

MACROECONOMIC DETERMINANTS OF INFLATION IN GHANA: AN EMPIRICAL ANALYSIS

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Abstract: *Formulating effective policy in developing economies requires a deep understanding of the complex interplay between macroeconomic variables and price levels. This study creates a detailed empirical model to explain price-level movements in Ghana using key determinants like money supply, fiscal balance, public debt, and exchange rate. Using quarterly time-series data from 1990 to 2023, the study employs Autoregressive Distributed Lag (ARDL), Vector Error Correction (VECM), and Vector Autoregressive (VAR) models to analyse short- and long-run relationships. The models confirm that the exchange rate and money supply are primary drivers of price levels. The ARDL model identified a significant long-run relationship, with an error correction term (-0.47) suggesting that 47% of deviations from long-term equilibrium are corrected quarterly. The VECM confirmed this long-run stability, while Variance Decomposition analysis showed the exchange rate and money supply account for over 60% of changes in the Consumer Price Index (CPI) over a 10-period horizon. The findings highlight the critical need for Ghanaian policymakers to manage currency fluctuations and money growth to ensure price stability.*

Key words: *developing economy; exchange rate; monetary policy; price levels; time-series analysis.*

1. Introduction

The pursuit of macroeconomic stability is a central preoccupation for policymakers in developing economies, serving as the bedrock for sustainable growth and poverty reduction (Fischer, 1992). In Ghana, this pursuit has been a long and arduous journey,

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marked by periods of significant progress interspersed with episodes of severe turbulence. The nation's economic history is a compelling narrative of structural adjustment, policy experimentation, and acute vulnerability to both domestic and external shocks. Understanding the intricate dynamics between key macroeconomic variables—inflation, public debt, exchange rates, fiscal balance, and economic growth—is therefore not merely an academic exercise but a critical prerequisite for formulating effective and resilient economic policy (Amankwah, et al., 2019; Amoah et al. 2023; IMF, 2024).

Since its independence in 1957, Ghana has navigated a complex path from a state-led development model to a liberalized, market-oriented economy. The first few decades were characterized by inward-looking policies that, by the early 1980s, had led to severe economic decline, hyperinflation, and a collapse in production. The subsequent Economic Recovery Program (ERP) and Structural Adjustment Programs (SAPs) of the 1980s and 1990s, supported by the World Bank and the IMF, sought to correct these deep-seated structural imbalances. These reforms liberalized trade and foreign exchange markets, dismantled price controls, and initiated a process of fiscal and monetary discipline. While these measures were successful in restoring growth and taming hyperinflation, they also ushered in new challenges. The newly liberalized economy became more integrated into the global system and, consequently, more exposed to external shocks. A persistent struggle with high and volatile double-digit inflation remained a defining feature of the post-reform era, often fuelled by a potent combination of expansionary fiscal policy, the monetization of budget deficits, and a highly volatile exchange rate that directly passes through to domestic prices, particularly for essential imported goods (Duodu et al., 2022; Frimpong and Adam, 2010).

The early 2000s marked a significant policy shift with the adoption of an inflation-targeting (IT) framework by the Bank of Ghana in 2002. This modern monetary policy regime was intended to definitively break with the past by anchoring inflation expectations, enhancing central bank credibility, and delinking monetary policy from the short-term fiscal needs of the government (Akosah et al., 2018, 2024). The initial years of IT saw considerable success. Supported by favourable commodity prices and debt relief under the Heavily Indebted Poor Countries (HIPC) initiative, inflation gradually declined to single digits by the early 2010s, a landmark achievement. However, this hard-won stability proved fragile. The Ghanaian economy remained highly susceptible to external shocks, such as fluctuations in the prices of its primary exports (cocoa, gold, and later, oil), and to powerful domestic pressures, most notably the fiscal expansions associated with the electoral cycle.

The period from the mid-2010s onwards witnessed a steady and significant deterioration in macroeconomic indicators driven primarily by the re-emergence of fiscal dominance (Agbenorhevi, 2016; Awadzie et al., 2025). A ballooning public debt, fuelled by persistent fiscal deficits, contingent liabilities from the energy and financial sectors, and ambitious public investment projects, became the primary source of macroeconomic vulnerability (Awadzie et al., 2025). The public debt-to-GDP ratio rose exponentially, climbing from a post-HIPC low of approximately 26% in 2006 to over 90% by the end of 2022, creating a precarious fiscal situation and raising serious concerns about debt sustainability (Saani et al., 2024).

