

Effects of price shocks of major commodities on Ghana's economic growth: A vector autoregression approach

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Abstract

The purpose of this study is to explore how shocks in major commodities prices affect Ghana's economic growth. Being heavily reliant on cocoa, gold and crude oil exports place Ghana at risk from external shocks in the prices of these primary commodities. The study uses annual time-series data and employs a Vector Autoregression (VAR) estimation technique. Further, the Composite Commodity Price Index is derived using Principal Component Analysis (PCA). Stationarity and cointegration tests were performed with unit root and Johansen cointegration tests followed by application of an error correction model (VECM), impulse response functions, and variance decomposition to capture short-run dynamics and long-run effects.

The results established a stable long-run equilibrium relationship between commodity prices, inflation and economic growth. The evidence indicates that such shocks have a large positive impact on inflation and a negative and statistically significant impact on growth. Additionally, we establish the presence of bi-directional causality between major commodities prices and inflation. The results of the impulse response and variance decomposition revealed that commodity price shocks have inflationary effects as well as output effects which die out over time.

The study concluded that Ghana is exposed to inflation instability and growth slowdowns due to global commodity market reliance. The results have significant policy implications as the researchers highlighted the need for export diversification, strengthened stabilization mechanisms, coordination of fiscal and monetary policies management to mitigate the adverse impact of commodities prices shocks to enhance long run growth.

Introduction

Commodity price volatility has long been recognized as a significant source of macroeconomic instability in developing and resource-rich economies. The prices of commodities traded globally, such as crude oil, gold and agricultural goods, fluctuate frequently due to various reasons. Mainly, these prices are affected by changes in global demand and supply as well as geopolitical tensions, financial speculation, and global business cycles (IMF, 2023; Caldara et al., 2023). In countries where the export structure is concentrated in primary commodities, the price movements of primary commodities are often translated into sizable external shocks that can have material ramifications on growth, inflation, fiscal sustainability, and exchange rate stability.

Sub-Saharan African (SSA) economy has high vulnerability to commodity price shocks due to lack of economic diversification, weak industrial base and heavy reliance on primary exports to earn foreign currencies (World Bank, 2022). According to empirical evidence, developing countries which export

commodities have greater volatility in output and lower long-term growth in comparison with their less diversified counterparts (Van der Ploeg & Poelhekke, 2021).

Ghana is a classic case of commodity dependence in SSA. In the past, Ghana's cocoa and gold exports formed the backbone of its economy, while crude oil has contributed significantly since commercial oil production began in 2010. In fact, cocoa, gold and oil account for over 60 percent of total export earnings of Ghana. Furthermore, they have generated significant revenue for the government through taxes and royalties as well as foreign exchange (Bank of Ghana, 2023; Ministry of Finance, 2022). Favorable prices for commodities have buoyed episodes of growth, while episodes of declining global prices have revealed structural weaknesses.

There are many ways through which commodity price shocks affect economic growth. Through the fiscal channel, rising commodity prices add to government revenues, thereby creating some space for higher public investment and social spending to stimulate economic activity. On the contrary, negative price shocks impact fiscal space negatively, widen budget deficits and development expenditure budget, and possibly stymie growth (Arezki et al., 2020). The external sector channel of commodity price movements affects the export earnings, foreign exchange reserves and exchange rate. The depreciation of exchange rate due to adverse price shocks increases the cost of imports, adds to inflationary pressure and lowers private sector confidence.

Inflation is the channel through which shocks to commodity prices affect growth rate. Ghana, along with other economies, often sees hikes in domestic prices as a result of increases in global prices of commodities. This is because global commodity price increases in particular oil and food-related commodities gets transmitted to domestic prices through higher production costs and import prices (Ha et al., 2023). When inflation lingers, households have to spend much more to maintain their usual standard of living. In Ghana, the historical episodes of high inflation have often coincided with shocks from commodities on the international market and exchange rate fluctuations. Hence, inflation is an important channel of transmission.

A thorough empirical analysis of the dynamic links between wholesale price shocks, inflation and economic growth is imperative in this backdrop. Appreciating the size, sign, and strength of these relationships is crucial for effective monetary, fiscal, and structural policy formulation to enhance economic resilience.

Literature Review

Though the economy has made significant strides over the years, Ghana has remained structurally vulnerable largely due to low diversification and high dependence on imports and a strong fiscal link to commodity revenues (World Bank, 2022; IMF, 2023). The fluctuations of international cocoa, gold and crude oil prices therefore pose a great risk to macroeconomic stability and sustainable economic growth.

