FISCAL EFFECTS OF EXCHANGE RATE DEVALUATION AND CAPITAL FLOWS TO EMERGING COUNTRIES

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Abstract

In the assessment of governments' fiscal performance, exchange rates play some roles while capital movements could serve as determinant of fiscal discipline. This study examined the effects of exchange rate devaluation, and capital inflows, on budgetary spending, and the interactions among the variables using the Bayesian vector autoregression (BVAR) and sys-generalized method of moments (GMM) estimators with 1,184 panel observations. The study covers 37 emerging nations. The variables had a co-integrating connection, demonstrating a long-run link between the variables studied. Having executed the Gibbs sampling for simulation efficiently, our Markov Chain Monte Carlo (MCMC) simulation converged appropriately. The sampling efficiency parameter is equal to 0.96257, close to 1. The Monte Carlo standard errors (MCSE) are extremely low at 0.000 with an implication of adequate precision in the BVAR model estimation. The results disclose that a 1 percent devaluation shock compressed fiscal spending by 0.56 percent and a shock to capital inflows stimulated 0.99% growth in fiscal spending. The 95 percent credible interval suggests a considerable size of effects on devaluation and capital flows. Accordingly, managing the exchange rate can be a valuable tool for managing capital shortage in Africa. Rather than increase government spending, governments should concentrate on revenue generation by utilizing an effective exchange rate policy to influence the national pattern of product diversification.

Keywords: Fiscal Spending, Exchange Rate Devaluation, Capital Inflows, Bayesian VAR, Revenue Generation

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1. INTRODUCTION

Fiscal performance is the capacity of the government to increase its revenue and invest in those infrastructures that can encourage capital flow from abroad. The need for governments to maintain favourable fiscal positions is desirous because it will provide support for macroeconomic stability required to achieve budgetary discipline. The exchange rate is a crucial macroeconomic indicator since exchange rate depreciation policies affect investment decisions. Genc and Artar (2014) claim that by lowering an economy's trade deficit and preserving its trade balance, the foreign exchange rates could be positioned to assess governments' fiscal effectiveness. Therefore, a stable exchange rate system may raise the price of imported goods and services compared to domestic alternatives, enhancing domestic industries' competitiveness (Kandil, 2004; Umoru, Effiong, Ugbaka, Iyaji, Akhor, et al., 2023; Umoru, Effiong, Ugbaka, Iyaji, Okpara, et al., 2023).

Rising foreign capital flows influence domestic policy. Monetary and fiscal policy discipline has been dramatically improved by expanding global markets. According to Rogoff (2007), improved central bank freedom has changed the structure of monetary transmission and improved monetary policy procedures in sub-Saharan Africa. The economic effects of financial policy today come more strongly from inflation expectations and exchange rates (Bean, 2016, as cited in Woodford, 2015; Corbo & Schmidt-Hebbel, 2018).

Exchange rate depreciation might negatively impact global trade terms if imports and exports prices are inelastic since this would put upward pressure on local prices (Umoru, Effiong, Umar, et al., 2023d; Galebotswe & Andrias, 2011). As exports become more affordable, demand-pull inflation from global markets is expected to follow. Pass-through effects from exchange rate depreciation are likely to occur in most emerging economies (Acar, 2000). It demonstrates no agreement on how exchange rates influence economic growth, underscoring the necessity for a thorough examination, especially for developing nations whose economies are hampered by exchange rate fluctuation, investigating the effects of devaluation and fiscal performance on capital inflows in Africa using 37 sub-Saharan countries as a case study provides answers to relevant questions such as how fiscal spending and how exchange rate devaluations affect capital inflows into sub-Saharan African nations.

The research enhances the scanty literature on the dynamic interactions between currency devaluation, fiscal spending, and capital inflows of emerging economies by delving empirically into the impact of exchange rate devaluation and capital flow on the budgetary performance of emerging countries of Africa. It is because earlier research has only concentrated on exchange rate devaluation and economic growth. This by no means added to the robustness of the empirical finding that capital flows harmed fiscal performance with a policy implication of detrimental effects of fiscal indiscipline in 37 emerging countries. Also, the study added to the empirical evidence that devaluation discourages capital inflows by 0.23 percent, with an outcome that suggests that fruitful exchange rate management is worthwhile for dealing with a capital shortage in Africa. The study enhanced existing literature on the dynamic interactions between currency devaluation, fiscal spending, and capital inflows of emerging economies.

The rest of the paper is structured as follows. Section 2 reviews recent literature on the relationship between devaluation, capital flows, and fiscal expenditure. Section 3 explains the methodology, sources, and measurements of data utilized in the analysis. Results are contained in Section 4, while a discussion of the same is found in Section 5. We concluded the research in Section 6, accordingly.

2. LITERATURE REVIEW

In finance and economics, the international mobility of capital and labor is covered in a well-known subset of the classic trade theory (Iyoha et al., 2022; Reisen & Soto, 2011; Levine, 2011). The initial idea of capital, the stock of human and physical capital, is the one that applies to this body of literature. This theory's fundamental finding is the benefits of trade realized through factor price equalization: a natural convergence of relative factor prices across nations. It may be accomplished through unrestricted trade in goods and the mobility of at least one manufacturing element. However, this theory says little about capital flows since it does not address how an equilibrium changes from one in which factor prices diverge due to a lack of free trade or factor mobility to one in which they are equalizing as a result of free trade or factor mobility. International capital flows allude to financial claims chronicled in the capital account of the balance of payments (Abdelal, 2016).

The influence of the first idea of physical capital must be considered when evaluating the costs and benefits of foreign capital flows. Reducing obstacles to foreign capital flows may lead to higher or perhaps lower investment since monetary entitlements can be used to fund such investments. Most banking professionals refer to capital in terms of equity capital. Under this gauge, capital consists of own money plus any additional borrowed money, whether in the form of short-term or long-term debt, used only for leverage to increase the return on equity (Levine, 2011). It is significant for comprehending institutional facets of global capital movements. Assessing the levels of equity capital required to guard against extreme risk outcomes is the foundation for both prudential capital requirements and standard performance criteria applied to banks and asset managers. It promotes procyclical fluctuations in gross foreign capital flows since banks and investment funds take on more debt during affluent periods.