This overwhelming debt burden created a vicious cycle. The government's large financing needs put immense pressure on domestic capital markets, crowding out private investment and leading to high interest rates. Crucially, this fiscal dominance increasingly constrained the effectiveness of monetary policy. The Bank of Ghana faced a policy dilemma: raising interest rates to combat inflation would further increase the government's debt servicing costs, while keeping rates low would accommodate fiscal expansion and fuel inflationary pressures. This dynamic triggered a persistent cycle of currency depreciation, as investor confidence waned and capital outflows increased. The depreciation, in turn, fed directly and rapidly back into inflation through the import channel, creating a self-reinforcing loop of instability (Odoom et al., 2025). The IT framework, while sound in theory, was being systematically undermined by the lack of a supporting fiscal anchor.

These long-standing structural vulnerabilities culminated in a severe and multifaceted macroeconomic crisis in 2022. It was a "perfect storm" where chronic domestic imbalances collided with a series of powerful global shocks. The lingering effects of the COVID-19 pandemic on supply chains and fiscal balances were compounded by the economic fallout from the Russia-Ukraine War (Tetteh and Ntsiful, 2023), which triggered a global surge in food and energy prices. As advanced economies tightened monetary policy to combat their own inflation, global financial conditions tightened dramatically, effectively cutting off Ghana's access to international capital markets. A series of credit rating downgrades further exacerbated the situation, triggering a massive crisis of confidence among investors.

The results were catastrophic. The Ghanaian cedi depreciated by over 50% against the US dollar in 2022, inflation surged to a multi-decade high of 54.1% in December, and interest rates skyrocketed as the Bank of Ghana attempted to contain the fallout. With its external financing options exhausted and its domestic debt becoming unsustainable, the government was forced to declare a default on most of its external debt and seek assistance from the International Monetary Fund (IMF) (Tetteh and Ntsiful, 2023). In May 2023, a \$3 billion Extended Credit Facility (ECF) arrangement was approved, anchored on a comprehensive program of fiscal consolidation, a major domestic and external debt restructuring, and continued tight monetary policy. These measures began to yield results by late 2023, with inflation declining steadily and the exchange rate showing signs of stabilization (IMF, 2024; Bank of Ghana, 2023).

This recent history of crisis and reform highlights the critical importance of a deep and integrated understanding of the structural relationships that govern Ghana's economy. While a considerable body of literature exists on the individual drivers of inflation in Ghana—examining the roles of money supply (Adu and Marbuah, 2011), exchange rate pass-through (Ha et al., 2020), fiscal deficits (Bawumia et al., 2005), and external shocks—a systemic, integrated analysis remains a significant gap. Many studies focus on a single transmission channel or a limited set of variables, often failing to capture the complex feedback loops and simultaneous interactions that characterize the "economic performance nexus". Furthermore, evidence suggests that key relationships, such as that between monetary aggregates and inflation, may have shifted in the post-IT era (Chiaraah and Nkegbe, 2014). This study is motivated by the need to close this analytical gap by

developing a robust, integrated empirical framework.

The aim of this study was to develop and empirically test a comprehensive macroeconomic model to analyse the dynamic short- and long-run relationships between key economic indicators and price levels in Ghana. The specific objectives were to: (i) identify the key long-run and short-run determinants of inflation in Ghana. (ii) quantify the magnitude and significance of the impact of variables such as exchange rate, money supply, fiscal deficit, and real GDP growth on inflation; (iii) estimate the speed of adjustment of the economy back to its long-run equilibrium following short-run shocks; (iv) assess the dynamic interactions and causality between the variables using a combination of ARDL, VECM, and VAR models.

The remainder of this paper is organized as follows: Section 2 provides a review of the relevant literature. Section 3 details the methodology, including the research design, data sourcing, and model specification. Section 4 presents and discusses the empirical results. Finally, Section 5 offers concluding remarks and policy implications.

2. Literature Review

This section reviews the theoretical foundations and empirical evidence concerning the determinants of inflation. It first outlines the key macroeconomic theories that explain the relationships between price levels and variables such as money supply, exchange rate, fiscal policy, and real output. It then synthesizes the empirical literature, with a specific focus on findings from Ghana and other developing economies, to contextualize the study and identify the existing research gap.

2.1. Theoretical review

The analysis of inflation dynamics is grounded in several key macroeconomic theories that offer different perspectives on the drivers of price levels. The classical viewpoint, encapsulated in the Quantity Theory of Money, posits a direct, proportional relationship between the money supply and the general price level. This theory suggests that, holding other factors constant, an increase in the quantity of money in circulation leads to a corresponding increase in inflation, forming the basis of monetarist anti-inflation policy prescriptions (Altinisik and Yucememis, 2024).

