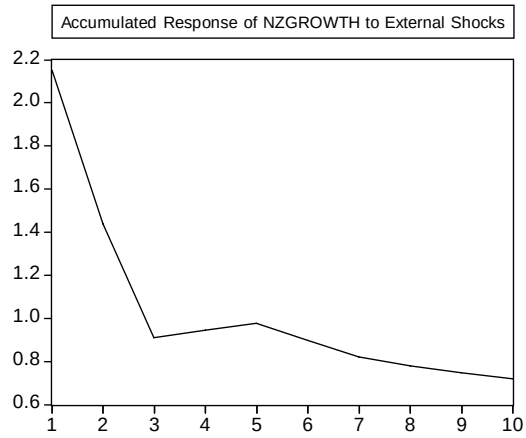
Figure 2 depicts the identified demand and supply shocks for Australia, New Zealand and Fiji. The charts in Figure 2 indicate that the supply and demand shocks appear to be relatively equally distributed between the positive and the negative. AUS and NZ seem to have similar demand shocks, but for the supply shocks, they follow the opposite way after 2002. Demand and supply shocks in Fiji exhibit greater differences compared to the two major countries. This finding seems to indicate that the economic effect did not follow at the same pace in the two major countries and one major country in PICs during the considered time period.

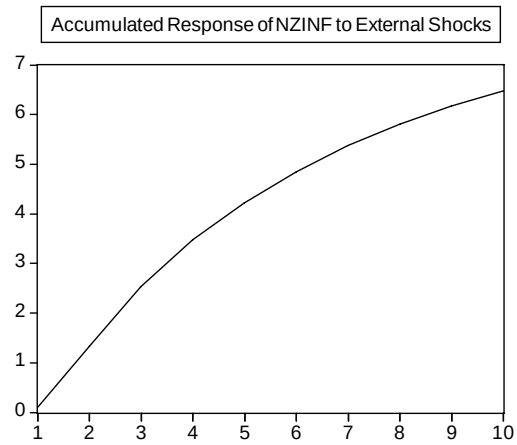
Figure 2
Accumulated Impulse Response of Domestic Growth and Domestic Inflation to External Shocks

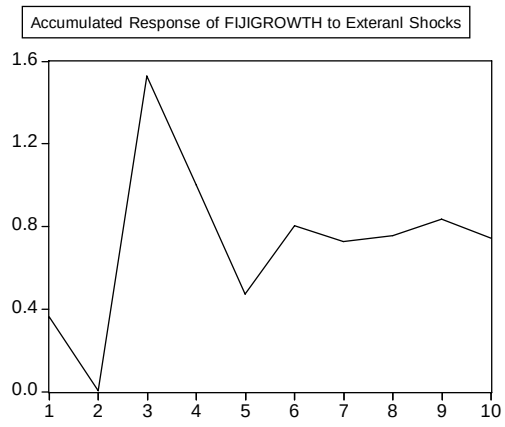
(Growth response: left; Inflation response: right)