Musgrave (1959) created the fundamental cornerstones for the early theory of fiscal performance. The framework for what was eventually accepted as the proper role of the state in the economy and the functions of the public and private sectors was recently called the "decentralization theory" (Ozo-Eson, 2005). Three processes are specified for the government sector in this framework. These include eradicating income disparity, ensuring macroeconomic stability, and addressing different aspects of market failure. The preservation of

macroeconomic stability and the restructuring of the market are under the purview of the central government.

Mankiw (2000) introduced the Savers-Spenders theory of fiscal policy. Its three ideas address taxation, spending, and debt in the public sector. According to the first hypothesis, transitory tax rate changes significantly impact consumer demand for goods and services, which can lead to changes in taxpayers' income and consumption (Eze & Ogiji, 2013). According to the second hypothesis, long-term government spending stifles investment. It indicates that increased consumption lowers investment, which raises the marginal product of capital and lowers production and employment levels. Additionally, higher interest rates encourage savers to increase the amounts set aside. In effect, increased consumption and higher interest rates deter investment, lowering production and employment levels. The hypothesis is that steady-state inequality rises due to government debt (Oates, 2005; Bird, 1971). As a result, taxation to pay interest will increase as debt levels increase.

Regarding the relations between capital movements and fiscal performance, Levine and Carkovic (2002) examined the link between capital inflows and budgetary spending in industrialized and developing countries between 1960 and 1995 using cross-sectional data. CPF inflows do not have a significant, independent impact on economic growth according to the ordinary least squares (OLS) and generalized method of moments (GMM) models. Chimhowu (2015) uses time series OLS to study the nature, importance, and influence of remittances on household income in SSA. Remittances improve prospects for income growth while immediately improving household earnings. Remittances have a multiplier impact on the local economy, encouraging the development of new services and institutions, mainly when solid structures and institutions have been established and supported. World Bank (2016) researched American remittances abroad, their economic effects, and how policies might enhance their contribution to eradicating poverty. Even though there is conflicting data on their impact on inequality, results show that remittances do lessen poverty. Its effect on the currency rate, inflation, and access to finance also indirectly impacts poverty in the recipient nation.

Adams et al. (2017) uses time series data to examine how capital flows affect a crucial budgetary aggregate in Senegal. Statistics do not support the influence of assistance flows on domestic spending. Domestic spending is significantly impacted negatively by debt servicing. De Vita and Kyaw (2019) use the panel data seemingly unrelated regression (SUR) approach to examine the effect of portfolio investment on the development of 126 emerging nations. They discover that emerging countries can only absorb the growth-enhancing impacts of investment flows. Shehu (2013) found positive and substantially negative significant relationships between exchange rate volatility and variations in Standard International Trade Classification (SITC) imports value. Much empirical work on the impact of devaluations focuses on currency crises since devaluations are frequently employed as a policy tool to address the balance of payment difficulties and speculative attacks. These studies reveal that output decreases immediately following a devaluation (Hutchison & Noy 2005; Basistha & Teimouri 2015). However, much of this research discovers that a devaluation ultimately promotes economic expansion because fiscal performance is enhanced (Bussière et al., 2021). These results are generally actual for African nations, according to Yiheyis (2006).

On the impact of devaluation and fiscal performance, it was reported that devaluations are more contractionary in non-Organisation for Economic Co-operation and Development (OECD) nations than in OECD countries, according to Bahmani-Oskooee and Miteza (2005). Significant differences in reactions, especially across developing nations, are shown by Gupta (2007). According to their research, only 60 percent of currency crises in emerging countries are contractionary. One rare study that focuses on the diverse implications of exchange rate fluctuations in Africa is Bahmani-Oskooee & Gelan's (2013) work. Twenty-two distinct African nations were examined concerning the impact of currency rate changes. Eight of the twenty-two countries had expansionary depreciation over time as it enhanced fiscal performance, whereas five suffered contractionary depreciations. Twenty-two developing nations were used by Kandil (2004) to study the impact of exchange rate variations on real production growth and found that exchange rate depreciation had a favourable effect on inflation but a negative impact on actual production growth. Okoroafor and Oluseyi (2017) investigated the contractionary devaluation theory. Using an error-correction model, the study discovered that currency devaluations are expansionary in the short run and contractionary in the long run. Khan et al. (2016) use the autoregressive distributed lag (ARDL) econometric approach to examine the effects of devaluation on Pakistan's foreign debt and fiscal performance from 1980 to 2014. The analysis's findings revealed long-term exchange rate changes only significantly influenced imports.

Using Nigerian data and the vector error correction approach, Umoru and Oseme (2013) investigate the J-curve effect. The study's findings suggested a recurring feedback relationship between the trade balance and the naira's actual exchange rate depreciation. Kandil (2004) reported that the amount of commerce alters as a function of the overall exchange rate shift. According to Foerster and Matthes (2020), there are substantial policy paradigm shifts as regards the execution of monetary policy concurrently with fiscal consolidation. It has been documented that South Asia strongly depends on domestic demand, amplifying imports over exports and broadening trade gaps (Hanif, 2018; Artuc et al., 2019). In the short run, Thuy and Thuy (2019) deployed the ARDL estimation technique to report that devaluation secondarily influenced the total exports of Vietnam. A significant gap is the lack of proper research connecting macroeconomic variables such as capital flow, fiscal performance, and currency rate devaluation in emerging countries of Africa. By employing 37 sub-Saharan African nations as a case study, this study closes these gaps by examining the effects of the exchange rate and capital flow on African fiscal performance. Explicitly, none of the reviewed studies utilized a time-varying vector autoregression (VAR) method, namely panel Bayesian VAR (PBVAR). This study shields such methodological gap. Unlike the traditional VAR modeling techniques, panel Bayesian techniques can provide parameter estimates where the models

include numerous variables and few data. Even in non-stationary variables, the PBVAR model yields unbiased coefficients. Also, when there are identification problems, Panel Bayesian VAR methods could provide a helpful synthesis between estimation involving lags of variables and calibration techniques.

