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Impact of Exchange Rate Changes on Domestic Inflation: A Study of a Small Pacific Island Economy

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Abstract

This paper investigates the effect of changes in exchange rate on consumer price level, in Fiji, known as exchange rate pass-through during a thirty year period (1982-2009). Specifically, three time periods are focused on: the pre-coup years (1982-1986); post coup years (1987-2009); and full time period (1982-2009). Monthly data on consumer price index, nominal exchange rate, monetary aggregate and interest rate are utilized. The study results show that the degree of exchange rate pass-through to domestic price was relatively low during the entire sample period at 0.183. It was 0.453 and 0.373 for the pre and post coups periods. Regardless of the sample periods under study, the monetary aggregate, as a variable plays a pivotal in stabilizing the price level.

Keywords: Exchange rate pass-through, price, monetary measure, cointegration, Granger causality

JEL Classification – F31, E31

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I. Introduction

Fiji, which has a fixed exchange rate regime, has been experiencing steep inflation since April 2009. In the context of Fiji's high degree of dependency on imports ranging from food and fuel to transport and machinery and to a host of manufactured consumer goods, it is generally held that the devaluation of the currency in April 2009 was largely responsible for the steep rise in consumer price level. However, much earlier than April 2009, Fiji had also been experiencing other shocks, mostly in terms of natural disasters, including cyclones and floods, which destroyed farms lands and roads and transport infrastructure. Further, there were increases in world's oil and food prices in early 2008. Shortages in supply of domestic food products due to fall in production of staples, such as taro and other root crops, vegetables and fruits, besides rise in world oil and food prices have also been identified as reasons for increases in monthly price level.

This paper seeks to investigate how far exchange rate movements have been responsible for rise in domestic price level. Specifically, the objective of the study is to focus on exchange rate pass- through (ERPT), which refers to the effect of changes in exchange rate on changes in consumer prices during a 28-year period (1982-2009). The paper is organized as follows: the second section provides a brief review of literature and various empirical studies on the subject of ERPT; the third section reviews Fiji's inflationary trends in recent years; the fourth section outlines the methodology for the study; the fifth section reports the results; and the last section is a summary.

II. A Brief Literature Survey

The term ERPT refers to the transmission of exchange rate changes to import prices of goods in the destination market currency as well as to aggregate domestic prices (Ghosh and Rajan 2007). Thus, changes in exchange rate under a fixed exchange rate regime affect (i) import and export prices; (ii) volumes of imports and exports; (iii) investment decisions, in regard to export promotion or import substitution activities; and (iv) consumer prices.

Kahn (1987), Menon (1995), Goldberg and Knetter (1997) and Ghosh and Rajan (2007) provide excellent summaries of both theoretical and empirical studies on the subject. These studies generally define ERPT as the percentage change in local currency import prices resulting from a one percent change in exchange rate between the exporting and importing countries. The ERPT is partial or incomplete, if the import price changes by less than the percentage change in the exchange rate. Menon (1995) identifies two channels of exchange rate pass through: a direct channel and an indirect channel. McFarlane (2006) illustrates the transmission mechanism in Figure 1.

Indirect channel as noted by Kahn (1987), Piggot and Reinhart (1985), and Phillips (1988) is influenced by changes in aggregate demand, which in turn is influenced by depreciation of domestic currency. The latter renders domestic products cheaper to foreigners. Consequently, exports rise and aggregate demand would rise relative to

potential output, resulting in domestic price level. The main factors influencing the degree of pass-through are the openness and size of the economy, besides relative elasticities of demand and supply for traded goods and macroeconomic conditions and microeconomic environment (McFarlane 2006).

In a small economy, exporters face perfect elasticity of demand for its exports and importers face perfect elasticity of supply of its imports. Hence the small economy is price taker. In such an economy, the pass-through is complete. Macroeconomic conditions would reinforce or counteract the influence of demand and supply elasticities. When domestic demand is close to full employment capacity, ERPT is likely to be high, irrespective of the relative elasticities of demand and supply (Piggot and Reinhart 1985; and Phillips 1988).

