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Exchange rate variability and export growth in Fiji

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Key to symbols used in tables

n.a.	not applicable
..	not available
-	zero
.	insignificant

Abstract

This paper conducts an empirical investigation of the effects of increase in real exchange variability on the slowdown of exports growth in Fiji for the period 1981:01 to 1997:06. Using error-correction and cointegration modelling techniques, it is shown that real exchange rate variability has both short- and long-run adverse effects on exports growth. However, the magnitude of the effects is not as significant as expected. Other factors which have a greater impact on exports growth are the level of the real exchange rate, foreign real income and relative prices. It is concluded that policy makers must give attention not only to the level of the real exchange rate but also its stability in efforts to promote exports growth.

Exchange rate variability and export growth in Fiji

Next to Papua New Guinea, Fiji is the second largest of the South Pacific island countries, with a population of 779,200 and occupying a land area of 18,376 square kilometres. On the basis of various socioeconomic indicators, Fiji can be considered as the most developed of the Pacific island countries. Fiji's Gross National Product in 1993 was US$2140 compared to an average of about US$1300 for the neighbouring Pacific island countries.[1] In 1994, Fiji was ranked 59th out of 173 countries on the basis of an index of 0.79 on UNDP's Human Development Index. In comparison, indices for other Pacific island countries were 0.60 for Samoa, 0.49 for Vanuatu, 0.43 for the Solomon Islands and 0.41 for Papua New Guinea.

After independence in 1970, Fiji enjoyed a period of relatively steady economic growth. However, economic growth was fairly sluggish in the early 1980s. Following the military coups in 1987, the economy suffered a severe slump with GDP declining by 6 per cent. In response to the ensuing economic crisis, the government instituted an economic reform program. The measures included devaluation of the currency, deregulation of interest rates, tight fiscal policy, tariff reduction, tax reform, labour market reform and removal of price controls.

Despite the reforms economic growth has remained sluggish. Between 1991 and 1994, real GDP averaged only 1.4 per cent (Table 1). The need for further reforms has been stressed by the major international lending agencies. Both the World Bank and AusAID have identified the property rights issue as being among the main constraints to foreign investment (World Bank 1995, AusAID 1995). The lack of strong economic growth has led to the inability of the economy to absorb the growing labour force. In a recent study Prasad and Asafu-Adjaye (1998) argue that urban poverty in Fiji has increased.

Fiji depends heavily on the export sector for its economic growth, with commodity exports accounting for about 25 per cent of GDP. However, since the onset of the economic reforms, there has been a slow-down in export growth with exports lagging behind imports (Figure 1). Tourism remains strong and accounts for about a third of GDP. It has been suggested that the reasons for the sluggish performance of the export sector include the following: relatively high inflation and wage rates; declining preferential advantages under the South Pacific Regional Trade and Economic Cooperation Agreement (SPARTECA) with Australia and New Zealand; uncertainty about the political environment; uncertainty about long-term access to land and failure to complete the economic reform agenda (AusAID 1995).

The Asian financial crisis and the recent drought brought on by the El Nino effect have exacerbated Fiji's economic problems. In addition to an expected fall in sugar prices,

Table 1 **Fiji: contribution to GDP by economic activity, 1987-94** (F$ million)