3. METHODOLOGY

In this research, we used the endogenous-growth model known as the AK model to investigate the connection between capital flows and growth. Pagano (1993), who utilized the AK model to highlight the possible consequences of financial development on growth in a closed economy, is prominently referenced in this section's explanation of the concept. Then, the framework is expanded to include global money flows. The economy's total output is determined by the AK version of the model (Lucas, 1988; Romer, 1989).

$$Y_t = AK_t \tag{1}$$

where, the total capital stock is a linear function of production. The total investment is given in Eq. (2):

$$I_t = K_{t+1} - (1-\theta)K_t \tag{2}$$

Savings are converted into investments under this paradigm through financial intermediaries. By doing this, they consume resources, resulting in households investing less money for every dollar they save. Let us assume that each dollar saved has a fraction that can be supported, while I is kept by the financial intermediaries as payment for their services. The difference between banks' lending and borrowing rates might be considered as transaction cost. The model requires equality of gross investment must and the portion of domestic resident savings that remains after financial intermediaries have taken their cut. It is necessary for capital market equilibrium. As a result, the capital market's stability guarantees that:

$$\phi S_t = I_t \tag{3}$$

The growth rate of production, g, may be expressed as follows using Eq. (1) through Eq. (3) and removing the time indices. Where s stands for the gross savings rate, the formula is:

$$g = A(I/Y) = As \tag{4}$$

Thus, Eq. (4) describes the steady-state growth rate of an AK model with financial intermediation for a closed economy. This equation identifies increased financial intermediation as the cause of economic growth, although other variables, including financial innovation or governmental regulations, may also have an impact. The effectiveness with which savings are allocated to investments is the first channel. The disparity between banks' lending and borrowing rates narrows as they raise their level of intermediation since they are likely to become more proficient at what they do. As a result, the percentage of funds directed toward investment rises, increasing g in Eq. (4).

Second, if increased financial intermediation improves capital allocation, it may impact growth. According to this paradigm, increased capital productivity leads to better development when capital allocation is improved. It is believed that banks would gain expertise in assessing alternative investment ideas and will be better equipped to choose high-yielding ventures. A more excellent pool of savings will be accessible for investment if there are net capital inflows than there would not be. As a result, when there are foreign capital inflows, the capital market equilibrium holds as follows:

$$(S_t + NCF_t) = I_t \tag{5}$$

where, NCF_t stands for net global capital flows. Now, we present the steady-state growth rate as:

$$g = A(I/Y) = A((S_t + NCF)/Y) = As \tag{6}$$

According to Eq. (5), if capital flows to enhance the pace of investment, it can spur growth. If there is international capital mobility, there must be net capital inflows ($NCF_t > 0$), which could fund investment rather than consumption. Second, if capital inflows result in investments with favourable spillovers, this can promote economic growth. Although similar benefits might also occur with other forms of capital flows, the research on CPF has focused on the possible advantages that capital flows can bring about via creating positive externalities. Blomstrom (1991) explains the various ways that the favourable effects of CPF might manifest themselves. First, foreign investment may boost competitiveness in the host country's industry, forcing domestic businesses to adopt more effective practices or invest in human and physical capital to remain competitive.

The trajectory of the nation's output may be changed by the government changing the real exchange rate (RER), which also affects the economy's overall incentive structure. The standard Ricardian model makes it simple to relate the RER's impacts and specialisation's impacts. Thus, following Ramzi (2010), the RER might be adjusted to change the nation's comparative advantage trajectory even when the potential for substantial technical advancements is constrained (Elbadawi, 2015). It implies that it is possible, in some cases, to modify the economic structure permanently by manipulating the nominal exchange rate. Although devaluation boosts the tradable sector's profitability and, as a result, investment, employment, and diversification into new product categories, it also raises the real wage rate since more people are employed in the tradable sector.

The latter effect would offset the expansionary impact of devaluation. A devaluation-induced rise in the trading sector profits translates into more outstanding capital and knowledge accumulation. The next technological advancement may outweigh the influence of an increase in real wage rate, allowing for higher steady-state real wages without compromising the trading sector's ability to compete (Ramzi, 2010). Therefore, the balance between these conflicting impacts ultimately determines how a devaluation would affect the growth of the tradable sector. According to the conventional theory by Yiheyis (2006), exchange rate depreciation raises actual export volumes while decreasing import volumes, which has an expansionary influence on the economy's overall output from the side of demand. Sibanda (2012) contends that,

in contrast to exchange rate depreciation and its benefits, it ultimately slows economic development and creates an inflationary environment. Devaluation of the currency tends to increase the cost of locally produced goods and services, leading to imported inflation (Acar, 2000).

By increasing import costs and decreasing export costs, currency devaluation impacts a nation's exports, favouring the trade balance (Khan et al., 2016). According to theory, devaluations can promote economic expansion by enhancing competitiveness overseas. Devaluations improve net domestic exports by increasing the demand for domestically produced items abroad and the relative price of imported goods. On the other hand, devaluations may cause harm by increasing inflationary pressure, distorting comparable pricing, and decreasing actual earnings. When government debt is expressed in a foreign currency, the effect might be more unstable, possibly resulting in a sovereign debt crisis, which could impede economic growth. The rationale behind the exchange rate depreciation is that it makes domestically produced products and services comparably affordable to those produced abroad, stimulating demand for home commodities (Galebotswe & Andrias, 2011).

In sum, there are three primary ways capital flows and exchange rate fluctuations affect critical variables: inflation, interest rates, credit, exports, and imports (Schnabl, 2007). The first is the inflation (or exchange rate pass-through) channel, in which shifts in the exchange rate affect domestic inflation by increasing the price of imported finished and intermediate goods, and the markups companies slap onto their costs. The second is the trade channel, where the number of goods exported and imported and the exchange rate impact their relative values. The third is the financial channel, which encompasses various effects on domestic economic conditions. The credit and asset markets are directly affected by capital movements, in particular. Additionally, asset prices might alter dramatically even in the absence of significant transactions. Thus, changes in the exchange rate may occur that do not initially correspond to capital movements. Based on the theoretical framework previously mentioned, this study developed its Bayesian VAR model, adapting the work of Muzekenyi et al. (2018) with some adjustments.

