Indian Journal of Applied Business and Economic Research
Vol. 3, No. 1, **2022** : pp. 51-72

URL : www.arfjournals.com
https://DOI: 10.47509 /IJABER.2022.v03i01.04

ARF INDIA
Academic Open Access Publishing
www. arfjournals. com

ANALYSING THE EXCHANGE RATE-INFLATION NEXUS: EVIDENCE FROM MAURITIUS

Ashok Babubudjnauth[1] and Boopen Seetanah[2]

[1]*Open University of Mauritius, Address of submitting Author: Royal Road, Poste de Flacq, Mauritius. E-mail: ashokbabubudjnauth@gmail.com*
[2]*University of Mauritius, Mauritius. E-mail: b.seetanah@uom.ac.mu*

Received : 11 February 2022; Revised : 09 March 2022;
Accepted : 12 March 2022; Published : 30 June 2022

Abstract: This paper examines the degree and speed of exchange rate pass-through (ERPT) to the inflation rate in Mauritius from 1980 to 2016 using dynamics regression analysis. Results reveal that the long-run ERPT elasticity to domestic inflation is incomplete and low. However, no such relationship is discovered in the short run. The speed of adjustment of actual inflation to its long-run equilibrium level is quite high and it takes approximately two years to attain that level. From a policy point of view, domestic inflation can be tamed by tightening the domestic money supply and maintaining exchange rate stability in the long run.

1. INTRODUCTION

The degree of exchange rate variations transmitted into the domestic price level is a vital issue in both monetary and exchange rate policies formulations. Interest in the exchange rate pass-through (ERPT) heightened when many countries already overheated by inflation had to shift from a fixed exchange rate regime to a floating one after the dismantling of the Bretton-Woods fixed exchange rate arrangement in the early 1970s.

Theoretically, the exchange rate pass-through (ERPT) operates through two transmission mechanisms. Firstly, changes in the nominal exchange rate are reflected on import prices which subsequently pass on to consumer prices (Gagnon and Ihrig, 2001; Campa and Goldberg, 2005). Under this channel, exchange rate pass-through is complete if mark-up over costs is constant; and the marginal cost of the foreign producer is fixed (Goldberg and knetter, 1997).

To cite this article:

Ashok Babubudjnauth and Boopen Seetanah (2022). Analysing the Exchange Rate-Inflation nexus: Evidence from Mauritius. *Indian Journal of Applied Business and Economic Research*, Vol. 3, No. 1, pp. 51-72. https://DOI: 10.47509 /IJABER.2022.v03i01.04

Secondly, consumers shift their expenditures to domestically produced goods in face of dearer imports induced by home currency depreciation (Bhundia, 2002; McFarlane, 2002). The surge in demand for local products put upward pressures on domestic prices and nominal wages. Spiral wages ultimately escalate domestic prices. However, empirical evidence suggests that a change in nominal exchange rate might not necessarily lead to substitution between domestic and foreign goods because their relative prices do not change much for the end-users (Devereux and Engel, 2002).

Recent developments in the ERPT literature tended to focus on the importance of ERPT in the formulations of monetary, fiscal, and exchange rate policies (Choudhri and Khan, 2000; Choudhri and Hakura, 2001). This interest arises from the fact that ERPT is a vital indicator for the private sector (McFarlane, 2002) and a low ERPT is believed to give greater flexibility to carry out an independent monetary policy and make inflation targeting easier (Edwards, 2006).

The gross majority of the past empirical studies of ERPT concentrated on developed economies. However, a few existing studies in Sub-Saharan African countries showed similar results to that of the industrial world (Choudhri and Hakura, 2001; Bhundia, 2002; Mwase, 2006).

This paper investigates the impacts of currency movements on the inflation rate in Mauritius. The latter is a good case study given that it is one of the best performers in the African continent and is also quite an open economy as many of the Developing State Economies (SIDS). In the context of SIDS, the high degrees of openness and dependency on imports have been identified as reasons for the spike in the monthly price level (Jayaraman and Choong, 2011). This study is believed to supplement the literature on the Exchange Rate-Inflation nexus, which has largely ignored SIDS and developing economies and it contributes to the discussion on the impact of exchange rate on inflation rate in Mauritius. Moreover, it builds on existing work by taking account of the elements of dynamism and endogeneity in the exchange rate-inflation modeling while also dwelling on an analysis of both the short-run and long-run impact of exchange rate on inflation through the use of co-integration analysis.

The rest of the paper is organized as follows. Section 2 explores the related literature and past empirical works in ERPT. A brief overview of the inflation rate and exchange rate in Mauritius is provided in section 3. Section 4 is exclusively devoted to empirical analysis and finally, section 5 concludes and suggests some recommendations.

2. RELATED LITERATURE

Effects of Exchange Rate on Inflation Rate: Theoretical underpinnings

Interest in prices and exchange rates is motivated not only by the desire to test the validity of the law of one price and purchasing power parity but also to investigate the impacts of movements in the exchange rate on the domestic inflation rate. Dornbush (1985) analyzed the phenomenon of exchange rate-led price changes by focusing on the role played by long-term wage contracts in macroeconomic adjustment. He drew on the models of industrial organizations to show that the interaction between exchange rate movements and sticky prices produced a cost shock wave that eventually led to an industry-level adjustment in prices. Additionally, the models unanimously predicted that appreciation of home currency lowered the price of imports.

Likewise, Froot and Klemperer (1989) leaned on the demand-side dynamic of an oligopolistic market to analyze price changes under cost and interest rate effects. The authors showed that an appreciation of the dollar decreased foreign firms' domestic currency costs and hence its price while increasing import prices under interest rate effects. In addition, a permanent change in the exchange rate canceled out the interest rate effect, but it strengthened the cost effects by decreasing dollar prices more than a temporary appreciation. Similarly, Taylor's (2000) model predicted that observed market or pricing power hinged greatly on the expectations of future costs and price movements. Accordingly, depreciation of domestic currency rendered imported input exorbitant. The ERPT was expected to be low if the depreciation was perceived to be temporary. Generally, less persistent exchange rate fluctuations resulted in smaller ERPT.

Under a monopolistic domestic market structure, (Bacchatta and Wincoop, 2003) showed that if the home non-traded sector was adequately large, then in equilibrium exporters set prices in their currency while the domestic firms set their prices in the local currency that resulted in complete pass-through to import prices but zero pass-through to consumer prices. Moreover, even though the domestic firms were faced with the exchange rate risk on their cost side, they set their prices in the home currency to avoid erratic price fluctuations relative to other consumer goods.

