# Equilibrium real exchange rate in Fiji: an empirical study

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**Abstract:** Given the fact that Fiji has a very narrow range of exportable commodities with a high degree of dependence on tourism earnings, maintenance of a competitive real exchange rate is of utmost importance. This paper undertakes an empirical analysis of Fiji's real exchange rate, by estimating long-run equilibrium real exchange rate and examining the short-run dynamics of real exchange rates and detection of possible misalignment. Empirical investigation shows that there has been no large, persistent instance of misalignment of Fiji's Real Effective Exchange Rate (REER).

**Keywords:** exchange rate misalignment; evaluation; monetary policy; cointegration; Granger causality.

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## 1 Introduction

The fixed exchange rate regime provides a nominal anchor for small, very open economies, which want to maintain stability of currency. Such a regime has been strongly recommended by economists for delivering low inflation (Corden, 1994, 2002) as well as for imposing fiscal and monetary discipline (Fischer, 2001). Fiji, a small, open island economy in the Pacific Ocean, has been following the fixed exchange regime since 1975 when its currency, the Fiji dollar, came to be linked to a basket of five currencies of its major trading partners: Australia, Japan, New Zealand, the UK and the USA. From the beginning of 2000, the British pound was replaced by euro.

Targeting the nominal exchange rate has its own problems. The problems arise out of misalignments of exchange rate, which are caused by foreign and domestic shocks, resulting in the movement away of nominal exchange rate from official rate. In the case of deviation of nominal exchange rate from official rate, Fischer (2001, p.19) notes that policy-makers can defend an overvalued rate through monetary and fiscal tightening measures towards reducing the current account deficits and discouraging capital outflows.

If the misalignment is substantial, more drastic adjustments are needed in terms of devaluation. Misalignment of substantial nature occurs when macroeconomic fundamentals change and the nominal exchange rate is left unchanged. This would give rise to deviation of actual real exchange rate from the equilibrium real exchange rate. Since competitiveness of the country's exports is influenced by changes in real exchange rate, large deviations of actual real exchange rate from the equilibrium real exchange rate would have adverse effects on trade and investment (Corden, 2002). Since macroeconomic policies affect the fundamentals, "exchange rate misalignment occurs because of a misaligned policy stance" (Mussa et al., 1994, p.2).

Fiji has witnessed three episodes of devaluation of its currency since 1975: the first was in 1988 by 33%, in 2000 by 20% and 2009 by 25%. Naturally, there has been a revival of interest in the relationship between exchange rate and macroeconomic variables to Fiji or Pacific island countries (Reddy, 1997; Jayaraman, 1997; Narayan and Narayan, 2004a, 2004b, 2007, 2008; Dulare, 2005; Chand, 2007; Jayaraman and Choong, 2008; Narayan and Prasad, 2008; Narayan et al., 2008a, 2008b, 2009). Available studies on Fiji's real exchange rate misalignments, however, are limited. For example, Narayan and Prasad (2008) did not go beyond establishing that shocks to Fiji's real exchange rate were permanent. Chand's study (2007), which was essentially a survey paper on Fiji's economic performance, made a passing reference to the likely overvaluation of Fiji's nominal exchange rate soon after the military coup of December 2006. The other studies examined either exchange market pressures or analysed the effects of monetary policy changes on exchange rate and effects of devaluation on Fiji's exports and they did not investigate instances of misalignment of Fiji's real exchange rate.

The objective of this paper is to fill the gap in the empirical literature. Specifically, the paper seeks to undertake an empirical analysis of real exchange rate in Fiji over

a 28-year period (1980–2007), for which full data series are available, with a view to examining the causes behind misalignment of actual real exchange rate from equilibrium real exchange rate. The paper is organised as follows. Section 2 gives a background of Fiji's exchange rate regime and traces developments since its independence in 1970. Section 3 briefly reviews the literature on real exchange rate including recent empirical studies; Section 4 outlines the methodology employed; Section 5 presents the empirical results; Section 6 presents a summary and conclusions with policy implications.

## 2 Fiji's exchange rate regime

Fiji's currency board arrangement during its colonial period was as replaced by a Central Monetary Authority (CMA)[1] soon after its political independence from Britain in 1970. Under CMA, Fiji severed its link with the British pound and pegged its currency, the Fiji dollar to the US dollar. Ending the short-lived link with the US dollar in 1975, Fiji decided to peg the Fiji dollar to a trade weighted basket of currencies of its five major trading partners, namely Australia, Japan, New Zealand, the UK and the USA, an arrangement continuing till today. From the beginning of 2000, the British pound in the basket of currencies was replaced by euro. The weights in the basket are based on a three-year moving average of Fiji's direction of trade, which are reassessed annually, but are not disclosed. On a daily basis, the exchange rate is determined in terms of buying and selling rates for US dollars and communicated to commercial banks.