$$CPF_{it}^{j} = \beta + \sum_{j=2}^{k} n_j X_{it}^{j} + \sum_{j=1}^{S} \delta_j Z_{it}^{j} + \gamma_t + e_{it} \quad (7)$$

where *cpf* is capital flows, X_{it}^{j} is a vector of *EXD,* which denotes exchange rate devaluation, and *CPF,* which represents capital flow; Z_{it}^{j} is moment conditions; β, η, δ are parameters estimated from Eq. (2). Following the works of Pacifico (2019) and Ciccarelli et al. (2018), we calculated a time-varying structural panel Bayesian VAR to evaluate the link between exchange rate depreciation, capital inflow, and fiscal performance in 37 SSA nations. The matrix representation is given in Eq. (9).

$$X_{it}^{m} = Q + \sum_{\gamma=1}^{1} \left[Q_{itj}^{m}(L) X_{it-\gamma}^{m} + D_{itj}^{q}(L) R_{it-\gamma}^{q} + S_{itj}^{\alpha}(L) Z_{it-\gamma}^{\alpha} \right] \quad (8)$$

$$\begin{pmatrix} X_{11,t} \\ X_{21,t} \\ X_{12,t} \end{pmatrix} = \begin{pmatrix} Q_{11,11} & Q_{11,21} & Q_{11,12} & Q_{11,22} \\ Q_{21,11} & Q_{21,21} & Q_{21,12} & Q_{21,22} \\ Q_{12,11} & Q_{12,21} & Q_{12,12} & Q_{12,22} \end{pmatrix} \begin{pmatrix} X_{11,t-1} \\ X_{21,t-1} \\ X_{12,t-1} \end{pmatrix} + \begin{pmatrix} D_{11,11} & D_{11,21} & D_{11,12} & D_{11,22} \\ D_{21,11} & D_{21,21} & D_{21,12} & D_{21,22} \\ D_{12,11} & D_{12,21} & D_{12,12} & D_{12,22} \end{pmatrix} \begin{pmatrix} R_{11,t-1} \\ R_{21,t-1} \\ R_{12,t-1} \end{pmatrix} + \\ + \begin{pmatrix} S_{11,11} & S_{11,21} & S_{11,12} & S_{11,22} \\ S_{21,11} & S_{21,21} & S_{21,12} & S_{21,22} \\ S_{12,11} & S_{12,21} & S_{12,12} & S_{12,22} \end{pmatrix} \begin{pmatrix} Z_{11,t-1} \\ Z_{21,t-1} \\ Z_{12,t-1} \end{pmatrix} + \begin{pmatrix} e_{11,t} \\ e_{21,t} \\ e_{12,t} \end{pmatrix} \quad (9)$$

where, $t = 1, 2, \ldots, t$ denotes time; Q is an $nm \times 1$ vector of intercepts for each country; Q_{itj}^{m} is an $nm \times nm$ matrix of coefficients for countries (i, j); $X_{it-\gamma}^{m}$ is an $nm \times 1$ vector of lagged capital flows, fiscal spending and exchange rate devaluation, for each country; D_{itj}^{q} is an $nq \times nq$ matrix of coefficients for countries (i, j); $R_{it-\gamma}^{q}$ is an $nq \times 1$ vector of lagged variables for each country; S_{itj}^{α} is a matrix of coefficients for countries (i, j); $Z_{it-\gamma}^{\alpha}$ is an $nm \times 1$ vector. The model factorization becomes:

$$\sum_{S=1}^{S} H_S \phi_{st} = H_1 \phi_{1t} + H_2 \phi_{2t} + \cdots H_S \phi_{1St} \quad (10)$$

Given the factorization equation, the structural normal linear regression model is thus specified as:

$$X_t = B \left[\sum_{S=1}^{S} H_S \phi_{st} + \varepsilon_t \right] + V_1 \equiv \lambda_{st} \phi_{st} + \upsilon_t \quad (11)$$

where, $B = [I_{NM} \otimes Z_t]$, B contains all lagged time-varying variables in the BVAR.

Other statistical methods are suitable for conducting this same research. These are vector error correction model (VECM), augmented VAR estimation techniques, fixed and random effects panel model estimation techniques, pooled mean group (PMG), co-integrated VAR, 2-stage and 3 stages least squares regression methods, linear and nonlinear ARDL estimation methods, fully modified OLS (FMOLS), and the error correction model. The motivation for the time-varying VAR derives from its allowance for complete cross-member heterogeneity of the response dynamics while assisting in analyzing rapid shifts in dynamic responses and shocks. Estimating the loading matrices while imposing priors on the autoregressive parameters within the framework of this Bayesian VAR (BVAR) method is uniquely apparent. The BVAR also became essential for the resolve to analyze the rapid shifts in dynamic responses and volatility in fiscal spending by the government. Also, in this study, we deployed the GMM estimators to check for robustness in the estimates of the impact of *EXD* and *FPE* on *CPF*.

Regarding data measurement:

1. Panel data was drawn from 37 sub-Saharan African nations, namely, Nigeria, Burundi, Angola, Togo, South Africa, Zambia, Burkina Faso, Botswana, The Congo Republic, Cape Verde, Eritrea, Ethiopia, Gabon, Ghana, Gambia, Kenya, Lesotho, Madagascar, Mali, Mozambique, Mauritania, Mauritius, Niger, Malawi, Rwanda, Sudan, Senegal, Sierra Leone, Swaziland, Chad, Zimbabwe, Uganda, Togo, Tanzania, The Democratic Republic of the Congo, Seychelles, and Zambia. The data covers 1990 to 2022. It yielded a total of 1,184-panel observations.

2. Data on capital flows were sourced from World Bank's Global Development Finance (GDF) database. Capital flows were measured as private net capital flows (PNCFs) and net official inflows (NOIs). PNCFs are net equity inflows (NEIs) and net debt inflows (NDIs). While NEIs were further calculated as the sum of FDI flows and portfolio equity, NDIs were calculated as the sum of bank lending, bond issuance, short-term liability, and net borrowing from private creditors. Lastly, NOIs were calculated as the total public debt from certified creditors plus IMF purchases minus IMF re-purchases.

3. Fiscal performance was measured by the difference between total income and government spending and sourced from the GDF database.

4. Effective exchange rate was divided by inflation to determine the amount of exchange rate devaluation.

4. RESULTS

Table 1 displays the descriptive figures panel for this investigation. The average *FPE* for the nations of Africa was 943,000. Within the study sample, the *FPE's* maximum value was 91,100, and its minimum was 137.10, with a standard deviation of roughly 5,070. The Jacque–Berra test indicates that the *FPE* is not regularly distributed. The average amount of capital inflows to African nations is 1,101,941.00. The variation from the mean is 3529138, while 13.34 and 25428 are the minimum and maximum values, respectively. The variable is not normally distributed, just as the *FPE*. The average exchange rate devaluation is 162.36, with a standard deviation of approximately 229.85. The minimum and maximum values of currency devaluation are 1110.55 and 1760.55, respectively.

