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Domestic and External Drivers of Inflation

The Gambia

Jean-Claude Nachega, Glen Kwende, Laurent Kemoe, and Fidel Márquez Barroeta

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Domestic and External Drivers of Inflation: The Gambia

Prepared by Jean-Claude Nachega, Glen Kwende, Laurent Kemoe, and Fidel Márquez Barroeta

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ABSTRACT: This paper investigates the drivers of headline inflation and the degree of exchange rate passthrough (ERPT) in The Gambia over the period 2014-2023. The analysis highlights the decisive long-term roles of global prices of commodities (food, oil and fertilizer), the exchange rate, and the domestic output gap. The short-run dynamics of inflation points to the roles of global food price and the second-round effects of changes in food prices and the output gap. Monetary policy has the potential to tame inflation in the short run provided the monetary policy rate is adjusted rapidly and boldly. Lastly, there is evidence of an asymmetric ERPT to domestic prices, and the size of currency depreciation matters for inflation dynamics.

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Prepared by Jean-Claude Nachega, Glen Kwende, Laurent Kemoe, and Fidel Márquez Barroeta [1]

[1] The authors would like to thank Andrea Manera for helpful comments and discussions.

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THE GAMBIA

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Prepared by Jean-Claude Nachega, Glen Kwende, Laurent Kemoe, and Fidel Márquez Barroeta

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THE GAMBIA: DOMESTIC AND EXTERNAL DRIVERS OF INFLATION[1]

This paper investigates the drivers of headline inflation and the degree of exchange rate passthrough (ERPT) in The Gambia over the period 2014-2023. The analysis highlights the decisive long-term roles of global prices of commodities (food, oil and fertilizer), the exchange rate, and the domestic output gap. The short-run dynamics of inflation points to the roles of global food price and the second-round effects of changes in food prices and the output gap. Monetary policy has the potential to tame inflation in the short run provided the monetary policy rate is adjusted rapidly and boldly. Lastly, there is evidence of an asymmetric ERPT to domestic prices, and the size of currency depreciation matters for inflation dynamics.

A. Literature Review

1. There is a wealth of theoretical and empirical literature on the sources of inflation in developing countries. Demand-pull factors, external factors, and/or cost-push/inertial factors have received more attention in explaining the dynamics of inflation in specific countries or groups of countries. Demand-pull factors have been emphasized by two theories of inflation. First, *fiscal-monetary doctrines* of inflation, also known as the "fiscal view" of inflation, stress that inflation is caused by fiscal imbalances. Persistent fiscal deficits and high public debt lead to high inflation by triggering excess aggregate demand, directly or ultimately, through either higher money growth (as in Sargent and Wallace (1981)'s "fiscal dominance" hypothesis of monetary policy) or perceived wealth effects and lack of confidence by the public in fiscal solvency (as in the "fiscal theory of the price level"; see Leeper, 1991; Woodford, 1995; and Sims, 1994).[2] Second, the *output gap model*, also known as the Philipps curve framework (Philips, 1958; Samuelson and Solow, 1960), is the other demand-pull theory of inflation. Positive (negative) output gaps, i.e., the differences between actual and potential output, reflect an excess (deficient) level of economic activity over potential output, i.e., an overheated (underheated) economy, and hence rising (falling) inflation.

2. External factors include movements in exchange rates, the prices of imported food and energy products, the global output gap, and remittance inflows. The "balance of payments view" emphasizes the inflationary role of currency depreciation in countries subject to large external shocks (Montiel 1989). Currency deprecation affects domestic inflation directly by changing the price of imports in domestic currency (first-round effect) and indirectly (depending on how this initial shock is transmitted to other sectors) through changes in costs and inflation expectations (second-round effects). Increases in international oil prices cause jumps in the CPI, directly through the presence of oil products in the consumer basket and indirectly through the effects on the

[1] Prepared by Jean-Claude Nachega, Glen Kwende, Laurent Kemoe, and Fidel Márquez Barroeta. The authors would like to thank Andrea Manera for helpful comments and discussions.

