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Revisiting the West African Commonwealth Countries' Exchange Rate Pass-Through to Inflation

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Abstract

The study analyzed the exchange rate pass-through (ERPT) to inflation in West African Commonwealth Countries (WACCs). The study used a Dynamic Panel Data Model–Pool Mean Group (PMG) that was chosen by the Hausman test over the Mean Group (MG) and Dynamic Fixed Effect Model (DFE). Data for a period 1980–2016 was used, and the results indicate the absence of ERPT to inflation in WACCs in the short run and the economy corrects itself towards the long run in about two short-run periods. Meanwhile, evidence of complete ERPT to inflation was established in WACCs in the long run. Therefore, the study advised the policymakers of WACCs to strengthen their export promotion policies and import substitution strategies for the purpose of stabilizing their exchange rate by which, without it, inflationary pressure will perpetuate itself in their economy. Stability in the exchange rate will help towards attaining, to some extent, sustainable price stability in WACCs economies.

Keywords

Commonwealth, dynamic panel, exchange rate, inflation, PMG

JEL Codes: E30, E31, F31

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1. Introduction

The implementation of a floating exchange rate regime in 1986 marked the beginning of the debate regarding whether the tremendous increases in prices of commodities, in developing economies, are being caused by currency devaluations in such economies. Such devaluation started immediately after 1986, as a consequence of adopting the floating exchange rate regime as against the regime of the fixed exchange rate that was being practiced before 1986. A stable rate of exchange is necessary for the attainment of a single-digit inflation rate, which is one of the requirements for the growth of the economic and its development (Anwar and Islam, 2013; Danlami *et al.,* 2018; Danlami, 2019; Babalola *et al*., 2015; Phiri, 2012; Risso and Sanchez-Carrera, 2009).

The majority of developing nations are situated in Africa, which the entire continent is divided into five geographical zones which include North, West, East, South and Central Africa. There are about 16 countries in West Africa and only four are members of a commonwealth in West Africa, which are; Sierra Leon, the Gambia, Ghana and Nigeria. Most of these countries, like the rest of the developing nations, are experiencing high currency devaluation and high rate of inflation, which the latter is mostly double-digits as against the recommended single-digit for development attainments of their economies. The research intends to revisit the exchange rate pass-through (*ERPT*) to inflation using the panel data of the West African Commonwealth Countries (WACCs). The remaining parts of the paper are a review of the related literature, which is in the second part, while the third part provides detailed explanations on the adopted econometric method of analysis used by the study. The presentations of findings and conclusion of the study constituted the fourth and fifth parts of the research.

2. Literature review

Many definitions of the term inflation by different analysts and scholars exist; such definitions are, basically, pointing towards the same thing or making the same point. When prices of commodities are persistently increasing or rising within a defined territory in a particular period, such vicinity will be said to have been experiencing inflation. Inflation occurs when too much money is chasing a few goods. Some perceived inflation in terms of multiplications of the velocity of money in the state which leads to an upsurge of the quantity of money in circulation (through the way commercial banks create money) thus leads to rises in the general price level (Haberler, 1960; Hazlitt, 1960; Melberg, 1992; Hamilton, 2001). High inflation rate is a plague of the contemporary economy, which, if not suppress, will sabotage and destroy decades of witnessed economic blooming and growth; it redistributes income unfairly by making some rich at the expense of others (Fielding, 2008).

Neo-classical economists perceived inflation as a speedy or what they called a galloping inflation, which is being caused by the imprudent and rampant expansion of the quantity of money. Their perception of inflation is that the term is a wrecking disease came up as a consequence of the absence of strong monetary control which injures business rules, creates widespread destructions in markets and financial decay as well as creates total uncertainty of the future. To Keynesians, money supply expansion in a state of underemployment economy will increase aggregate demand, total output, and level of employment. In a period of depression, expansion of money supply will result to a proportionate rise in output, aggregate demand, and employment levels, but when diminishing return starts, bottleneck appears the prices will start rising, the process will continue until the economy reached full employment level. To Keynesians, this rise in prices is perceived to be semi-inflation or bottleneck inflation (Keynes, 1936; Jhingan, 2011).