Table 1. Descriptive statistics

Measures	*FPE*	*CPF*	*EXD*
Mean	943000.00	1101941.00	162.36
Median	92462.30	59215.95	83.63
Maximum	91,100.00	25428.00	1760.55
Minimum	137.10	13.34	1110.55
Std. dev.	5070.00	3529138.00	229.85
Skewness	14.66	4.15	2.17
Kurtosis	232.72	20.13	8.19
Jarque–Bera	1783240.00	12053.84	1523.02
Probability	0.00	0.00	0.00
Observations	798.00	798.00	798.00

Source: Computed by the authors.

Using the Levin, Lin & Chu, and Breitung panel tests, we evaluate the state of the adopted series. The outcomes are shown in Table 2. Using the results of the Breitung test, all variables at levels except *LnEXD* and *LnCPF* are non-stationary.

Table 2. Unit root output

Variables	*Intercept (I)/Trend (T)*	*Method*	*Level*		*Difference*	
			Statistic	*Prob.***	*Statistic*	*Prob.***
LnFPE	I	LLC t*	-0.24	0.40	-24.43	0.00
	I & T	LLC t*	-0.42	0.34	-19.87	0.00
	I & T	B. t-stat.	-0.78	0.22	-13.01	0.00
LnCPF	I	LLC t*	-1.83	0.03	-26.35	0.00
	I & T	LLC t*	-3.27	0.00	-23.65	0.00
	I & T	B. t-stat.	-0.38	0.35	-13.35	0.00
LnEXD	I	LLC t*	-4.18	0.00	-19.65	0.00
	I & T	LLC t*	-4.95	0.00	-15.83	0.00
	I & T	B. t-stat.	-0.97	0.17	-9.92	0.00

Source: Computed by the authors.

Table 3 presents co-integration results. All methods agree that the variables used are stationary after the first difference, I(1). It suggests that none of our variables is inactive at this level. Other than panel rho-statistic, all other figures reported in Table 3 should be less than the significance level. In this study, we have 0.05, according to the conditions for co-integration using the Pedroni co-integration. In addition to the panel rho statistic, all other figures that fulfilled the requirement for co-integration came to the same conclusion. A panel co-integrating link exists between the variables at 0.05 significance or probability level.

Table 3. Co-integration results

Measures	*Statistic*	*Prob.*	*Weighted statistic*	*Prob.*
Panel rho-statistic	-0.06	0.02	-2.39	0.00
Rho-statistic	-0.41	0.34	-1.21	0.00
Phillips–Perron-statistic (PP)	-2.05	0.02	-2.98	0.00
Augmented Dickey–Fuller-statistic (ADF)	-2.62	0.00	-2.26	0.01

Source: Computed by the authors.

In terms of optimal lag, Table 4 shows the ideal lag for panel BVAR estimation. The Bayesian model selection results are displayed in Table 4 below where log(ML) stands for the log-marginal (ML) likelihoods, the prior model probabilities are denoted as P(M), and the posterior model probabilities are represented as P(M/y). In all, the P(M) is equal to 0.35. The results show clearly that the highest posterior probability goes to the BVAR model with lag one since it has a 0.83 probability value compared to others that are extremely low. Tremendously, therefore, the BVAR1 model is the best model, and lag one was implemented in the estimation of the BVAR model.

Table 4. Bayesian model selection

BVAR model	*log(ML)*	*P(M)*	*P(M/y)*
BVAR1	123.90	0.3500	0.83461
BVAR2	102.76	0.3500	0.00027
BVAR3	99.47	0.3500	0.00156
BVAR4	95.63	0.3500	0.00574
BVAR5	92.78	0.3500	0.00129

Source: Computed by the authors.

The estimated BVAR regression results are reported in Table 5. Having executed the Gibbs sampling for simulation efficiently, our Markov chain Monte Carlo (MCMC) simulation converged appropriately. The sampling efficiency parameter is equal to 0.96257. This is high, almost 1. By implication, our sample size of 1,000 for the MCMC is comparable to an approximate value of 960 independent draws from the posterior. This indeed adequately delivers precision in our BVAR model estimation. The Monte Carlo standard errors (MCSE) are extremely low at 0.000. This implies that the uncertainty about our sample due to sampling error is infinitesimal. The BVAR results contain an enormous number of regression coefficients because it has 3 BVAR equations, each with 3 regression coefficients plus the regression intercept. The BVAR estimation also contains the covariance matrix Sigma.

Table 5. Estimated results of the Bayes VAR model with 1 lag (Gibbs sampling)

Acceptance rate = 1			Efficiency:		Minimum	0.86851	
Burn-in		3000			Average	0.96257	
MCMC sample size		1,500			Maximum	1	
Sample		1990	2022	Number of obs.		1,184	
MCMC iterations		4,500	Log marginal-likelihood			114.50	
Variables		***Mean***	***Std. dev.***	***MCSE***	***Median***	***95% credible interval (equal-tailed)***	
D_LnFPE	*LnFPE(-1)*	1.46810	0.08346	0.000453	1.46358	0.56829	0.78579
	LnCPF(-1)	-0.08931	0.00793	0.000369	-0.08514	-0.03841	0.06835
	EXD(-1)	-0.94785	0.00122	-0.00024	-0.94395	-0.89542	0.27894
	cons	1.79562	0.03756	0.000891	1.79012	-0.98347	0.35692
D_LnCPF	*LnFPE(-1)*	0.56892	0.00893	0.000761	0.56153	1.038923	2.83489
	LnCPF(-1)	1.83795	0.00256	0.000384	1.83569	0.34789	0.73892
	EXD(-1)	-0.35759	0.00178	-0.00011	-0.35680	0.56832	0.8928
	cons	0.00376	0.05710	0.000945	0.00354	1.37986	1.569868
Ln_EXD	*LnFPE(-1)*	0.34689	0.094478	0.000378	0.34121	0.18341	0.23095
	LnCPF(-1)	0.01582	0.02765	0.000831	0.01519	0.05376	0.04761
	EXD(-1)	-1.02893	0.00937	-0.00045	1.02856	0.32168	0.89622
	cons	0.49265	0.02351	0.000391	0.49247	0.24551	0.346256
Sigma_1_1		0.00035	0.034533	0.000033	0.00035	0.14234	0.25234
Sigma_2_1		0.00016	0.01407	0.000578	0.00051	0.02735	0.19565
Sigma_3_1		0.00993	0.00023	0.000091	0.00982	0.15478	0.19478
Sigma_2_2		0.00015	0.00396	0.000236	0.00140	0.4756	0.9756
Sigma_2_3		0.00378	0.00202	0.000564	0.00710	0.31587	0.96582
Sigma_3_3		0.00258	0.01378	0.000378	0.00520	0.027825	0.37951

Source: Computed by the authors.