The direct channel is due to operation of law of one price based on purchasing power parity theory. It is postulated that exchange rate between two currencies is determined by relative movements in the price levels in two countries. The formal presentation is given below

$$P = P^*. E \qquad (1)$$

Where
P = domestic currency price of the imported good;
E = exchange rate expressed as units of domestic currency per unit of foreign currency;
P* = foreign currency price of the imported good;

Expressing it in logs, we obtain (2)

$$log\ P = \beta\ log\ P^* + \lambda\ log\ E$$

The law of one price implies $\beta = \lambda = 1$, in which case changes in the exchange rate completely pass through to the domestic price of the traded good.

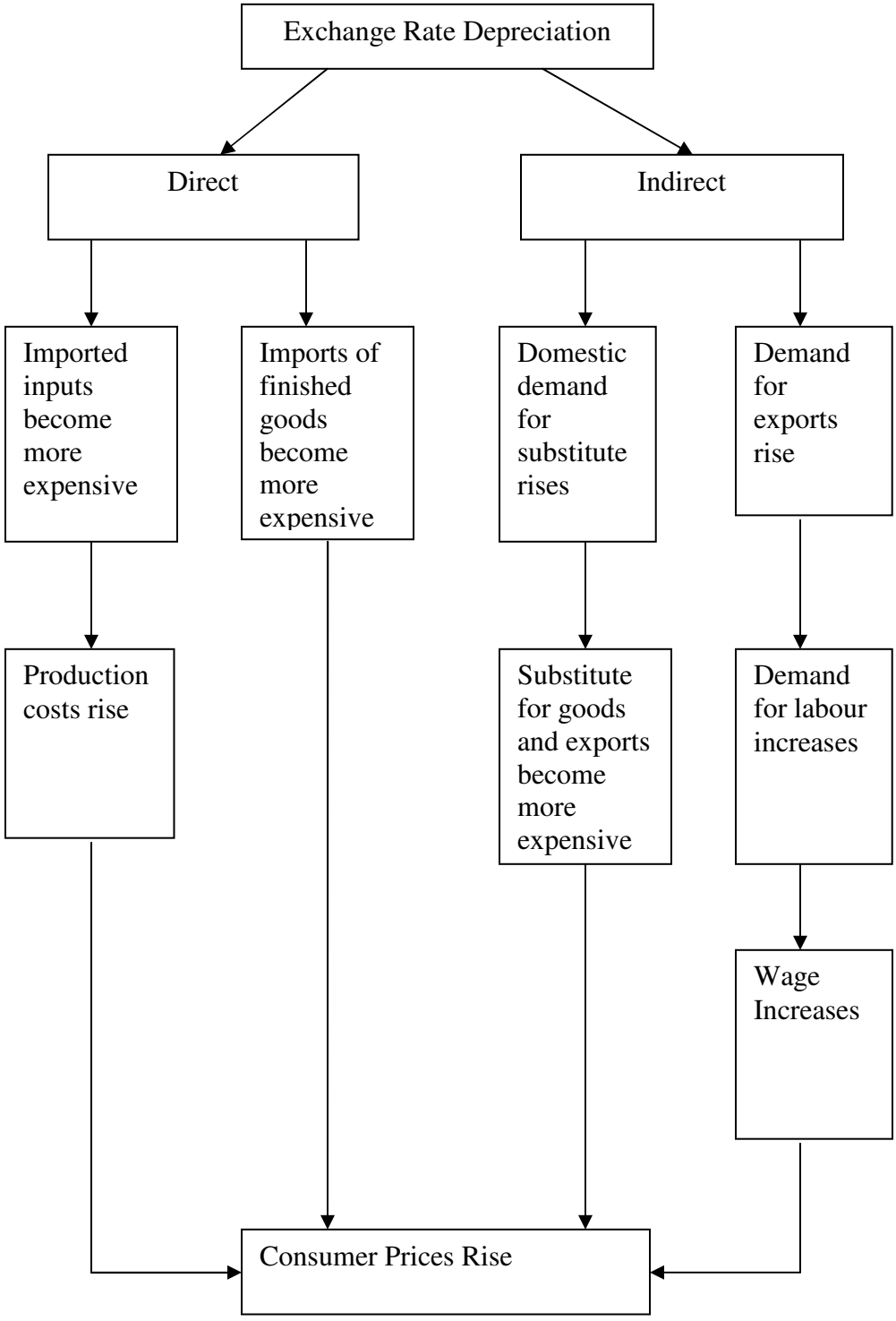
Recognizing that prices are dependent on marginal costs and mark-ups, we obtain the following:

$$log\ P = \beta(1+m)c^* + \lambda log\ E \qquad (3)$$

where,

m= foreign mark up; and c* = foreign cost of production

Figure 1: Transmission Mechanism of Exchange Rate Pass-Through



Source: McFarlane (2006)

If foreign markets are competitive and the overseas output shocks are temporary and if the given country is small and hence a price taker, the first term in Eqn (2) would be relatively stable. Goldberg and Knetter (1997) note that ERPT is complete if marginal costs and mark ups of costs are constant and if $\beta = \lambda = 1$.

After a review of 43 empirical studies, Menon (1995) concluded that degree of pass-through observed in each study was quite different across countries The differences were due to (i) methodology employed; (ii) model specification; and (iii) variable selection, rather than due to difference in time periods studied.

There have been further improvements in methodology employed in their studies by Kim (1998) and McCarthy (2000). Kim (1998), in contrast to other studies, found fluctuations in exchange rate had a significant negative effect on the USA producer price inflation rate. McCarthy (2000) in a study on industrialized countries found that ERPT to consumer prices is modest in most of the countries. More recent studies, including McFarlane (2006) and Engel (2001), have documented that ERPT is generally weak. Our objective is to examine the specific case of a small Pacific island country and examine ERPT in the light of the April 2009 devaluation by a study of monthly movements in price level following the devaluations of 2009, 1998 and 1987.

III. Inflationary Trends in Fiji: 1980-2009

Fiji's central bank, the Reserve Bank of Fiji (RBF) has two objectives[1]. They are: maintaining price stability and ensuring an adequate level of foreign reserves. In regard to the objective of price stability, RBF seeks to keep headline inflation[2] low in the range between 0-3 percent[3]. Since the headline inflation measure is often influenced by large, but temporary policy shocks, RBF also looks at underlying measures of inflation such as "trimmed mean" and "inflation excluding volatile items". Trimmed mean or the core inflation is calculated using 70 percent of the CPI basket by excluding the 15 percent of extreme price increases and 15 percent of extreme price reductions from the CPI basket. This measure of inflation eliminates temporary price fluctuations and reflects permanent price changes that are mainly caused by supply side factors. In other words, high variability components are excluded from the aggregate inflation measure. Commonly excluded components include wheat products, cereals, fresh fish, vegetables & root crops, preserved fruits, fruit, fruit juice, *yaqona*, dairy products and spices.

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[1] Section 4 of the Reserve Bank of Fiji (RBF) Act (1985) lays down: "The principal purposes of the Reserve Bank shall be – (a) to regulate the issue of currency, availability and international exchange of money; (b) to promote monetary stability; (c) to promote a sound financial structure; and (d) to foster credit and exchange conditions conducive to the orderly and balanced economic development of the country."

[2] This is the official measure of consumer price inflation and calculated using the overall consumer price index (CPI) basket.

[3] There is no announced target by RBF for inflation. However, the Government in the 2009 National Budget has a target of 0-3 percent.

As regards the second objective, RBF seeks to maintain an adequate level of foreign reserves. Generally the adequate level is supposed to cover at least 4 months of imports of goods and services.

Exchange Rate adjustments

The aforesaid two objectives of Fiji's monetary policy, are sought to be achieved in the context of a fixed exchange rate arrangement regime. Under this arrangement, the value of Fiji dollar, which is the domestic currency, is linked to a trade weighted basket of currencies of major trading partners, including Australia, Japan, New Zealand, eurozone and the USA. Maintenance of a stable exchange rate[4] has been a necessity as merchandise trade alone represents more than 6o to 65 percent of GDP.