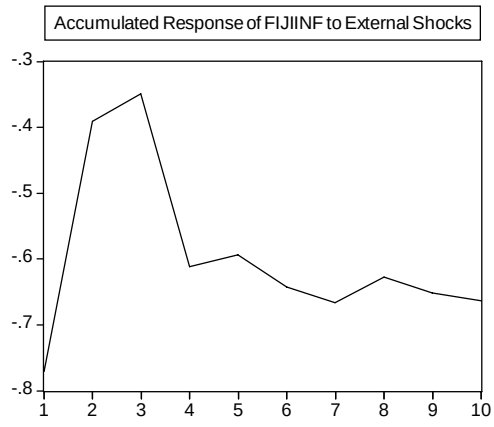


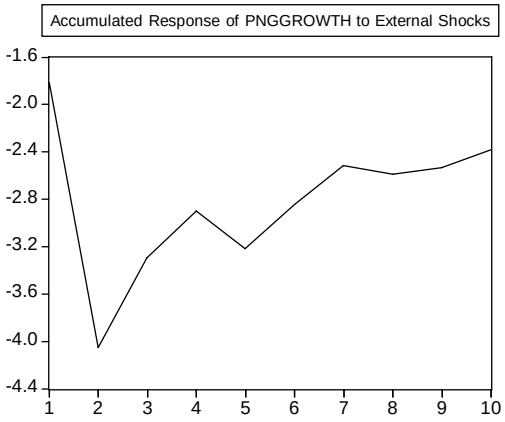


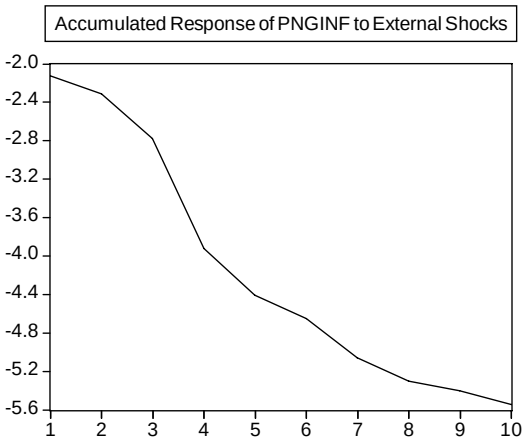


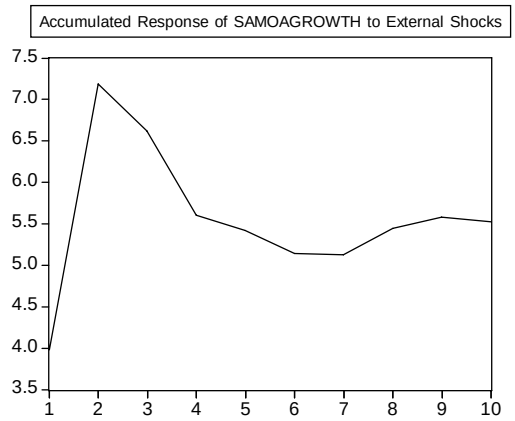







Accumulated Response of PNGGROWTH to External Shocks
-1.6
-2.0
-2.4
-2.8
-3.2
-3.6
-4.0
-4.4
1 2 3 4 5 6 7 8 9 10


Accumulated Response of PNGINF to External Shocks
-2.0
-2.4
-2.8
-3.2
-3.6
-4.0
-4.4
-4.8
-5.2
-5.6
1 2 3 4 5 6 7 8 9 10


Accumulated Response of SAMOAGROWTH to External Shocks
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6.5
6.0
5.5
5.0
4.5
4.0
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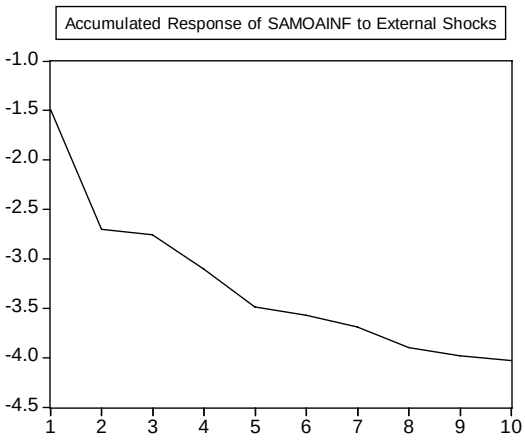
Accumulated Response of SAMOAINF to External Shocks
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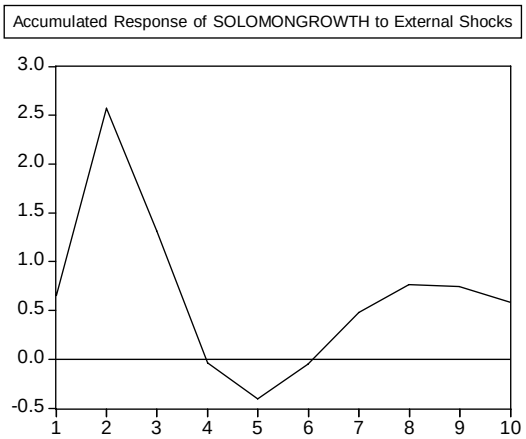
-2.5
-3.0
-3.5
-4.0
-4.5
1 2 3 4 5 6 7 8 9 10