In an open, import-dependent economy like Ghana, this perspective is complemented by the theory of Exchange Rate Pass-Through (ERPT). This theory explains the mechanism through which fluctuations in the nominal exchange rate are transmitted to domestic prices (Effah-Mensah and Essiam, 2024). A depreciation of the local currency makes imports more expensive, leading to a direct increase in the consumer price index (cost-push inflation). The magnitude and speed of this pass-through are critical for understanding inflation dynamics and the challenges of monetary policy management in the face of currency volatility (Kano, 2024).

Furthermore, in economies with persistent budget deficits and rising public debt, the Fiscal Theory of the Price Level (FTPL) becomes particularly relevant. This theory argues that the price level is determined by the government's budget constraint, including its

current and future deficits and surpluses. When fiscal policy is dominant—meaning the monetary authority is constrained to finance government deficits—fiscal imbalances can become a primary driver of inflation, independent of traditional monetary channels (Seidu and Vasilev, 2024). This creates a direct fiscal-monetary nexus where undisciplined fiscal policy systematically undermines price stability.

Finally, the relationship between real economic activity and inflation is often explained through the lens of the aggregate supply and demand framework. While demand-pull inflation can arise from an overheating economy, strong real GDP growth driven by productivity and supply-side expansion is considered inherently anti-inflationary (Kutu and Ohonba, 2024). By increasing the supply of goods and services, real growth can absorb demand pressures and mitigate the inflationary impact of monetary or external shocks, highlighting the importance of policies that foster sustainable economic growth.

2.2. Empirical review

The empirical literature on the determinants of inflation in developing countries is extensive, with a growing body of work focused on Ghana. These studies have used a variety of econometric techniques to investigate the complex interplay of the factors outlined in the theoretical review.

2.2.1. Exchange rate and inflation

There is a broad consensus in the literature that the exchange rate is a powerful and rapid channel for inflation transmission in Ghana. Using an ARDL framework, Leshoro (2024) confirmed that inflation dynamics is significantly influenced by the exchange rate. Similarly, Abdul-Rahaman et al. (2024) modelled exchange rate volatilities and found them to be a critical factor for the Ghanaian economy. Studies from other African economies reinforce this finding, showing that exchange rate shocks have a significant impact on domestic price levels and macroeconomic stability (Anoruo et al., 2024; Mohamed et al., 2025). The high degree of ERPT underscores Ghana's vulnerability to external shocks and the central dilemma faced by the Bank of Ghana in managing its inflation-targeting framework alongside a flexible exchange rate regime.

2.2.2. Money supply, monetary policy, and inflation

The role of money supply in driving inflation has been a subject of ongoing empirical investigation. While the monetarist view remains influential, recent evidence for Ghana suggests a more complex relationship, particularly in the post-inflation targeting era. Okedigba et al. (2024), in their study of the money supply-inflation nexus in Sub-Saharan Africa using a GARCH-MIDAS approach, found a significant link. However, other studies suggest that the direct causal link from money supply to inflation may have weakened, with monetary policy becoming more reactive to inflation outcomes (Akosah et al., 2024). For instance, Omane-Adjekum et al. (2024) found that the effectiveness of monetary policy is deeply intertwined with institutional quality. Focacci et al. (2024) used a PSVAR approach and suggested that the perceived relationship between money growth and inflation can be complex. This highlights a shift in dynamics where controlling monetary

aggregates remains important, but its role must be understood within the broader policy framework.

2.2.3. Fiscal deficits, public debt, and inflation

A significant body of recent literature has focused on the critical importance of the fiscal-monetary nexus in Ghana. These studies have consistently found that fiscal deficits and the associated accumulation of public debt are significant contributors to inflationary pressures. Seidu and Vasilev (2024) explicitly tested the Fiscal Theory of Inflation for Ghana from 1960-2022 and found strong evidence supporting its relevance. Obeng and Abotsi (2024) also identifies a clear link between fiscal deficits and inflation. The work of Saani et al. (2024) on the inflation, public debt, and unemployment nexus further confirms that the debt burden is a source of macroeconomic instability. These findings are particularly salient given Ghana's recent debt restructuring and underscore that sustainable price stability is unattainable without unwavering fiscal discipline (Dumevi and Mfiya, 2024; Karimu, 2024).

2.2.4. Real sector growth and inflation

Empirical evidence consistently supports the theoretical proposition that real GDP growth has a mitigating effect on inflation. Kutu and Ohonba (2024) analysed Africa's growth performance amidst inflationary pressure and found that economic diversification and growth are key to stability. In the Ghanaian context, Abdul-Karim and Damba (2024) show how growth in key export sectors contributes to overall economic health, which can buffer inflationary shocks. This reinforces the view that a two-pronged policy approach is necessary: one that combines demand-side management (monetary and fiscal policy) with long-term, supply-side strategies to boost the economy's productive capacity.