[2] Under the fiscal theory of price level, higher bond-financed deficits lead to higher equilibrium price level through their effects on private sector wealth and aggregate demand, whereas money plays no (or a lesser) role.

marginal costs of production of domestic firms. If exchange rates are flexible, there will be a currency depreciation (given the higher oil import bill), which will feed back into the CPI. As to global food prices, they are more closely correlated (than oil prices) with headline CPI in EMDEs given the large weight of food in households' consumption (Catao and Chang, 2015). For a net food importer, higher global food prices lead to nominal currency depreciation (given the higher import bill) and second-round effects on wages and prices of other goods. Lastly, remittances are an important external factor with potential aggregate demand and inflationary effects in EMDEs; see, for instance, Chami and others (2006) and Ball, Lopez, and Reyes (2013).

3. Cost-push and inertial factors include exogenous domestic food price and wage shocks, and backward-looking indexation mechanisms. Exogenous domestic food price and wage shocks lead to inflation if monetary policy is accommodative. Likewise, backward-looking indexation mechanisms, whereby current wages are adjusted to lagged inflation, may render inflation strongly persistent and increase the cost of disinflation (Dornbusch and Fischer, 1993; Blanchard and Gali, 2007).

4. Empirical research confirms the role of both domestic and external factors for inflation dynamics in EMDEs.[3] A recent comprehensive study by Ha, Ivanova, Montiel, and Pedroni (2019) highlights the sizable role global factors play in driving inflation in LICs. Their main findings are as follows. First, although LIC inflation has declined sharply since the mid-1990s, the level and volatility of headline inflation have remained above those in AEs. Second, core inflation in LICs was more susceptible to external shocks—in particular, to global core, food, and energy prices—than in the other country groups.[4] Third, domestic characteristics appear to matter for determining the responsiveness of inflation to external shocks. Fourth, ERPT to core inflation in LICs is much larger than for the other country groups.

B. Stylized Facts

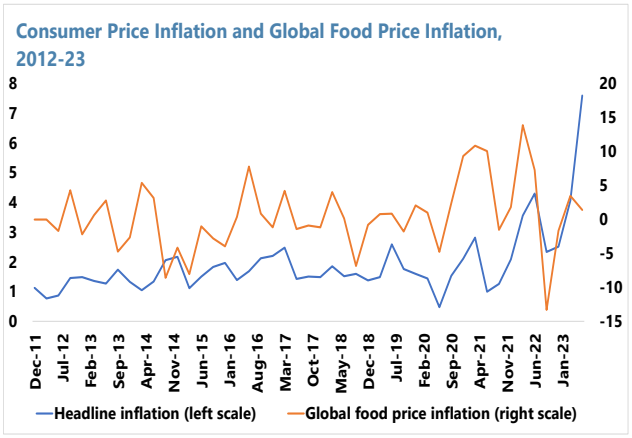
5. Stylized facts and the limited studies on The Gambia point to the role of both domestic and external drivers for inflation dynamics. Alagidede, Coleman, and Cuestas (2012) find that Gambia's inflation is persistent despite being mean reverting. Figure 1 suggests potential links of domestic inflation with global food and fertilizer (phosphate) prices, currency depreciation, and the domestic output gap. The Gambia is indeed a net importer of essential foods and energy. The weight of food items and non-alcoholic beverages in The Gambia's CPI basket is around 50 percent, explaining the co-movement between global food inflation and headline inflation in The Gambia. Unlike international food prices, however, the transmission of movements in international energy prices into domestic prices is somewhat complex, as the prices of fuel products (and

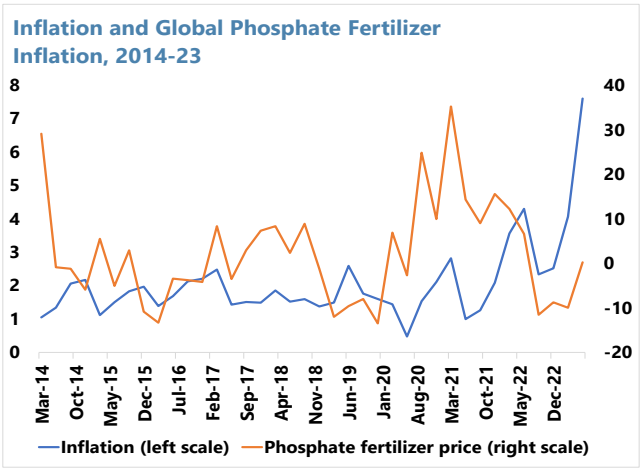
[3] See, for instance, Coe and McDermott (1997), Loungani and Swagel (2001), Barnichon and Peiris (2008), Nguyen et al. (2017), and Baldini and Poplawski-Ribeiro (2011) for studies focusing on LICs and Africa.