Accumulated Response of SOLOMONGROWTH to External Shocks
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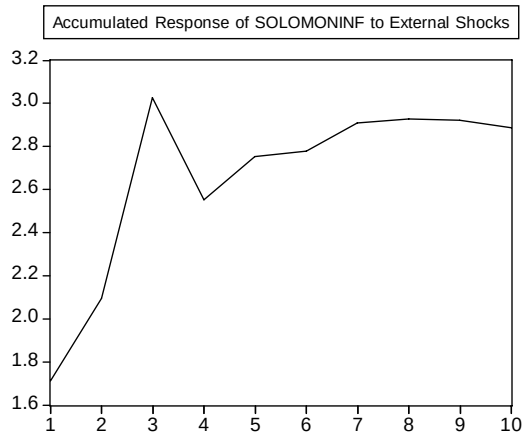
2.0
1.5
1.0
0.5
0.0
-0.5
1 2 3 4 5 6 7 8 9 10


Accumulated Response of SOLOMONINF to External Shocks
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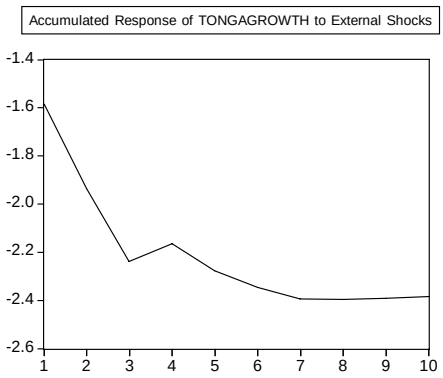
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1 2 3 4 5 6 7 8 9 10


Accumulated Response of TONGAGROWTH to External Shocks
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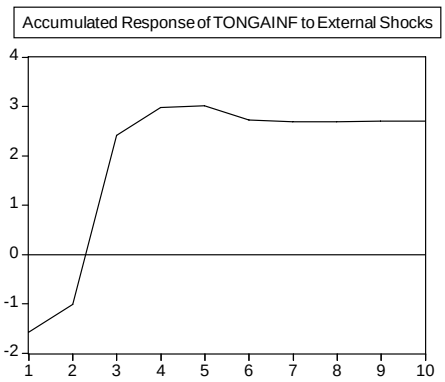
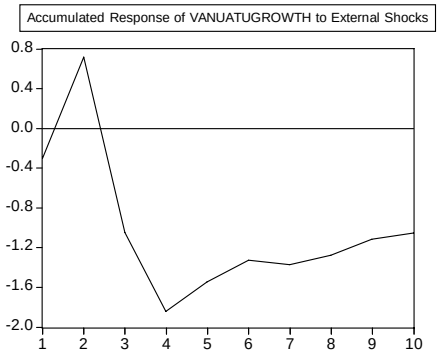
-1.6
-1.8
-2.0
-2.2
-2.4
-2.6
1 2 3 4 5 6 7 8 9 10


Accumulated Response of TONGAINF to External Shocks
4
3
2
1
0
-1
-2
1 2 3 4 5 6 7 8 9 10


Accumulated Response of VANUATUGROWTH to External Shocks
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0.0
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-0.8
-1.2
-1.6
-2.0
1 2 3 4 5 6 7 8 9 10

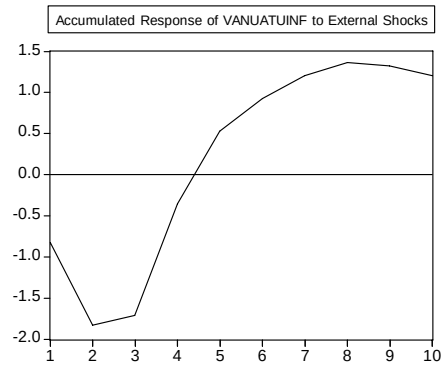

Accumulated Response of VANUATUINF to External Shocks
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
1 2 3 4 5 6 7 8 9 10