The cumulative orthogonal impulse responses are contained in Table 6 below. The results show that at the end of 20 quarters, a 1% exchange rate devaluation shock stimulated a 0.56% drop in fiscal performance. This is captured by the posterior mean estimate. Relatively, a 1% shock to capital inflows results in a 0.99% growth in government fiscal spending. The 95% credible interval suggests a considerable size of effects to both shocks to devaluation and capital inflows. Even when we excluded the zero at the end of 20 quarters, the cumulative IRFs still indicate a strong negative effect of devaluation on government spending with about 0.9% probability while it upheld the positive effect of capital inflows on fiscal spending with 0.3% probability.

Table 7 presents variance decomposition results for fiscal performance. Table 8 below shows variance decomposition results for capital inflows.

Table 6. Cumulative orthogonal IRFs

Step	*Posterior means (Impulse = EXD, response = D_FPE)*	*Lower 95%, credible band (Impulse = EXD, response = D_FPE)*	*Upper 95%, credible band (Impulse = EXD, response = D_FPE)*
0	-0.09048	0.13688	0.32782
1	0.01347	0.28634	0.34661
2	0.34656	0.2973	0.35570
3	0.37982	0.31479	0.36789
4	0.37981	0.33975	0.38908
5	0.43572	0.39289	0.47957
6	0.48968	0.47689	0.48893
7	0.46539	0.48560	0.49783
8	0.48433	0.52730	0.57821
9	0.75211	0.57378	0.57930
10	0.84663	0.59230	0.59813
11	0.85308	0.67829	0.64657
12	0.91824	0.69102	0.65123
13	0.95382	0.79492	0.66378
14	0.95561	0.84028	0.68794
15	0.95795	0.85201	0.71034
16	0.98356	0.88237	0.72394
17	0.96761	0.89084	0.73895
18	0.96575	0.86429	0.78510
19	0.98896	0.91245	0.81246
20	0.98992	0.92152	0.93561
Step	*Posterior means (Impulse = D_LnCPF, response = D_FPE)*	*Lower 95%, credible band (Impulse = D_LnCPF, response = D_FPE)*	*Upper 95%, credible band (Impulse = D_LnCPF, response = D_FPE)*
0	-0.56192	0.19947	0.35047
1	-1.0478	0.2892	0.3634
2	-1.06129	0.31568	0.55568
3	-0.23897	0.32789	0.56789
4	-0.04865	0.26795	0.66235
5	-0.78343	0.42830	0.71830
6	-0.57925	0.31520	0.72520
7	-0.76824	0.57873	0.73873
8	-0.56321	0.68949	0.74949
9	-0.69247	0.68959	0.75159
10	-0.42349	0.71083	0.8012
11	-0.24878	0.71184	0.8234
12	-0.56910	0.74389	0.8345
13	-0.12478	0.75573	0.84685
14	-0.15689	0.78290	0.85609
15	-0.25760	0.79715	0.86189
16	0.19021	0.81763	0.9763
17	0.26793	0.82379	0.9782
18	0.95712	0.98465	0.98100
19	0.03972	0.98776	0.99156
20	-0.30942	0.99723	0.99723

Source: Computed by the authors.

Table 7. Variance decomposition results for fiscal performance

Period	*S.E.*	*LnFPE*	*LnCPF*	*LnEXD*
1	0.65	100.00	0.00	0.00
		0.00	0.00	0.00
2	0.86	100.00	0.00	0.00
		(0.20)	(0.08)	(0.10)
3	1.01	99.90	0.00	0.00
		(0.28)	(0.12)	(0.14)
4	1.13	99.75	0.00	0.00
		(0.46)	(0.17)	(0.20)
5	1.22	99.55	0.01	0.00
		(0.68)	(0.24)	(0.27)
6	1.30	99.35	0.01	0.01
		(0.92)	(0.33)	(0.35)
7	1.36	99.14	0.01	0.01
		(1.15)	(0.43)	(0.43)
8	1.41	98.95	0.02	0.01
		(1.38)	(0.53)	(0.51)
9	1.46	98.77	0.02	0.01
		(1.60)	(0.64)	(0.60)
10	1.50	98.61	0.03	0.01
		(1.80)	(0.76)	(0.68)

Source: Computed by the authors.

Table 8. Variance decomposition results of capital flows

Period	*S.E.*	*LnFPE*	*LnCPF*	*LnEXD*
1	0.65	0.06	99.94	0.00
		(0.28)	(0.28)	0.00
2	0.86	0.05	99.95	0.00
		(0.29)	(0.36)	(0.12)
3	1.01	0.04	99.91	0.02
		(0.25)	(0.37)	(0.15)
4	1.13	0.07	99.80	0.05
		(0.25)	(0.44)	(0.21)
5	1.22	0.15	99.62	0.09
		(0.31)	(0.59)	(0.32)
6	1.30	0.25	99.38	0.15
		(0.42)	(0.80)	(0.45)
7	1.36	0.39	99.10	0.21
		(0.55)	(1.05)	(0.61)
8	1.41	0.55	98.78	0.28
		(0.71)	(1.31)	(0.77)
9	1.46	0.73	98.44	0.36
		(0.88)	(1.59)	(0.94)
10	1.50	0.92	98.09	0.43
		(1.07)	(1.86)	(1.12)

Note: Standard errors: Monte Carlo (4,500 repetitions).
Source: Computed by the authors.