The fixed rate regime has been providing an anchor for inflation and inflationary expectations. Price stability, which is one of the two objectives of the country's central bank's the other being maintenance of adequate foreign reserves, has been a notable achievement (Table 1) during recent years (IMF, 2002).

Fiji's central bank has been making periodical adjustments to the exchange rate. The Fiji dollar was devalued twice in 1988, by a total of 33% with a view to stemming the capital outflows consequent to the two military coups of 1987. Another round of devaluation by 20% was resorted to in 1998 as a preventive step to meet the eventualities arising out of the Asian financial and currency crises of October 1997. These two devaluations were defended on the ground that they were required as corrective measures for improving the competitiveness of the Fiji dollar. Following the military coup in 2006, which saw the country was isolated by the two developed countries in the Pacific region, namely Australia and New Zealand with economic sanctions imposed against it, as well deteriorating economic conditions arising out of the world recession since 2008, Fiji devalued its currency in April 2009 by 25%.

Aside from these major adjustments by way of substantial devaluation, RBF has not been effectively intervening in the market. It allows the exchange rate varying within the existing bound from +/− 0.07% of the central rate. Exchange controls on capital movements, which came to be imposed during the post-coup years of 1987–1990 and 2000–2001, were withdrawn, as soon as conditions improved leaving the current account transactions in the balance of payments free. However, there still remained some quantitative restrictions on offshore portfolio and direct investments by the Fiji National Provident Fund and other resident non-bank financial institutions, companies and individuals as well as in regard to payments for certain items of procurement overseas. These were subject to case-by-case approval by RBF when in excess of specified threshold amounts in Fiji dollars. But, most of the transaction limits were rarely

reached; virtually, all transactions were approved and processed within three days. As IMF (2004) noted in their more recent consultations with RBF under Article IV of the IMF Charter, main restrictions appear to be on capital transactions by residents.

**Table 1** Fiji: selected key indicators

| *Years* | *Annual growth* (%) | *Annual inflation* (%) | *Budget deficits* (% *of GDP*) | *Current account balance* (% *of GDP*) | *Int'l reserves* (F$ million) | *Int'l reserves* (*months of imports*) | *Exchange rate* (US$/F$) |
|---|---|---|---|---|---|---|---|
| 1975–1984 (Average) | 2.6 | 9.0 | 5.8 | –3.8 | 120.7 | 6.2 | 1.1 |
| 1985–1994 (Average) | 1.9 | 6.1 | 5.3 | –6.6 | 325.1 | 6.1 | 0.71 |
| 1995–1999 (Average) | 3.1 | 3.3 | 5.5 | –0.2 | 728.7 | 6.4 | 0.61 |
| 2000 | –1.7 | 3.0 | 6.6 | –2.9 | 1039.0 | 7.1 | 0.46 |
| 2001 | 2.0 | 2.3 | 9.4 | –7.7 | 994.4 | 6.2 | 0.43 |
| 2002 | 3.2 | 1.6 | 8.7 | –0.1 | 902.1 | 6.1 | 0.48 |
| 2003 | 1.0 | 4.2 | 9.2 | –7.8 | 943.6 | 5.7 | 0.58 |
| 2004 | 5.3 | 2.8 | 6.9 | –11.1 | 1096.9 | 5.0 | 0.61 |
| 2005 | 0.7 | 2.4 | 4.3 | –11.4 | 908.2 | 4.0 | 0.57 |
| 2006 | 1.9 | 3.1 | 3.4 | –21.1 | 865.7 | 3.8 | 0.61 |
| 2007 | –0.5 | 4.3 | 1.6 | –19.6 | 958.7 | 4.2 | 0.64 |
| 2008 | –0.1 | 6.6 | 0.2 | –17.9 | 685.8 | 0.56 | 2.5 |
| 2009 | –2.5 | 6.7 | –3.0 | –10.0 | 1140.0 | 3.9 | 0.53 |

*Source*: IMF (2008, 2010), Asian Development Bank (2006), Reserve Bank of Fiji (2008) and United Nations ESCAP (2008)