Table 5
Correlation of Shocks

a. Correlation Coefficients of External Shocks

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.000							
NZ	0.882	1.000						
Fiji	0.825	0.758	1.000					
PNG	0.505	0.435*	0.420*	1.000				
Samoa	0.661	0.692	0.527	0.022*	1.000			
Solomons	0.706	0.486	0.685	0.534	0.260*	1.000		
Tonga	0.924	0.811	0.780	0.552	0.599	0.751	1.000	
Vanuatu	0.799	0.709	0.878	0.397*	0.518	0.729	0.752	1.000

b. Correlation Coefficients of Supply Shocks

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.000							
NZ	0.116	1.000						
Fiji	0.043	0.132	1.000					
PNG	-0.004	0.168	-0.292	1.000				
Samoa	-0.382	0.323	-0.095	0.056	1.000			
Solomons	0.267	0.204	0.153	0.365	-0.066	1.000		
Tonga	-0.021	-0.547	-0.016	-0.291	-0.272	-0.357	1.000	
Vanuatu	0.293	-0.184	-0.249	-0.184	-0.519	-0.131	0.138	1.000

c. Correlation Coefficients of Demand Shocks

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.000							
NZ	0.569*	1.000						
Fiji	0.021	-0.340	1.000					
PNG	-0.279	-0.349	0.107	1.000				
Samoa	0.174	-0.052	0.404	-0.215	1.000			
Solomons	0.247	0.127	0.011	-0.074	-0.051	1.000		
Tonga	-0.175	0.018	-0.091	0.294	0.059	0.326	1.000	
Vanuatu	0.375	0.397	-0.091	-0.472	-0.304	0.193	0.133	1.000

* Statistically significant at 5%.

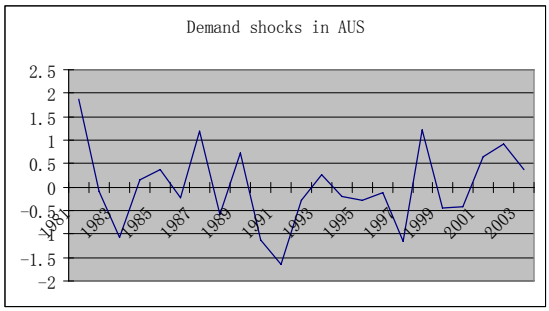
To examine the similarity of shocks between countries, we can compare the correlation coefficients for the same type of shock. Table 5 presents detailed individual correlations of the various shocks for the PICs. Looking at the external shocks, only PNG's is statistically significantly correlated with most of the other 7 countries except for Australia, Solomon Islands and Tonga, while that of Solomon Islands exhibits a high correlation with that of Samoa. All the correlation coefficients are positive, which may be due to the fact that most of the Pacific Island countries are small and possess relatively similar economic structures. As for the supply shocks, the correlations are not statistically significant for any of these countries, which is consistent with our previous results that supply disturbances vary considerably among the three largest economies. Only the correlation coefficients of demand shocks between Australia and New Zealand are statistically significant. There are both positive and negative correlations of demand and supply shocks.

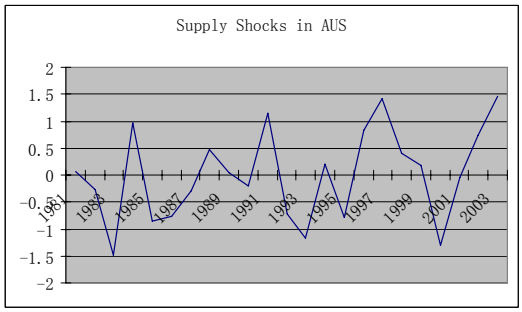
Accumulated Responses of Shocks

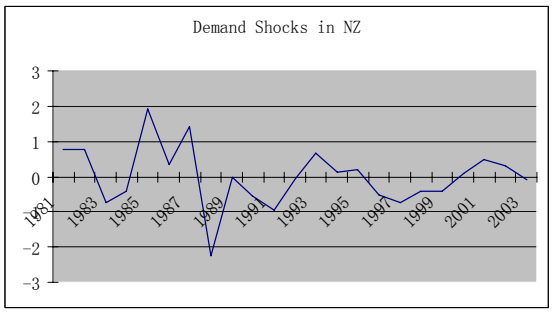
The identification of shocks reveals important information about the symmetry or asymmetry of shocks. If the responses to the same type of shock are different, the shocks can cause economic costs in a currency union. This is because countries cannot use the exchange rate to eliminate the disequilibria. Based on this consideration, we examine the accumulated impulse responses of domestic growth and inflation to the external shocks in PICs and check whether they exhibit similar patterns, which are shown in Figure 2. They illustrate output and price responses for external shocks for each Pacific Island Countries. There is a tendency that the accumulated response of domestic growth and inflation to external shocks is moving towards the zero line regardless of whether the response is positive or negative. These findings are consistent with the economic theory that demand shocks do not exert real effects in the long run, while supply shocks have both the positive long-run effect on output and negative long-run effect on prices.