In the same spirit, Champa and Goldberg (2006) by focusing on a two-country framework demonstrated that despite distribution margins reducing the responsiveness of consumption prices of tradable goods to the exchange rate; they led to a degree of pass-through when non traded goods prices were responsive to the exchange rates. Likewise, in the

Devereux and Yetman (2010) staggered price-setting approach, CPI-adjusted slowly and gradually to the exchange rate changes. But in the case of flexible prices, the pass-through to domestic inflation stepped up. Besides nominal price rigidity, distribution shocks also accounted for low ERPT. Additionally, the exchange rate pass-through was high even when prices were given, and shocks were persistent. Low exchange rate pass-through in the model stemmed from a mixture of price sluggishness and relatively transitory shocks.

Empirical Review

In their pioneering empirical analysis, Froot and Klemperer (1989) tested an important implication of their model: that the degree of pricing to market depended on the permanence of exchange rate changes. The results failed to prove that expected future depreciation affected the degree of pricing to the market. Temporary appreciation of the dollar was associated with surging dollar import prices.

In a study in Sub-Saharan Africa, Canetti and Green's (1992) reported a positive effect of exchange rate movements and monetary expansion on consumer price inflation. On the other hand, Klitgaard (1999) investigating the dollar/yen movements on the US import prices revealed that the surged in US import price of Japanese goods was less than the change in the exchange rate in the early 1990s as Japanese firms accepted lower export prices in term of their domestic currency.

Also, McCarthy (2000) showed that exchange rate shocks had modest effects on domestic inflation, and import price shocks had inflationary effects in industrialized countries over 1976:1-1998:4 periods. Additionally, between 1996 and 1998, exchange rate and import prices had a disinflationary effect while by the late 1980s and 1990s the pass-through effect began to wane.

Choudhri and Hakura (2001) tested Taylor's hypothesis[2] by classifying countries into low, moderate and, high inflation economies. Pass-through was low in low inflation countries whereas it was higher in higher inflation economies. In Fiji, Jayaraman and Choong (2011) reported a trivial coefficient of the exchange rate pass-through over a twenty-eight years period (1982-2009). The pass-through elasticities estimated by Razafimahefa (2012) for Sub-Saharan African economies were about 0.4 on average. Specifically, for Mauritius the average pass-through elasticities estimated by Razafimahefa (2012) and Tandrayen-Ragoobur and Chicooree (2013) were 0.10 and 0.14, respectively, both studies used impulse response functions analysis.

In the European transition economies, Mirdala (2014) analyzed exchange rate pass-through to domestic prices under different exchange rate regimes before and during the crisis periods. During the pre-crisis period, a negative oil price shock appreciated the exchange rate in all countries. The effect in countries with fixed exchange rate regimes was temporary and neutral in the long run whereas, under the flexible exchange rate system, the effect was persistent and permanent in the long run. During the crisis period, the response was low in countries with fixed exchange rate arrangements. A slender increase in the exchange rate was noticed in the categories of flexible exchange rate economies and the effect of the oil price shock was slightly intensified in the long run.

Quarterly data between 1986 and 2009 from the Chilean economy was used by Saens and Mujica (2015) to examine the effect of the gradual implementation of an inflation-targeting regime on exchange rate pass-through to prices. The results documented that the adoption of an inflation-targeting regime in Chile through the gradual consolidation of a low inflation environment had contributed to a substantial decline in the exchange rate pass-through to prices. The Granger causality test applied to the exchange rate and inflation data from Tunisia by Charef and Ayachi, (2015) revealed a unidirectional relationship running from inflation to exchange rate. Bada *et al.* (2016) reexamined the exchange rate pass-through to inflation in Nigeria by utilizing two alternative models. Empirical findings from both models showed that changes in imports prices had a greater impact on the exchange rate in both the short-run and the long run.

The empirical investigation of Jasova *et al.* (2016) in both the advanced and emerging market economies documented that the exchange rate pass-through in the emerging economies on average declined after the financial crisis and that the decline in pass-through was linked to falling inflation. Additionally, in the advanced economies, where inflation was relatively low, the exchange rate pass-through was also low. Despite the recent declines in inflation in emerging economies, the pass-through estimates were still lower in advanced countries than in emerging economies.

Finally, Miyajima (2019) extended the standard empirical model of the ERPT by adding exchange volatility to examine the extent to which the latter affects inflation, both directly and indirectly in South Africa. The findings suggested that higher exchange rate volatility caused inflation but to a relatively limited extent. The results also lent support to a free-floating exchange system that worked as a shock absorber which was consistent with the nation's successful inflation targeting regime.

The past empirical studies of ERPT indicated that the degree of ERPT was quite different across both developed and developing countries. This wide dispersion in the degree of ERPT is attributed to the different methodologies adopted, model specifications and variable selections rather than the different periods of study. Moreover, several studies reported generally weak or incomplete ERPT which implies that exchange rate movements might not cause greater substitution between domestic and foreign goods as the changes in the relative prices of those products are insignificant.

3. OVERVIEW OF INFLATION AND MUR/USD EXCHANGE RATE IN MAURITIUS

Mauritius is a small open economy with a high degree of dependency on imports ranging from food and fuel to transport and machinery and toast of manufactured consumer goods. The 1970s and 1980s were characterized by large swings in the general price level, caused mainly by a series of exchange rate decisions that had rippled effect on economic activities. Development in the inflation rate in Mauritius over the period 1975 to 2016 is depicted in figure 1.