The exchange rate is the ratio at which legal tender, of a particular nation, is being swapped with an international currency, frequently USD, for the purpose of conducting transactions across international borders (World Bank, 2019). It is being derived through demand and supply interactions of foreign exchange of the concerned country. A rise in the exchange rate implies a depreciation of the local currencies whereas, a fall in exchange rate signifies appreciations of the local currencies (Amuedo-Dorantes and Polo, 2004; Pan *et al*., 2007; Pontines and Rajan, 2011). Many scholars including Yanamandra (2015) and Karagoz, Demirel and Bozdag (2016) highlighted that; changes in the exchange rate derived from the rates of exchange fluctuations mostly, devaluations of currencies by developing countries, either as a loan requirement or condition given by multinationals organization (World Bank and International Monetary Fund – IMF) or as import promotion strategy, have an influence on the general price level changes, majorly, inflation of the concerned country.

The notion of Exchange Rate Pass-Through (*ERPT*) consists of the definitions of the *ERPT*. Amoah and Aziakpono (2018) defined *ERPT* as the movement of exchange rate changes into domestic prices. Similarly, Choudhri and Hakura (2006), An and Wang (2012), Bangura *et al.* (2012), and Jobarteh (2016) defined *ERPT* as the extent to which the changes in the exchange rate of a country move into the general prices of commodities of the concerned country. Basically, all the definitions stress the extent of the movement of the changes in exchange rate into the prices of commodities, that is to say, an increase in exchange rate results to increase in the domestic prices of goods and services. Lafleche (1996) and Jiang and Kim (2013) maintained that the theoretical expositions of *ERPT* to inflation consist of a direct link by which the local currency devaluation leads to a rise in import prices. The indirect link by which the local currency devaluation leads to a rise in the aggregate demand of the locally manufactured goods, and hence general inflation in the entire economy. Therefore, to them, the primary source of inflation, in developing economies, is the excessive devaluation of their local currencies caused by excessive demand for foreign exchange, or as a means of implementing one program or another; for example, SAP, or even as a condition of loan and aid collections from IMF, World Bank, and Paris club.

Studies were conducted to empirically measure the extent of exchange rate pass-through with dissimilar conclusions that is not likely to make generalization to other studies. Most of these studies were conducted to investigate the existence of *ERPT*, on one hand, Adeyemi and Samuel (2013) in Nigeria, Campa, Goldberg and Gonzalez-Minguez (2005) based on their studies in Euro area, then, comparative studies among Asia-pacific, South America and Turkish economies by Karagoz *et al.* (2016). Studies by Leigh and Rossi (2002) in Turkey and studies on industrialized economies by McCarthy (2007) established the presence of *ERPT* in their respective studies. On the other hand, in their research on Nigeria, Adelowokan (2012) and Omisakin (2009) indicated in the findings of their studies that there is no evidence of *ERPT*. In terms of size and location, Karagoz, Demirel and Bozdag (2016) investigated the effect of *ERPT* in Turkey, Latin America, and Asia, and confirmed its existence. Though, the effect of *ERPT* in Turkey and Latin America are higher than that of Asia. Yanamandra (2015) upheld that the *ERPT* in India is about -1.16. It truly exists, and it is negative. Leigh and Rossi (2002) confirmed the existence of positive *ERPT* in Turkey. They confirmed that the extent of the pass-through is high in the first four periods, and hence, reiterate that they are short-run effects. Savoie-Chabot and Khan (2015) confirmed the existence of positive *ERPT* in Canada that is about 0.5% and 0.7% points whereas, the inflation fluctuated between 0.9% to 1.1% points.

Furthermore, some studies indicated that *ERPT* is negative meanwhile it is positive in some studies. For instant, Leigh and Rossi (2002), Campa *et al.* (2005), Oyinlola and Babatunde (2009), Adeyemi and Samuel (2013), Savoie-Chabot and Khan (2015), Karagoz *et al.* (2016), and Mawajje and Lwanga (2016), as well as Usman and Musa (2018) discovered and reported positive *ERPT* in their findings. This signifies that the rapid increase in exchange rate changes depreciates local currencies and fuels the flame of inflation. On the contrary, negative *ERPT* is reported in the findings of McCarthy (2007), Aliyu *et al.* (2009), and Yanamandra (2015). Nevertheless, another source of controversy in the findings of the previous studies is on whether the *ERPT* discovered and reported, is complete or incomplete as well as high *ERPT* of low *ERPT*. On this basis, Aliyu *et al.* (2009), Oyinlola and Egwaikhide (2011), An and Wang (2012), Razafimahefa (2012), Jiang and Kim (2013), Zubair *et al.* (2013), Choudhri and Hakura (2015), and Bada *et al.* (2016) discovered and reported incomplete

