South Pacific Studies Vol. 27, No. 1, 2006

Feasibility Study of a Single Currency for Pacific Islands: a Principal Components Approach

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Abstract

In August 2003, an Australian Senate Committee recommended adoption of a single regional currency, preferably the Australian dollar as a possible remedy to meet the deteriorating economic situations in the Pacific Island Countries, arising from poor fiscal discipline and failure to effectively use external aid inflows. A suggestion to adopt the Australian dollar as a common currency amongst Pacific Island Countries was initiated by Australia during the Annual Meeting of the Pacific Islands Forum Leaders in Auckland, in August 2003. Although the subject was not discussed, the idea of a single currency for the region became a widely discussed topic in other forums in the later months. This paper examines the feasibility of the formation of a currency union by Pacific Island Countries with Australia in light of the principal components approach. This determines any synchronization in the movements of various key economic variables over the last two decades so that common exchange rate and monetary policies can be followed by a currency union amongst Pacific Island Countries and the two major metropolitan countries in the region.

Key words: Common currency area, Economic synchronization, Pacific Island Countries, Principal Components

Introduction

Various evaluation studies on aid utilization including the better publicized one by Professor HUGHES (2003) noted that implementation reform measures, such as improvements in aid delivery, discontinuance of annual budgetary support and institutional strengthening, have been slow and that aid has proved to be ineffective. These concerns prompted an Australian Senate Committee (2003) to examine the need for promoting regional stability in the context of deteriorating fiscal situations and failure of law and order in some of the Pacific Island Countries (PICs) and to come up with a strong plea of setting up a *Pacific Economic and Political Community.* One of the recommendations is to adopt a common currency, preferably the Australian dollar re-

Received: October 13, 2005
Accepted: February 7, 2006
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placing the existing national currencies of PICs.

A common currency reflects economic integration of states, without having to surrender their political identity as nations and their sovereignty. Currency union 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 an economic integration of states is expected to bring about greater fiscal and monetary discipline, thereby acting as "an agency of restraint" to wayward governments (COLLIER 1991).

A common currency entails a single set of exchange rate, monetary and fiscal policies to influence the balance of payments of the region. Therefore, this set of policies can be justified only when there is a high degree of synchronization of business cycles for all prospective member countries in terms of growth rates of their domestic outputs. According to optimum currency area (OCA) conditions (MUNDELL 1961), 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 studies on PICs (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. There are no detailed studies on synchronization in the movements of gross domestic products of the island countries, and Australia and New Zealand. The present paper, which seeks to fill the gap by presenting some preliminary results of such an analysis, is organized into three sections. The first section provides a brief background of the PICs 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.

I. Pacific Islands: A Background

The 14 PICs[1] 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 kilometres (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, of which over five million people are in PNG. At the other end of the scale is Niue, with a population of less than 2000 (Table 1).

Table 1. Selected Indicators of Pacific Island Countries.

Country	Land Area sq.km	Population ('000) (2002)	Exclusive Economic Zone ('000 sq.km)	Total GDP (US$ mill) (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

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 (Table 2).

[1] The 14 Pacific Island Countries, which are members of the Pacific Islands Forum (the 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.

Table 2. Economic Indicators of Pacific Island Countries.

Category	Average GDP Growth Rate (%)					Average Overall Fiscal Balance (% of GDP)					Inflation (%)				
	(1995-1999)	2000	2001	2002	2003	(1995-1999)	2000	2001	2002	2003	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 Is	-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 Is	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 exchangpe rate															
P.N.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)

The PICs are open economies. Their trade volumes (exports and imports), expressed as percentages of gross domestic product (GDP), are fairly high. In 2000, they ranged from 120% in Kiribati to 68% in the 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. Thus, PICs are more competitive than complementary to each other. For this reason, intra-PIC trade has been small[2].

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 (Table 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 linked to the proportion of trade. Among the 14 PICs, only PNG has a freely floating exchange rate regime. Inflation has been higher in PNG and in the dollarised countries. On the other hand, those PICs with independent currencies seem to have done better on the inflation front, indicating that there is nothing remarkable to commend about any regime in particular (ROSALES 2001).