Empirical evidence shows that price shocks in commodities may cause considerable macroeconomic dislocations in developing countries through their impact on government revenue, inflation, exchange rate and investment (Arezki et al. 2020; Van der Ploeg and Poelhekke 2021). Ghana experiences budget shortfalls and increased debt when commodity prices drop heightened inflation and currency devaluation frequently follow in their wake. These developments will hinder growth outlook and complicate macroeconomic management especially in the context of inflation targeting and fiscal consolidation framework.

Ghana has put in place a number of policies designed to reduce the asymmetry of adverse external shocks. These include the fiscal rules, inflation targeting, stabilisation funds, among others. However, the IMF (2022) notes that these policies have limited effectiveness. This is due to a commodity price volatility shock of considerable magnitude and persistence.

Existing empirical studies of Ghana's macroeconomic performance suffer from many limitations, despite the apparent importance of commodity price shocks. To start off with, a good share of the literature investigates oil-exporting or emerging economies outside Ghana. As such, the findings do not apply to Ghana (Kilian, 2022; Nguyen & Bhatti, 2023). Additionally, various studies of Ghana focus on the effect of a particular commodity, or they adopt a descriptive strategy. This ignores the dynamic and multi-

directional nature of the macroeconomic variables. Furthermore, insufficient attention has been paid to inflation, which constitutes the key channel through which commodity price shocks affect economic growth.

In addition, many studies that exist to date do not provide a firm conclusion on the causality direction of shocks.

Due to these gaps, a detailed empirical assessment of the dynamic and causal impact of commodity price shocks on inflation and economic growth in Ghana is required.

The main objectives targeted by the study are as follow.

- i. Find how commodity price shocks affect inflation and economic growth.
- ii. Create a connection between the shocks in commodity prices, inflation and growth.
- iii. Investigate how changing commodities prices affect Ghana's economic growth and inflation over time.

Theoretical Review

Using endogenous growth and neoclassical growth theory as the theoretical study foundation, the study adds significant knowledge about how commodity price shocks affect inflation and economic growth in resource-dependent economies.

According to the neoclassical growth theory of Solow (1956), capital accumulation, labour growth, and exogenous technological progress are responsible for long-run economic growth. In this sense, commodity price shocks affect growth indirectly by affecting savings, investment, and capital accumulation. The view is that commodity price shocks that are positive may cause national income and savings to increase, thereby increasing investment which thereby leads to a temporary growth acceleration. Yet, investment can be reduced, capital accumulation slowed, and growth constrained by negative commodity price shocks. Inflation is important in this process, as the inertia effect of inflation could distort relative prices, lower real investment returns and weaken long-term growth (Barro, 2015).

The endogenous growth theory introduced by Romer (1990) refers to the framework explaining long-run economic growth that can result from endogenous and not just from exogenous factors. In particular, it is essential to practice and not forget the role of human capital, innovation and institutional quality used in sustaining long-run economic growth (Aghion et al. 2019). This suggests that the volatility rather than the abundance of commodities poses a serious threat to growth. Frequent and unpredictable commodity price shocks increase macroeconomic uncertainty and discourage investment over the long term in productive sectors. Such shocks also lead to the diversion of resources away from the development of human capital and innovation. In countries with weak institutions, booms in commodities also generate rent-seeking activity and wasteful public spending, reducing long-term growth.

Empirical Review

The early empirical studies have mostly concluded that commodity price shocks slow down long-term growth, particularly in resource-rich economies. According to Sachs and Warner (2001), countries endowed with abundant natural resources often experience slower growth than those with fewer resources. They attribute this to these countries experiencing price volatility, institutional fragility and governance blindness.

Subsequent studies refine this argument by placing less emphasis on interference from the resource curse process and more on volatility rather than abundance being the cause of bad growth. (Van der Ploeg & Poelhekke, 2021)

Recent empirical studies with advanced econometric techniques offer richer understandings. As per Arezki et al. (2020), commodity price shocks have time-varying effects on growth. Countries with weak fiscal institutions experience more negative effects. In comparable work, Nguyen and Bhatti (2023) exploit panel data on Sub-Saharan African countries to show that volatility in commodity prices leads to higher inflation volatility and lower output growth. This latter effect is more pronounced in less diversified economies.