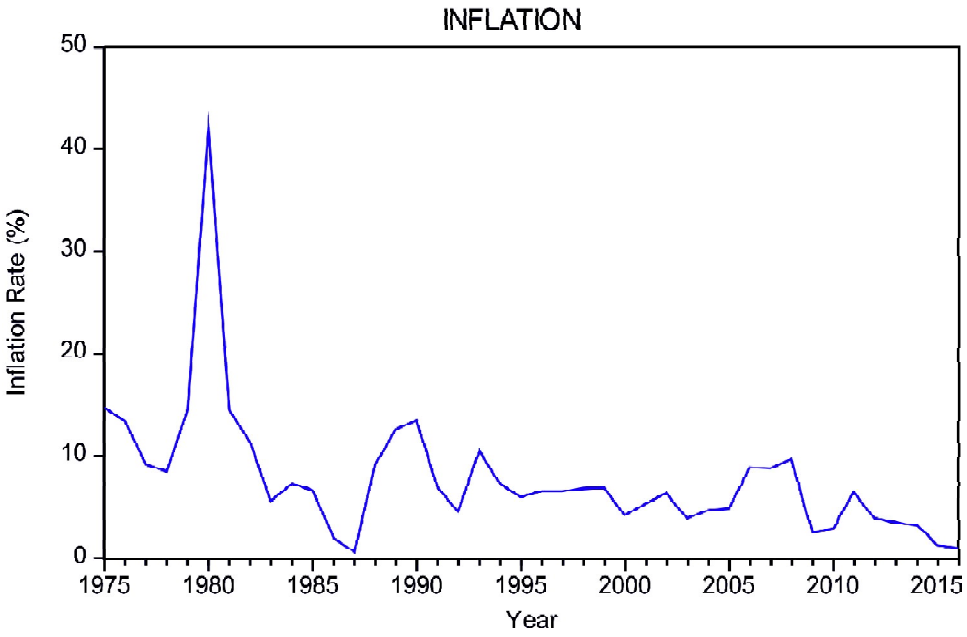


Figure 1: Evolution of the Inflation Rates: 1975-2016

Source: Authors' Computation

During the period 1975 to 1982, price developments on both domestic and foreign markets generated substantial increases in the domestic price level. The sugar boom17 of 1974 was accompanied by an increase in money supply and significant increases in wages and salaries. In 1979, as part of the Structural Adjustment Programme, MUR was devalued by 30 percent and by a further 20 percent when it was officially delinked from the IMF's Special Drawing Right (SDR) and pegged to a trade-weighted basket of the currencies of its major trading partners (Zafar, 2011). The devaluations resulted in an all-time high inflation rate of 42 percent in 1980. The period 1983-1991 was marked by the second Structural Adjustment Programme which laid the building block for rapid economic development. Initially, the rate of inflation declined mainly due to appreciation of MUR against USD, dropped in prices of oil and raw mater, s and a reduction in import duties on specific commodities. In 1990, there was a sudden jump in the inflation rate which attended a two-digitized rate of 13.5 percent. Balance of payments surpluses and higher salaries stimulated monetary expansion which ultimately generated an increase in aggregate demand in the economy.

The rate of inflation was effectively reduced to an average of 4.9 percent during the period 2000 to 2005, ranging between a minimum of 3.9 percent and a maximum of 4.6 percent. The factors responsible for sustaining the average inflation close to 5 percent were the hike in the value-added tax rate to 12 percent and the substantial increase in the prices of petroleum products in the international market which were passed on to consumers through the Automatic Pricing Mechanism. The higher inflation rate registered over the period 2006-2008 was driven by supply-side factors, primarily the increase in freight rate due to Somalia's pirate threat.

As expected the inflation rate fell in 2009 in line with the general trend worldwide. In 2010, the budgetary measures notably the increase in excise duties on undesirable items and surged in the prices of electricity and transport led the consumer price index to rise from 100 in 2010 to 106.5 in 2011. The annual average inflation rate over the period 2012-2016 was recorded at 2.6 percent. Muted external price pressures; low exchange rate pass-through to consumer prices; and subdued demand conditions had contributed to keeping domestic inflation low.

The inflation rate climbed to 4.2% in April 2020 from a record low of -1.4 % in March 2019. This jump in inflation was caused by a sudden hike in the demand for food and non-beverages, boosted mainly by the fear of shortages of essential products due to the spread of COVID 19.

Since its colonial times, Mauritius has opted for different exchange rate arrangements to improve its exchange rate system to enhance the

smoothness of the flows of goods, services and capital. The most important development in the history of the exchange rate in Mauritius took place in the 1990s when all the restrictions on the exchange rate were dismantled. Over the period 1994-2009, the country had a managed floating exchange rate regime. At the end of 2009, the IMF proposed to re-classify the exchange rate arrangement from managed float to free-floating in its Annual Report of Exchange Arrangements and Exchange Restrictions.

In terms of its evolution, the Mauritius exchange rate against USD reached an all-time high of Mauritian rupee (MUR) 40.45 in May 2020 and a record low of MUR 4.76 in November 1967. The data averaged MUR 35.72 in December 2019 as compared with MUR 33.95 in December 2018, a depreciation of 5.2%. Generally, on average, the MUR showed a depreciating tendency against the USD since 1970.

4. ECONOMETRIC MODEL

The ERPT model is drawn from the works of Parsley and Poppert (1998), Mwase (2006), McFarlane (2002), Jayaraman and Choong (2011) and Bada *et al.* (2016). A VAR approach is preferred over a single-equation model because it accounts for both absolute and relative pass-through in upstream and downstream prices (Faruqee, 2006). The pass-through to consumer prices is modeled by the following specification in a VAR system:

$$mcpi_t = \alpha_0 + \alpha_1\, ner_t + \alpha_2\, gdp_t + \alpha_3\, uscpi_t + \alpha_4\, bm_t + \varepsilon_t \qquad (1)$$

Where mcpiis the log of consumer price index, ner is the log of nominal bilateral exchange rate defined as the units of MUR per USD, GDP is the log of Gross Domestic Product at market price, bm is the log of broad money supply and uscpi is the log of US consumer price index. All variables are transformed in logs so that their coefficients represent elasticities. The annual data over the period 1980-2016 was sourced from the International Financial Statistics (IFS), World Development Indicators (WDI), and Mauritius Statistics.

The board money supply variable is incorporated in equation (1) to explicitly emphasize the role of money supply on ERPT following Parsley and Poppert (1998) and Carrier-Swalloo *et al.* (2016). Including GDP growth rate as an additional control, variable ensures that the estimated parameter of the exchange rate reflects direct effects of ERPT instead of the indirect effects that influence inflation through aggregate demand (Zubair *et al.* (2013), Abdellatif *et al.* (2016) and Ghosh and Rajan (2009) and Bada *et al.* (2016)). Following Bhundia (2002), Choudhri and Hakura (2001) and Tandrayen-Ragoobur (2013), the US consumer price index is included to capture the effect of the changes in foreign prices.

The ERPT model (1) is expressed and estimated as a VAR and Cholesky decomposition is used to identify the shocks.

The structural VAR model is given by:

$$A_0\, y_t = A(L)\, y_{t-1} + \epsilon_t \tag{2}$$

Where y_t is the 5×1 vector of contemporaneous endogenous variables (Mauritius consumer price index, Gross domestic product, nominal bilateral exchange rate, US consumer price index and broad money supply), the matrix A_0 is of order 5×5 and describes the contemporaneous relationships between the variables. $A(L)$ is a 5×5 matrix polynomial in the lag operator L and ϵ_t is the vector of structural shocks of order 5×1.