Although currency reforms by replacing the existing currencies with a currency of their own or simply accepting the Australian dollar, have not been given any priority by PICs; they were not lagging behind in their efforts toward greater integration. The PICs took major steps by signing two agreements in 2001. One signed by all 14 PICs 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 Island 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

[2] For a fuller discussion on trade, see (JAYARAMAN 2005).

concerned, (six in the case of PICTA; and seven in the case of PACER), the two agreements became effective[3]. These two agreements are expected to speed up the process of trade integration, promoting greater intra regional trade and in the process further economic cooperation in the region.

Based on the foregoing discussion, the indications are clear. The PICs and the two advanced member countries of the Forum are not similarly placed. Intra-regional trade among PICs themselves is of low volume. 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. High degrees of correlation in growth rates, inflation rates and real exchange rates, are essential ingredients for economic integration. The next section deals with these aspects.

II. Methodology and Empirical Findings

The methodology extends beyond the usual correlation analysis of key variables, which include GDP growth rate, inflation and real effective exchange rate (REER) indices. The correlation analysis shows relationship between pairs of countries and hence it is of a limited value. Hence, we propose to focus on the coherence in each of the above variables by resorting to a more sophisticated methodology, the principal component analysis.

Most of the PICs became independent in the 1980s. Further, many of their economic databases suffer from inadequacies due to weak human resources. For growth rates and inflation, we have data for six PICs [Fiji (FJ), PNG, Samoa (SAM), the Solomon Islands (SOL), Tonga (TON) and Vanuatu (VAN)], besides Australia (AUS) and New Zealand (NZ). In light of data for REERs, we have reliable time series only for 5 PICs and two advanced countries. The availability of GDP data is restricted to 20 years (1984-2003), while for inflation and real exchange rate data for PICs are available for a longer period (1979-2003). The relevant data were taken from the *International Financial Statistics Yearbook* (IMF 2003) and *Asian Development Bank's Key Indicators* (ADB 2003).

Correlation Analysis

For our analysis, correlation coefficients with positive sign are relevant to determine the presence of synchronization. Table 3 provides the estimated correlation coefficients of growth rates. It is seen that only 13 among the correlation coefficients have

[3] The PACER and PICTA became effective on 3 Oct. 2002 and 13 Apr. 2003 respectively.

positive signs, of which, only one (the correlation coefficient of Australian and Samoa) is significant at the 5% level[4]. According to Table 4, 14 of them are positive and significant. In addition, Table 5 reveals that 10 are positive and significant.

Table 3. Correlation Matrix for Real GDP Growth Rate Data (1984-2003).

Country	AUS	NZ	FJ	PNG	SAM	SOL	TON	VAN
AUS	1 .000							
NZ	0.361	1.000						
FJ	0.113	-0.050	1.000					
PNG	-0.225	0.168	-0.010	1.000				
SAM	0.629*	0.363	0.020	-0.262	1.000			
SOL	0.138	-0.070	0.278	0.185	-0.184	1.000		
TON	-0.165	-0.079	0.003	-0.220	-0.178	-0.140	1.000	
VAN	0.068	-0.201	-0.004	-0.037	-0.242	0.413	0.134	1.000

* Indicates significance at the 5% level

Table 4. Correlation Matrix for Inflation Data (1979-2003).

Country	AUS	NZ	FJ	PNG	SAM	SOL	TON	VAN
AUS	1.000							
NZ	0.883*	1.000						
FJ	0.573*	0.540*	1.000					
PNG	-0.232	-0.351	-0.204	1.000				
SAM	0.605*	0.632*	0.634*	-0.290	1.000			
SOL	0.239	0.304	0.450*	-0.296	0.232	1.000		
TON	0.565*	0.570*	0.395*	-0.003	0.465*	0.250	1.000	
VAN	0.507*	0.575*	0.629*	-0.223	0.430*	0.587*	0.298	1.000

* Indicates significance at the 5% level

Table 5. Correlation Matrix for Real Exchange Rate Index Data (1979-2003).