Due to their widespread impact on the economy, oil price shocks have received much empirical attention. According to Kilian (2022) and Caldara et al. (2023), oil price shocks have a significant impact on inflation, output, and uncertainty, with asymmetric effects on oil-importing and oil-exporting countries. Oil price volatility has worsened fiscal and external imbalances for IMF (2023) African economies, including oil-producing countries that are dependant on imported refined petroleum products.

Research on the price shocks of agricultural commodities, especially cocoa, has strong income and welfare effects. According to research conducted by Collier and Goderis in the year 2012, negative agricultural price shocks have a significantly larger and more lasting detrimental impact on growth as compared to positive shocks. According to Anderson et al. (2020), volatility in agricultural prices impacts rural livelihood and the dynamics of poverty disproportionately, with significant macroeconomic spillovers in agrarian economies.

The analysis of gold price shocks mainly concerns financial markets and safe haven dynamics. According to Baur and Lucey (2010) and Baur and Smales (2020), gold tends to rise in price during financial uncertainty and has hedging benefits. According to exporters of gold, prices can cause exchange rate appreciation and imbalances in the sector as well as uncertain growth outcome (Van der Ploeg & Poelhekke, 2021).

There are not many Ghana studies. Research works so far have looked at either a single commodity or taken a descriptive approach. Thus, they did not capture the dynamic and causal relationships amongst commodity prices, inflation, and growth

Methodology

This section presents the methodology for the study. It consists of the estimation techniques and model specifications.

VAR Estimation Technique

A Vector Autoregression (VAR) estimation technique was employed for the examination of commodity prices, inflation and economic growth. Endogeneity problems commonly observed in other estimation techniques are effectively catered for by VAR.

In this study, we employed the VAR Approach because it is expected that the shocks in commodity price, inflation and also economic growth will have mutual impacts on each other. Thus, the VAR is the most suitable technique for this analysis.

Variance Decomposition (VD) and Impulse Response Functions (IRF)

The research also used impulse response functions to show how the system responds to outside disturbances. Under the VAR model, the impulse response function (IRF) measures how an endogenous variable reacts to the innovations in another variable.

Principal Component Analysis (PCA)

The PCA equation is specified as follows;

$$CPINDEX_K = W_{K1}X_1 + W_{K2}X_2 + \dots + W_{KN}X_N \dots\dots\dots (1)$$

The CPINDEX represent commodities price index, W_K is the parameter's weight; X is the respective component value; whilst N is the total number of variables contained in the equation.

Model Specification

The study employs the VAR (Vector Autoregressive) estimation technique to investigate commodity price shock, inflation, and growth relationship and causal nexus. The chosen estimation technique, VAR, tackles endogeneity issue effectively. In addition, the researcher expects bidirectional causality among the variables. Thus, VAR is the most applicable method as it will treat all variables in the system as endogenous. The VAR equations are specified as follows;

$$\text{CPINDEX}_t = \alpha + \sum_{j=1}^P \phi_{1j} \text{CPINDEX}_{t-j} + \sum_{j=1}^P \phi_{2j} \text{INFLA}_{t-j} + \sum_{j=1}^P \phi_{3j} \text{GDPPCGR}_{t-j} + e_{1t} \dots\dots\dots (2)$$

$$\text{INFLA}_t = \beta + \sum_{j=1}^P \phi_{1j} \text{INFLA}_{t-j} + \sum_{j=1}^P \phi_{2j} \text{CPINDEX}_{t-j} + \sum_{j=1}^P \phi_{3j} \text{GDPPCGR}_{t-j} + e_{2t} \dots\dots\dots (3)$$

$$\text{GDPPCGR}_t = \lambda + \sum_{j=1}^P \phi_{1j} \text{GDPPCGR}_{t-j} + \sum_{j=1}^P \phi_{2j} \text{CPINDEX}_{t-j} + \sum_{j=1}^P \phi_{3j} \text{INFLA}_{t-j} + e_{3t} \dots\dots\dots (4)$$

Findings/Results

This section focuses on the analysis, presentation, and discussion of the empirical results.