The overall balance in Fiji's external accounts was fairly comfortable until 2005. The two devaluations in 1988 and the one in 1998 not only helped Fiji to ward off expectations of speculative attack on the currency but also improved the competitiveness of its exports. Emergence of new exports in the efforts towards diversification, such as garments and spices, mineral water and other herbal-based consumer goods helped the country to record positive overall balance until 1999. However, in the years soon after 2000, expansionary fiscal policy measures and credit expansion resulted in bulging annual trade and current account deficits. The situation was exacerbated by a continuous decline in traditional exports such as sugar and gold, besides the discontinuance in 2005 by the USA of its import quota of garments from Fiji. As against the annual growth rate of 3.5% in exports during 1990–2005, exports during the five-year period of 2001–2005 increased only at a mere 0.9% per annum. The trade and current account deficits rose during the five-year period, simultaneously along with expanding fiscal deficits and increases in domestic credit to private sector. The trade and current account deficits as percentages of Gross Domestic Product (GDP) reached the historically high figures at 27% and 17% of GDP in 2005 (Reserve Bank of Fiji, 2006).

The pressures on the international reserve position soon began to be felt as there was a steady decline in reserves in terms of months of import cover. From a comfortable

position of 7.1 months of import cover in 2000, the international reserves declined to 5.7 months in 2003, 5.6 months in 2004 and 4.0 months in 2005. In May 2006, the international reserves reached the lowest ever figure of F$ 649 million, sufficient to cover only 2.8 months of imports. Falling exports and escalating import demand, despite rise in short-term interest rate by RBF, gave rise to speculations about the currency devaluation (Narayan, 2006; Narayan and Narayan, 2007).

Following a military coup in December 2006, the economy was on a downward path. Aside from the political developments that have strained Fiji's international relations and hurt business confidence, poor economic performance and decline in terms of trade contributed to economic contraction by during 2007 and 2008. There was further decline in the national output by 2.5% in 2009, reflecting the adverse impact of the global crisis on exports and tourism. The economy was also hit by flooding in January 2009 that damaged tourism, crops and infrastructure.

The IMF (2010) noted that the REER appreciated by 10% between 2000 and 2008 as the terms of trade deteriorated by 15% because of lower export prices for sugar and higher oil prices. In early 2009, foreign exchange reserves fell to US$300 million, less than two months of imports. In April 2009, Fiji devalued the currency by 20% and intensified exchange controls. Following the devaluation, weak economic activity and lower commodity prices helped contain inflation. Tourism recovered mid-year.

Between April 2009, which witnessed the devaluation of the currency, and November 2009, Fiji's reserves went up to reach US$593 million, equivalent to four months of imports. About half of the increase is due to the SDR allocation (US$93 million) by IMF and repatriation of foreign assets of the Fiji National Provident Fund (FNPF, a public pension fund). The other half was due to improvement in trade balance consequent to decline in imports and increase in remittance inflows (IMF, 2010). The next section undertakes a quantitative analysis of real exchange rate movements.

## 3 Review of empirical research on real exchange rates

Most of the recent empirical studies test hypotheses against various theoretical backgrounds ranging from the law of one price or Purchasing Power Parity (PPP) theory to concepts of uncovered interest parity to equilibrium real exchange rates. These studies include Rusydi and Islam (2010), Petrevski (2007, 2010), Hsing and Sergi (2009), Russel (2009). While some of the papers tested the validity of PPP or the Balassa-Samuelson effect, some modelled the dynamics of real exchange rates and others attempt to determine the long-run equilibrium real exchange rates and to assess the possible misalignment. The methodologies adopted in the studies included time series analysis working with cross section or panel data, utilising reduced form equations or large structural models. The earlier research employed simple regression models and recent research used co-integration techniques (Petrevski, 2007).

Froot and Rogoff (1996) observe while most of the first-generation tests rejected the PPP hypothesis, the second-generation tests found that the PPP hypothesis was valid only for very long periods covering more than 100 years and that too for industrialised countries with similar income levels, growth rates and inflation. Finally, the latest models utilising the co-integration methodologies validated the PPP hypothesis.

A study by Narayan and Prasad (2008) on real exchange rates in four Pacific island countries took the approach that a stationary real exchange rate is consistent with PPP

theory and tested whether shocks to real exchange rates have a permanent effect or transitory effect. Their study employed Lee and Strazicich (2003a, 2003b) unit root test and concluded that for Papua New Guinea and Samoa, real exchange rates were stable, implying that shocks had a transitory effect, while for Fiji and the Solomon Islands real exchange rates were unstable, implying that shocks had a permanent effect on real exchange rate. Accordingly, if real exchange rate is found to be non-stationary, then shocks may be principally due to aggregate demand, such as changes in monetary policy.