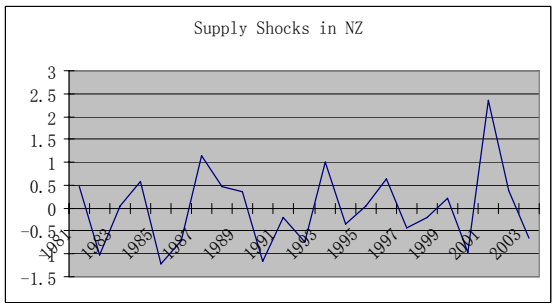
Figure 3

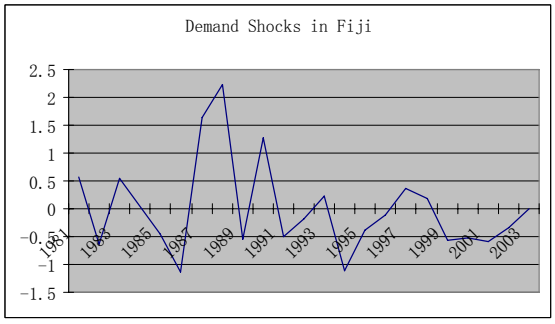
Identified Demand and Supply Shocks in Australia, NZ and Fiji

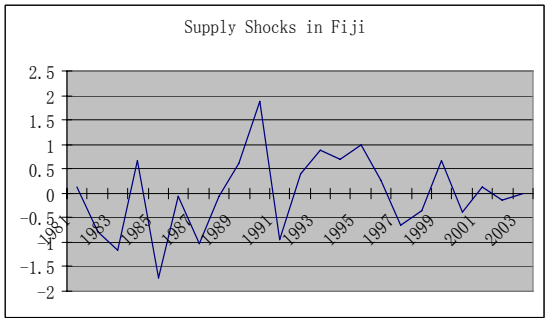












On the left hand side of Figure 2, it also shows that Australia, New Zealand and Fiji have similar output responses to the external shocks in terms of magnitude and direction. PNG, Tonga and Vanuatu appear to have negative responses. The accumulated responses of domestic inflation to external shocks in Australia and New Zealand show very steady increasing trends, while a down-ward sloping shape of responses appears for Fiji, PNG and Samoa.

Since there are differences among the countries in the responses to the external shocks, we need to examine the dynamic responses in detail by looking at the correlation coefficients of the impulse response functions. According to economic theory, high correlations of response of shocks suggest that asymmetric shocks between the countries are not pronounced, which implies low costs of monetary union. Table 6 shows correlation coefficients of accumulated responses of domestic growth and inflation to external shocks. According to Table 6a, the two major countries' responses to external shocks are not statistically significant correlated, while Australia's response is significant correlated with the most of the other PICs. In PICs, the response of Vanuatu's growth is highly correlated with other countries except for PNG and Samoa. Table 6b shows that the accumulated responses of domestic inflation to external shocks are statistically significant correlated with each other except for those of Fiji.

Table 6
Correlation Coefficients

Correlation Coefficients of Accumulated Responses of Domestic Growth to External Shocks.