Country	AUS	NZ	FJ	PNG	SAM	SOL
AUS	1.000					
NZ	0.044	1.000				
FJ	0.783*	-0.251	1.000			
PNG	0.812*	-0.053	0.845*	1.000		
SAM	0.847*	-0.199	0.875*	0.740*	1.000	
SOL	0.706*	-0.395	0.806*	0.576*	0.901*	1.000

* Indicates significance at the 5% level

[4] The statistic used for testing the correlation coefficient is $t = r(N-2)^{1/2}/(1-r^2)^{1/2}$, where r is the sample correlation coefficient and N is the number of observations. It is known that t is distributed as t(v), where v=N-2 is the degree of freedom. The test of level α of the null hypothesis that the correlation is zero ($\rho = 0$) versus the alternative that the correlation is not zero ($\rho \neq 0$) is to reject it if $|t|>t(1-\alpha/2; v)$. When N=20, α=0.05, the rejection region is $|t|>t(0.975, 18)=2.1009$, and when N=25, α=0.05, the rejection is $|t|>t(0.975, 23)=2.0687$ (KARSON 1982).

As noted earlier, the exchange rate regimes in PICs, except that of PNG, are all fixed rate regimes and the currencies are pegged to baskets of currencies of major trading partners with weights in accordance with proportion of trade with them. Since Australia is the dominant trade partner, the movements in exchange rates of PICs and Australia are close to each other. This is reflected in a large number of significant correlation coefficients of REERs. For the same reasons, 50% of the correlation coefficients in regard to inflation are significant, since inflation in PICs is largely imported; the major source of imports is Australia. However, the major concern is in regard to economic growth, which is to a major extent determined by domestic factors and policies. Only one out of 28 correlation coefficient of GDP growth is significant, which implies that there is no coherent pattern of association amongst the candidate countries, indicating weak economic interdependence.

Principal Components Analysis

When multivariate data are collected, it is common to find some correlated variables. One implication of these correlations is that there will be some redundancy in the information provided by the variables. In the extreme case of two perfectly correlated variables, one is redundant. Thus, principal components analysis (PCA) explores the redundancy in multivariate data, enabling to:

- reduce the number of variables comprising a data set while retaining the variability in the data;
- identify hidden patterns in the data, and classify them according to how much of the information, stored in the data, they account for.

The exploratory data analysis examines the correlation of change in each of the variables, real GDP growth, inflation and REER index. For this purpose, the PCA is employed as it highlights a multi-variable measure of correlation (For details, see Appendix)

Table 6 provides the estimated proportion of the total variance of real GDP growth, inflation, and REER index explained by the first principal component among the candidate countries.

Table 6. Proportion of Variance Explained by the First Principal Component.

Pacific Island Countries					
Period	Real GDP Growth	Period	Inflation	Period	Real Exchange Rate
1984-2003	0.386	1979-2003	0.573	1979-2003	0.805

In light of Table 6, the first principal component accounts for 38.6% of the total variance of real GDP growth. This low degree of confluence indicates that the real GDP growth is not possibly synchronized in terms of business cycles. On the basis of the proportion of inflation's total variance explained by the first principal component, the price movements are substantially correlated among the candidate countries. It is also seen that there is no pattern of consistency in inflation performance among the 8 countries. As regards to REERS, we find that the movements of the real effective exchange rate index are highly significant with positive signs across the candidate countries except NZ. The PCA analysis confirms the findings of the simple correlation analysis.

III. Summary and Conclusions

Adoption of a common currency requires synchronization in growth rates, inflation and real exchange rates. Only when there is such a synchronization, a common set of exchange rates and monetary and fiscal policies could be effectively formulated and implemented.