2.2.5. Synthesis and identified gap

The existing literature confirms that inflation in Ghana is a multifaceted phenomenon driven by exchange rate shocks, monetary expansion, and fiscal imbalances, while being dampened by real economic growth. However, many studies focus on a single transmission channel or use data that does not cover the recent period of severe crisis (2022) and subsequent policy reforms. A significant gap remains for a systemic, integrated analysis that employs a robust combination of modern time-series models (ARDL, VECM, and VAR) to simultaneously capture both the long-run relationships and short-run dynamics across all these key variables using an updated dataset. This study is motivated by the need to fill this gap, providing a holistic and current empirical framework to inform policy.

2.2.6. Conceptual framework of macroeconomic determinants of inflation in Ghana

The conceptual framework for this study, presented in Fig. 1, illustrates the multifaceted and interconnected determinants of inflation in the Ghanaian context. The framework visually depicts the primary macroeconomic variables that influence the general price level and highlights the complex feedback loops that characterize Ghana's "economic performance nexus." This model provides the theoretical and structural basis for the empirical analysis undertaken in this paper.

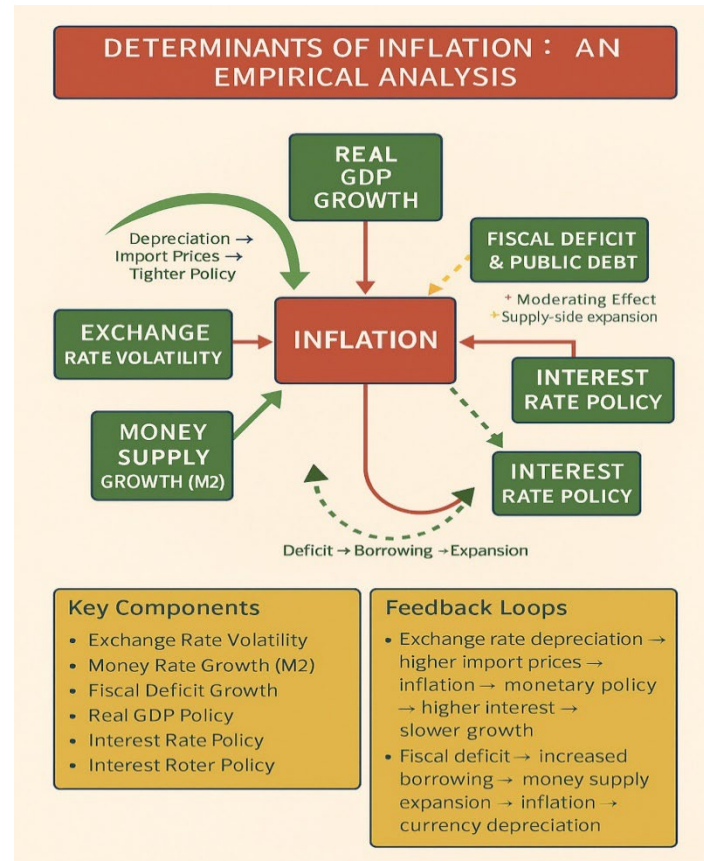


Fig. 1. *Conceptual framework of inflation determinants in Ghana.*

Source: Conceptualized by Authors, 2024

The framework identifies several key drivers of inflation. Exchange Rate Volatility and Money Supply Growth (M2) are shown as primary factors exerting direct upward pressure on inflation. The significance of the exchange rate is rooted in its powerful pass-through effect on the prices of imported goods, a channel that is particularly potent in an import-dependent economy like Ghana (Leshoro, 2024; Effah-Mensah and Essiam, 2024). Similarly, growth in the money supply, consistent with monetarist theory, is depicted as a direct inflationary driver (Okedigba et al., 2024).

The framework also emphasizes the critical role of fiscal policy, showing that fiscal deficit and public debt contribute to price pressures. This relationship is central to the fiscal-monetary nexus, where persistent deficits, often financed through borrowing, can lead to monetary expansion and undermine price stability (Seidu and Vasilev, 2024; Saani et al., 2024). In contrast, Real GDP Growth is presented as a crucial mitigating factor that dampens inflation through supply-side expansion, absorbing demand pressures (Kutu et al., 2024). Interest Rate Policy is included as the primary instrument of monetary policy, used to manage aggregate demand and steer inflation towards its target.