Important findings of a few major research studies on long-run real exchange rates of the major world currencies, which employed different methodologies, including co-integration technique and panel data analyses are succinctly summarised by Petrevski (2007). MacDonald (1997) and MacDonald and Nagayasu (1999) in their studies on real exchange rates of major world currencies formulated models on the lines that real exchange rates are functions of the standard fundamental variables such as: productivity differentials, fiscal balance, private savings and interest rate differentials. While the co-integration analysis for each individual country revealed very weak relationship between real exchange rate and the fundamentals, panel co-integration analysis indicated a stronger relationship for a number of countries.

Studies on real exchange rate in developing countries, which employed different theoretical foundations and research methodologies, established the presence of a strong relationship between real exchange rate and structural and fundamental variables. Krumm (1993) applied the major trading partners methodology to the analysis of real exchange rates in Tanzania and the Philippines during the period from the mid-1960s to the mid-1980s. Their regressions include the standard structural variables as well as the set of economic policy variables, which proved to have an important impact on the real exchange rates in the short run.

In their study on Argentina, Alberola et al. (2004) employed the co-integration technique to calculate the equilibrium real exchange rate of the Argentine peso during 1960–2001 as well as the extent of the misalignment. In the long run, the equilibrium real exchange rate is a function of the country's Net Foreign Assets (NFA) and the relative sectoral productivity differential. They showed that the misalignment of the peso was a consequence of the inconsistent macroeconomic policy and the reliance on inappropriate nominal anchor.

Similarly, Elbadawi and Soto (1994), in their study on the real exchange rate in Chile during 1960–1992, concluded that real exchange rate was influenced by the fundamentals, with the capital flows being the most prominent driving force in the short run. Focusing on African countries, Baffes et al. (1999) found out that the equilibrium real exchange rates in Burkina Faso and Cote D'Ivoire were functions of the standard fundamental variables.

## 4 Modelling, methodology and data

Our modelling follows the approach adopted by Petrevski (2007). Since equilibrium values are unobservable, we resort to estimating a long-run relationship between the current values of the real exchange rate and the current values of the fundamentals. Three variables are chosen to represent the fundamentals. They are: the degree of Openness of the Economy (OP), which is represented by the ratio of total trade (imports and

exports) to GDP, NFA in F$ millions and Government Expenditures (GOVEXP), which is expressed as percentage of GDP.

Holding other things constant, a rise in OP would result in depreciation of REER. This is in accordance with the observed phenomenon that trade-liberalising reforms tend to depreciate the equilibrium RER (Goldfajn and Valdes, 1999). On the other hand, increase in the international reserves would lead to appreciation of REER. The reasoning behind this view is that the country relying on higher net resource transfer (i.e., capital inflows) would experience appreciation in REER (MacDonald and Ricci, 2003). Under *ceteris paribus* conditions, an increase in GOVEXP contributes to appreciation of REER. The rationale behind direct relationship between GOVEXP and REER runs on the following lines: a high proportion of GOVEXP in developing countries happens to be on non-tradable goods and services, such as labour and house and office space rentals and other local services, which raise the domestic price level relative to foreign price level, and consequently, REER would appreciate given the nominal exchange rate and the foreign price level.

Accordingly, we write the functional relationship as follows:

$$\text{REER} = f(\text{OP}, \text{NFA}, \text{GOVEXP}). \tag{1}$$

With a view to examining the existence of any long-run cointegrating relationship between REER, OP, NFA and GOVEXP, we use multivariate cointegration methodology proposed by Johansen and Juselius (1990). The estimation of Johansen and Juselius methodology involves the following procedures. First, let $X_t$ represent an $(n \times 1)$ vector of variables and $X_t$ follow $I(1)$ process, then examining the number of cointegrating vector involves estimation of the vector-error correction representation as follows:

$$\Delta X_t = A_0 + \Pi X_{t-p} + \sum_{i=1}^{p-1} A_i X_{t-i} + \varepsilon_t. \tag{2}$$

In equation (1), the vectors $\Delta X_t$ and $\Delta X_{t-i}$ are $I(0)$ while the vector $X_{t-i}$ are $I(1)$ variables. Hence, the long-run relationship among $X_t$ is determined by the rank of $\prod$ matrix. If the rank of $\prod$, say $r$, is equal to zero, then equation (1) is reduced to a VAR model of $p$th order and there appears no long-run cointegrating relationship between the variables. On the other hand, if $0 < r < n$, then there are $n \times r$ matrices of $\alpha$ and $\beta$ such that

$$\prod = \alpha\beta' \tag{3}$$

where $\beta$ is cointegrating vector; hence, $\beta' X_t$ is $I(0)$ although $X_t$ are $I(1)$ and the strength of cointegration relationship is measured by $\alpha's$. In this model, we have to estimate ($A_0$, $A_1$,…, $A_{p-1}$, $\prod$ and $\Omega$) by using maximum likelihood procedures, such that '$\Pi$' can be stated as in equation (2).