The reduced form of the VAR model is:

$$y_t = A_0^{-1} A(L) X_{t-1} + e_t \tag{3}$$

Where e_t is a 5×1 vector of serially uncorrelated structural errors of the model and is derived as follows:

$$A_0 e_t = u_t \;\; or \;\; e_t = A_0^{-1} u_t \tag{4}$$

From equation (4), the one-period ahead forecast error of inflation is:

$$e_{mcpit} = \delta e_{uscpit} + \chi e_{bmt} + \Gamma e_{nert} + \varphi e_{gdpt} + u_{mcpit} \tag{5}$$

The inflation forecast error is caused by domestic consumer price index shock and other shocks in the system. The complete system, with no particular ordering assumed, can be written as:

$$\begin{bmatrix} e_{uscpit} \\ e_{bmt} \\ e_{nert} \\ e_{gdpt} \\ e_{mcpit} \end{bmatrix} = \begin{bmatrix} 1 & \theta_1 & \theta_2 & \theta_3 & \theta_4 \\ \rho & 1 & \theta_5 & \theta_6 & \theta_7 \\ \alpha & \Phi & 1 & \theta_8 & \theta_9 \\ \beta & \gamma & \psi & 1 & \theta_{10} \\ \delta & \chi & \Gamma & \varphi & 1 \end{bmatrix} \begin{bmatrix} u_{uscpit} \\ u_{bmt} \\ u_{nert} \\ u_{gdpt} \\ u_{mcpit} \end{bmatrix} \tag{6}$$

Where the matrix $A_0^{-1} = \begin{bmatrix} 1 & \theta_1 & \theta_2 & \theta_3 & \theta_4 \\ \rho & 1 & \theta_5 & \theta_6 & \theta_7 \\ \alpha & \Phi & 1 & \theta_8 & \theta_9 \\ \beta & \gamma & \psi & 1 & \theta_{10} \\ \delta & \chi & \Gamma & \varphi & 1 \end{bmatrix}$ exogenous an

Exogenous of exogenous shock to the exchange rate, u_{ner} on e_{mcpit} underscores the importance of exchange rate variations in consumer prices development. As long as $\alpha \neq 0$, $\Phi \neq 0$, $\theta_8 \neq 0$ and $\theta_9 \neq 0$, e_{ner} rockscks oocks and on otheshshockes shocks u_{uscpit}, u_{gdpt}, u_{mcpit}, and u_{bmt}. Hence, at least ten restrictions will be needed to be imposed to extract e_{nert} from other innovations. Theory-consistent restrictions on the structure of the A_0^{-1} matrix are imposed to derive the economic meaning of the various shocks.

Identification Procedure

US consumer price index presumably captures supply-side shocks in the world market and is not likely to be affected contemporaneously by any other shocks except its shocks while all the other variables in the VAR are affected by US consumer price index shock. This restriction implies that $\theta_1 = \theta_2 = \theta_3 = \theta_4 = 0$. Thus from equation (6):

$$e_{uscpit} = u_{uscpit} \tag{8}$$

Money supply shocks are assumed to be associated with world price development. Shocks to world inflation rate are counteracted by monetary policy to maintain price stability and promote orderly and balanced economic development. The nominal exchange rate is not assumed to have a contemporaneous effect on money supply shock as the role of the nominal exchange rate in the conduct of monetary policy in Mauritius is not clear (IMF, 2017). The money supply shock is denoted by:

$$e_{bmt} = \rho u_{uscpit} + u_{bmt} \tag{9}$$

Shock to the nominal exchange rate is influenced by developments in foreign prices and domestic money supply. Foreign prices are likely to be influenced by exogenous factors such as bad weather conditions. Surges in foreign prices will put upward pressure on the demand for foreign currency as importers will need more foreign currency to purchase the same amount of goods as previously. Moreover, according to the monetary models of exchange rate determination, the nominal exchange rate is determined solely by contemporaneous excess supplies of money in two trading countries (Islam and Hasan, 2006). Hence, the nominal exchange rate shock can be written as:

$$e_{nert} = \alpha u_{uscpit} + \phi u_{bmt} + u_{nert} \tag{10}$$

Output growth rate shocks are assumed to be associated with foreign inflation shocks, broad money supply and exchange rate shocks. World prices affect GDP through prices of intermediate goods. Shocks to broad money supply are transmitted to output shocks through aggregate demand.

Movements in nominal exchange rate influence output growth through aggregate demand and aggregate supply. The domestic output growth rate shock is modeled as follows:

$$e_{gdpt} = \beta u_{uscpit} + \gamma u_{bmt} + \psi u_{nert} + u_{gdpt} \tag{11}$$

Domestic prices shock is assumed to be affected by innovations in all other variables in the system. Higher inflation abroad affects domestic inflation through imported inflation. An accommodative monetary policy is expected to increase domestic inflationary pressure. Fluctuations in nominal exchange rates influence the domestic consumer price index through the doctrine of purchasing power parity. Finally, the surge in domestic productivity will lead to a fall in the general price level. Inflation shock is therefore given as:

$$e_{mcpi} = \delta u_{uscpit} + \chi u_{bmt} + \Gamma u_{nert} + \phi u_{gdpti} + u_{mcpit} \tag{12}$$

The system of shocks that incorporates the above assumptions is model as:

$$\begin{bmatrix} e_{uscpit} \\ e_{bmt} \\ e_{nert} \\ e_{gdpt} \\ e_{mcpit} \end{bmatrix} = \begin{bmatrix} 1 & \theta_1 & 0 & 0 & 0 \\ \rho & 1 & 0 & 0 & 0 \\ \beta & \phi & 1 & 0 & 0 \\ \beta & \gamma & \psi & 1 & 0 \\ \delta & \chi & \Gamma & \varphi & 1 \end{bmatrix} \begin{bmatrix} u_{uscpit} \\ u_{bmtt} \\ u_{nert} \\ u_{gdpt} \\ u_{mcpit} \end{bmatrix} \tag{13}$$

The structural shocks are identified by applying Cholesky decomposition to the variance-covariance matrix of the reduced form residuals e_t.

EMPIRICAL RESULTS AND DISCUSSIONS

Unit Root Test

The augmented Dickey-Fuller (ADF) and Phillips and Perron (PP) tests are employed to carry out unit roots tests and the results are depicted in table 1 below. Both tests show that the variables are non-stationary at levels, but stationary after first differencing.