[4] Around ¾ of the variation in domestic core inflation rates among LICs was accounted for by external inflation shocks, and very little by shocks to domestic core inflation. Global food and energy price shocks account for another 13 percent of core inflation variation in LICs—50 percent more than in AEs and 20 percent more than in non-LIC EMDEs.

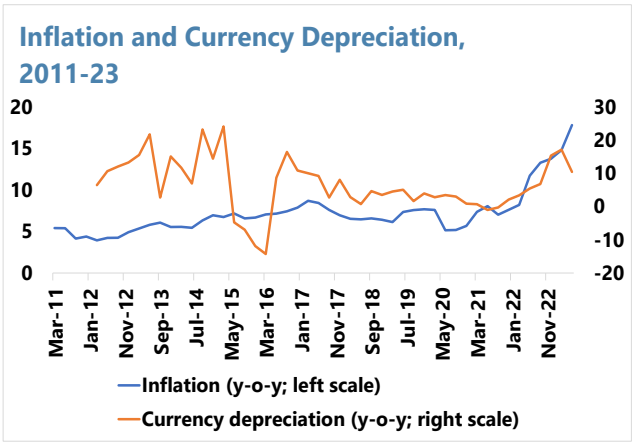
transport services) are highly administered in The Gambia. The co-movement between currency depreciation and domestic inflation, which is also impacted by the high dependence on imports, appears stronger over the most recent period. Finally, there appears to be some co-movement between headline inflation and the domestic output gap, with the latter able to capture the impact of fiscal and monetary policies or remittances, a key determinant of private consumption and investment in The Gambia.

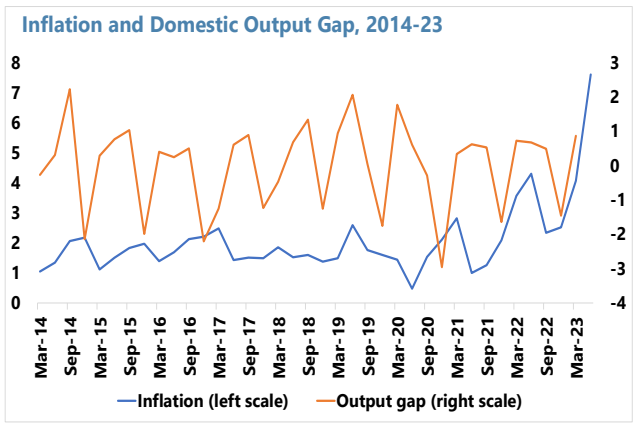
Figure 1. Headline Inflation and Drivers





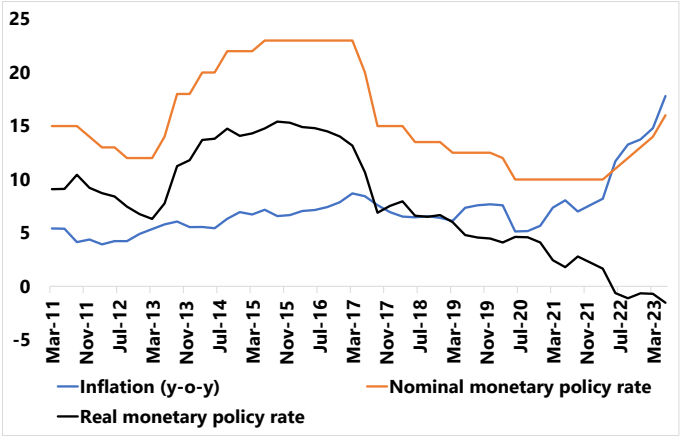
Sources: Gambian authorities and IMF staff estimates.