The *LnEXD* variance decomposition for devaluation is shown in Table 9. The *LnEXD* innovation is still the best way to explain *LnEXD*; in comparison to the other variables used in the VAR system, its role is fading but still significant. The second-largest factor influencing *LnEXD* after *LnEXD* is *LnFPE*. It could have improved the exchange rate management in Africa by enhancing *LnFPE*.

Table 9. Variance decomposition results in exchange rate devaluation

Period	*S.E.*	*LnFPE*	*LnCPF*	*LnEXD*
1	0.35	0.16	0.00	99.79
		(0.28)	(0.21)	(0.47)
2	0.42	0.11	0.15	99.62
		(0.25)	(0.38)	(0.55)
3	0.46	0.13	0.20	99.51
		(0.24)	(0.44)	(0.63)
4	0.48	0.20	0.26	99.32
		(0.29)	(0.50)	(0.79)
5	0.49	0.31	0.31	99.08
		(0.40)	(0.57)	(0.99)
6	0.50	0.46	0.37	98.81
		(0.56)	(0.65)	(1.23)
7	0.50	0.63	0.43	98.53
		(0.76)	(0.75)	(1.48)
8	0.51	0.82	0.49	98.24
		(0.97)	(0.85)	(1.73)
9	0.51	1.02	0.55	97.94
		(1.20)	(0.97)	(1.99)
10	0.51	1.23	0.61	97.65
		(1.44)	(1.09)	(2.24)

Note: Standard errors: Monte Carlo (4,500 repetitions).
Source: Computed by the authors.

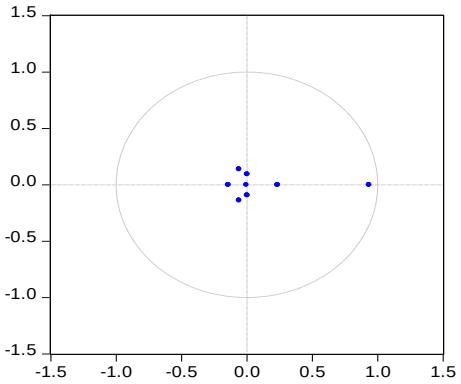
Table 10. Autocorrelation test results

Lag	*LRE* stat.*	*df*	*Prob.*	*Rao F-stat.*	*df*	*Prob.*
1	33.07	16.00	0.01	2.08	(16, 2224.7)	0.01
2	57.36	16.00	0.00	3.62	(16, 2224.7)	0.00
3	7.32	16.00	0.97	0.46	(16, 2224.7)	0.97

Source: Computed by the authors.

The stationary/stability test was carried out by examining the inverse roots of the autoregressive (AR) characteristic polynomial before looking at how dynamically each variable responded to a single standard error innovation in itself, as well as to innovations in other variables in the system. The plot is presented in Figure 1.

Figure 1. Stationary of estimated VAR system



Source: Computed by the authors.

As revealed in Table 11 of the stability condition, the stability parameter is given by the posterior probability of the eigenvalues inside the unit circle. This is equal to 1. What this means is that the BVAR model is empirically stable. Besides, the posterior mean of the BVAR estimates for the eigenvalue moduli decreases as follows, 0.72890, 0.12685, and 0.00131.

Table 12 displays the generalized panel technique of moment estimates for robustness checks.

Table 11. Bayesian stability condition

Pr(eigenvalues lie inside the unit circle) = 1.0000						
Companion matrix size		3	MCMC sample size		1,500	
Eigenvalue modulus	***Mean***	***Std. dev.***	***MCSE***	***Median***	***95% credible band***	
1	0.72890	0.0568	0.00233	0.72230	0.57812	0.83471
2	0.12685	0.0267	0.00476	0.00132	0.16473	0.25892
3	0.00131	0.0059	0.00319	0.12610	0.07562	0.34763

Source: Computed by the authors.

Table 12. Panel GMM estimation output

Variable	***FDGMM(t-2)***	***FDGMM(t-3)***	***SYSGMM(t-2)***	***SYSGMM(t-3)***
LnFPE(-1)	0.714 (266.21)	0.634 (19.21)	0.479 (11.234)	0.652 (54.237)
LnCPF	-0.01 (3.13)	-0.387 (29.410)	0.963 (2.456)	-1.420 (2.015)
LnEXD	-1.11 (-15.29)	-0.131 (-128.29)	-0.550 (-124.15)	-0.231 (-123.9)
M1	-3.276	-5.247	-6.231	-2.479
M2	-3.297	-0.397	-1.379	-0.974
Difference-in-Sargan test	0.000	0.003	0.000	0.002
AR(1)	-2.815	-2.452	-2.402	-2.345
AR(2)	0.005	0.001	0.000	0.003
J-statistic	-	-	24.50	24.50

Source: Computed by the authors.

5. DISCUSSION OF RESULTS AND FINDINGS

Regarding BVAR variance decomposition of Table 7, capital inflows innovation shock results in a continuous movement in *LnCPF*. Reactions to *LnCPF* innovation happen gradually and rise from the third period to 0.56 percent in the tenth period. Due to *LnCPF* innovation, the same response also applied to *LnEXD*. Innovation in *LnFPE*, in addition to *LnCPF*, is a significant way to increase capital flows to the African continent. Capital flows innovation shock leads to a continuous shift in fiscal spending, as evidenced by the decomposition of the *LnFPE* variance. Table 8 shows that *LnCPF* is not suddenly shocked. However, the response to capital inflows innovation happens gradually and increases from 0.28 percent in the first term-the eleventh period to 1.86 percent. The same reaction was experienced by *LnEXD*, which increased from 0.10 percent in the second period to 1.12 percent in the tenth period due to the *LnCPF* innovation from 0.10 percent in the second quarter to 1.23 percent in the tenth, *LnFPE* increases. Innovation in *FPE* is crucial to boost capital flows to the African continent and *LnCPF*. The *LnEXD* variance decomposition for devaluation is shown in Table 9. The *LnEXD* innovation is still the best way to explain *LnEXD*; compared to the other variables used in the VAR system, its role is fading but still significant. The second-largest factor influencing *LnEXD* after *LnEXD* is *LnFPE*. It could have improved the exchange rate management in Africa by enhancing *LnFPE*.