ERPT in their respective studies. Similarly, Faruqee (2006) and Rodriguez-lopez (2011) discovered low *ERPT* in their studies, whereas, high and complete *ERPT* is discovered and reported in their various studies by Shambaugh (2008), Ogundipe and Samuel (2013), Cheikh and Louhichi (2016), Helali and Kalai (2015), Yanamandra (2015), and Comunale and Simola (2018).

In another view, the extent of *ERPT* is associated with the inflation regime of the concerned importing country; high inflation associated with high *ERPT* while low inflation rate is unanimous with low *ERPT* (Cheik and Louhichi, 2016; Junttila and Korhonen, 2012; Razafimahefa, 2012; Choudhri and Hakura, 2006; Taylor, 2000). Similarly, the extent of *ERPT* is associated with the nature of the exchange rate fluctuations; a high volatile exchange rate change is associated with the high *ERPT* while a low volatile exchange rate change is associated with low *ERPT* (Amoah and Aziakpono, 2018; Kilic, 2016; Razafimahefa, 2012; Campa and Goldberg, 2005). Meanwhile, in his view, Lafleche (1996) highlighted that the extent of *ERPT* is being determined by the channels of some components (exports and imports) either directly or indirectly.

Similarly, McCarthy (2007) scrutinized industrialized economies and documented the existence of *ERPT* to inflation. The result proved that the pass-through is retiring but has disinflationary effects. Adeyemi and Samuel (2013) examined level of *ERPT* to inflation in Nigeria, and confirmed its existence. To them, the level of pass-through is big and can clarify the inflationary circumstances of the nation than causes by the money supply. Campa *et al.* (2005) based on their studies in the Euro area, also confirmed the existence of *ERPT*. Their finding reveals that the pass-through is high even during the short-run, although it is incomplete and not uniform throughout the industries and the countries. It is advanced in the long-run, and close to completeness. Aliyu *et al.* (2009) investigated the *ERPT* in Nigeria and confirmed its existence. They reported positive *ERPT* to import prices as well as negative *ERPT* to consumer prices. On the other hand, Bada *et al.* (2016), based on Johansen cointegration and VECM, reported incomplete *ERPT* in Nigeria. Ocran (2010) reported and confirmed in his study, the existence of positive *ERPT* in South Africa, while Omisakin (2009) found no evidence of *ERPT* in his study in Nigeria. On the other hand, Oyinlola and Egwaikhide (2011) reported the existence of positive *ERPT* in the long-run of Nigeria and reported that there is no evidence of it in the short-run. Nevertheless, Taylor (2000) concluded that high inflation persistence is associated with high and complete *ERPT,* whereas, low inflation persistence is associated with low and incomplete *ERPT.* Zubair *et al.* (2013) reported an incomplete *ERPT,* low and slow during the period of their study in Nigeria.

Meanwhile, Mawajje and Lwanga (2016) analyzed the level of *ERPT* in Uganda and affirmed its existence in an analysis that is considered to be of multi-stages. At what they term as the external sector stage, the pass-through is positive, having a one percent rise in exchange rate resulting to a 0.91 percent rise in the inflation. On the other hand, in their general result of a model of single equation, it is established that a one percent rise in the rates of exchange increases the inflation by 0.15 percent in the third period (three lags). Usman and Musa (2018) discovered positive *ERPT* from 1960–2015 in Nigerian, both the log-run and the short-run. Moreover, in terms of the methodology used on *ERPT* investigation, most of the studies used Impulse Response Function (IRF), Vecto Error Correction Model (VECM), and Vector Autoregressive (VAR) Model, as well as Variance Decomposition (VD), approaches. Among them include; Adeyemi and Samuel (2013) find positive *ERPT*, Aliyu et al. (2009) reported negative *ERPT*, An and Wang (2012) reported incomplete *ERPT*.