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.000							
NZ	0.117	1.000						
Fiji	0.016	-0.541*	1.000					
PNG	-0.760*	0.152	0.124	1.000				
Samoa	0.846*	-0.307	0.084	-0.890*	1.000			
Solomons	0.849*	0.277	-0.271	-0.486*	0.665*	1.000		
Tonga	0.208	0.981*	-0.481	0.068	-0.195	0.329	1.000	
Vanuatu	0.624*	0.635*	-0.635*	-0.335	0.355	0.855*	0.639*	1.000

* Statistically significant at 5 per cent significance level.

b. Correlation Coefficients of Accumulated Responses of Domestic Inflation to External Shocks

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.000							
NZ	0.978*	1.000						
Fiji	-0.238	-0.280	1.000					
PNG	-0.965*	-0.986*	0.424	1.000				
Samoa	-0.962*	-0.969*	0.091	0.934*	1.000			
Solomons	0.858*	0.824*	0.164	-0.744*	-0.835*	1.000		
Tonga	0.912*	0.821*	-0.048	-0.788*	-0.817*	0.914*	1.000	
Vanuatu	0.848*	0.884*	-0.661*	-0.945*	-0.788*	0.551*	0.631*	1.000

* Statistically significant at 5 per cent significance level.

According to the empirical findings, most of the external, demand and supply shocks for the Pacific Island countries are not significantly correlated. Moreover, the asymmetry of the shocks implies that the 16 Forum countries are not suitable candidates for a monetary union since the a common set of fiscal, monetary and exchange rate policies would not be appropriate, as the costs involved in the loss of adjustment tools now available to each of them would be high.

3. Summary Conclusions

This paper examined the viability of a common currency for the Pacific region comprising 14 PICs and the two advanced countries in the region, namely Australia and New Zealand. The study adopted a SVAR approach to examine the nature of shocks hitting these countries. The OCA criterion, which is a pre-requirement to determine the suitability of the countries for forming a monetary union, lays down that countries should have experienced a high degree of similarity in shocks affecting them so that a common set of policies, fiscal and monetary as well as a common exchange rate would be successfully adopted and implements. The study results show that there is no coherence in the pattern of shocks experienced by the candidate countries, as reflected in various measures.

The logical conclusion is that the time is not ripe for the 14 Pacific island nations and the two major metropolitan powers to consider a monetary union.

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Appendix

Table 1 t-statistics for testing Ho: r(ij)=0 -- ie, no correlation

a. t-statistics for Testing Correlation Coefficients of Growth Series

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.000							
NZ	1.469	1.000						
Fiji	1.360	0.261	1.000					
PNG	-0.581	0.789	0.265	1.000				
Samoa	*2.241*	1.127	0.761	-0.727	1.000			
Solomons	0.435	0.213	1.142	0.531	-0.851	1.000		
Tonga	-1.414	-0.907	-0.806	-1.207	-1.268	-0.189	1.000	
Vanuatu	0.325	-0.679	-0.071	-0.726	-0.963	1.398	0.437	1.000

NB: Only Samoa_AUS correlation coefficient is statistically significant at 5%.
5% Critical Value t = 2.131415 (n=15, df=15)

b. t-statistics for Testing Correlation Coefficients of Inflation Series

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.000							
NZ	*7.270*	1.000						
Fiji	*2.731*	*2.438*	1.000					
PNG	-0.886	-1.412	-0.757	1.000				
Samoa	*2.953*	*3.171*	*3.321*	-1.155	1.000			
Solomons	0.891	1.188	1.807	-1.035	0.871	1.000		
Tonga	*2.718*	*2.761*	1.751	-0.093	2.074	1.083	1.000	
Vanuatu	*2.229*	*2.661*	*3.129*	-0.762	1.781	*2.682*	1.321	1.000

NB: Figures in bold italics indicate rejection of Ho: no correlation.
5% Critical Value t = 2.131415 (n=15, df=15)

c. t-statistics for Testing Correlation Coefficients of External Shocks

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.000							
NZ	7.248	1.000						
Fiji	5.660	4.506	1.000					
PNG	2.264	*1.870*	*1.793*	*1.000*				
Samoa	3.411	3.715	2.403	*0.087*	1.000			
Solomons	3.860	2.153	3.638	2.444	*1.042*	1.000		
Tonga	9.384	5.360	4.829	2.566	2.895	4.410	1.000	
Vanuatu	5.143	3.892	7.118	*1.674*	2.344	4.125	4.417	1.000