This paper demonstrates the simple correlation and principal components analyses to determine whether there is a high degree of co-movements in growth rates, inflation and real exchange rate indices of the selected PICs, and Australia and New Zealand, which are the members of the regional organization, the Pacific Islands Forum. The results of the two analyses are consistent with each other. It is established that there are high degree of co-movements in inflation and real exchange rates. The reasons are that PICs' inflation is determined in a substantial manner by consumption goods, most of which are sourced from Australia and New Zealand; and that PICs' exchange rates are pegged to baskets of currencies of major trading partner countries, Australia and New Zealand.

What is lacking, however, is the critical pre-requirement of a high degree of correlation in growth rates. The study reveals that there is no coherence in the movement of growth rates among them. In the absence of fulfillment of an important OCA condition for a common currency, the conclusion is obvious: The PICs are not ready to forming a currency union with Australia.

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Appendix

Principal Components Analysis : Some Theoretical Background and Analyses

Principal components are linear combinations of variables, which have special properties in terms of variances. For example, the first principal component is the normalized linear combination (the sum of squares of the coefficients being one) with maximum variance. In many exploratory studies the number of variables under consideration is too large to handle. Since it is the deviations in these studies that are of interest, a way of reducing the number of variables to be treated is to discard the linear combinations, which have small variances and study only those with large variances.

Let $X = (X_1,..,X_p)'$ be a vector of p-components with positive definite covariance matrix

$$Var(X) = \Sigma = (\sigma_{ij}),\ j,k = 1,..,p.$$

Suppose that $(\lambda_1, \gamma_1),...,(\lambda_p, \gamma_p)$ are pairs of eigenvalue-eigenvector of Σ, where $\lambda_1 \geq ... \geq \lambda_p \geq 0$ and $\gamma_j = (\gamma_{1j}, ..., \gamma_{pj})'$, $j=1,..,p$. are the *jth* component coefficients. Then the jth principal component is given by

$$Y_j = \sum_{j=1}^{p} \gamma_j' X_j = \gamma_{1j} X_1 + ... + \gamma_{pj} X_p,\ j = 1,..., p.$$

We also observe that the variances are $Var\ (Y_j) = \lambda_j$, $j=1,..,p$, and covariance are $Cov\ (Y_j,Y_k) = 0$, $j \neq k$.

It is common to define the total variation of X as the sum of the variances of X. The total variation is

$$\sum_{j=1}^{p} \sigma_{jj} = \sum_{j=1}^{p} \lambda_j ,$$

where

$$\sum_{j=1}^{p} \sigma_{jj} = \sum_{j=1}^{p} Var(X_j) \quad \text{and} \quad \sum_{j=1}^{p} \lambda_j = \sum_{j=1}^{p} Var(Y_j).$$

However, the proportion of the total variation attributed to each principal component is largest for the first principal component and successively smaller for the second, third, etc., principal components. The proportion of the total variation that λ_j constitutes is

often referred to as the proportion of the total variation accounted for by the principal component. Thus

$$\lambda_j \Big/ \sum_{j=1}^{p} \lambda_j$$

is the proportion of the variance of Y_j to the total variation. If this ratio is large for each of the first few principal components, study about the variability in the X_j may be confined to study about these first few principal components. For details, see (KARSON 1982).

Tables A1-A3 report the results of the first five principal components (PC1, PC2, PC3, PC4, PC5) with respect to the real GDP growth, inflation and real exchange rate data. In fact, these results are an extended version of the result presented in Table 5. The first row in each table gives the standard deviations (Std. Dev.), which are the square root of the eigenvalues) of the data along the direction of the corresponding principal component. The sums of all the variances add up to the sums of the variances of the eight input macro-variables (AUS, NZ, ...,VAN). By convention, the principal components are given in order of their contribution to the total variance. This is given as "Prop. of Var." for proportion of variance in the second line, and the "Cum. Var. Prop." for cumulative variance proportion in the third line.

In the lower part of each table, the columns of numbers (scores) for each principal component represent the weights assigned to each input variable. By convention, these weights are chosen so that the sum of their squares is 1. This fixes the scale of the new variable. The sign of the new variable is therefore arbitrary.