Maintaining the external exchange rate stability requires appropriate domestic policies. While financial sector stability and efficiency are sought to be achieved by prescribing and enforcing internationally accepted prudential standards which financial institutions should meet, the objectives of price and exchange rate stability are maintained through formulation and implementation of an appropriate monetary policy in close coordination with the finance ministry, which is exclusively responsible for fiscal policy (Ali and Jayaraman 2002).

Foreign reserves came to be re-defined in 2005[5]. As a result, foreign reserves at the end of 2005 were estimated at F$908 million, equivalent to around 3.3 months of imports of goods and non-factor services. Due to increases in the size of current account deficits in 2006, 2007 and 2008, there was an alarming decline in foreign reserves. The reserves declined in December 2008 to reach F$558.7 million, equivalent to imports of 1.6 months. The international reserves declined further to F$429.6 million by March 2009, just to about one month equivalent of imports of goods and services. Following the devaluation in April 2009 by 20 percent, the foreign reserves were revised upwards to reach F$ 640.3 million in May 2009 (RBF 2009). With additional allocation of special drawing rights of FJ$188 million in August and September 2009, and due to the dampening effects of devaluation on trade account[6], the foreign reserves position improved substantially. For the first time in Fiji's history, foreign reserves reached a new

[4] The nominal exchange rate was allowed to fluctuate within a band of +0.07 percent and -0.07percent. A higher range for allowing greater flexibility (a larger band of plus or minus 2% to 3%) has been recommended by IMF (2011).

[5] In 2005, the Bank reviewing the definition of foreign reserves according to the IMF's Balance of Payments Manual, (5th Edition) decided to include non-bank financial institutions' (NBFIs) offshore investments as part of official reserve assets. Accordingly, foreign assets presently included RBF's own foreign assets of F$549 million and holdings of NBFIs' foreign assets of F$359 million, totalling F$908 million.

[6] A significant fall in imports of petroleum products and overall declines in import payments by 22 percent and improved export earnings from fish, gold, sweet biscuits, molasses, corned meat and ginger. Foreign reserves in April 2010 were around F$1,084 million, equivalent to 3.4 months of imports of goods and services.

milestone of F$ 1 billion on September 22, 2009 (RBF 2009) or equivalent to 3 to 4 months of imports of goods and services.

Inflationary trends

Fiji's inflation during the first 15 years since independence in 1970 was largely influenced by its fixed exchange rate regime as well as the country's openness reflected in the high ratio of imports and exports to gross domestic product, ranging between 60 percent to 70 percent. Oil price shocks of the mid 1970s accelerated inflation worldwide and Fiji was no exception. In the early 1980s, inflation declined sharply in Fiji. However, inflation rose sharply in the late 1980s, mainly because of two devaluations in 1987 (Morling *et al.,* 1999).

Inflation was once again on its downward path in the early 1990s in concert with the rest of the world. As the central banks of Australia and New Zealand began to target inflation as their goal, and since Fiji's imports of consumer goods of mass consumption, including food and beverage products and manufactured goods have been traditionally sourced from these two major economies in the region, Fiji's inflation remained low and steady.

In 1998, devaluation of Fiji's currency by 20 percent as a measure to meet the adverse impact of the Asian financial crisis resulted in a sharp temporary rise in inflation. Morling *et al*. (1999) in their study note that over a 32-year period (1966-1998) annual inflation in Fiji and Fiji's trading partners averaged 6.7 percent.

During the last decade, average underlying (trimmed mean) inflation in Fiji has been around 1.7 percent, while average headline inflation, calculated using the overall CPI basket, has been around 3.8 percent. In 2007, inflation was 4.3 percent compared with 3.1 percent in 2006, which would be attributed to rise in international commodity prices. In 2008, higher import prices raised food prices. Inflation spiked from 5.8 percent in May 2008 to a 20-year high of 9.8 percent in September 2008 before falling to 8.5 percent in October 2008. Fall in fuel prices and subsequent decline in transport costs in late 2008 moderated price level increases for the year, however only to some extent (UN ESCAP 2009). The year 2008, for the entire 12-month period, recorded inflation at 6.6 percent, the highest since 1990. The reasons were that food prices rose by 11.5 percent and non-food prices by 6.9 percent.