NB: Figures in bold italics indicate rejection of Ho: no correlation.
5% Critical Value t = 2.131415 (n=15, df=15)

d. t-statistics for Testing Correlation Coefficients of Supply Shocks

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.000							
NZ	0.451	1.000						
Fiji	0.167	0.516	1.000					
PNG	-0.017	0.661	-1.184	1.000				
Samoa	-1.600	1.322	-0.370	0.218	1.000			
Solomons	1.071	0.806	0.599	1.517	-0.256	1.000		
Tonga	-0.081	-2.531	-0.064	-1.177	-1.096	-1.481	1.000	
Vanuatu	1.187	-0.727	-0.994	-0.724	-2.354	-0.510	0.539	1.000

NB: The correlations are not significant at 5 per cent significance level for each country. 5% Critical Value t = 2.131415 (n=15, df=15)

e. t-statistics for Testing Correlation Coefficients of Demand Shocks

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.000							
NZ	*2.680*	1.000						
Fiji	0.082	-1.399	1.000					
PNG	-1.124	-1.444	0.416	1.000				
Samoa	0.684	-0.201	1.712	-0.851	1.000			
Solomons	0.989	0.494	0.042	-0.286	-0.197	1.000		
Tonga	-0.689	0.070	-0.355	1.191	0.229	1.337	1.000	
Vanuatu	1.565	1.676	-0.353	-2.073	-1.235	0.763	0.520	1.000

NB: Only 1 correlation coefficient statistically significant at 5% (ie, NZ_AUS)

5% Critical Value t = 2.131415 (n=15, df=15)

f. t-test for Testing Correlation Coefficients of the Accumulated Responses of Domestic Growth to External Shocks

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.00							
NZ	*17.98*	1.00						
Fiji	-0.95	-1.13	1.00					
PNG	*-14.29*	*-22.63*	1.81	1.00				
Samoa	*-13.58*	*-15.14*	0.35	*10.13*	1.00			
Solomons	*6.47*	*5.64*	0.64	*-4.31*	*-5.89*	1.00		
Tonga	*8.61*	*5.57*	-0.18	*-4.95*	*-5.48*	*8.71*	1.00	
Vanuatu	*6.19*	*7.31*	*-3.41*	*-11.15*	*-4.95*	*2.55*	*3.15*	1.00

NB: Figures in bold italics indicate rejection of Ho: no correlation.

5% Critical Value t = 2.131415 (n=15, df=15)

g. t-test for Testing Correlation Coefficients of the Accumulated Responses of Domestic Inflation to External Shocks

	AUS	NZ	Fiji	PNG	Samoa	Solomons	Tonga	Vanuatu
AUS	1.00							
NZ	*2.12*	1.00						
Fiji	*-2.21*	*1.75*	1.00					
PNG	*7.76*	0.96	*-2.01*	1.00				
Samoa	*9.04*	*2.66*	-1.76	*4.01*	1.00			
Solomons	*-6.78*	-1.80	1.83	*-4.36*	-11.58	1.00		
Tonga	-1.05	*3.02*	*9.31*	-1.23	-0.93	1.07	1.00	
Vanuatu	*-9.54*	*-3.89*	0.74	*-4.77*	-9.69	7.59	-0.12	1.00

NB: Figures in bold italics indicate rejection of Ho: no correlation.

5% Critical Value t = 2.131415 (n=15, df=15)

Table 7 : Unit Root Tests (Constant, no Trend in test equation)				
	World growth (y*)			
	ADF Statistic	p-value		
World	-4.860	0.0009		
	Domestic growth (y)		Domestic inflation (p)	
	ADF Statistic	p-value	ADF Statistic	p-value
AUS	-5.700	0.0001	-4.775	0.0011
NZ	-4.287	0.0039	-6.009	0.0001
FIJI	-5.668	0.0002	-6.928	0.0000
PNG	-3.543	0.0188	-4.902	0.0009
SAMOA	5.623	0.0002	-11.87	0.0000
SOLOMONS	-5.264	0.0006	-7.822	0.0000
TONGA	-6.760	0.0000	-4.871	0.0010
VANUATU	-6.261	0.0001	-5.976	0.0001

Given the extremely small p-values for the test statistics the null hypothesis of nonstationarity is clearly rejected for each series.