Descriptive Statistics

The descriptive statistics of the study is presented below:

Table 1: Descriptive Statistics

	COMMODITY PRICE INDEX	INFLATION	GDPPCGR
Mean	-3.00	15.09	3.41
Median	0.35	12.03	3.14
Maximum	2.04	41.50	11.14
Minimum	-2.57	7.14	-1.70
Std. Dev.	1.27	8.12	2.88
Skewness	-0.47	2.00	0.78
Kurtosis	2.39	6.95	4.12
Jarque-Bera	1.05	26.49	3.08
Probability	0.59	0.00	0.21
Observations	20	20	20

Source: Researcher's Construct (2026)

From table 1, the mean values of the commodity price index, inflation, and GDP per capita growth rate (GDPPCGR) are -3.00, 15.09, and 3.41, respectively. However, because the mean can be heavily influenced by outliers, the discussion places greater emphasis on the median values. The median commodity price index of 0.35 is regarded as relatively representative, as it is less affected by extreme observations. The median values for inflation and GDPPCGR are 12.03 and 3.14, respectively.

The standard deviation of inflation is 8.12, suggesting substantial variability around the mean. In contrast, the standard deviation of the commodity price index is 1.27, indicating relatively low dispersion in commodity price movements. Similarly, the standard deviation of GDPPCGR is 2.88, implying limited variation between the observations and the mean.

Results of Unit Root

Variables that follow a trend are described as non-stationary or having a unit root, whereas those that revert to their mean are regarded as stationary and free of unit roots.

As a result, econometric analysis requires testing each data series for stationarity prior to model estimation to ensure the validity of the results. In addition, identifying the order of integration of the variables is crucial for selecting the most appropriate econometric model for estimation.

Table 2: Unit Root Test

LEVEL	CPINDEX	INFLATION	GDPPCGR
ADF	-4.056**	-1.97	-2.47
PP	-2.51	-3.89**	-2.47
FIRST DIFFERENCE	CPINDEX	INFLATION	GDPPCGR
ADF		3.99**	4.58***
PP	3.89**		4.59***

Note: ***/**/* significant at 1%, 5% and 10%, respectively.

The results of the unit root test are presented in Table 2 above. Two of the variables, inflation and GDPPCGR were not stationary at levels or integrated order zero I (0). However, commodities price index (CPINDEX) was stationary at integrated at level or integrated order I (0). Both inflation and GDPPCGR became stationary after taking the first difference, I (1).

Optimal Lag Length Selection

Typically, the lag length corresponding to the minimum value indicated by these criteria (often marked with an asterisk) is chosen for the model.

Table 3: Optimal Lag Length Selection

Endogenous variables: CPINDEX INFLATION GDPPGR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-103.43	NA	120.42	13.30	13.44*	13.31
1	-93.99	14.16	117.69*	13.25*	13.83	13.28
2	-89.87	4.64	253.41	13.86	14.87	13.91
3	-72.82	12.78	146.77	12.85	14.30	12.92*

Based on the results, the researcher selected a lag length of one (1) as indicated by the Schwarz Information Criterion (SC) and Hannan-Quinn Criterion (HQ), both of which were asterisked to show the minimum values. Although the AIC and FPE were also asterisked, the researcher opted for lag length one. According to Obi (2015), when multiple information criteria display the same number of asterisks, it is left to the researcher's discretion to decide which criterion to follow. This guided the decision to use lag 1 in the model.

Cointegration Tests

The study aimed to simulate shocks within the VAR system and analyze their effects on the endogenous variables hence the need to run cointegration tests. The study applied the Johansen cointegration approach, utilizing both the Trace and Maximum Eigenvalue tests. The results of these tests are presented in Table 3.

Table 4: Cointegration Tests

Series: CPINDEX, INFLATION, GDPPCGR

Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	Critical Value (0.05)	Probability**
None*	0.304	139.618	29.798	0.000
At most 1*	0.226	59.981	15.495	0.000
At most 2	0.017	3.683	3.841	0.055
Hypothesized No. of CE(s)	Eigen Value	Max-Eigen Statistic	Critical Value (0.05)	Probability**
None*	0.304	79.637	21.132	0.000
At most 1*	0.226	56.298	14.265	0.000
At most 2	0.017	3.683	3.841	0.055

Note: Trace statistic test indicates 2 cointegration equations at 0.05 significance level
Max-Eigen statistic test indicates 2 cointegration equations at 0.05 significance level

The results show that both the Trace and Maximum Eigenvalue statistics indicate the presence of at most two cointegrating equations in the model, suggesting a long-run relationship among the variables. This is supported by a probability value of 0.055 for both the Trace and Max-Eigen tests. Based on these findings, it was necessary to employ the Vector Error Correction Model (VECM) to estimate the long-run dynamics of the model.