In April 2009, Fiji devalued its currency by 20 percent to meet the crisis created by rapid decline in international reserves. As a result, higher prices were noted across almost all categories. Notably, consumer prices rose by 8 percent.

IV. Methodology, Modeling and Data

The empirical analysis, which covers a 28- year period (1982-2009), is constrained by the availability of data series on gross domestic output (GDP) on a monthly basis. Hence, the

methodology is therefore restricted to examining the influence of the direct channel, which requires data only on price and exchange rate changes.

Equation (2) is the basis of the modeling. Adopting the procedure followed by Parsley and Popper (1998), the investigation is extended to cover monetary policy changes as well. Accordingly, we consider RBF's monetary policy measures during the period under study. Beginning from 1989, RBF was targeting short-term interest rate by commencing open market operations in its own short-term papers, known RBF Notes. Following the December 2006 coup, RBF has been placing greater reliance on the direct instrument, notably the statutory reserve ratio. The RBF through changes in SRD ratio aims at changing its liabilities, namely the monetary base. Accordingly, the Equation (2) is expanded to reflect the monetary policy actions.

$$Log\ P = \beta(1+m)c^{*} + \lambda\ log\ E + \delta\ \log M2 + \gamma log\ i \qquad \text{(Eqn. 3)}$$

where, in addition to the definitions earlier,

M2= Broad money; i =money market interest rtae

Table 1: Fiji Inflation, Exchange Rates and Money Supply

	Inflation		Nominal Exchange Rate		M2		TB Rate		MM Rate	
	(%)	SD	(F$/US$)	SD	(Mil F$)	SD	(%)	SD	(%)	SD
1971-1980 (Ave)	11.7	4.7	0.84	0.04	184.2	94.2	4.7	0.5	-	-
1981-1990 (Ave)	6.8	3.0	1.18	0.22	712.1	324.5	5.7	2.3	5.4	2.7
1991-1995 (Ave)	3.9	2.3	1.48	0.05	1376.9	138.9	3.6	1.2	3.7	0.6
1996-2000 (Ave)	3.0	1.7	1.79	0.34	1452.1	90.0	2.6	0.7	1.9	0.6
2001-2005 (Ave)	2.9	1.4	1.96	0.26	1945.9	430.9	1.5	0.3	1.0	0.2
2006	2.5	NA	1.73	NA	3012.3	NA	7.5	NA	4.8	NA
2007	4.8	NA	1.61	NA	3325.9	NA	4.5	NA	4.7	NA
2008	7.7	NA	1.59	NA	3097.7	NA	0.3	NA	1.0	NA
2009	3.7	NA	1.96	NA	3212.3	NA	NA	NA	1.0	NA
2006	2.5	NA	1.73	NA	3012.3	NA	7.5	NA	4.8	NA

Notes: NA= not applicable; SD= Standard Deviation; TB = Treasury Bill; MM = Money Market
Sources: UN ESCAP(2010) and IMF (2010)

There are alternative approaches as well. Parsley and Popper (1998) and McCarthy (2000) included a monetary aggregate instead of monetary base. On the other hand, Bernanke and Mihov (1997) utilized interest rate instead of monetary aggregate, as they found monetary aggregates were not significant in the Bundesbank reaction function (McFarlane 2006).

We employ the following variables: consumer price index (CPI); broad money (M2); nominal exchange rate (XER) defined as units of Fiji dollar per one unit of US dollar; and the treasury bill rate (TBR). Three time periods are considered: (i) 1982-1986 (60 monthly observations), which marks the period prior to first of the four coups; (ii) 1987-2009 (156 monthly observations); and (iii) the entire study period: (1982-2009) covering in all 216 monthly observations. The monthly data series are drawn from IMF (2010). The data employed in the study are presented in Table 1.