Table A1. Results of First Five Principal Components based on Real GDP Growth Data (1984-2003).

Component	PC1	PC2	PC3	PC4	PC5
Std. Dev.	8.157	6.067	5.633	4.174	2.914
Prop. of Var.	0.386	0.214	0.184	0.101	0.049
Cum. Var. Prop.	0.386	0.600	0.784	0.885	0.935
Variable	PC1	PC2	PC3	PC4	PC5
AUS	-0.105	0.110	0.000	0.000	0.000
NZ	0.000	0.000	-0.154	0.000	-0.151
FJ	0.000	0.337	-0.812	-0.889	0.000
PNG	0.381	0.349	-0.169	0.000	-0.193
SAM	-0.853	0.413	0.389	0.000	-0.136
SOL	0.306	0.730	0.151	0.358	0.000
TON	0.000	-0.183	0.199	0.000	-0.892
VAN	0.114	0.000	0.000	0.244	-0.353

Table A2. Results of First five Principal Components based on Inflation Data (1979-2003).

Component	PC1	PC2	PC3	PC4	PC5
Std. Dev.	10.023	4.725	4.494	3.747	3.104
Prop.of Var.	0.573	0.127	0.115	0.080	0.055
Cum. Var. Prop.	0.573	0.701	0.816	0.896	0.951
Variable	PC1	PC2	PC3	PC4	PC5
AUS	0.263	0.000	0.108	-0.168	0.355
NZ	0.464	0.000	0.235	-0.410	0.535
FJ	0.240	0.120	0.000	0.259	0.000
PNG	-0.139	-0.462	0.000	0.695	0.481
SAM	0.617	0.141	-0.701	0.242	0.000
SOL	0.109	0.142	0.252	0.000	-0.370
TON	0.369	-0.772	0.172	0.000	-0.453
VAN	0.332	0.361	0.589	0.422	0.000

Table A3. Results of First Five Principal Components based on Real Exchange Rate Data (1979-2003).

Component	PC1	PC2	PC3	PC4	PC5
Std. Dev.	39.72	14.08	9.870	6.919	4.853
Prop. of Var.	0.805	0.101	0.050	0.024	0.012
Cum. Var. Prop.	0.805	0.906	0.956	0.980	0.992
Variable	PC1	PC2	PC3	PC4	PC5
AUS	0.333	-0.160	-0.555	-0.250	0.679
NZ	0.000	-0.391	-0.587	0.568	-0.384
FJ	0.593	0.000	0.385	0.650	0.261
PNG	0.504	-0.631	0.240	-0.399	-0.359
SAM	0.377	0.237	-0.324	0.000	-0.186
SOL	0.373	0.602	-0.191	-0.178	-0.400

Principal Components: Screeplot

The purpose of principal components analysis is to reduce the complexity of multivariate data by transforming the data into the principal components space, and then choosing the first nprincipal components that explain "most" of the variation in the original variables. In the following, this aspect is illustrated by screeplot.

A screeplot plots the eigenvalues (variances) against their components, and generally breaks visually into a steady downward slope (the mountainside) and a gradual tailing away (the scree). The break from the steady downward slope indicates the break between the "important" principal components and the remaining components which make up the scree.

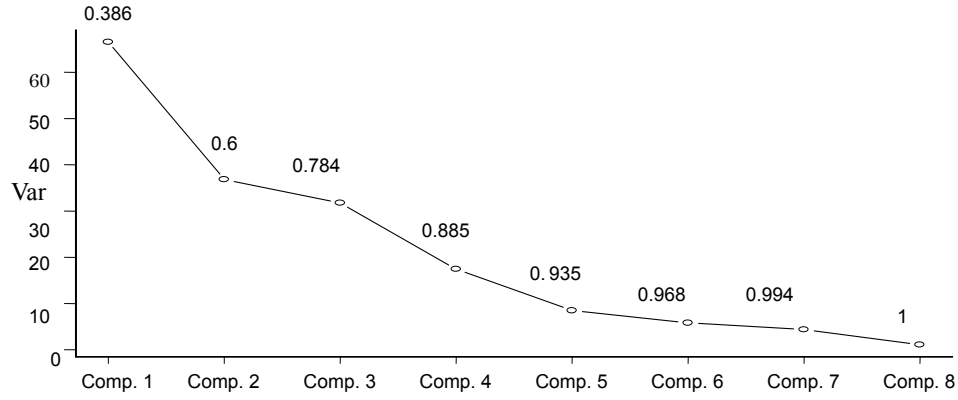

Fig. 1. Screeplot for Real GDP Growth Rate Data (1984-2003).