Once we establish the existence of a long-run relationship between the variables by appropriate cointegration testing procedure, we proceed to estimate an Error Correction Model (ECM). The ECM is used to investigate the short-run dynamics of the real exchange rate. As shown by Engle and Granger (1987), the vector-error correction model for these variables can be written as follows:

$$\Delta \text{REER}_t = \alpha_1 + \sum_{i=1}^{k} \beta_{1i} \Delta \text{REER}_{t-i} + \sum_{i=1}^{k} \gamma_{1i} \Delta \text{OP}_{t-i} + \sum_{i=1}^{k} \phi_{1i} \Delta \text{NFA}_{t-i} + \sum_{i=1}^{k} \phi_{1i} \Delta \text{GOVEXP}_{t-i} + \delta \varepsilon_{t-1} + u_{1t} \quad (4)$$

$$\Delta \text{OP}_t = \alpha_2 + \sum_{i=1}^{k} \beta_{2i} \Delta \text{REER}_{t-i} + \sum_{i=1}^{k} \gamma_{2i} \Delta \text{OP}_{t-i} + \sum_{i=1}^{k} \phi_{2i} \Delta \text{NFA}_{t-i} + \sum_{i=1}^{k} \phi_{2i} \Delta \text{GOVEXP}_{t-i} + \delta \varepsilon_{t-1} + u_{2t} \quad (5)$$

$$\Delta \text{NFA}_t = \alpha_3 + \sum_{i=1}^{k} \beta_{3i} \Delta \text{REER}_{t-i} + \sum_{i=1}^{k} \gamma_{3i} \Delta \text{OP}_{t-i} + \sum_{i=1}^{k} \phi_{3i} \Delta \text{NFA}_{t-i} + \sum_{i=1}^{k} \phi_{3i} \Delta \text{GOVEXP}_{t-i} + \delta \varepsilon_{t-1} + u_{3t} \quad (6)$$

$$\Delta \text{GOVEXP}_t = \alpha_4 + \sum_{i=1}^{k} \beta_{4i} \Delta \text{REER}_{t-i} + \sum_{i=1}^{k} \gamma_{4i} \Delta \text{OP}_{t-i} + \sum_{i=1}^{k} \phi_{4i} \Delta \text{NFA}_{t-i} + \sum_{i=1}^{k} \phi_{4i} \Delta \text{GOVEXP}_{t-i} + \delta \varepsilon_{t-1} + u_{4t} \quad (7)$$

where $\alpha_i$, $\beta_i$, $\gamma_i$, $\phi_i$ and $\delta$ are parameters that need to be derived via a VAR regression, $\Delta$ is the difference and $\varepsilon_{t-1}$ is the Error Correction Term (ECT) derived from the long-run cointegrating vector, as shown in equation (1). The coefficient of the ECT $\delta$ can be interpreted as the speed of adjustment.

The empirical study covers a 28-year period (1980–2007) and uses the annual data on *REER* in index numbers, which are drawn from *International Financial Statistics CD ROM* of International Monetary Fund (2008) and annual data on OA, NFA and GOVEXP are sourced from various issues of the *Quarterly Economic Review* of Reserve Bank of Fiji (2008). All variables are expressed in the natural logarithm.

## 5 Empirical results

### *5.1 Unit root test results*

Our empirical investigation starts with testing the stationarity properties of the times series of the variables proposed to be employed in the study. The results of unit root tests[2] in regard to time series of REER, OP, NFA and GOVEXP indicate that all the aforementioned variables have unit roots.[3] However, the presence of a unit root is rejected at first difference. Thus, time series of all the four variables are of *I*(1) process.

### *5.2 Cointegrating vector*

Since all variables are integrated of the order one, $I(1)$, we proceed to check whether these series are cointegrated by undertaking the Johansen and Juselius (1990) multivariate cointegration test. Table 2 presents the results of the cointegration tests. According to both maximum eigenvalue and trace test statistics, we have sufficient evidence to reject the null hypothesis of no cointegration at 5% significance level. The model performs well in terms of standard diagnostic tests for serial correlation (LM test), normality in residuals (Jarque-Bera test) and heteroskedasticity (Panel III, Table 4).