6. Headline inflation increased in 2021-2022 but monetary policy has lagged the rise in domestic inflation. As shown in Figure 2, inflation started to rise in Q1 2021 and after the eruption of the Russian war in Ukraine in March 2022, inflation accelerated in Q2 2022. However, monetary policy was slow to react, with the CBG keeping the policy rate at 10 percent – a level reached in March 2020 during the deflationary shock of the COVID19 pandemic – until May 31, 2022, when the Monetary Policy Committee raised the policy rate to 11 percent. More importantly, the magnitude of that adjustment in the policy rate and those that followed were limited, such that the policy rate in real terms fell into negative territory as of Q2 2022. From June 2022 to June 2023, the real policy rate was on average negative 0.9 percent.

Figure 2. Inflation and Monetary Policy Rates



Sources: Gambian authorities and IMF staff estimates.

C. Empirical Analysis

7. We perform three types of econometric modeling to study the drivers and dynamics of inflation in The Gambia. First, we perform ordinary least squares (OLS) regressions and quantile regressions using data on inflation and its potential domestic and external drivers over the period 2011-2023. Second, to further investigate the long- and short-term determinants of inflation, we perform non-linear cointegration analysis and error-correction modelling using the non-linear autoregressive distributed lag (NARDL) bounds testing procedure.[5] Third, we run local projection models (Jordà, 2005) under three scenarios to generate the dynamic cumulative response of domestic prices to exchange-rate movements.

8. OLS results suggest inflation in The Gambia is highly persistent, impacted significantly by currency depreciation, as well as global food and fertilizer inflation, but only marginally by the domestic output gap (Table 1).[6] First, inflation appears to be highly persistent, with the coefficients of the first and fourth lags of inflation highly significant, and their sum not statistically different from unity. This result is suggestive of the existence of inertial factors. Second, the coefficient of the domestic output gap is not significant; however, a quantile regression (with the quantile set at 80 percent) of our preferred model shows a positive and statistically significant coefficient of the domestic output gap at the 10 percent level, suggesting that the output gap matters at high levels of inflation. Third, currency depreciation and potassium fertilizer price inflation (both at lag one) as well as phosphate fertilizer price inflation (with lag two) impact inflation

[5] Pesaran, Shin, and Smith (2001) and Shin, Yu, and Greenwood-Nimmo (2014).

[6] The preferred OLS regression is as follow: Inflation = *constant term* + a1**lagged inflation* + a2**output gap* + a3**global food inflation* + a4**global (phosphate, potassium, and nitrogen) fertilizer inflation* + a5**rate of change in the monetary policy rate* + a6**squared rate of change in the monetary policy rate* + a7**currency depreciation* (y-o-y) + *error term*.

positively and significantly.[7] Fourth, the combined effect of the rate of change of the policy rate and its square is negative and statistically significant, suggesting that monetary policy in The Gambia, with sufficiently more rapid adjustments in the nominal policy rate, is potentially effective in taming high inflation.

9. Non-linear co-integration analysis highlights the decisive long-term roles of global food prices, the exchange rate, and the domestic output gap. Based on unit root test results (Table 2), headline inflation, global food prices, the dalasi per US dollar exchange rate, and the domestic output gap are first-difference stationary and therefore we can test for co-integration in the NARDL framework. Non-linear cointegration between inflation and its three determinants is confirmed at the 1 percent level over the period 2014Q1-2023Q1 (Table 3). In the long run, inflation is therefore mainly driven by world food prices, the exchange rate, and the output gap, with significant asymmetric inflationary effects for the latter two variables (Table 4).[8] First, an increase in global food prices of 10 percent leads to an increase of 0.8 percentage points in the quarterly rate of inflation. This magnitude is reasonable since it's equivalent to an increase of 3.4 percentage points in the annualized rate of inflation. Second, the long-run coefficients of positive and negative changes of the exchange rate are 0.045 (significant at 5 percent critical level) and -0.036 (not significant at 5 percent critical level), respectively. Thus, a 10 percent depreciation of the exchange rate leads to 0.45 percentage point increase in the quarterly rate of inflation (i.e., 1.8 percentage point increase in the annualized rate of inflation), but an appreciation of the exchange rate does not appear to reduce inflation. Finally, the long-run coefficients of positive and negative changes of the output gap are 0.064 and 0.080, respectively.