Co-integration Tests

Based on the maximum likelihood, a lag order of two is retained to carry out the Johansen Co-integration test. The trace and maximum eigenvalue tests

Table 1: Unit Root Test Results

Variable	*Level*		*First Difference*		*Status*
	ADF	*PP*	*ADF*	*LMC*	
LMCPI	-0.450582	-0.881455	-3.861275**	-3.604456**	I(1)
LNER	-3.176321	-3.224384	-6.110340***	-12.90440***	I(1)
LUSCPI	-2.270441	-2.593499	-5.159888***	-5.149946***	I(1)
LGDP	3.71512	0.381721	-4.484601***	-4.293373***	I(1)
LBM	-0.014156	-0.168768	-5.702781***	-6.057991***	I(1)

Notes: ***and ** indicate significance at 1% and 5% level ofsignificancetrespectsy.
Source: Authors' Computation

indicate the existence of two and one co-integration equations, respectively. Since it is not straightforward to interpret long-run relationships in the presence of multiple co-integration vectors as linear combinations of those vectors yield co-integration vectors (Enders, 2014), only one long-run equation as evidenced by the Maximum-eigenvalue test is assumed.

VECM Estimates of the Pass-Through Effects

The establishment of at least one co-integration relationship among the variables validates the use of a vector error correction model (VECM).

Table 2: Estimates of Long Run Coefficients

Mauritius Inflation Rate (LMCPI)	*Nominal Exchange Rate (LNER)*	*US Inflation Rate (LUSCPI)*	*Gross Domestic Product (LGDP)*	*Broad Money Liabilities (LBM)*	*Constant*
1.000000	0.249116***	0.005619***	–0.070910	0.225543***	–1.075686***
	(0.03271)	(0.00068)	(0.13004)	(0.08217)	(0.12396)
	[7.61672]	[8.30634]	[-0.54529]	[2.74470]	[-3.41061]

Notes: ***,** denote significant level at 1% and 5% level, respectively.
Source: Authors' Computation

The results in table 2 show that the co-integrating vector, normalized by the inflation rate, has the expected signs. Except for the coefficient of GDP, all other estimated coefficients are statistically significant of at least a 5% level of significance. Throughout the study, the extent of exchange rate pass-through to CPI inflation is found to be below depreciation of the home currency will cause the inflation rate to rise by only 2.5%. The estimated long-run ERPT elasticity is comparable to those found in industrial and emerging economies (Gagnon and Ihrig (2002); Carriere-Swallow *et al.* (2016)). The exchange rate pass-through coefficient is slightly higher than

Jayaraman and Choong's (2011) estimate of 0.183 in Fiji. It is interesting to note that the ERPT is incomplete in the long run.

The US inflation rate has a highly significant positive effect on the inflation rate in Mauritius. One percentage point increase in foreign prices causes prices in Mauritius to increase by 0.006%. This outcome is in line with the findings of Crowder (1996), Cheung and Yuen (2002) and Feyzialu and Willard (2006), who showed that inflation was transmitted from the US to the rest of the world. Bergin (2003), on the other hand, reported that foreign prices have little effect on Australia's inflation rate.

Interestingly, the sign of the coefficient of GDP obeys the theoretical underpinning but it turns out to be insignificantly different from zero. This finding is in accord with the result of Bada *et al.* (2016), who found that real output did not significantly affect the inflation rate in Nigeria. By contrast, Munyeka (2014) reported a significant impact of the GDP growth rate on inflation in South Africa. The elasticity of money supply is positive and significant at a five percent level of significance. In other words, a one percent increase in money supply leads to a 0.23% increase in the domestic inflation rate. In the words of Carrier-Swallow *et al.* (2016), price stability and greater monetary policy credibility have importantly diminished exchange rate pass-through to consumer prices. Parsley and Poppert (1998) showed that when the monetary variable was excluded from the regression equation the exchange rate pass-through coefficient was -0.079 whereas when a measure of money was included in the analysis the exchange rate pass-through elasticity declined to -0.138[3].

Table 3: Short-Run VECM Coefficients

lags	*ΔLMCPI*	*ΔLNER*	*ΔLUSPI*	*ΔLGDP*	*ΔLBM*	*ECM*
1	0.447710*	-0.066763	-0.001610	0.272118	-0.392329***	-0.462378***
	(1.91717)	(-1.24931)	(-0.50209)	(1.62074)	(-3.12921)	(-3.03300)
2	-0.158162	-0.055448	-0.001838	0.047464	-0.096222	
	(-0.935578)	(-0.06352)	(-0.76382)	(0.17758)	(-0.77685)	

Note: *** , ** and *denote significance at 1, 5and 10 percent levels, respectively.
Standard error in parentheses
Source: Authors' Computation

The short-run dynamics in table 3 suggest that each year the gap between actual inflation and its long-run value is adjusted by 0.46% so it takes approximately two years for inflation to adjust to its long-run value. The speed of adjustment is quite high which can be attributed to the greater share of imported goods in the CPI basket. As regards the short-run ERPT

elasticity, it is negative and not statistically significant. Another interesting result is that the elasticity of money supply to the inflation rate is negative and highly significant in the short run-run. An increase in the stock of money supply will cause the rate of interest to fall to motivate people to hold the excess money in the short-run short online in the interest rates will reduce the cost of production and given the limited size of the domestic market, the domestic firms will engage in price cuts to improve their profitability.

One percent increase in the inflation rate in the previous year will increase the rate of inflation by 0.4 percent in the current year. People fearing further surges in the prices in the future increase their expenditure on goods and services now and thereby superficially step up the general price level. And, as they gain confidence in the credibility of the Central Bank in stabilizing prices, inflation subsides and even becomes negative and insignificant.

Diagnostic Tests

The VECM-based diagnostic tests are carried out to check the validity of the fitted model. To investigate whether the error terms in the fitted model are white noise errors, residual serial correlation LM tests, White's heteroskedasticity and normality tests are carried out. Table 4 reports the results of these diagnostic tests.

Table 4: Residual Test of the VECM

Test	*Test Statistic*	*Probability*
Multivariate Normality		
Jarque-Bera	JB(10)=11.35168	0.3308
Whites Heteroskedasticity		
No Cross Terms	χ^2 (330)=344.8467	0.2758
Autocorrelation		
LM Test	LM(25)=22.47923	0.6079

Source: Authors' Computation

The Jarque-Bera test in the table indicates the acceptance of the null hypothesis of normally distributed error terms. Similarly, both the LM and white's heteroskedasticity tests accept the null hypothesis of no serial correlation and homoskedastic residuals, respectively.

Impulse Response Functions

Another way to interpret the variables in a VAR is to compute impulse response function (IRF) and Variance decomposition measures. IRF from the VECM is used to examine the pass-through from the nominal exchange

rate, US inflation rate, broad money supply, and gross domestic product to domestic prices. Table 5 and Figure 1 exhibit the impulse response of the log of the variables to one standard deviation structural shocks. The combined graphs are based on the output of restricted VAR showing the response to Chelosky one standard deviation innovation over 10 years periods. The solid lines depict the percentage change in the inflation rate to a one-unit standard deviation in the respective macroeconomic variables.