**Table 2** Results of Johansen and Juselius multivariate procedure

| *Panel I: Maximum eigenvalue and trace tests* | | | | |
|---|---|---|---|---|
| | *Maximum eigenvalue* | | *Trace* | |
| *Hypothesis* | *Test statistic* | *95%* | *Test statistic* | *95%* |
| *Fiji* | | | | |
| $p = 0$ | 34.30* | 32.11 | 67.28* | 63.87 |
| $p \leq 1$ | 22.20 | 25.82 | 32.98 | 42.91 |
| $p \leq 2$ | 7.404 | 19.38 | 10.77 | 25.87 |
| $p \leq 3$ | 3.37 | 12.51 | 3.37 | 12.51 |
| *Panel II: Normalised cointegrating vector* | | | | |
| *REER* | *OP* | *NFA* | *GOVEXP* | *Intercept* |
| –1.00 | –2.33** | 0.16** | 1.38** | 10.12 |
| *Panel III: Diagnostic checking* | | | | |
| Jarque-Bera | $\chi(2) = 2.7203$ [0.2566] | | | |
| Breusch-Godfrey LM Test | F(1) = 1.2523 [0.2819] F(2) = 0.5926 [0.5671]<br>F(3) = 0.3960 [0.7582] F(4) = 0.2729 [0.8893] | | | |
| ARCH Test | F(1) = 1.3804 [0.2525] F(2) = 1.6085 [0.2250]<br>F(3) = 1.0970 [0.3759] F(4) = 0.8787 [0.4983] | | | |

* and ** indicate significant at 5% and 1% levels, respectively.

Critical values of trace and maximum eigenvalue according to Osterwald-Lenum (1992).

Figures in square parentheses [ ] refer to marginal significance level. Figures in bracket ( ) refer to the lag length used in testing the battery tests.

Using the estimation results of the cointegration test, we get the following result for the long-run relationship. The *t*-statistics are given in brackets.

$$\begin{aligned} \text{REER} &= 10.12 - 2.33\text{OP}^{**} + 0.16\text{NFA}^{**} + 1.38\text{GOVEXP}^{**} \\ t = & \qquad (-6.77) \qquad (2.71) \qquad (4.79) \end{aligned} \tag{8}$$

**denotes significance at 1% level.

We observe that the results are along the theoretically expected lines. Further, the estimated coefficients of the three variables, representing the economic fundamentals, are statistically significant. Thus, the three hypotheses are successfully tested and proven: the OP and real exchange rate are negatively associated, whereas the NFA and GOVEXP are positively associated with real exchange rate.

### *5.3 Estimation of degree of misalignment*

According to Petrevski (2007), the long-run parameters obtained based on the model could not be viewed as the equilibrium real exchange rate. Therefore, we obtain these values by employing two statistical techniques, namely a 5-year moving average and Hodrick-Prescott (HP) filter, proposed by Ravn and Uhlig (2002), for calculating the equilibrium real exchange rate. The HP technique decomposes the series into a cyclical component and trend component ($c_t$) and a trend component ($g_t$), by minimising with respect to $g_t$, for $\lambda > 0$, the following quantity:

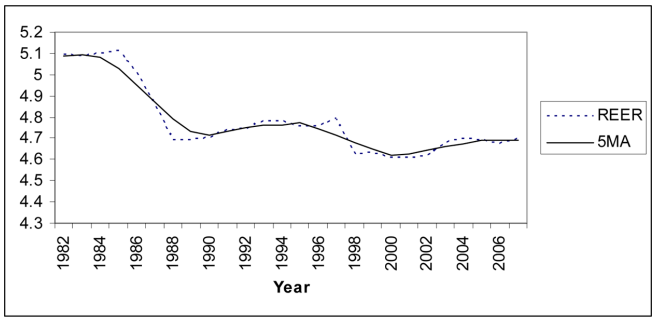
$$\sum_{t=1}^{T}(y_t - g_t)^2 + \lambda\sum_{t=2}^{T-1}(g_{t+1} - g_{t-1})^2. \tag{9}$$

This technique utilises the value proposed by Ravn and Uhlig (2002) for annual data for the smoothness parameter, $\lambda$, i.e., 6.25, so that the HP filter yields cyclical components comparable with those obtained by the band-pass filter.