10. The short-run dynamics of inflation is driven by global food price inflation and the second-round effects of global food price inflation and of changes in the domestic output gap (Table 5)**.** The error-correction coefficient (*ECT*(-1)) is negative (-1.176) and very significant, confirming the existence of cointegration. The change in the (natural logarithm of) global food prices is the only variable affecting contemporaneously the short-run dynamics of inflation. The short-run impact (0.106) looks stronger than its long-run value (0.8). Three-quarter lagged changes in global food prices and in the output gap, as well as one- to two-quarters lagged changes in the

[7] The OLS coefficient of the fertilizer nitrogen inflation (with lag one) is significant but with a negative sign. However, under the quantile regression (with the quantile set at 80 percent) of our preferred model, it is no longer statistically significant. Also, the fertilizer phosphate inflation (with lag two) is not statistically under the quantile regression (with the "tau" set at 80 percent), suggesting that in periods of high inflation, only the fertilizer potassium inflation (with lag "one") matters for inflation in The Gambia.

[8] We started with the linear ARDL model but found no evidence of cointegration, possibly due to the existence of a non-linear relationship among the variables. The non-linear ARDL approach confirmed cointegration among inflation, global food prices, the exchange rate, and the output gap (Table 3). There appeared numerically some evidence of asymmetric inflationary effects from all three regressors. (The long-run coefficients of positive and negative changes of the food prices were 0.075 (significant at 1 percent critical level) and 0.035 (not significant at conventional critical levels), respectively. Thus, a 10 percent increase in the food price index causes a rise of 0.75 percentage points in the quarterly rate of inflation, but a decrease in the food price index does not necessarily induce a reduction in domestic inflation.) Nonetheless, a formal symmetry test for the long-run coefficients of positive and negative changes of food prices was not statistically rejected, but symmetry was rejected not only for the positive and negative coefficients of the exchange rate but also for the positive and negative coefficients of the output gap. In other words, the asymmetric inflationary effects of the exchange rate and the output gap were statistically stronger.

output gap affect the short-run dynamics of inflation significantly but with a negative sign.[9] These negative signs likely reflect second-round inflationary effects of initial shocks to food prices and the output gap on wages and prices of other goods as well as (inflationary) expectations. Finally, we assess the effectiveness of monetary policy by introducing in the error correction model the change in the level of the monetary policy rate (ΔMPR) and the change in its square (ΔMPR^2). Their individual effects are positive (0.84) and negative (-2.26), respectively, and they are not significant.[10] Nonetheless, since their short-run combined effect is negative (-1.4), this result suggests there's potential effectiveness of monetary policy implemented through rapid and bold adjustments in the policy rate to tame inflation.

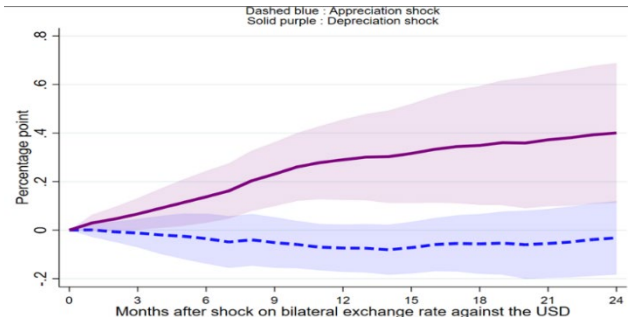
11. Local projection models confirm evidence of asymmetric ERPT, and the size of the currency depreciation matters for inflation dynamics in The Gambia.[11] Under the baseline model, a one percentage point increase in the rate of depreciation of dalasi against the US dollar leads to an increase in inflation by 0.15 percentage points within the first year, and 0.24 percentage points after two years. We also find that the ERPT to inflation is asymmetric in The Gambia (Figure 3), reaching 0.3 on average twelve months after the shock and 0.4 two years after during episodes of depreciation. In contrast, prices remain muted in periods of currency appreciation. This result suggests that prices may not come down when the dalasi strengthens after periods of depreciation. Lastly, there's evidence of nonlinearity in the impact of exchange rate depreciation on inflation. Small currency depreciations are almost inconsequential for inflation. However, at higher levels of currency depreciation (i.e., depreciation of the dalasi vis-à-vis the US dollar of above 15 percent) the resulting inflation is not only disproportionately larger in the first year (0.46), but it continues to be high well into the second year after the shock (0.36). Thus, larger currency depreciations present considerable risks of inflation de-anchoring in The Gambia, especially if the credibility of the CBG is perceived as weak.