VECM Estimation

The VECM is a specialized variant of the VAR model designed to estimate long-run relationships among variables. After confirming the existence of a long-run relationship between the variables, the study proceeded to apply the VECM. The results from the VECM analysis are presented below.

Table 5: VECM Estimates.

Commodities Prices	1.00		
Inflation (-1)	0.19 (0.065) [2.94]		
GDPPGR (-1)	0.33 (0.12) [2.58]		
C	-3.95		
	CPINDEX	INFLATION	GDPPGR
Coint. Eqn 1	-0.49 (0.23) [-2.08]	-2.27 (1.55) [-1.46]	-0.84 (1.11) [-0.75]
CPINDEX (-1)	0.195*** (0.065) [3.001]	4.188** (2.125) [1.970]	-3.164** (1.608) [-1.967]
INFLATION (-1)	0.001** (0.000) [2.294]	0.984*** (0.001) [124.198]	0.029*** (0.006) [4.839]
GDPPGR (-1)	0.003 (0.002) [1.438]	-0.121* (0.068) [-1.780]	0.235*** (0.052) [4.552]
R-squared	-0.037	0.946	0.060
Adjusted R-squared	-0.045	0.945	0.052
Sum. Sq. residuals	6.970	7428.612	4253.780
F-Statistic	-4.480	2180.661	7.930

Note: ***/**/* significant at 1%, 5% and 10%, respectively.

The study revealed significantly positive relationship between commodities price index and its lag. This implies that the past levels on commodities prices positively impacts on the current levels of commodities prices all other things being equal. The study also revealed significantly positive relationship between inflation and the lag of commodities prices. This result was statistically significant at 5% significance level. The researcher explained this by asserting that when prices of major commodities prices go up, there is likelihood of resultant inflation in the economy. This result is consistent with the findings of Honohon (2008) who found commodities prices to have a positive connection with inflation. Our results differentiate itself from earlier studies. While previous studies largely examined a unidirectional causal relationship between commodity prices and inflation, this study identifies a bidirectional causality between the two variables. This is an important finding for policymakers since it suggests that both

variables should be treated simultaneously as predictors and outcomes in the formulation of policies since one depends on the other.

Moreover, the research shows the evidence of a negative relationship between economic growth and the lagged values of commodity prices indicating a 5% significance level. Higher commodity prices result in lower growth, other things being equal. This finding is consistent with Arezki and Gylfason (2001), who also noted a negative impact on economic growth from rising commodity prices. Other studies, such as Peersman and Van Robays (2009) and Kilian and Park (2009), which use MENA data, also find similar findings.

Contrary to the previous results, evidence suggesting that the first lag of commodity prices causes inflation in the short run is provided by the t-statistic of 1.97. This finding indicates that commodity price increases have predictive power for inflation in Ghana. Furthermore, the study has established that commodity price index also affects inflation, thus establishing reverse causality.

Overall, the results point to a two-way interaction in which commodity prices generate inflation and inflation generates commodity prices. This suggests that in Ghana, policymakers need to consider inflation and commodity prices not only as outcomes, but also as predictors in their economic policies.

$$ECT_{t-1} = [1.00CPINDEX_{t-1} + 0.19INFLATION_{t-1} + 0.33GDPPGR_{t-1} - 3.95]$$

The outcomes of the VECM are given above, and this section interprets the long-run results. The findings show that the short-run instability in the prior year is corrected at a rate of 49% and is controlled by other factors of the model.

Variance Decomposition

Forecast error variance decomposition (FEVD) shows how much of the variation in endogenous variables can be explained by shocks/innovations in the other variables. It also indicate how much one variable influence other variable.

Table 6: Variance Decomposition of CPINDEX

Period	S.E.	CPINDEX	INFLATION	GDPPGR
1	0.167	100.000	0.000	0.000
2	0.170	99.440	0.036	0.524
3	0.171	99.298	0.093	0.609
4	0.171	99.229	0.156	0.615
5	0.171	99.167	0.219	0.615
6	0.171	99.106	0.279	0.615
7	0.171	99.048	0.337	0.615
8	0.171	98.993	0.391	0.616
9	0.171	98.940	0.443	0.617
10	0.171	98.890	0.493	0.617

Source: Researcher's Construct (2026)

Results of forecast error variance decomposition (FEVD) for CPINDEX showed that in the first year (short run), 100% CPINDEX was explained by itself. This means that commodity prices' short run (year) fluctuations were driven entirely by commodity price's past values. However, in the long run, that is, after ten years, shocks in inflation explain 0.493% of the variations in commodities prices, whereas shocks in GDP per capita growth (GDPPGR) explain 0.617% of the variations. This indicate that GDP growth and inflation have a significant exogenous effect on CPINDEX over time.