Figures 1 and 2 present the using 5-moving average procedure and HP filter technique actual real exchange rates, using 5-year moving average estimation procedure and the HP filter technique, and equilibrium values of the real exchange rate. From the figures, it is seen that the path of both actual and equilibrium REER is decreasing over time with a substantial depreciation in the mid-1980s and early 2000s, signifying the devaluation of Fiji dollar by 30% in 1987 and by 20% in 1998. Table 3 shows the estimated degree of misalignment of the real exchange rate at the end of each year during 1982–2007.

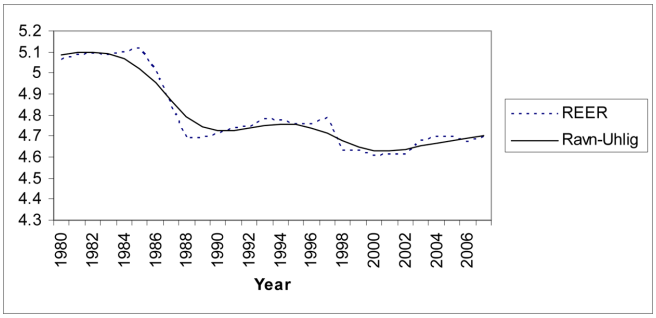
We observe that during the five years (1982–1987), preceding the devaluation of Fiji's currency in 1987, real exchange rate appears to be overvalued to the extent of 8%, if we go by moving averages, and 9%, according to HP Filter (Ravn and Uhlig, 2002) technique. Following the 1987 devaluation of Fiji dollar, there was a misalignment, in terms of undervaluation of the currency in 1988 by 10% under both procedures. Thereafter until 1996, the estimated deviation from the equilibrium real exchange rate was in terms of overvaluation, though of smaller degree. In 1997, the estimated misalignment by of overvaluation was a close 8% as per the moving average, and 7% by HP Filter (Ravn and Uhlig, 2002) procedures. After the devaluation of 1998, misalignment seems to have persisted, this time by way of undervaluation, to the extent of 5%. In 1998, the extent of exchange rate misalignment was around 5%. In 1999 and thereafter until 2004, it is around 2–3%. During 2005–2007, the degree of misalignment has been much less.

**Figure 1** Actual and equilibrium real exchange rates using 5-moving average, 1982–2007 (see online version for colours)




*Source*: IMF (2008)

**Figure 2** Actual and equilibrium real exchange rates using Hodrick-Prescott Filter (Ravn and Uhlig, 2002), 1980–2007 (see online version for colours)




*Source*: IMF (2008)

**Table 3** The estimated misalignment of the real exchange rate, 1982–2007

| *Year* | *5MA* | *HP Filter* (*Ravn and Uhlig, 2002*) |
|---|---|---|
| 1982 | 0.0058 | –0.0065 |
| 1983 | –0.0093 | –0.0046 |
| 1984 | 0.0202 | 0.0315 |
| 1985 | 0.0827 | 0.0910 |
| 1986 | 0.0553 | 0.0554 |
| 1987 | –0.0225 | –0.0209 |
| 1988 | –0.0967 | –0.1021 |
| 1989 | –0.0439 | –0.0552 |
| 1990 | –0.0084 | –0.0209 |
| 1991 | 0.0060 | 0.0104 |
| 1992 | –0.0063 | 0.0035 |
| 1993 | 0.0226 | 0.0296 |
| 1994 | 0.0135 | 0.0179 |
| 1995 | –0.0150 | 0.0024 |
| 1996 | 0.0161 | 0.0173 |
| 1997 | 0.0763 | 0.0740 |

**Table 3** The estimated misalignment of the real exchange rate, 1982–2007 (continued)

| *Year* | *5MA* | *HP Filter* (*Ravn and Uhlig, 2002*) |
|---|---|---|
| 1998 | –0.0542 | –0.0521 |
| 1999 | –0.0224 | –0.0203 |
| 2000 | –0.0119 | –0.0267 |
| 2001 | –0.0173 | –0.0177 |
| 2002 | –0.0279 | –0.0229 |
| 2003 | 0.0199 | 0.0263 |
| 2004 | 0.0271 | 0.0298 |
| 2005 | 0.0051 | 0.0126 |
| 2006 | –0.0184 | –0.0178 |
| 2007 | 0.0106 | –0.0005 |

Positive value indicates the exchange rate is overvalued while negative value indicates the exchange rate is undervalued.