V. Results

Unit root and Cointegration tests

As a first step towards examining the existence of a long-run relationship or cointegration among variables, we investigate the stationarity properties of each variable by using two unit root tests, namely augmented Dickey-Fuller (ADF) and Ng-Perron (NP) tests. It is found that the series are non-stationary at levels, but stationary after first-differencing. After establishing the time series are of I (1), we proceed to conduct cointegration analysis by adopting Johansen and Juselius (JJ) Multivariate Procedure

Table 2: Results of Unit Root Tests

Variable	ADF		Ng and Perron	
	Level	First Difference	Level	First Difference
LCPI	-1.835	-15.720**	-2.261	-52.179**
LM2	-1.794	-19.331**	-2.791	-64.842**
LXER	-2.101	-18.032**	-3.870	-49.184**
LTBR	-2.897	-9.549**	-2.868	-52.999**
Critical Value				
1 per cent	-4.324	-3.689	-23.8	-13.8
5 per cent	-3.581	-2.972	-17.3	-8.1
10 per cent	-3.225	-2.625	-14.2	-5.7

Notes: The ADF critical values are based on Mckinnon. The optimal lag is chosen on the basis of Akaike Information Criterion (AIC). The null hypothesis for both ADF and Ng-Perron tests is a series has a unit root (non-stationary) while the null hypothesis of the KPSS test is does not contain unit root (stationary). The asterisk ** denotes the rejection of the null hypothesis at the 5% level of significance.

Table 2 reports the results of cointegration tests for three different periods: full period (1982M1-2009M12), pre-coups Period (1982M1-1986M12) and post-coups period (1987M1-

2009M12). The results reveal the existence of one cointegrating vector in each of the three periods. The following are the estimated long-run equations obtained by JJ analysis.

Full period (1982M1-2009M12)

$$LCPI = 2.172 + 0.255LM2^{***} + 0.183LXER^{***} - 0.710LTBR^{*} + 0.001TREND^{***}$$

$t =$ (10.407) (4.271) (−1.646) (8.469)

Pre-coup Period (1982M1-1986M12)

$$LCPI = 2.451 + 0.207LM2^{***} + 0.453LXER^{***} - 0.260LTBR + 0.001TREND$$

$t =$ (4.470) (6.543) (−0.526) (0.427)

Post-coup period (1987M1-2009M12)

$$LCPI = 2.767 + 0.462LM2^{***} + 0.373LXER^{***} - 1.831LTBR^{**} + 0.001TREND$$

$t =$ (6.294) (4.208) (−2.483) (0.173)

*, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 3: Results of Johansen and Juselius Multivariate Procedure

Ho:rank=p		**Trace Test**		**Maximum Eigenvalue**	
		Test Statistic	**95%**	**Test Statistic**	**95%**
Panel 1: Full Period: 1982M1-2009M12					
p = 0		70.478**	63.876	30.550	32.118
p ≤ 1		39.928	42.915	18.982	25.823
p ≤ 2		20.946	25.872	13.230	19.387
p ≤ 3		7.716	12.518	7.716	12.518
Normalized cointegrating coefficients (standard error in parentheses):					
	LCPI	**LM2**	**LXER**	**LTBR**	**Trend**
	1.000	0.255***	0.183***	-0.710*	0.001***
		(10.407)	(4.271)	(-1.646)	(8.469)
Panel 2: Pre- Coup Period: 1982M1-1986M12					
p = 0		120.995**	63.876	69.303**	32.118
p ≤ 1		51.692**	42.915	28.490**	25.823
p ≤ 2		23.202	25.872	13.136	19.387
p ≤ 3		10.066	12.518	10.066	12.518
Normalized cointegrating coefficients (standard error in parentheses):					
	LCPI	**LM2**	**LXER**	**LTBR**	**Trend**
	1.000	0.207***	0.453***	-0.260	0.001
		(4.470)	(6.543)	(-0.526)	(0.427)
Panel 3: Post-Coup Period: 1987M1-2009M12					
p = 0		69.147**	63.876	26.250	32.118
p ≤ 1		42.897	42.915	22.461	25.823
p ≤ 2		20.436	25.872	11.027	19.387
p ≤ 3		9.409	12.518	9.409	12.518
Normalized cointegrating coefficients (standard error in parentheses):					
	LCPI	**LM2**	**LXER**	**LTBR**	**Trend**
	1.000	0.462***	0.373***	-1.831**	0.001
		(6.294)	(4.208)	(-2.483)	(0.173)

Notes: ** and *** indicate significant at 5% and 1% levels. Figures in parentheses ( ) refer to t-statistics.