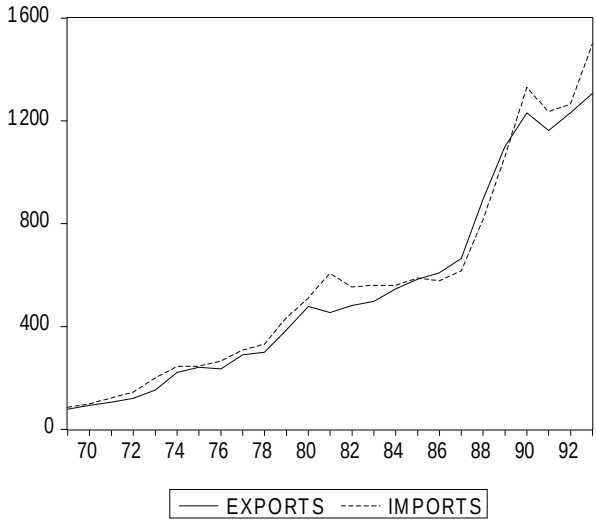
Variable/Sector	1987	1989	1990	1991	1992	1993	1994
GDP (current prices)	1329	1661	1811	1942	2059	2203	2331
Real GDP (1977 prices)	712	815	854	859	885	903	936
Real GDP growth rate (per capita, %)	-6.2	11.4	3.6	-0.8	1.6	-0.4	2.8
Agriculture[a]	325	386	386	406	430	454	498
Mining and quarrying	2	4	4	3	4	4	4
Manufacturing[b]	157	189	210	234	241	263	282
Electricity, gas & water	17	21	23	25	28	30	32
Building & construction	54	68	78	104	133	104	112
Trade & hotels	219	328	389	390	393	447	465
Services[c]	431	486	525	576	611	658	688
Transport & Communication	164	226	254	272	295	325	338

a.Includes forestry, fishing and subsistence.
b.Includes sugar, food, drink and tobacco.
c.Includes Financial Services, community and personal services.
Source: AusAID (1995).

sugar output in 1998 is expected to fall by 43 per cent due to the effects of the drought (Chand 1998a). In a bid to revive Fiji's external competitiveness and boost domestic exports, the Fiji government devalued the dollar by 20 per cent in January 1998.

The idea to investigate the impacts of exchange variability in this paper is motivated by the fact that much attention has been paid to the effects of a devaluation. It is a widely accepted fact that, *ceteris paribus*, a devaluation makes traded goods more attractive to foreign buyers and therefore enhances exports. However, relatively little work has been

Figure 1 **Fiji: nominal exports and imports, 1969-93**



done on the impact of exchange rate variability, especially for developing countries. Whatever work has been done has focussed mainly on either the industrialised countries or the newly industrialised countries. Notable exceptions are Bahmani-Oskooee (1991), Bahmani-Oskooee and Ltaifa (1992) and Bahmani-Oskooee and Payesteh (1993). For example, Bahmani-Oskooee and Payesteh (1993) investigated the response of trade flows for six LDCs to exchange rate volatility for the period 1973-1990 and found evidence of adverse effects of exchange rate uncertainty on the trade volume. Kumar and Dhawan (1991) estimated the impact of exchange rate uncertainty on Pakistan's exports to the developed world for 1974-85 and found evidence to suggest that exports were adversely affected by the increased volatility of its bilateral exchange rates.

Fiji maintains a fixed exchange rate regime in which the Fiji dollar is pegged to a basket of currencies. However, that alone is not sufficient insurance against volatility in the currency. Bahmani-Oskooee and Ltaifa (1992) have shown that even if a country pegs its currency to a major currency or to a basket of currencies, it cannot avoid fluctuation in its nominal effective exchange rate, as long as the major currencies float against each other. In such situations, fluctuations of the major currencies could introduce uncertainty, which, in turn, could have an adverse impact on trade.

In this paper, the relationship between exchange rate variability and exports growth is investigated for Fiji. The main thesis of this paper is that export performance depends not only on the level of the real exchange rate but also on its stability. This hypothesis is tested using the techniques of cointegration analysis and error-correction modelling.

Methodology

Model specification

The long-run equilibrium export demand function is specified as follows

$$x_t = \alpha_0 + \alpha_1 y^f_t + \alpha_2 P_t + \alpha_3 e^*_t + \alpha_4 S_t + v_t \qquad (1)$$

where: x_t is the logarithm of real exports; y^f_t is the logarithm of real foreign income; P_t is the logarithm of Fiji export prices relative to trade-weighted foreign prices; e^*_t is the logarithm of the real effective exchange rate; S_t is a measure of exchange rate variability; and v_t is an error term.