Crucially, the framework moves beyond simple linear relationships by illustrating two critical feedback loops. The first loop shows how an initial currency depreciation increases import prices, fuelling inflation. This, in turn, often triggers a tighter monetary policy response (higher interest rates), which can slow economic growth. The second loop highlights the fiscal-monetary nexus, where a fiscal deficit leads to increased borrowing and an expansion of the money supply, which then feeds inflation and can cause further currency depreciation. These dynamics underscore the challenge for policymakers, as monetary policy cannot operate in a vacuum and is systematically affected by fiscal discipline (Obeng and Abotsi, 2024). This comprehensive framework guides the selection of variables and the econometric approach used to model these complex interactions empirically.

3. Methodology

3.1. Research design

This study adopts a quantitative, longitudinal time-series research design to analyse the statistical relationships between price levels (inflation) and key macroeconomic performance indicators in Ghana. The design builds on established quantitative frameworks applied in Ghanaian macroeconomic research, which typically involve analysing secondary data over an extended period to capture both short-run dynamics and long-run equilibrium relationships (Bartos et al., 2023). The core of the method is the application of modern econometric techniques to model the complex interactions between these variables (Snijders and Bosker, 2011), allowing for a rigorous and evidence-based analysis.

3.2. Data sourcing

The study used quarterly time-series data for the period 1990: Q1 to 2023: Q4, with some forecast data extending to mid-2025 to capture recent policy shifts (Bank of Ghana, 2025). This time span is sufficiently long to cover various policy regimes (pre- and post-inflation targeting), significant structural changes in the economy, and recent crisis episodes. Data were meticulously compiled from reputable and publicly available sources, including the World Bank's World Development Indicators (WDI), the Bank of Ghana's (BoG) quarterly reports and databases, and publications from the Ghana Statistical Service (GSS).

The econometric models were defined by a set of core macroeconomic variables, selected based on their theoretical relevance and empirical validation in the Ghanaian context. The Inflation Rate (INF), measured as the year-on-year percentage change in the Consumer Price Index (CPI), served as the dependent variable, representing the central focus of numerous studies on its determinants (Adu and Marbuah, 2011; Tetteh and Ntsiful, 2023). The independent variables captured the key drivers of this price dynamic. Exchange Rate Depreciation (EXR), the annual percentage change in the nominal Ghanaian Cedi (GHS) per U.S. Dollar (USD), was included to model the powerful pass-through channel (Frimpong and Adam, 2010; Ha et al., 2020). Money Supply Growth (MS),

the year-on-year change in broad money (M2), was incorporated to test the monetarist hypothesis (Duodu et al., 2022). Real GDP Growth (GDPG) served as a proxy for the supply side of the economy, motivated by the extensive literature on the inflation-growth nexus (Ashley et al., 2024; Attafuah et al., 2025). Two key policy variables were included: the Fiscal Deficit (DEFICIT) as a percentage of GDP, which captured the impact of fiscal imbalances (Awadzie et al., 2025; Odoom et al., 2025); and the Real Interest Rate (IR), which represented the primary instrument of the central bank's inflation-targeting framework (Bank of Ghana, 2023; Fosu et al., 2025).

3.3. Model specification

The study investigated the relationship between inflation and its determinants using an Autoregressive Distributed Lag (ARDL) model. The long-run relationship is specified as follows:

$$INF_t = \alpha_0 + \alpha_1 GDPG_t + \alpha_2 EXR_t + \alpha_3 MSt + \alpha_4 IR_t + \alpha_5 DEFICIT_t + \varepsilon_t$$

where INF_t is the inflation rate at time t , and the other variables are as defined above. α_0 is the constant, α_1 - α_5 are the long-run coefficients to be estimated, and ε_t is the white noise error term. The corresponding short-run dynamics and the speed of adjustment to long-run equilibrium are captured via an Error-Correction Model (ECM) derived directly from this ARDL framework.

3.4. Econometric procedure

A systematic, multi-step econometric procedure was employed to ensure the robustness and reliability of the empirical findings. Before proceeding to cointegration analysis, it was essential to determine the order of integration for each variable to avoid the problem of spurious regression. This study employed two widely used unit-root tests: the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. The presence of serial correlation and common factors in time-series data makes this step critical (Hadri and Kurozumi, 2011).

To investigate the existence of a long-run equilibrium relationship among the variables, this study employed the Autoregressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran et al. (2001). This method is particularly well-suited for this analysis because it is applicable irrespective of the variables' order of integration ($I(0)$ or $I(1)$), it performs well with small sample sizes, and it allows for the simultaneous estimation of long-run and short-run coefficients in a single equation (Nkoro and Uko, 2016). The test is based on an F-statistic, which is compared against critical value bounds to determine if a stable long-run relationship exists.