Using the same method of analysis, Choudhri and Hakura (2015) and Cheikh and Louhichi (2015) show the association of high inflation and high *ERPT* while low inflation and low *ERPT*, Faruqee (2006) reported low *ERPT*, Helali and Kalai (2015) reported complete *ERPT*, while Jiang and Kim (2013) reported incomplete *ERPT*, Usman and Musa (2018), Karagoz *et al.* (2016), Mawajje and Lwanga (2016), Shambaugh (2008) and Leigh and Rossi (2002), all established the presence of *ERPT* in their studies. Meanwhile, the few studies that utilized different methods of econometric analysis include; Saiki (2015) whose applied Generalized Method of Moment (GMM), whereas, logistic smooth transition pass-through (LSTP) was developed as used to measure non-linear *ERPT* by Kilic (2016) and reported that *ERPT* is influenced by the nature of exchange rate fluctuations in a nation.

3. Methodology of research

3.1. Data Source

The data of the four WACCs from 1980–2016 utilized by this study are obtained from the world development indicator (WDI). It consists of the Consumer Price Index as the rate of inflation, while the exchange rate used by the research is the nominal rate of exchange of the countries' currencies against United States Dollars. The measure of economic growth is the usual Gross Domestic Products, while net export is used as the trade balance. The annual expenses of government are used as government expenditure in the study. To ease interpretation and unify the measurements of variables, the series of all the study variables are logged for that purpose.

3.2. Method of Analysis

Dynamic panel data is used for the purpose of this research. It involves first ascertaining the level of variables' integration. Once the level of integration of the variables is established, and none of the series is integrated to the second-order I(2), the next step involves estimating the short-run/long-run relationship via applying Pesaran *et al.* (2001) model, that was widely used by many researchers, among them include Pesaran *et al*. (1999, 2001), Nguyen (2014), Adu and Marbuah (2011), among others.

The dynamic panel model to be used in this research involves either Dynamic Fixed Effect (DFE), Mean Group (MG), or Pool Mean Group (PMG). Blackburne and Frank (2007) highlighted that the MG estimates the cross-sectional time series based on averaging the coefficients. It requires that all coefficients in both short-run and long-run to be heterogeneous across the entities or cross-sections. The PMG and DFE estimate the cross-sectional time series based on pooling and averaging the coefficients. Specifically, the PMG estimator requires that all the short-run coefficients, including intercepts and the speed of adjustment to be heterogeneous across the entities or cross-sections. It requires the long-run coefficients to be homogeneous across the entities or cross-sections. While DFE is similar to PMG in the sense that it requires all long-run coefficients to be homogenous across the entities or cross-sections, it differs with PMG in the sense that it requires the homogeneity of the short-run coefficients with the exception of intercept which is restricted to country or cross-section specific. Hausman test is used to choose the best among the estimates (Blackburne and Frank, 2007).

3.3. Specifications of the Model

The model estimated in this research is in the following form:

$$LFL = f(CLX, LMS, LGDP, LTB, LGX) \quad (1)$$

Where: *LFL* is the inflation rate, *CLX* is the change in exchange rate, *LMS* is Broad Money Supply, *LTB* is trade balance, and *LGX* is government expenditure.

The econometric form of Equation (1) is presented as:

$$LFL_{i,t} = \beta_0 + \beta_1 CLX_{i,t} + \beta_2 LMS_{i,t} + \beta_3 LGDP_{i,t} + \beta_4 LTB_{i,t} + \beta_5 LGX_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where: β_{is} are coefficients *(i=1, 2, … 5)*, *t* is the time series segment, and *i* is the panel data segment. The rest is as defined in Equation (1).

The short-run and long-run segments of the dynamic method of estimations are specified in Equation (3) and (4), respectively.

$$LFL_{i,t} = \alpha_0 + \sum_{j=1}^{p} \alpha_1 LFL_{i,t-j} + \sum_{j=0}^{q_1} \alpha_2 CLX_{i,t-j} + \sum_{j=0}^{q_2} \alpha_3 LMS_{i,t-j} \sum_{j=0}^{q_3} \alpha_4 LGDP_{i,t-k} + \sum_{j=0}^{q_4} \alpha_5 LTB_{i,t-j} + \sum_{j=0}^{q_5} \alpha_6 GOV_{i,t-j} + \varepsilon_{i,t} \quad (3)$$

where: α_i (*i* = 1, …, 6) are the long-run coefficients, *p* and *q*. are the first lag of the dependent and the independent variables, respectively, *j* is the maximum lag length determined by Akaike Information Criterion (AIC).