An increase in foreign income will lead to an increase in exports and therefore the coefficient α_1 is expected to have a positive sign. A rise in relative prices will lead to a fall in export demand, so α_2 is expected to be negative. The variable e^*_t is defined in terms of US dollars per domestic currency. Thus, a fall in e^*_t (i.e. a devaluation) reduces the foreign currency price of domestic goods, leading to an increase in exports and *vice versa*. As such, α_3 is expected to be negative. International trade theory is unclear about the *a priori* sign of the coefficient of exchange rate variability, α_4. The Belgian economist, De Grauwe has posited a hypothesis for producer behaviour under exchange rate risk from a political

economy perspective. According to him, as output and employment decline due to exchange rate overvaluation, influential individuals lobby for protectionist legislation. However, this legislation tends to be remain in place during periods of undervaluation. Therefore, volatility of the real exchange rate exceeding a few months (or quarters) is likely to lead to a decline in exports (De Grauwe 1986).

In this study, exchange rate volatility is proxied by the sample standard deviation of the growth rate of the real exchange rate, e_t, which can be represented by the root mean square error (RMSE), and is defined as

$$S_t = 100 * \sqrt{\frac{1}{12}\sum_{j=1}^{12}\left(\frac{e_t - e_{t-1}}{e_{t-1}}\right)^2} \qquad (2)$$

where e_t is the rate of change in the real exchange rate in time t, i.e., $e_t = 100*(E_t - E_{t-1})/E_{t-1}$, where E is the levels form of the real exchange rate. This proxy for exchange rate uncertainty is essentially a moving sample standard deviation of the growth rate of the real effective exchange rate calculated over the previous twelve months. Variants of this measure have been used by Dwyer et al. (1996) and Akhtar and Hilton (1984).

Unit root analysis

Classical linear regression assumes that the time series in Equation (1) are stationary[2]. However, as Engle and Granger (1987) have shown recently, the use of non-stationary variables could result in spurious regression. Furthermore, the estimated coefficients are likely to be inconsistent and the standard statistical tests will be invalid. To avoid these defects, we employ cointegration and error correction techniques in this study. Prior to applying these models, the first step in the procedure is to test whether the time series are stationary. Augmented Dickey-Fuller (ADF) tests (Dickey and Fuller 1981) are employed to identify the order of integration (i.e. the number of times a variable needs to be differenced to make it stationary).

Cointegration analysis

Once it has been established that the variables in Equation (1) are integrated of the same order, the next step is to determine whether there exists a long-run equilibrium relationship amongst them. If so, then they are cointegrated. Two conditions must be met for two or more variables to be cointegrated. First, they must be integrated of the same order. Secondly, linear combinations of the variables from the regression of the non-stationary variables (in levels form) must be stationary. In this study, we use the Johansen's (Johansen 1988; Johansen and Juselius 1990) maximum likelihood approach to test for cointegration. This approach has been shown to be superior to Engle and Granger's (1987) residual-based approach. Among other things, the Johansen approach is capable of detecting multiple cointegrating relationships.

Error-correction model (ECM)

If it is established that the relevant variables are cointegrated, it is appropriate to estimate an error-correction model of the form:

$$Dx_t = \beta_1(L)Dx_{t-1} + \beta_2(L)\Delta H + \delta ECT_{t-1} + \mu_t \qquad (3)$$

where *D* is a difference operator; $\beta_i(L)$ are lag polynomials; *ECT* is the lagged error-correction term generated from the residuals of Equation (1) and μ_t is an error term.

Equation (3) describes the short-term determinants of Fiji's export demand. The inclusion of *ECT* accounts for the fact that actual exports do not adjust instantaneously to their long-term determinants. The parameter * measures the short-run adjustment to correct any disequilibrium in long-run export demand. Thus, the *ECM* reflects how the system converges to the long-run equilibrium suggested by Equation (1).

Data sources

All the data were obtained from *International Financial Statistics (IFS)* published by the International Monetary Fund. The data are monthly and cover the period 1981:01 to 1997:06. Monthly data for commodity exports were not available so the annual data were converted to a monthly series using using the computer package Time Series Processor (TSP) version 4.3 (Hall 1995). The definitions of the variables are as follows

x_t - real commodity exports.

y_t^f - index of foreign income. This variable is proxied by index of real GDP for the industrialised countries (1990 = 100).