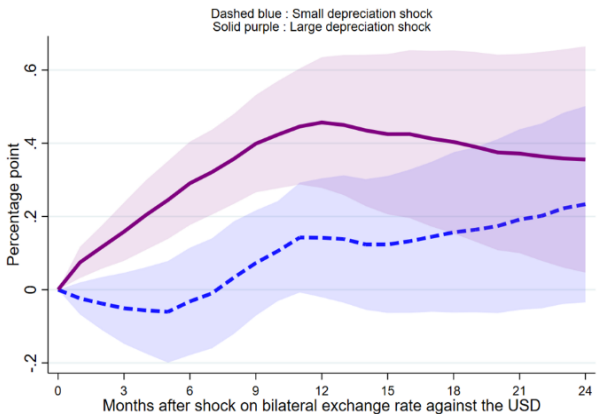
[9] These results also justify the choice of four lags length for our NARDL analysis.

[10] The *p*-value of the *F* statistic is 0.1718 which is more than the 5 percent level of significance and therefore we fail to reject the null hypothesis. Under the null hypothesis ΔMPR and ΔMPR^2 are jointly insignificant.

[11] Jordà (2005) estimates impulse response functions directly from local projections. Stock and Watson (2007) and Auerbach and Gorodnichenko (2013) consider this approach as a flexible alternative to the dynamic restrictions embedded in ARDL specifications.

Figure 3. Exchange Rate Pass-Through to Inflation





Sources: The Gambian authorities and IMF staff estimates.
Note: The grey shaded area represents the 95 percent confidence interval of the estimated pass-through coefficients.

Table 1. The Gambia: OLS Regressions of Inflation and Its Determinants

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Inflation(t-1)	0.491***	0.455***	0.446***	0.328**	0.361***	0.399***
	(0.114)	(0.112)	(0.117)	(0.095)	(0.067)	(0.101)
Inflation(t-4)	0.718***	0.812***	0.808***	0.836***	0.733***	0.771***
	(0.126)	(0.135)	(0.139)	(0.104)	(0.074)	(0.106)
Growth of MPR		0.011*	0.011.	0.014**	0.009**	0.009**
		(0.005)	(0.006)	(0.004)	(0.003)	(0.003)
Square of Growth of MPR		-0.026.	-0.027.	-0.036**	-0.033***	-0.032**
		(0.015)	(0.016)	(0.012)	(0.009)	(0.009)
Growth of Nominal XR(t-1)			0.005	0.022*	0.022*	0.022*
			(0.014)	(0.010)	(0.008)	(0.008)
Growth of Global Food Prices				0.077***	0.075***	0.076***
				(0.017)	(0.013)	(0.013)
Growth of Nitrogen Fertilizer Prices(t-1)				-0.015***	-0.012***	-0.013***
				(0.004)	(0.003)	(0.003)
Growth of Potassium Fertilizer Prices(t-1)				0.015**	0.012**	0.012**
				(0.005)	(0.003)	(0.004)
Growth of Phospate Fertilizer Prices(t-2)				0.017*	0.017**	0.018**
				(0.008)	(0.005)	(0.006)
Output Gap					0.008	0.009
					(0.005)	(0.005)
Covid Dummy	-0.021**	-0.022**	-0.021**	-0.016**	-0.015***	-0.015***
	(0.007)	(0.007)	(0.007)	(0.005)	(0.004)	(0.004)
Constant						-0.001
						(0.003)
N	43	43	42	42	37	37
R^2	0.918	0.927	0.927	0.966	0.982	0.876

Standard errors in parentheses
$p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2. The Gambia: ADF Unit Root Tests