Discussion of Results

Results show that in all the three periods the estimated coefficients of monetary measure (LM2) and exchange rate (LXER) are positive and statistically significant. That is, a rise in M2 and an increase in the exchange rate, defined as units of domestic currency per unit of US dollar (which represents depreciation of domestic currency), have a direct effect on price level. Interest rate is found statistically not significant in the pre-coup period. However, it has emerged to be significant in the post-coup period, indicating that monetary authorities have been more efficient at using it with notable success in curbing inflation during post-coup years.

Turning to ERPT, which is the focus of examination in the paper, we find over the period of study, there is a slow-down of the extent by which changes in exchange rate affected price level. In the pre-coup years, we note that depreciation of domestic currency by one percent led to rise in price level by 0.45 percent. In the post-coup period (1987-2009), the coefficient of exchange rate has a lower value, indicating that depreciation of domestic currency by one percent raises the price level by 0.37 percent.

Our estimates for long-run pass-through to price level in a small developing island country in different periods are comparable to the study findings from advanced countries, as reported by Gagnon and Ihrig (2002) and Anderson (2003). For example, in the sample of 20 advanced countries, Gagnon and Ihrig (2002) find a long-run pass-through rate of 0.23 on inflation.

Granger causality test

The results of short-run causality test are reported in Table 4. The results indicate that exchange rate pass-through channel is significant in all the different time periods. Looking at both monetary aggregate and interest rate policy measures, we find that although it is possible to use these instruments for stabilizing the price level, interest rate may not be as effective as monetary aggregate in the stabilization of price level in the long-run. The short-run pass-through is consistent with the long-run cointegration test as the error correction term (ECT) for different periods is negative and statistically significant at 5% significance level or better. The finding is also consistent with the Granger causality test results that both money and price Granger cause output and there is no reverse causality from output to both money and price.

Variance Decomposition Analysis

We now proceed to conduct variance decomposition analysis with a view to investigating the dynamic interactions and strength of causal relations among variables in the system. Variance decomposition is specifically employed to measure the percentage of variation in the endogenous variables induced by the shocks (innovations) emanating from any of the variables in the system. Since all variables are co-integrated, we entered the variables in their first differences in the VECM framework and adopted the methodology of

orthogonalized forecast error variance decomposition, which is based on Choleski factorization with particular ordering, namely: LM2 LXER LTBR LCPI.

Table 4. Granger Causality Tests

Dependent Variable	F-statistic				ECT (t-statistics)
	ΔLCPI	ΔLM2	ΔLXER	ΔLTBR	
Full Period: 1982M1-2009M12					
ΔLCPI	-	6.775***	7.988***	4.850***	-0.0023** (-2.179)
ΔLM2	0.551	-	0.221	1.022	-0.0057 (-1.132)
ΔLXER	1.518	2.936*	-	3.503***	-0.0016 (-0.372)
ΔLTBR	2.491*	2.926*	0.069	-	-0.0057 (-1.063)
Pre- Period: 1982M1-1986M12					
ΔLCPI	-	2.237*	6.092***	3.913**	-0.1298*** (-2.913)
ΔLM2	0.289	-	1.015	0.652	-0.6981 (-1.228)
ΔLXER	0.737	3.300*	-	0.938	-0.0534 (-0.590)
ΔLTBR	4.544***	9.399***	3.022**	-	-0.0304 (-0.346)
Post Period: 1987M1-2009M12					
ΔLCPI	-	5.286***	8.365***	7.261***	-0.0005** (-1.992)
ΔLM2	0.881	-	0.822	0.578	-0.0004 (-1.208)
ΔLXER	0.894	3.063**	-	2.499**	-0.0001 (-0.169)
ΔLTBR	4.543***	7.614***	9.236***	-	-0.014 (-0.633)

Note: *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively. Figures in parentheses representing t-statistics.