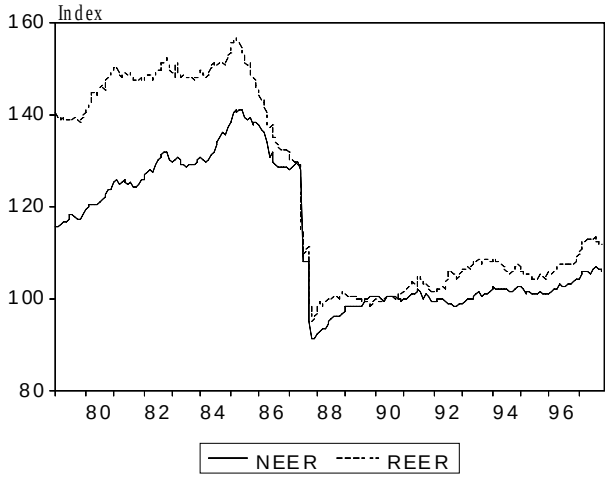
P_t - ratio of domestic prices to world prices. Fijian consumer prices deflated by the CPI of industrialised countries.

e_t^* - real effective exchange rate. This is an index (1990=100) of the trade-weighted nominal effective exchange rate adjusted for relative movements in national price or cost indicators of Fiji and her trading partners. An increase denotes appreciation of the exchange rate.

Discussion and empirical results

Figure 2 shows a plot of monthly nominal and real exchange rates for Fiji in the period 1979:1 to 1997:11. It can be seen that in both nominal and real terms, the currency has been appreciating since 1985. The official devaluation in 1987 led to a rapid fall in the Fijian dollar. However, between the period 1988 to 1997 there has been a gradual appreciation in the currency, with a 11 per cent rise since that time. Although the graph suggests that the Fiji dollar is still below the post-1987 value in real terms, the trend points to continuing appreciation. On that basis, the recent devaluation of the dollar may be considered as a timely policy. Figure 3 shows a plot of the variability of the Fiji dollar within the period under review. It can be seen that the greatest volatility in the currency

Figure 2 **Fiji: exchange rates, 1979:1–97:11** (100=1990)



was in the period immediately following the events of 1987. A visual inspection of the 'spread' of the movements in the currency suggests lesser volatility after the onset of the structural reform program.

Unit root test results

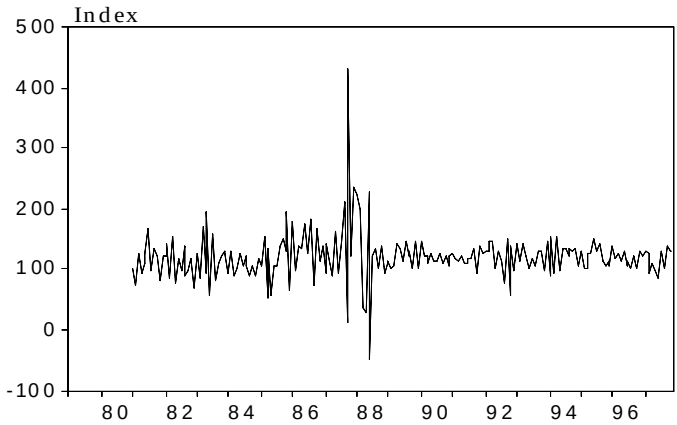
The results of the augmented Dickey-Fuller tests (ADF) are reported in Appendix Table 1. For the levels (in logs) of the variables, it can be seen that with the exception of real exchange rate variability, the null hypothesis of a unit root cannot be rejected at the 1 percent significance level for all the variables. To ascertain whether there is a second unit root, the ADF test was applied to the first differences (in logs) of the time series. The results (second column) show that, with the exception of real exchange rate variability, the presence of a unit root is easily rejected.