Table 7 : Variance Decomposition of INFLATION

Period	S.E.	CPINDEX	INFLATION	GDPPGR
1	5.451	1.857	98.143	0.000
2	7.760	4.448	95.139	0.414
3	9.497	5.952	93.288	0.760

4	10.910	6.847	92.165	0.988
5	12.105	7.414	91.447	1.139
6	13.141	7.796	90.961	1.242
7	14.056	8.069	90.614	1.317
8	14.873	8.273	90.355	1.372
9	15.609	8.430	90.156	1.415
10	16.278	8.554	89.997	1.448

Source: Researcher's Construct (2026)

The FEVD results for inflation indicate that, in the short run (first year), the shocks in commodity price explain the 1.857% while shocks in GDP per capita growth (GDPPGR) explain 0.000% of the variation in inflation. Over the long run, after ten years, 8.554% of the variation in inflation is attributed to CPINDEX shocks, and 1.448% is explained by GDPPGR shocks.

Table 8: Variance Decomposition of GDPPGR

Period	S.E.	CPINDEX	INFLATION	GDPPGR
1	4.125	0.319	0.030	99.652
2	4.277	2.019	0.192	97.789
3	4.294	2.207	0.417	97.376
4	4.299	2.203	0.658	97.139
5	4.305	2.207	0.894	96.900
6	4.310	2.220	1.119	96.660
7	4.315	2.237	1.333	96.430
8	4.320	2.254	1.536	96.210
9	4.325	2.271	1.728	96.001
10	4.330	2.288	1.909	95.804

Source: Researcher's Construct (2026)

The FEVD results for GDP per capita growth (GDPPGR) indicate that, in the short run (first year), 0.319% of the variation in GDPPGR is explained by shocks in CPINDEX, while 0.030% is explained by inflation shocks. In the long run, after ten years, 2.288% of the variation in GDPPGR is attributed to CPINDEX shocks, and 1.909% is explained by inflation shocks.

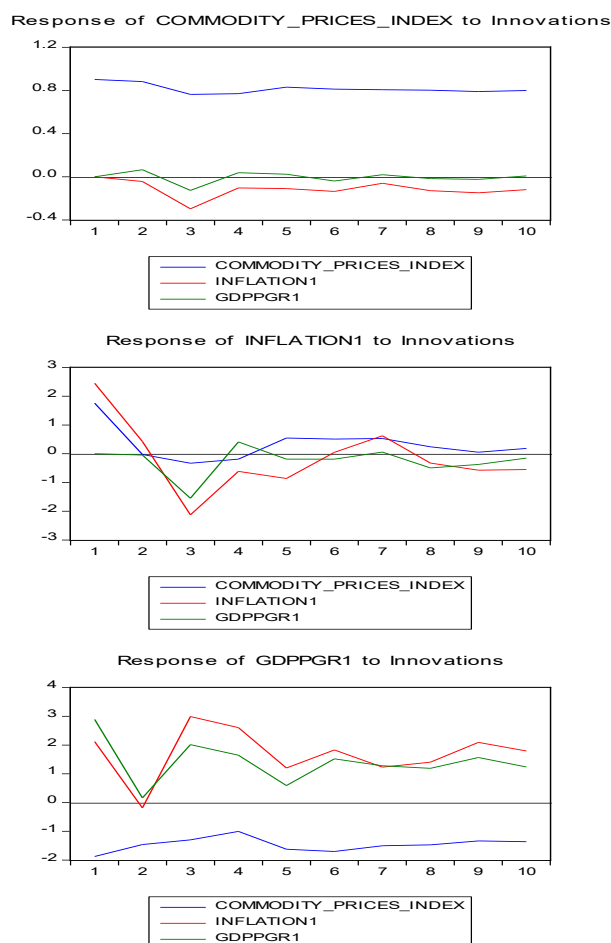
Impulse Response Function

Estimating IRFs is important because individual VAR coefficients alone often do not provide sufficient guidance for policy formulation, as they do not reveal how endogenous variables respond to shocks. In this study, IRFs were computed for CPINDEX, INFLATION, and GDPPGR, with the results presented in Figure 1.