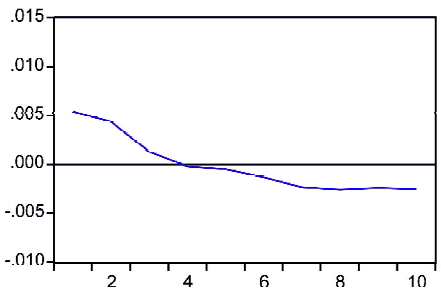
Table 5: Response to Cholesky One S.D. Innovation ± 2 S.E

Response of LMCPI

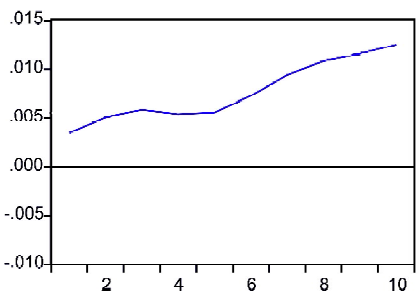
LMC	*LMCPI*	*LNER*	*LGDP*	*LUSCPI*	*LBM*
1	0.005393	0.003521	0.000464	0.005131	-0.001657
2	0.004400	0.005052	0.002652	0.009847	-0.005092
3	0.001302	0.005826	0.000661	0.010495	-0.004863
4	-0.000209	0.005375	-0.000739	0.008975	-0.000614
5	-0.000454	0.005555	-0.000623	0.005535	0.003382
6	-0.001278	0.007279	-0.001652	0.002607	0.005131
7	-0.002280	0.009440	-0.002305	0.001747	0.006668
8	-0.002509	0.010837	-0.001331	0.001186	0.009024
9	-0.002355	0.011565	-0.000315	3.65E-06	0.010603
10	-0.002473	0.012530	-0.000332	-0.000668	0.010887

Source: Authors' Computation

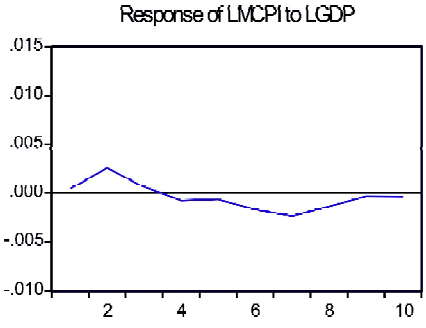
Graph (a)



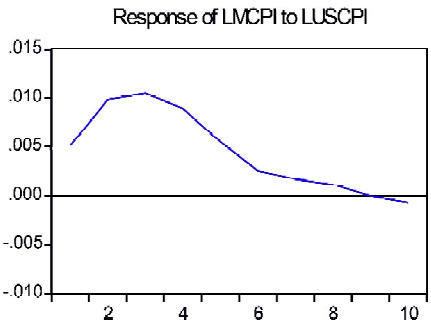
Graph (b)



Graph (c)



Graph (d)



Graph (e)

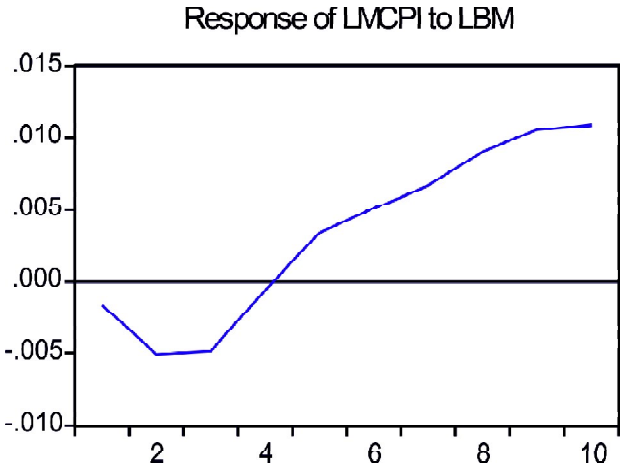


Figure 2: Response to Cholesky One S.D. Innovation ± 2 S.E

Source: Authors' Computation

Graph (a) reveals that the response of the domestic consumer price index to its shocks is positive and strong at the time of the impact and gradually declines to zero at the end of year four. This implies that the impact of the shock on domestic inflation dissipates over time and thus the domestic inflation rate tends to its long-run equilibrium values. The response of the domestic inflation rate to an unexpected shock to the nominal exchange rate (see graph (b)) is consistent and persistent over the time horizon. The impulse response functions confirm the result obtained by the long-run co-integration equation that depreciation of the domestic currency is associated with an increase in inflation in Mauritius. Though the exchange rate pass-through is trending upward in the long run, it remains incomplete, low, and quite slow as depicted in table 5. This finding reveals that the pass-through elasticity is relatively lower as compared to other SSA countries (Mwase (2006); Frimpong and Adam (2010); Razafimahefa, (2012)) and study carried out in Mauritius (Tandrayen-Ragoobur and Chicooree 2013)

The consumer price index when disturbs by a shock in GDP, increases during the first two years after which it reverses (see graph (c)). In effect, the elasticity of GDP growth rate changes sign from positive to negative after three years and remain negative thereafter over the time horizons. This behavior of the inflation rate corroborates with the results obtained in the long-run and short-run analysis in tables 2 and 3 above.

In graph (d), US inflation rate shock to local prices impacts positively up to three years and thereafter it effect diminishes gradually and even

becomes negative in the long-run. As regards the unanticipated monetary shock, the immediate effect on the domestic price level is to slow it down (see graph (e)). It is only after year two that the inflation starts to shore up as expected.T his observation is in line with the result obtained in the analysis of short-run and long-run impacts of broad money supply in domestic inflation rate above.

Variance Decomposition

The measures of the relative importance of the variations of the nominal exchange rate, gross domestic product, US consumer price index and broad money supply to fluctuations in domestic price index are provided in table 6 below. Results, shown in figure 3 and table 6, indicate that the proportion of variation explained by own shock declines from 41% in the first year to 8% in year 5 and 5% in year 10. These findings emphasize the importance of other factors causing volatility in the domestic inflation rate.

The percentage of domestic inflation rate forecast error attributable to variation in the nominal exchange rate is 18% initially. It then increases to 22% in the medium term and by the end of the time horizon, its contribution averages to 43%. The variance of GDP accounts modestly from an average of 0.3% at the beginning of the period to 1.2% at the end of year 10.