These tests were supplemented by inspecting plots of the autocorrelation and partial autocorrelation functions of the levels and first differences of the variables. They confirm that, with the exception of real exchange rate variability, all the series under consideration are stationary and are integrated of order one, that is, I(1). The series can therefore be used for cointegration analysis.

Cointegration test results

The Johansen test (Johansen and Juselius 1990) for cointegration was applied in this study because the maximum likelihood framework involved is known to offer better properties than the traditional Engle and Granger approach which is residual based[3]. Appendix Table 2 reports the results for the Johansen maximum likelihood test. Comparing the likelihood ratio statistics with the corresponding critical values, it can be seen that the null hypothesis of one cointegrating relationship cannot be rejected at the 1 per cent significance level[4].

Figure 3 **Fiji: variability of the real exchange rate**



The test results suggest the presence of a unique cointegrating relationship. The cointegrating vector corresponding to the maximal eigenvalues (i.e., the dominant long-run relationship) can be written as follows:

$$x_t = \underset{(3.134)}{4.060} + \underset{(6.470)}{1.351y^f_t} - \underset{(-4.002)}{0.164P_t} - \underset{(-7.507)}{0.824e^*_t} - \underset{(-0.774)}{0.00008S_t} \qquad (4)$$

The signs of the independent variables are as expected in the above *a priori* hypotheses. The t-statistics (in parentheses) are highly significant for all the independent variables except exchange rate variability. Since the variables are expressed in logarithms the coefficients yield direct estimates of the elasticities. The long-run elasticity of exports with respect to foreign income is quite high. A one-percentage point increase in foreign income increases exports by about 1.4 per cent. Relative price effects are much lower. A one-percentage point increase in relative prices decreases exports by about 0.2 per cent. The result for the real exchange rate suggests that the impact of the real exchange rate is nearly one for one. A one-percentage point appreciation (i.e. increase) in the real exchange rate reduces exports by 0.8 per cent. As indicated above, while real exchange rate variability tends to lower exports in the long-run, the effects do not appear to be significant. These results are in contrast to those of Arize (1997) and Bahmani-Oskooee and Ltaifa (1992) who found that real exchange rate volatility significantly reduced exports for both industrialised and developing countries.

Error-correction model results

The error-correction model results, which represent the short-run effects, are presented by the following equation (t-ratios in parentheses)

$$Dx_t = \underset{(5.293)}{0.006} + \underset{(0.199)}{0.051Dy^f_t} - \underset{(-1.746)}{0.032DP_t} - \underset{(-1.616)}{0.090De^*_t} - \underset{(-0.116)}{0.000021DS_t} - \underset{(-7.789)}{0.024DUM_t} - \underset{(-6.637)}{0.045ECT_{t-}} \qquad (5)$$

R^2=0.31; Adj. R^2=0.28; F=13.92; Std. error of regression=0.013; Log Likelihood=574.4; DW=0.21; Normality test F=4.195; Heteroscedasticity F=6.19

A dummy variable (DUM) was included to account for the effects of the 1987 coups and the resulting structural adjustment reforms. The empirical results suggest that although the explanatory power of the model (as suggested by the R^2 statistics) is quite low, the F-statistics for the overall regression is quite high. This implies that the null hypothesis that all the right-hand side variables are jointly zero can be strongly rejected. The results of the diagnostic tests indicate that there are no serious econometric problems.

The following observations can be made about Equation (5). First, the coefficient of the error-correction term, ECT, is statistically significant. This suggests that, apart from the long-run relationships alluded to earlier, foreign income, relative prices, real exchange rates and real exchange rate variability have significant short-term effects on export demand. From the coefficient of ECT it can be implied that about 5 per cent of the monthly change in exports can be attributed to the disequilibrium between actual and equilibrium levels. Second, in terms of relative impacts, the equation suggests that the level of the real exchange rate has a greater impact than the other variables. It is important to note that although the coefficient of real exchange rate variability is not statistically significant, this variable has a short-run effect on exports in conjunction with the others as suggested by the error correction term. It is also instructive to note that the coefficient of the dummy variable is highly significant, confirming the fact that the events of 1987 served to depress commodity exports.