## *5.4 Granger causality test*

Having established the existence of a long-run relationship between the REER and its determinants, we now proceed to investigate causality relationship, which should exist by definition at least in one direction (Engle and Granger, 1987). The test results of causality relationships between the variables estimated through vector-error correction model are summarised in Table 4. While the ECT with the required negative sign in the equation with REER as dependent variable is statistically significant, the ECT in other three equations is not significant. Thus, we conclude that long-run causal relationship is in only one direction and that it is running from the three fundamentals, OP, NFA and GOVEXP, to REER. The estimated value of the coefficient is 0.2428, indicating that if the real exchange rate drops below the equilibrium rate, the adjustment towards restoration of the equilibrium rate would take four years.

**Table 4** Granger causality results based on Parsimonious Vector Error Correction Model (PVECM)

| | *Wald test* (*F statistics*) | | | | |
|---|---|---|---|---|---|
| | *REER* | *OP* | *NFA* | *GOVEXP* | *ECT* |
| REER | – | 5.2751* | 5.4439* | 0.5196 | –0.2428*<br>(–2.73) |
| OP | 0.5824 | – | 0.1879 | 1.2169 | –0.7889<br>(–1.69) |
| NFA | 0.0294 | 0.2932 | – | 0.2924 | –0.9079<br>(–0.82) |
| GOVEXP | 1.8430 | 2.0178 | 1.6455 | – | –0.0561<br>(–0.21) |

The Wald statistic, which tests the joint significance of the lagged values of the independent variables, is reported. This statistic is to be compared with *F*-statistics. The *t*-statistic is reported in the parentheses.

The asterisk indicates the following level of significance *1%.

In the short run, the REER is influenced by economic fundamentals, i.e., OP and NFA, and not by GOVEXP. As the F-statistics of both, OP and NFA in the REER equation are statistically significant, we conclude that the short-run causal relationship is seen to be running from OP and NFA to REER. Therefore, any decrease in OP and rise in NFA would lead to the appreciation of the real exchange rate in Fiji.

## 6 Summary and policy recommendation

The paper undertook an empirical study of Fiji's real exchange rate during a 27-year period (1980–2007) by modelling its dynamics with the estimation of the long-run equilibrium real exchange rate. The determination of the long-run equilibrium real exchange rate was based on an empirical model in which we employed variables representing three economic fundamentals: the degree of OP, the NFA and GOVEXP. On the basis of the estimated long-run equilibrium rate, we calculated the degrees of misalignment of the actual exchange rate from the equilibrium values.

The estimated long-run cointegration equation is acceptable, as the coefficients of all the three explanatory variables are not only in accordance with the theoretical expectations but are also statistically significant. The study findings thus confirm that Fiji's real exchange rate is strongly influenced by the three economic fundamentals.

The empirical results also show that there has been no large, persistent over – or undervaluation of the REER in Fiji away from its long-run equilibrium value. The actual rate has moved in a narrow band of plus and minus 10% of the long-run equilibrium exchange rate over the period of 1980–2007.

The Granger causality relationships were investigated by a VECM procedure. The tests show that the long-term relationship is only in one direction, which is from fundamentals to real exchange rate, as confirmed by the significant ECT only in the equation with real exchange rate as dependent variable. In addition to long-term relationship, we also observe that the causal linkage is running in the short run from each of the three variables to real exchange rate. As for the deviation of the actual real exchange rate from its equilibrium values, it takes around 24% per year for the real exchange rate to fully adjust to a given exogenous shock and reach its long-run equilibrium.

The policy implications are clear: In the context of a high degree of openness of a small island economy in an increasingly globalised world, there is a critical need for the government to rein in public sector expenditures. Fiscal deficits and the resultant trade deficits, usually referred to as twin deficits, given the limited range of exports and high import dependence of all island countries in the Pacific region, including Fiji, would exercise substantial inflationary pressures, contributing to appreciation of REER. On the other hand, depletion of foreign reserves consequent to expanding trade deficits would exert pressures on nominal exchange rate. In the absence of any corrective steps, they would create large deviation from equilibrium exchange rate, hurting export competitiveness. Though periodical adjustments by way of devaluation in the nominal rate have been a way out, it is often painful for the domestic economy, given the inelastic supply of exports to take advantage of exchange rate depreciation. In these circumstances, fiscal prudence is the only way out to maintain equilibrium exchange rate.

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## Notes

[1]The Central Monetary Authority was replaced in 1984 by the establishment of the Reserve Bank of Fiji (RBF) under a parliamentary statute.

[2]To conserve space, the results are not provided. However, they would be made available on request.

[3]The number of lags was determined using the Akaike Information Criterion (AIC).