The innovation in the US consumer price index accounts for 37% in the variation in domestic price index during the first year, increases to 60% in

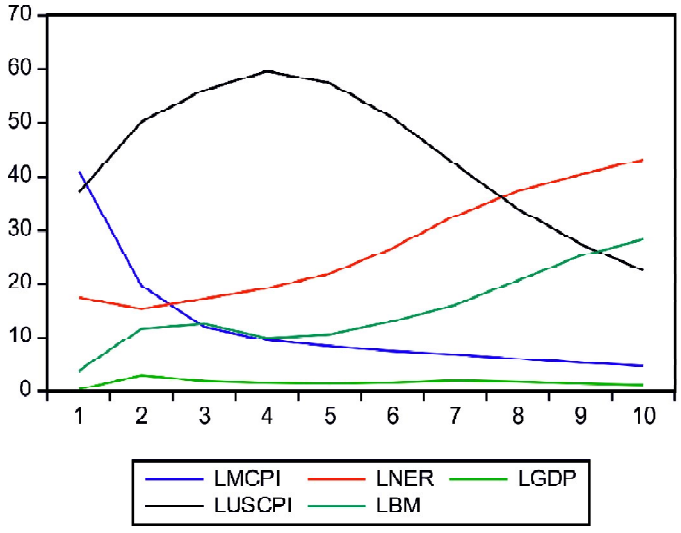


Figure 3: Variance Decomposition

Source: Authors' Computation

the medium run and then subsides to 22% by the end of the time horizon. Finally, 4% of the domestic consumer price index is induced by the variation in broad money supply in the initial year, the proportion increases to 11% in the medium term and it increases further in the long term with an average of 28%.

Table 6: Variance Decomposition of Inflation

Variance Decomposition of LMCPI

Period	*LMC*	*LMCPI*	*LNER*	*LGDP*	*LUSCPI*	*LBM*
1	0.008413	41.08907	17.52054	0.304246	37.20489	3.881247
2	0.015671	19.72454	15.44049	2.951543	50.20665	11.67679
3	0.020382	12.06778	17.29863	1.849897	56.18951	12.59418
4	0.022932	9.542261	19.16049	1.565293	59.71044	10.02152
5	0.024482	8.406085	21.95870	1.438013	57.49730	10.69990
6	0.026265	7.540396	26.75973	1.645060	50.94244	13.11237
7	0.028931	6.835929	32.70228	1.990535	42.35213	16.11912
8	0.032331	6.075760	37.41853	1.763198	34.04531	20.69720
9	0.036016	5.323746	40.46506	1.428573	27.43622	25.34639
10	0.039741	4.759655	43.17561	1.180291	22.56211	28.32234

Notes: S.E indicates standard error. Period refers to one year.
Source: Authors' Computation

Consistent with the results of the impulse response function, the variance decomposition reveals the importance of each factor in the volatility of the domestic inflation rate with varying periods. The overall findings confirm the significance of the nominal exchange rate, foreign inflation rate, and broad money supply in explaining fluctuation in the domestic price level in Mauritius.

5. CONCLUSIONS AND RECOMMENDATIONS

This paper examined the degree and speed of exchange rate pass-through to the inflation rate in Mauritius from 1980 to 2016 based on the vector error correction model, impulse response functions and variance decomposition analysis. These methodologies unanimously showed the importance of nominal exchange rate, foreign inflation rate, and domestic money supply in influencing domestic price level. Additionally, the long-run ERPT elasticity was found to be low and incomplete.

In fact, from policies perspective, against the backdrop of high foreign inflation, reduction of excise duties on selected items and contained oil prices will drive the domestic inflation rate in a downward trajectory in the

long run. In the short run, inflationary pressures emanating from external factors should be closely managed. Undervaluation of MUR is likely to generate inflationary pressures in the long run. Thus, maintaining the real exchange rate to its long-run equilibrium level will spare the domestic economy from the undesirable consequences of higher inflation. The tightening of the money supply by the Central Bank of Mauritius could be an effective tool to combat inflation. Moreover, the announcement of a clearly defined medium-term inflation objective could help to better anchor inflation expectations.

However, the findings should be interpreted with some precautions as this empirical investigation is not free from limitations. VECM usually yields unbiased estimators in large samples. The sample period (1980-2016) covered in this study is relatively small. Moreover, VARs are very often claimed to be atheoretical and each variable is assumed to influence other variables in the system.

Finally, this study open venues for further research as this type of work can be replicated in other developing countries and SIDS. In addition, other sampling strategies and econometric modeling techniques can be deployed to examine the exchange rate-inflation nexus in future empirical investigations.

Notes

1. These models include the Cournot model, Dixit-Stigliz model and Salop (1979) model.
2. The fall in pass-through or pricing power is due to low inflation that many countries have been able to achieve in recent years
3. The authors measure the exchange rate such that an increase implies appreciation of USD.

References

Abdellatif, C, Abdelouahab, M and Aziz, R (2016). "An Empirical Investigation of the Exchange Rate Pass-Through to Prices in Morocco," *Global Journal of Management and Business Research,* Vol. XVI, Issue V, pp. 21-31.

Bacchatta, P, and Wincoop, V, E (2003). "Why do Consumer Prices React Less than Import Prices to Exchange Rates?," *Journal of European Economic Association,* Vol. 1, pp. 662-670.

Bada, A, S, Olufemi, A, I Tata, I, A, Peters, I, Bawa, S, Onwubiko, A,J and Onyowo, U, C (2016). "Exchange Rate Pass-through to Inflation in Nigeria," *CBN Journal of Applied Statistics,* Vol. 7, No. 1(a), pp. 49-70.

Bergin, P, R (2003). "Putting the 'New Open Economy Macroeconomics' to a Test," *Journal of International Economics,* Vol. 60, pp. 3-34.

Bhundia, A (2002). "An empirical Investigation of Exchange Rate Pass-Through in South Africa," *IMF Working Paper,* WP/02/165, Washington DC, pp. 1-26.

Canetti, E, and Green, J (1992). "Monetary Growth and Exchange Rate Depreciation as causes of Inflation in African Countries: Empirical Analysis," *Journal of African Finance and Economic Development,* Vol. 1, pp. 37-62.

Carriere- Swallow, Y, Gruss, B, Magud, N, E and Valencia, F (2016). "Monetary policy credibility and Exchange Rate Pass-through," IMF Working Paper, WP/16/240, Washington DC, pp. 1-33.

Champa, J, M, and Goldberg, L (2005). "Exchange rate pass-through into domestic prices," *The Review of Economics and Statistics,* Vol. 87, No. 4 pp. 679-690.

Champa, J, M, and Goldberg, L, S (2006). "Distribution Margins, Imported Inputs, and the Sensitivity of the CPI to Exchange Rates," NBER Working Paper 12121, Cambridge, pp. 1-46.

Charef, F and Ayachi, F (2015). "Dynamic Links between Exchange Rate, Inflation and Economic growth in Tunisia," *International Journal of Economics, Finance and Management,* Vol. 4, No. 5, pp. 166-169.