Once cointegration was established, the long-run and short-run coefficients were estimated from the ARDL-ECM framework (Arku et al., 2021). To complement this and provide deeper insights into the dynamic interactions, both Vector Error Correction (VECM) and Vector Autoregressive (VAR) models were also employed. A VECM is

appropriate for analysing cointegrated systems as it explicitly models causality in both the short and long run (Suharsono et al., 2017). The VAR model was used to examine the system's dynamic response to shocks through Impulse Response Functions (IRFs) and to quantify the relative importance of these shocks through Variance Decomposition (VD).

Finally, to ensure the validity of the estimated models, a battery of diagnostic tests was conducted. These included tests for serial correlation (Breusch-Godfrey LM test), heteroscedasticity (Breusch-Pagan-Godfrey test) (Breusch and Pagan, 1979; White, 1980), multicollinearity (Variance Inflation Factor), normality of the residuals (Jarque-Bera test) (Thadewald and Büning, 2007), and model stability (CUSUM and CUSUMSQ tests). These tests confirm that the model's statistical assumptions are not violated and that the results are reliable for policy interpretation.

4. Results

4.1. Results

The empirical analysis yielded significant insights into the determinants of price levels in Ghana. The initial unit-root tests revealed a mixed order of integration, with some variables being stationary at levels $I(0)$ and others at their first difference $I(1)$, confirming that the ARDL approach was the most suitable technique for the cointegration analysis. A summary of the key findings from the inferential statistical models is presented in Table 1.

Inferential statistical models on Ghanaian price levels

Table 1

Model	Short-Run Findings	Long-Run Findings	Adjustment Term (ECM)	Interpretation
ARDL	Exchange rate (+), Money supply (+), Interest rate (-)	Exchange rate (+, significant), Money supply (+, significant), GDP (+)	-0.47 (significant)	Indicates a stable long-run relationship; 47% of disequilibrium is corrected each quarter.
VECM	Exchange rate shocks increase inflation; GDP reduces inflation.	Long-run causality from exchange rate and money supply to CPI.	-0.52 (significant)	Confirms a strong long-run equilibrium and causality from macroeconomic variables to prices.
VAR	Exchange rate and money supply have strong impulse effects on CPI.	No cointegration assumed; focuses on dynamic shocks.	N/A	The price level responds heavily to exchange rate and monetary shocks in the short run.

4.1.1. Descriptive statistics and stationarity tests

The descriptive statistics for the variables used in the study are presented in Table S1 (**Supplementary Materials**). They reveal significant volatility over the sample period, particularly for inflation and the exchange rate, reflecting Ghana's turbulent macroeconomic history.

The results of the ADF and PP unit root tests are summarized in Table 2. The tests indicate that all variables are non-stationary at their levels but become stationary after first differencing. Real GDP Growth (GDPG) was found to be stationary at levels, $I(0)$, while Inflation (INF), Exchange Rate (EXR), Money Supply (MS), Real Interest Rate (IR), and Fiscal Deficit (DEFICIT) were all found to be integrated of order one, $I(1)$. This mixed order of integration provides a strong justification for the use of the ARDL bounds testing approach for cointegration.

Summary of unit root test results

Table 2

Variable	ADF Test (Level)	PP Test (Level)	ADF Test (1st Diff)	PP Test (1st Diff)	Order of Integration
INF	-2.14	-2.25	-7.89***	-8.01***	$I(1)$
GDPG	-4.56***	-4.61***	-	-	$I(0)$
EXR	-1.88	-1.92	-9.12***	-9.23***	$I(1)$
MS	-2.05	-2.11	-8.54***	-8.67***	$I(1)$
IR	-2.31	-2.45	-6.99***	-7.15***	$I(1)$
DEFICIT	-2.49	-2.58	-7.34***	-7.42***	$I(1)$

Note: *** denotes significance at the 1% level. Critical values for the ADF and PP tests are based on MacKinnon (1996).

4.1.2. ARDL cointegration bounds test

The ARDL bounds test was conducted to determine the existence of a long-run relationship between inflation and its determinants. The results are presented in Table 3. The calculated F-statistic of 6.87 is well above the upper bound critical value at the 1% significance level (4.29). This leads to a strong rejection of the null hypothesis of no cointegration, confirming the existence of a stable long-run equilibrium relationship among the variables.