The autocorrelation test results of Table 9 provide evidence in support of the absence of serial dependence of successive residual terms with implications that estimated coefficients are efficient. The outcomes show that our results, shown in Table 10, are devoid of autocorrelation. The panel GMM must have first-order AR(1) autocorrelation and no second-order [AR(2)] serial correlation. The difference in Sargan statistic accepts the validity of our instruments utilized in the level equations

at 5%. We deployed both difference GMM and system GMM estimators to overcome the upward bias coefficients of lagged fiscal variables that characterised the OLS estimator and the downward bias associated with the within-group estimator, respectively. Nevertheless, we based the analysis on sys-GMM because the estimated coefficient of lagged capital flows is above the one obtained from the within groups (0.023) but falls below the coefficient (0.720) calculated with the OLS estimator.

The results show that Africa's capital flows, exchange rates, and fiscal performance have a long-term link. For all estimations, the dynamic lag of capital inflow positively and significantly impacted current inflows to Africa. The GMM results established that a 1% rise in capital flows to emerging nations generates 0.96% growth in fiscal spending. According to the results, fiscal spending was negatively affected by the devaluation in the exchange rate by 0.55% following a 1% rise in devaluation. Relatively, the cumulative orthogonal IRFs reported a 0.56% negative effect of devaluation on fiscal spending. Specifically, a 1% exchange rate depreciation shock stimulated a 0.56% drop in government spending while the same shock to capital inflows resulted in a 0.99% rise in government fiscal expenditure. These effects obtained from the BVAR and GMM methods are similar and significant. In sum, devaluation negatively impacted current fiscal performance. According to the findings, the influence of currency depreciation is significant. It supports Elbadawi (2015) that a real effective exchange rate might be adjusted to change the trajectory of the nation's comparative advantage even when the possibility for substantial technical advancements is constrained. It implies that it is possible, under some circumstances, to modify the economic structure permanently by manipulating the nominal exchange rate. Accordingly, managing the exchange rate is a valuable tool for managing fiscal performance. One would counter that such a role could be attributed to revenue generation rather than increasing government spending. The necessity for borrowing arises because emerging nations' savings are inadequate to cover rising developmental needs. Hence, the justification for the expansionary policy is that it will eventually improve the tax base and fill infrastructure deficiencies. Unfortunately, regardless of the financial cycle experienced, the concept of fiscal illusion persists in African countries and has been a critical instrument politicians employ to buy voters over (Alesina & Perotti, 1995). In line with our results, the empirical findings included that devalued local currencies deleteriously affected all economies. It resulted in the monetization of budget shortfalls in all countries covered by the study while it improved external balances at the expense of fallen output and higher prices. It had indeed reduced purchasing power as savings and salaries were rendered worthless. Consequently, with devaluation-induced inflation, higher budget deficits are incurred via higher government spending and interest rates. In sum, devaluation impedes fiscal performance in emerging African countries.

Similarly, given that devaluation increases the money value of countries with stronger currencies, with the devaluation of domestic currencies, currencies of trading partners of all emerging countries covered in this study appreciated causing residents and investors abroad to earn more money given a favorable exchange rate vis-a-vis local currency. Our analysis upholds that orthodox comparative trade advantage models, whereby a country's comparative advantage and trade pattern are influenced mainly by its resource endowment and technological capabilities, belittle the impact of policy in redefining comparative advantage and altering a nation's trade pattern because they assume perfectly competitive markets. The policy results derived from these models are not best for all the merging countries covered in this study, especially in the long run, as many of the perfectly competitive assumptions driving such models are not satisfied. Government policy interventions are thus permissible when there are market failures to establish a socially optimal structure of production and trade. The trajectory of the nation's output may be transformed by the government adjusting the real effective exchange rate, which also affects the economy's overall incentive structure. A similar strategy may be used to diversify production and exports into new markets as well as boost the supply of conventional exports.

6. CONCLUSION

The study evaluates the effects of currency devaluation and capital inflows on fiscal performance in Africa. The BVAR and sys-GMM methods were deployed for estimation. It embraced the conventional theory of world commerce. The shock of capital inflows innovation sparks a tenacious fiscal spending movement. There is a reaction to capital inflows innovation which happens gradually and rises from the third period to 0.56 percent in the tenth period. Therefore, capital inflow in the process of development is a catalyst that triggers government effectiveness by way of fiscal discipline required for national growth. Hence, nations turn to foreign capital inflows to address resource allocation shortfalls and the build-up of foreign debt burden. Innovation in effective exchange rate policy management, in addition to capital flows to emerging countries, are significant measures to sustain fiscal expenditure by the governments of emerging African countries. The study suggests the need for various governments in emerging nations to be committed to capital investments and efficient management of the exchange rate policy to improve their local currencies. Also, African governments should take the initiative and make plans to develop several revenue streams. It will assist emerging economies in financing its expenditures and fulfilling its debt obligations. A monitoring committee should be established to guarantee that budgetary restraint is upheld in African nations. It will reduce resource waste and costs that may have been better spent.

Moreover, governments can utilise effective actual exchange rate policy as a critical macroeconomic policy tool to influence the national patterns of production diversification towards revenue generation. The trajectory of national output could be re-directed on the path of economic recovery by the government changing the real effective exchange rate. A similar strategy may be

used to diversify production and exports into new markets and boost industrial export supply. Economic diversification is needed to boost non-oil industry performance and employment in that sector. Stabilization and structural reform programs should not be anchored solely on the devaluation of domestic currencies; instead, governments should run the path of fiscal discipline by minimizing budgetary imbalances. To avoid a deficit while paying its bills, the government should appropriately utilize its resources. Such policies should be created to encourage people to pay taxes and provide incentives to those who do not. Government should lower interest rates on loans so that small domestic investors can make investments that improve government revenue and job possibilities. Given the limitations of unobserved heterogeneities between dynamic movements of different variables across a panel of countries due to structural changes and policy regime shifts, we suggest that further research be carried out based on multi-country structural panel Bayesian vector autoregression (SPBVAR) modeling and estimation technique with control for highly indebted emerging countries. Additionally, devaluation may affect fiscal balance through domestic interest rates, which increase the cost of government debt. Further studies should investigate the budgetary effects of currency devaluation with empirical emphasis on the impact of depreciation on local currency costs of foreign debt service.

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