Cheung, Y-W and Yuen, J (2002). "Effects of US Inflation on Hong Kong and Singapore," *Journal of Comparative Economics,* Vol. 30, pp. 603-619.

Choudhri, E and Hakura, D, S (2001). "Exchange Rate Pass-Through to Domestic Prices: Does the Inflationary Environment Matter?," IMF Working Paper, 2001, WP/01/194, Washington DC, pp. 1-36.

Choudhri, E, U, and Khan, M, S (2002). "The Exchange Rate and Consumer Prices in Pakistan: Is Rupee Devaluation Inflationary?" *The Pakistan Development Review,* Vol. 41, No. 2, pp. 107-120.

Crowder, W, J (1996). "The International Convergence of Inflation Rates During Fixed and Floating Exchange Rate Regimes," *Journal of International Money and Finance,* Vol. 15, pp. 551-575.

Devereux, M, B, and Engel, C (2002). "Exchange rate pass-through, exchange rate volatility, and exchange rate disconnect," *Journal of Monetary Economics,* Vol. 49, pp. 919-940.

Devereux, M, B and Yetman, J (2010). "Price Adjustment and Exchange Rate Pass-through," *Journal of International Money and Finance,* Elsevier, Vol. 29, No.1, pp. 181-200.

Dornbush, R (1985). "Exchange rate and Prices," NBER Working Paper No. 1769, Cambridge, pp. 1-31.

Edward, S (2006). "The Relationship between Exchange Rates and Inflation Targeting Revisited," NBER Working Paper No. 12163, Cambridge, pp. 1-45.

Enders, W (2014). "Applied Econometrics Time Series," Third Edition, Wiley & Sons, Inc., Hoboken, New Jersey.

Faruqee, H (2006). "Exchange rate Pass-Through in the Euro Area," IMF Staff Papers, Vol. 53, No.1, pp. 63-88.

Feyziaglu, T and Willard, L (2006). "Does inflation in China affect the United States and Japan?," IMF Paper, WP/06/36, Washington DC, pp. 2-29.

Frimpong, K, and Adam, A, M (2010). "Exchange Rate Pass-Through in Ghana," *International Busisness Research,* Vol. 3, No. 2, pp. 186-192.

Froot, K, A and Klemperer, P, D (1989). "Exchange Rate Pass-Through When Market Share Matters," *American Economic Review,* Vol. 79, pp. 637-654.

Gagnon, J and Ihrig, J (2002). "Monetary Policy and Exchange Rate Pass-Through," Board of Governors of the Federal Reserve System, *International Finance Discussion* Paper No. 704, pp. 1-50.

Goldberg, P, K, and Knetter, M, M (1997). "Goods Prices and Exchange Rates: What have we learned," *Journal of Economic Literature,* Vol. 35, No 2, pp. 1243-1272.

Ghosh, A and Rajan, R (2009). "Exchange rate pass-through in Korea and Thailand: Trends and determinants," *Japan and the World Economy,* Vol. 21, Issue 1, pp. 55-70.

International Monetary Fund, (2017). Mauritius: 2017 Article IV Consultations- Staff Report, IMF Country Report No. 17/362 (Washington: International Monetary Fund), pp. 1-58.

Islam, M, F, and Hassan, M, S (2006). "The monetary Model of Dollar-Yen Exchange Rate Determination: A Cointegration Approach," *International Journal of Business and Economics,* Vol. 5, No. 2, pp 129-145.

Jasova, M, Moessner, R and Takasts, E (2016). "Exchange rate pass-through: What has changed since the crisis," BIS Working Paper, No. 583, pp. 1-31.

Jayaraman, T, K, and Choong, C (2011). "Impact of exchange rate changes on domestic inflation: a study of small Pacific economy," MPRA Paper, No. 33719, pp. 1-15.

Klitgaard, T (1999). "Exchange rates and profit margins: the case of Japanese exporters," *Economic Policy Review,* Vol. 5, No. 1, pp 41-54.

McCarthy, J, (2000). "Pass-Through of Exchange Rates and Import Prices to Domestic Inflation in Some Industrialized Economies," Mimeo, Federal Reserve Bank of New York, pp. 1-28.

McFarlane, L (2002). "Consumer Prices Inflation and Exchange Rate Pass-Through in Jamaica," Research Services Department, Research and Economic Programming Division, Bank of Jamaica, pp. 1-22.

Miyajima, K (2019). "Exchange rate volatility and pass-through to inflation in South Africa," IMF Working Paper, WP/19/277, Washington DC, pp. 1-27.

Mirdala, R, (2014). "Exchange Rate Pass-Through to Consumer Prices in the European Transition Economies," *Procedia Economic and Finance,* Vol. 12, pp. 428-436.

Munyeka, W (2014). "The Relationship between Economic Growth and Inflation in the South African Economy," *Mediterranean Journal of Social Sciences,* Vol. 5, No. 15, pp. 119-129.

Mwase, N (2006). "An Empirical Investigation of the Exchange Rate Pass-Through to Inflation in Tanzania," IMF Working Paper, WP/06/150, Washington DC, pp. 1-34.

Parsley D, C and Poppert, H, A (1998). "Exchange Rates, Domestic Prices, and Central Bank Actions: Recent U.S. Experience," *Southern Economic Journal,* Vol. 64, No.4, pp. 957-972.

Razafimahefa, I, F, (2012). "Exchange Rate Pass-Through in Sub-Saharan African Economies and its Determinants," IMF Working Paper, WP/12/141, Washington DC, pp. 1-23.

Saens, R and Mujica, P (2015). "Exchange rate pass-through and inflation targets in Chile," *Cepal Review,* Vol. 117, pp. 137-146.

Tandrayen-Ragoobur, V, and Chicooree, A (2013). "Exchange Rate Pass Through to Domestic Prices: Evidence from Mauritius," *Journal of Economic Research,* Vol. 18, pp. 1-33.

Taylor, J, B, (2000). "Low inflation, Pass-Through, and the Pricing Power of Firms," *European Economic Review,* Vol. 44, pp. 1389-1408.

Zafar, A, (2011). "Mauritius: An economic Success Story," in Yes Africa Can: Success stories from a Dynamic Continent (eds. Chuhan, P, and Angwalo, M), World Bank Group, Washington DC, pp. 91-106.

Zubair, A, Okorie, G and Sanusi, A, R (2013). "Exchange Rate Pass-Through to Domestic Prices in Nigeria: An Empirical Investigation," *Central Bank of Nigeria Economic and Finance Review,* Vol. 51, No. 1, pp. 1-32.