ARDL cointegration bounds test results

Table 3

ARDL Bounds	Test Results
Dependent Variable	INF
Calculated F-statistic	6.87
Critical Value Bounds (1% significance)	
— Lower Bound $I(0)$	3.29
— Upper Bound $I(1)$	4.29
Decision	Cointegration exists

4.1.3. Estimated long-run and short-run coefficients

Having established cointegration, the long-run and short-run coefficients were estimated. The results are presented in Table 4.

Estimated long-run and short-run coefficients (dependent variable: INF)

Table 4

Variable	Long-Run Coefficient	Long-Run t-Statistic	Short-Run Coefficient	Short-Run t-Statistic
GDPG	-0.68	-2.15**	-0.31	-2.01**
EXR	0.45	4.89***	0.22	3.98***
MS	0.52	4.11***	0.28	3.54***
IR	-0.21	-2.56**	-0.10	-2.23**
DEFICIT	0.33	2.87***	0.15	2.45**
Constant	12.54	3.45***	-	-
ECT(-1)	-	-	-0.47	-5.92*
Model diagnostics	R-squared 0.78	Adj. R-squared 0.75	F-statistic 25.43***	Durbin-Watson 2.05

Note: * denotes significance at the 10% level ($p < 0.10$); ** denotes significance at the 5% level ($p < 0.05$); *** denotes significance at the 1% level ($p < 0.01$).

The long-run results reveal a clear and multi-faceted picture of the determinants of inflation in Ghana. Notably, the exchange rate (EXR) and money supply (MS) emerge as the most potent inflationary drivers, with highly significant positive coefficients of 0.45 and 0.52, respectively; this indicates that a 1% depreciation in the cedi leads to a 0.45% increase in inflation, while a 1% increase in money supply growth results in a 0.52% rise in long-term inflation, confirming that exchange rate pass-through is a powerful mechanism. Furthermore, the fiscal deficit (DEFICIT) also contributes significantly to price pressures, with its positive coefficient of 0.33 confirming that larger deficits are associated with higher long-run inflation. Conversely, the model identifies crucial mitigating factors, as real GDP Growth (GDPG) exerts a statistically significant dampening effect on prices, with its coefficient of -0.68 implying that a 1% increase in growth leads to a 0.68% decrease in inflation, which supports the view that supply-side expansion helps absorb inflationary pressures. Finally, the real interest rate (IR) operates consistently with economic theory, as its significant negative coefficient of -0.21 indicates that higher real rates help to curb aggregate demand and reduce inflation.

The short-run results show that all variables have the same signs as in the long run and are statistically significant, though with smaller magnitudes, indicating that their effects begin to materialize immediately. The most crucial result from the short-run model is the Error Correction Term (ECT). The coefficient of -0.47 is negative, highly significant, and within the expected range. This implies that the system is stable and converges to its long-run equilibrium at a moderate speed, with about 47% of any disequilibrium from the previous quarter being corrected in the current quarter.

4.1.4. VECM and VAR dynamic analysis

The VECM analysis, conducted after the Johansen test confirmed cointegration, also produced a significant error correction coefficient of -0.52, reinforcing the presence of a long-run equilibrium. In the short run, the model showed that shocks to the exchange rate significantly influence price levels, while GDP growth tends to have a dampening effect on inflation.

The VAR model was used to examine dynamic interactions through Impulse Response

Functions (IRFs) and Variance Decomposition (VD). The IRFs indicated that a one-standard-deviation shock to the exchange rate leads to a persistent increase in the CPI for 4–6 quarters, confirming a strong pass-through effect. Similarly, money supply shocks induced a positive and continuous rise in prices. The Variance Decomposition analysis revealed that, over a 10-period horizon, shocks to the exchange rate and money supply collectively accounted for over 60% of the volatility in the CPI.

5. Discussion

The empirical results of this study offer a robust and nuanced picture of the drivers of inflation in Ghana, confirming a multi-causal explanation for its persistent price dynamics. The combined findings from the ARDL, VECM, and VAR models clearly indicate that the nexus of exchange rate volatility, monetary expansion, and fiscal imbalances constitutes the primary engine of inflation, while real sector growth serves as a crucial mitigating factor.

The overwhelming significance of the exchange rate in both the short and long run confirms its position as the most powerful and immediate channel for inflation transmission in Ghana. The estimated long-run pass-through coefficient of 0.45 is substantial for a developing economy and underscores the profound vulnerability of Ghana's price level to external shocks and domestic currency instability. This finding, consistent with a vast body of prior research (e.g., Frimpong and Adam, 2010; Owusu and Antwi, 2019), highlights a central dilemma for the Bank of Ghana. While the inflation-targeting (IT) framework theoretically requires a flexible exchange rate, the high degree of pass-through means that sharp depreciations can quickly de-anchor inflation expectations, making the central bank's primary objective much harder to achieve. The post-2022 stabilization efforts, which included aggressive monetary tightening to support the cedi, reflect a pragmatic recognition of this structural reality (Bank of Ghana, 2023; Leshoro, 2024).