$$\Delta LFL_{i,t} = \theta_0 + \sum_{j=1}^{p} \theta_1 \Delta LFL_{i,t-j} + \sum_{j=0}^{q_1} \theta_2 \Delta CLX_{i,t-j} + \sum_{j=0}^{q_2} \theta_3 \Delta LMS_{i,t-j} \sum_{j=0}^{q_3} \theta_4 \Delta LGDP_{i,t-j} + \sum_{j=0}^{q_4} \theta_5 \Delta LTB_{i,t-j} + \sum_{j=0}^{q_5} \theta_6 \Delta LGX_{i,t-j} + v_1 ECT_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

Where; θ_i (*i* = 1 … 6) are the short-run coefficients, v_1 is the speed of adjustment towards long-run equilibrium, and ECT is the error correction term.

4. Findings of the study

The section highpoints whats the results of the study find out, and it started by presenting the nature of the variables in terms of their level of integration, determined through unit root tests presented on the first table (Table 1).

The table shows that none of the variables is integrated in the second-order as desired by the method of estimation, but the level of their stationarity is mixed as inflation rate (LFL), exchange rate changes (CLX) and trade balance (LTB) are stationary at level the rest (money supply – LMS, GDP -LGDP and government expenditure – LGX) are stationary at first difference.

Table 1. Test of Stationarity Results

Test Type	LFL		CLX		LMS		LGDP		LTB		LGX	
	Level	1st Diff	Level	1st Diff	Level	1st Diff	Level	1st Diff	Level	1st Diff	Level	1st Diff
Levin, Lin & Chu t*	-3.51 (0.00)	-- --	-5.90 (0.00)	-- --	0.79 (0.78)	-5.21 (0.00)	-0.90 (0.18)	-9.45 (0.00)	-2.12 (0.02)	-- --	-1.93 (0.03)	-11.45 (0.00)
Breitung t-stat	-- ---	-- --	-- --	-- --	-6.21 (0.00)	-1.69 (0.05)	0.50 (0.69)	-7.08 (0.00)	-- --	-- --	-0.57 (0.29)	-7.52 (0.00)
Im, Pesaran and Shin W-stat	-2.61 (0.00)	-- --	-5.77 (0.00)	-- --	1.61 (0.95)	-6.92 (0.00)	0.69 (0.76)	-7.80 (0.00)	-2.72 (0.00)	-- --	-1.44 (0.08)	-9.98 (0.00)
ADF - Fisher Chi-square	21.71 (0.01)	-- --	46.79 (0.00)	-- --	5.45 (0.71)	54.50 (0.00)	4.27 (0.83)	60.26 (0.00)	22.79 (0.00)	-- --	12.22 (0.14)	82.54 (0.00)
PP - Fisher Chi-square	25.05 (0.00)	-- --	46.64 (0.00)	-- --	2.33 (0.97)	75.65 (0.00)	4.98 (0.76)	64.17 (0.00)	20.55 (0.01)	-- --	11.11 (0.19)	188.81 (0.00)

The result of choice among the three dynamic panel data methods of estimation is presented in Table 2. It shows the summary of estimations using PMG, MG, DFE based on the Hausman test that was used for making the choice. The test is in favor of PMG, given the results of the Hausman test probability of above five percent (Blackburne and Frank, 2007). Therefore, PMG is used for the ERPT dynamic panel data analysis. This implies that PMG, as the chosen model, has no problem of cross-sectional dependence based on the houseman test result (prob = 0.19). In addition to that, the Woodridge test of serial correlation withered away the presence and showed the absence of serial correlation in the model (prob = 0.27).