ADF test results	Level	First difference
Inflation	-0.14	-6.71***
Global food price index	-0.90	-5.38***
Exchange rate level	-3.44*	-8.86***
Output gap	-1.70	-8.62***

Notes:

1. Each regression contains both the intercept and the trend terms.
2. The optimal lag structure of the ADF test is chosen based on the modified Akaike Information Criterion.
3. *, **, and *** indicate the significance at 10 percent, 5 percent, and 1 percent, respectively

Table 3. The Gambia: Bounds Test for Cointegration in Non-Linear Specification

Dependent variable: Δ(*DLCPI*)	*F*-PSS[2]	95% lower bound	95% upper bound	99% lower bound	99% upper bound	Cointegration Result
NARDL with no imposed symmetry for food prices, exch. rate and the output gap	7.17***	2.97	4.50	4.27	6.21	Yes
NARDL with imposed long-run symmetry for food prices[1]	8.21***	3.13	4.61	4.54	6.37	Yes

1. The exact specification of asymmetric model with imposed long-run symmetry imposed for global food prices is presented in Table 5.
2. *F*-PSS indicates the *F*-PSS statistic testing the null hypothesis of no cointegration.

Note: *, **, and *** indicate the significance at 10 percent, 5 percent, and 1 percent, respectively.

Table 4. The Gambia: NARDL Estimation Results for the Long-Run Cointegrating Vector

Variable	Coefficient	*p*-Value	*t*-Statistic
Dependent variable: DLCPI (Inflation)			
Ln FoodPI	0.083634	0.0000	8.306573
Ln EXR(-1)$^{+}$	0.044767	0.0164	2.554707
Ln EXR(-1)$^{-}$	-0.035928	0.0518	-2.031153
Output gap^{+}	0.063966	0.0321	2.255042
Output gap^{-}	0.079619	0.0139	2.624906

Notes:

1. The NARDL model contains an unrestricted constant and no trend (Case 3). The trend term was non-significant under Case 5 (unrestricted constant and unrestricted trend).

2. The optimal lag structure of the NARDL model is chosen automatically based on the Akaike Information Criterion (AIC).

3. *, **, and *** indicate the significance at 10 percent, 5 percent, and 1 percent, respectively

Table 5. The Gambia: NARDL Estimation Results for the Parsimonious Model

Variable	Coefficient	Standard Error	*t*-Statistic	*p*-Value
Dependent variable: Δ(*DLCPI*) (change in the rate of inflation)				
ECT_{t-1}	-1.176***	0.148	-7.932	0.000
$\Delta(Ln\ FoodPI_{t})$	0.106***	0.015	7.235	0.000
$\Delta(Ln\ FoodPI_{t-1})$	-0.0186	0.015	-1.221	0.235
$\Delta(Ln\ FoodPI_{t-2})$	-0.0086	0.015	-0.584	0.565
$\Delta(Ln\ FoodPI_{t-3})$	-0.080***	0.017	-4.704	0.000
$\Delta(Output\ gap_{t})$	-0.0154	0.010	-1.578	0.128
$\Delta(Output\ gap_{t-1})$	-0.088***	0.017	-5.068	0.000
$\Delta(Output\ gap_{t-2})$	-0.052***	0.015	-3.468	0.002
$\Delta(Output\ gap_{t-3})$	-0.030***	0.011	-2.860	0.009
Constant	-0.443***	0.056	-7.928	0.000

R-squared	0.861	Mean dependent var	0.001
Adjusted R-squared	0.807	S.D. dependent var	0.008
S.E. of regression	0.004	Akaike info criterion	-8.225
Sum of squared residuals	0.000	Schwarz criterion	-7.772
Log likelihood	145.716	Hannan-Quinn criterion	-8.073
F-statistic	15.871	Durbin-Watson statistic	1.908
Prob (F-statistic)	0.000		

Notes:

1. The NARDL model includes an unrestricted constant and no trend (Case 3). The trend term was non-significant under Case 5 (unrestricted constant and unrestricted trend).

2. The optimal lag structure of the NARDL model is chosen automatically based on the Akaike Information Criterion (AIC).

3. *, **, and *** indicate the significance at 10 percent, 5 percent, and 1 percent, respectively.

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