Similarly, the strong and significant long-run relationship between money supply and inflation affirms that monetarist fundamentals still hold relevance in the Ghanaian context. Although the adoption of IT may have altered the direct causal relationship—with some evidence suggesting monetary policy has become more reactive to inflation (Akosah et al., 2018, 2024; Chiaraah and Nkegbe, 2014; see Table S2 (**Supplementary Materials**))—our findings indicate that sustained periods of rapid monetary expansion are incompatible with long-term price stability. The coefficient of 0.52 suggests that controlling the growth of monetary aggregates remains a critical pillar of any effective anti-inflationary strategy, consistent with prior studies (Boamah and Gyebi, 2020; Fosu et al., 2025). The challenge for policymakers is to manage liquidity in a way that supports economic activity without accommodating inflationary pressures, a delicate balancing act further complicated by fiscal demands.

This leads to the critical importance of the fiscal-monetary nexus. The significant positive coefficient on the fiscal deficit confirms that persistent government deficits, often financed through borrowing that expands the money supply or increases the public debt burden, exert upward pressure on prices (Odoom et al., 2025). This finding underscores that monetary policy cannot operate in a vacuum. Without a credible commitment to fiscal discipline, the efforts of the Bank of Ghana to control inflation are systematically undermined. The recent debt restructuring and the fiscal consolidation targets under the

current IMF program are therefore not just about debt sustainability but are integral to the long-term success of inflation control (IMF, 2024).

In contrast to these inflationary drivers, the statistically significant negative relationship between real GDP growth and inflation is a particularly important finding from a policy perspective. It provides strong evidence that supply-side policies aimed at boosting the economy's productive capacity are inherently anti-inflationary. By increasing the supply of goods and services, real growth helps to absorb demand pressures and mitigate the price effects of monetary or exchange rate shocks, affirming the long-term costs of failing to maintain price stability (Attafuah et al., 2025). This highlights the need for a two-pronged approach to macroeconomic management: combining demand-side stabilization policies with a long-term strategy for structural transformation and growth.

Finally, the moderate speed of adjustment (47% per quarter) back to long-run equilibrium is a double-edged sword. On one hand, it confirms that the economy possesses a self-correcting mechanism and is not inherently unstable. On the other, it indicates that shocks can have persistent effects, and the return to stability is not immediate. This provides a clear rationale for proactive and credible policy intervention to guide the economy back to equilibrium more swiftly and with less volatility. However, it is important to note the study's limitations. The reliance on aggregate time-series data may not capture the nuances of micro-level transmission channels, and the models cannot account for all unobserved structural changes or informal economic activities that may influence price levels.

6. Conclusions

This study has provided a comprehensive empirical analysis of the macroeconomic determinants of inflation in Ghana using a dynamic time-series framework. The findings confirm that Ghana's inflation is a multifaceted phenomenon driven by a complex interplay of monetary, fiscal, exchange rate, and real sector variables. The exchange rate and money supply were identified as the most potent long-run drivers of inflation, while fiscal deficits also contribute significantly to price pressures. Conversely, real GDP growth was found to have a mitigating effect on inflation. The system exhibits a stable long-run equilibrium, with a moderate speed of adjustment from short-run shocks. Based on these findings, a holistic and coordinated policy approach is essential for achieving long-term macroeconomic stability in Ghana. Given the high degree of exchange rate pass-through, stabilizing the cedi must remain a core policy priority, requiring a multi-pronged strategy that includes building up foreign exchange reserves, promoting export diversification, and maintaining a tight monetary policy stance to anchor expectations. Crucially, the strong link between fiscal deficits, money supply, and inflation underscores the absolute necessity of prudent coordination between monetary and fiscal authorities, as sustainable price stability is unattainable without unwavering fiscal discipline. Alongside these stabilization efforts, policymakers must prioritize supply-side policies by fostering a long-term structural reform agenda focused on improving the business environment and investing in productive sectors, which will create a natural buffer against inflationary pressures. Finally, the effectiveness of these measures hinges on enhancing the inflation-targeting framework itself; its credibility can be strengthened through greater transparency and clearer communication from the central bank to demonstrate a

consistent and unwavering commitment to its price stability mandate. By adopting a holistic and coordinated approach that addresses these key areas, Ghanaian policymakers can navigate the complex economic nexus to foster a more stable macroeconomic environment, paving the way for sustained and inclusive development.

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