Table 2. The Choice among the three dynamic panel data methods of ERPT estimations

	PMG			MG			DFE		
The long-run estimations									
Variable	Coef	St. Error	Prob	Coef	St. Error	Prob	Coef	St. Error	Prob
CLX	-0.63***	0.14	0.000	-0.36	0.37	0.340	-0.34*	0.19	0.077
LMS	0.55***	0.15	0.000	0.31	0.30	0.312	0.33*	0.20	0.094
LGDP	-1.57***	0.32	0.000	-1.26**	0.62	0.041	-1.00**	0.36	0.005
LTB	0.70***	0.16	0.000	0.57*	0.32	0.077	0.86**	0.43	0.044
LGX	0.50**	0.25	0.046	0.30	0.39	0.442	0.36	0.30	0.234
The short-run estimations									
ECT	-0.75***	0.22	0.001	-0.94***	0.13	0.000	-0.62***	0.08	0.000
CLX_D1	0.53	0.47	0.260	0.51	0.40	0.203	-0.01	0.24	0.961
LMS_D1	0.06	0.43	0.892	-0.15	0.44	0.728	0.85	0.52	0.101
LGDP_D1	0.27***	0.09	0.004	0.35	0.38	0.347	-0.14	0.38	0.712
LTB_D1	-1.03*	0.10	0.069	-1.01*	0.54	0.060	-0.23	0.26	0.384
LGX_D1	-0.10***	0.25	0.301	-0.15	0.23	0.159	0.02	0.24	0.933
_Cons	11.92*	3.65	0.001	17.87***	4.53	0.000	6.65*	2.17	0.002
Hausman Tests									
Test Command			Probability			Test Between			Choice
hausman pmg mg, sigmamore			0.1861			PMG/MG			PMG
hausman DFE mg, sigmamore			0.0023			MG/DFE			MG

Note that: "*" "**" & "***" show significant coefficient at ten, five, and one percent, respectively.

The outcomes of PMG estimations presented in Table 3 consist of the short-run period and the long-run period. The short-run results show no evidence of ERPT in WACCs as the coefficients of CLX are insignificant. It is only the coefficient of LMS after one year that is significant at five percent, and it is inflationary; this implies that money supply increment by one percent leads to an increment in inflation by 0.98 percent after one year. The economy corrects itself toward long-run equilibrium at 53 percent each year; hence it can be considered as very fast as in about two short-run periods the economy

reaches long-run. Meanwhile, during the period of long-run, all coefficients of the variables are significant except that of LGX. There is evidence of complete and positive ERPT to inflation in WACCs in this period, as the coefficient of CLX is significant at one percent. It implies that a rise in the change in exchange rate by one percent leads to a rise in the rate of inflation by 1.59 percent, similar to many previous studies.

Table 3. The Pool Mean Group Results

Variables	Coefficients	Std. Error	*t*-Statistics	Probability
Short-Run				
ECT	- 0.53**	0.23	-2.31	0.02
D(LFL(-1))	0.07	0.26	0.28	0.78
D(LFL(-2))	-0.05	0.17	-0.29	0.77
D(LFL(-3))	-0.16	0.13	-1.20	0.23
D(CLX)	0.31	0.59	0.53	0.60
D(CLX(-1))	0.01	0.36	0.013	0.99
D(LMS)	-0.45	1.01	-0.45	0.65
D(LMS(-1))	0.98**	0.46	2.15	0.03
D(LGDP)	0.42	0.44	0.95	0.34
D(LGDP(-1))	-0.03	0.22	-0.11	0.91
D(LTB)	-0.76	0.74	-1.02	0.31
D(LTB(-1))	0.70	0.69	1.01	0.31
D(LGX)	0.02	0.15	0.15	0.88
D(LGX(-1))	-0.18	0.25	-0.71	0.48
C	6.93**	3.26	2.12	0.04
Long-Run				
CLX	1.59***	0.19	8.51	0.00
LMS	-0.06**	0.02	-2.23	0.03
LGDP	-1.09**	0.46	-2.39	0.02
LTB	1.32***	0.25	5.30	0.00
LGX	0.76	0.56	1.36	0.18

All asterisks are as noted in Table 2.

5. Conclusions

The study discovered an absence of ERPT to inflation during the period of short-run but the economy corrects itself toward the long-run period very fast and in about two short-run periods, the remaining variables are insignificant in the short run. Meanwhile, complete ERPT to inflation exists in the long run period and also all other variables are significant except government expenditure. Therefore, the study advised the policymakers of WACCs to strengthen their export promotion policies and import substitution strategies for the purpose of stabilizing their exchange rate by which without it, inflationary pressure will perpetuate itself in their economy. Stability in the exchange rate will help towards attaining, to some extent, sustainable price stability in WACCs economies.

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