Since the study focuses on CPI, we decompose the forecast-error variance of CPI response to a one standard deviation innovation in other variables. Results of variance decomposition for a 24-month-ahead period with forecast errors are presented in Table 5. The variance decomposition analysis shows that variability in price level is explained by innovations to M2 to a larger extent than by innovations to exchange rate, not only in the short-run, but also in the long-run, irrespective of the time periods under concern. In the post-coup years, shocks to M2 are particularly important as they account for 35 percent of variability in price level, as compared to pre-coup years (26 percent).

Shocks to exchange rate explain variability in CPI to the extent of 9 percent, 53 percent and 63 percent in the one-month, 12-month and 24-month period ahead. The extent of effect is less in the post-coup years. Innovations to exchange rate, account for variability in price level to a lesser extent in post-coup years: 9 percent, 21 percent and 30 percent for one-month, 12-month and 24-month ahead. In contrast, shocks to interest rate variable have minimal effect on CPI in different periods.

Table 5. Variance decomposition of CPI: after initial shock to nominal exchange rate

Period (month)	LXER	LM2	LTBR	LCPI
Panel 1: Full Period: 1982M1-2009M12				
1	11.1	19.5	2.2	67.2
6	16.0	20.7	3.5	59.8
12	26.6	23.6	3.7	46.1
18	33.7	24.8	2.0	39.6
24	35.5	24.7	1.6	38.2
Panel 2: Pre- Coup Period: 1982M1-1986M12				
1	12.0	20.9	0.1	67.0
6	40.6	12.5	2.2	44.7
12	53.4	11.4	1.4	33.8
18	68.6	15.3	5.5	10.6
24	63.7	26.7	5.0	4.5
Panel 3: Post-Coup Period: 1987M1-2009M12				
1	9.8	19.3	2.6	68.2
6	25.8	22.3	9.3	42.6
12	21.4	30.3	12.3	36.0
18	29.2	35.3	8.6	26.9
24	30.0	35.3	10.2	24.5

Correlation Matrix of Reduced-form VAR Residuals

With a view to testing the robustness of the variance decomposition results, which would vary depending on different orderings of the variables, we tested the correlation of reduced-form VAR residuals. Table 6 shows the correlation matrix of the reduced-form VAR residuals based on the ordering of variables, namely: LM2 LXER LTBR LCPI. The elements of the correlation matrix between these variables are relatively low, implying that the contemporaneous feedback is not a problem. Low magnitudes of correlation coefficients therefore confirm that the ordering of the variables in a Choleski decomposition is not of any major concern.

Table 6. Correlation Matrix of the Reduced-form VAR residuals

	LXER	LM2	LTBR	LCPI
Panel 1: Full Period: 1982M1-2009M12				
LXER	1.000	-0.113	-0.108	-0.211
LM2	-0.113	1.000	-0.100	-0.055
LTBR	-0.108	-0.100	1.000	0.252
LCPI	-0.211	-0.055	0.252	1.000
Panel 2: Pre- Coup Period: 1982M1-1986M12				
	LXER	**LM2**	**LTBR**	**LCPI**
LXER	1.000	0.322	0.167	-0.364
LM2	0.322	1.000	-0.178	0.021
LTBR	0.167	-0.178	1.000	-0.375
LCPI	-0.364	0.021	-0.375	1.000
Panel 3: Post-Coup Period: 1987M1-2009M12				
	LXER	**LM2**	**LTBR**	**LCPI**
LXER	1.000	-0.125	-0.064	-0.196
LM2	-0.125	1.000	-0.133	-0.086
LTBR	-0.064	-0.133	1.000	0.280
LCPI	-0.196	-0.086	0.280	1.000

VI. Conclusions

The exchange rate pass-through to price level is confirmed regardless of the periods under study. However, over the 28-year period, the extent of ERPT has been declining. In the pre-coup years (1982-1986), exchange rate changes have had a significant influence on price level. On the other hand, in subsequent years, due to a partly tighter and more efficient use of monetary policy tools, mainly through employment of changes in SRD ratios, ERPT appears to have slowed down. It appears a combination of conditions of stable exchange rate and increased competition might have contributed to slow down in ERPT. These are the areas for further research.

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