Conclusions and policy implications

After periods of steady growth following independence in 1970, the Fiji economy experienced sluggish growth in the 1980s. The economy went into a severe depression after the coups of 1987. Despite the institution of structural reforms in the late 1980s and early 1990s, the performance of the Fijian economy has been below expectations. In particular, there has been a slowdown in exports growth, although the tourism sector remains a strong performer. This paper makes a contribution to the policy debate by examining the extent to which exchange rate variability has affected exports growth.

The adoption of flexible exchange rate regimes in many developing countries, coupled with high inflation rates, has led to large swings in the real values of their currencies. The effect of uncertainty about exchange rate stability has led to calls for protectionist measures in some of these countries. In the case of Fiji, exchange rate movements have been fairly stable between 1989 and 1997. The econometric results in this study show that whereas increase in real exchange variability has had an adverse effect on exports growth in Fiji, the effects have not been significant compared to the experience of other developing countries. In the long-run, factors such as foreign income growth, relative prices and the level of the real exchange rate have had more adverse effects on exports growth.

The study highlights the need for policy measures to maintain stability in the currency in addition to keeping it competitive. There is some doubt as to whether a fixed exchange rate regime with periodic devaluations is an optimal policy. Chand (1998b) notes various reasons why Fiji should consider a floating exchange rate regime. Another point in favour of a floating currency from a producer's viewpoint is that it enables exchange rate risk to be minimised by hedging on the futures market, an option which is not possible under the current fixed exchange rate regime. Inflation is always a threat to any gains in competitiveness and therefore there is the need to maintain an environment of low inflation[5]. The policy challenge is to find ways of keeping down real resource costs, in particular, wages. Now, more than ever, there is an urgent need for the government to pursue the economic reform agenda more vigorously in order to put Fiji on a path of sustainable economic growth.

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Notes

1. These countries are: Western Samoa, Vanuatu, Tonga, Solomon Islands, Marshall Islands, Kiribati and Federated States of Micronesia (see World Bank 1995).
2. In a strict econometric sense, a random variable is said to be stationary if its mean and variance are constant over time.
3. When there are more than two I(1) variables under consideration, residual-based cointegration tests have been shown to be inefficient. For example, they can be sensitive to the so-called direction normalisation rule. That is, sensitivity to the choice of the left-hand side endogenous variable. Also these tests ignore the possibility of more than one cointegrating vector when there are more than two variables in a given equation. See Juselius (1992).
4. A repeat of the test for the other two endogenous variables for normalisation resulted in the same conclusions.
5. In a recent study (Asafu-Adjaye 1998), I show that exchange rate depreciation is associated with significant inflation in a small open economy. The issue of complementary policies to keep down inflation is therefore very important.

Appendix

Table A1 **Results of Augmented Dickey Fuller Unit Root Tests**

Variable	Level	First Difference
x_t	-2.23	-3.01[b]
y^f_t	0.40	-4.39[A]
P_t	-0.71	-7.10[a]
e^*_t	-1.10	-4.24[a]
S_t	-3.91[a]	-6.30[a]
Critical values:		
1%	-3.46	
5%	-2.87	
10%	-2.57	

Notes: a. Significant at the 1% level of significance. b. Significant at the 5% level of significance.

Table A2 **Results of the Johansen Cointegration Tests**

Eigenvalue	Likelihood ratio (L.R.)	5 Per cent Critical Value	1 Per cent Critical Value	Hypothesized No. of CE(s)
0.19669	84.8381	68.52	76.07	None **
0.11193	41.0331	47.21	54.46	At most 1
0.06326	17.2901	29.68	35.65	At most 2
0.02006	4.22011	15.41	20.04	At most 3
0.00083	0.1672	3.76	6.65	At most 4

Notes: *(**) denotes rejection of the hypothesis at 5%(1%) significance level.
L.R. test indicates 1 cointegrating equation(CEs) at 5% significance level.