The results indicate that a one standard deviation positive shock to GDPPGR leads to a decline in CPINDEX in the first year. From the second to third year, a decline in GDPPGR continues to reduce CPINDEX, but from the second year onward to the tenth year, the relationship between GDPPGR and CPINDEX becomes positive. Similarly, a one standard deviation negative shock to inflation causes a decline in CPINDEX in the first year, while from the fourth year to the tenth year, both inflation and commodity prices stabilize.

Regarding inflation, a one standard deviation negative shock to GDPPGR in the second year reduces both inflation and CPINDEX in that year. Over the long run, a positive shock to GDPPGR results in declines in both inflation and commodity prices. The response of GDPPGR shows that a one standard deviation increase in CPINDEX leads to a fall in GDPPGR in the first year, with subsequent increases in CPINDEX from the second year causing sharper declines in GDPPGR. From the fourth to tenth year, commodity prices remain relatively stable, while economic growth continues to fluctuate. Additionally, a one standard deviation negative shock to inflation leads to a fall in GDPPGR in the first year, indicating that inflation and GDPPGR move in the same direction in both the short and long run. The IRF results are summarized in Figure 1.

Figure 1: Impulse Response Function
Response to Cholesky One S.D. (d.f. adjusted) Innovations



Discussions and Conclusion

The empirical evidence demonstrates that the variables are cointegrated, indicating the existence of a long run equilibrium relationship among commodity prices, inflation and economic growth. According to the VECM estimates, a high-speed adjustment process ensures that deviations from equilibrium are corrected. This means shocks to the system are not permanent but have fairly significant transitional effects. Within a short timeframe, commodity price shocks lead to a considerable increase in inflation owing to significant cost-push and exchange-rate transmission channels. Simultaneously, the rise in commodity prices suffers a negative and statistically significant economic growth effect. This finding indicates that the volatility and uncertainty of export prices undermine productive investment and macroeconomic stability.

The analysis also shows that there is bi-directional causation between commodity prices and inflation which simultaneously affect each variable. A commodity-dependent economy is a complicated macroeconomic management depending on each other. The variance decomposition results indicate that although most variations of each variable are explained by their own innovations, shocks from commodity prices are playing a growing role in inflation and growth variation over time. The analysis of impulse response reveals that negative commodity price movements negatively impact output over the long term while increasing inflation.

The results indicate that although commodity exports are a main source of revenue for Ghana, dependence on a volatile global commodity market will expose it to inflation instability and slowed growth. Commodity price shocks without buffers and diversification can harm fiscal performance, deter

investment, and harm long-term development. For these reasons, the evidence points to the need for a coordinated set of fiscal, monetary and structural reforms to enhance resilience and promote sustainable economic growth.

Policy Recommendations

The researchers proposed the following policy recommendations based on findings.

Promote Export Diversification and Industrialization

The government must promote value addition, agro-processing, and light manufacturing to reduce overreliance on cocoa, gold, and oil. Widening the export base will insulate the economy from external commodity price shock and stabilize economic growth.

Strengthen Commodity Stabilization and Sovereign Wealth Funds

Ghana must improve the operational effectiveness of stabilisation/sinking funds that save windfall revenues during booms for use during downturns. This counter-cyclical fiscal device will smooth expenditures and safeguard public investments.

Develop Risk-Hedging and Price Insurance Mechanisms

The government and commodity exporters should look into futures contracts and other hedging instruments to mitigate price risks on sudden drop in commodity prices.

Limitations of the Study and Directions for Future Research.

This study has some limitations that should be acknowledged nonetheless. The VAR/VECM framework is effective in capturing dynamic relationships between macroeconomic variables but operates under an assumption of linearity; it ignores the effects of possible nonlinearities, asymmetries, or structural breaks arising from major global shocks.

Subsequent investigations might overcome these limitations by implementing nonlinear or regime-switching models (for example, Markov-switching models) to reflect asymmetric impacts of commodity price shocks across economic cycles. If we conducted comparative or panel-based analyses across the Sub-Saharan African economies, we would know better how institutional quality and diversification help boost resilience to commodity price volatility.

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