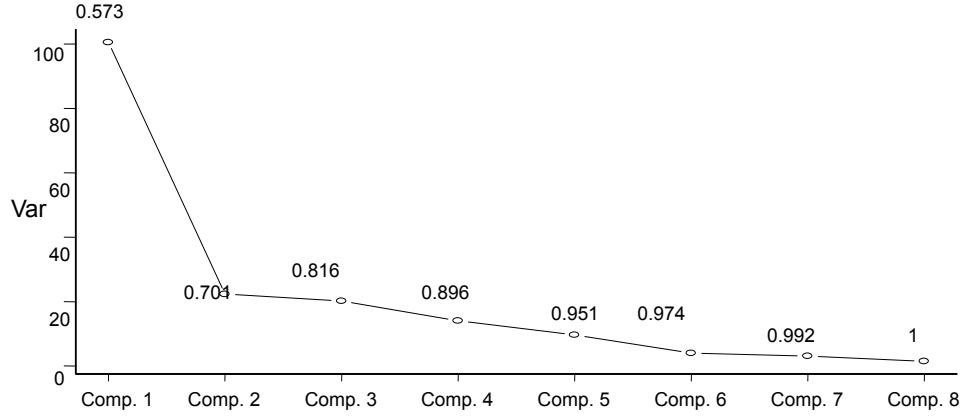

Fig. 2. Screeplot for Inflation Rate Data (1979-2003).

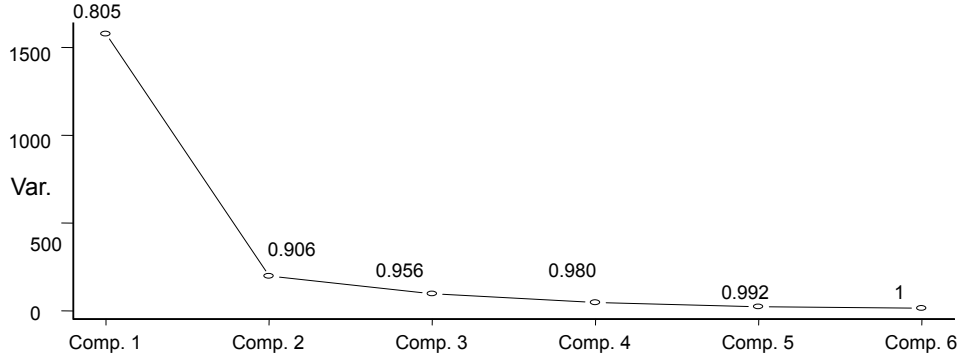

Fig. 3. Screeplot for Real Exchange Rate Data (1979-2003).

The screeplots in Figures 1-3 provide graphical views to help make the decision on how many components are useful. The results obtained in Tables A1-A3 are typically supported by these plots, which show the relative importance of each component

in fitting the real GDP growth, inflation and real exchange rate index data. The components are sorted according to their relative importance, therefore, initial components explain more variance than those placed in subsequent positions.

The numbers beside the points provide information about the fit of each component. The first number is the proportion of the variance of the data that is accounted for by the component. The second number is the difference in variance from the previous component. The third number is the total proportion of variance accounted for by the component and the receding components, and so forth.

The information in the screeplots indicate that the first three components of the real GDP growth data account for 78.4%, the first two components of the Inflation data account for 70.4%, and the first component of the Real exchange rate index data accounts for 99.6% of the total variance.