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Econometric Analyses of the Effect of Commodity Price Shock on Economic Growth in Kenya

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ABSTRACT

Purpose: Government policies about commodity consumption have an influence on the growth of numerous economic sectors in the globalized world. Africa has experienced a decline in economic welfare, largely due to, a sudden increase in prices and high dependency rate. This study aimed to exploring the uncertainty of commodity price on the Kenya's economic growth. To assess kind and intensity of the nexus, both descriptive and correlational research designs were utilized.

Design/Methodology/Approach: The work also employed correlational approach applying quarterly time series data trends for the period spanning for 14 years (2008- 2022). Analysis of the data was conducted using E-views software and several diagnostic estimations as well as regression was conducted to check the null hypothesis that stated that explanatory variable had no statistical effect on explained variable.

Findings: From the correlational output of -0.2639(0.0416) commodity price shock revealed a negative significant connection. Both commodity price shock and economic growth dataset had unit root problem, which was resolved after first differencing. The simple regression findings revealed a significant negative impact of -0.2019 (0.0321) for the commodity price shock. Advanced diagnostic tests were also conducted and revealed absence of autocorrelation, and data was normally distributed making the established model appear stable and relevant.

Implications/Originality/Value: The analysis report recommends that the government should embrace local production to control commodity price volatility as well as imports, which make the country more sensitive to shocks. Additionally, establishment of new local industries as well as revival of the existing industries to boost internal production mitigating price volatility as well as vulnerability dependence.

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Introduction

The price of commodities has a significant impact on how many developing countries progress economically, especially those that rely heavily on primary exports. Global trade balances, fiscal stability, inflation, and general economic performance can all be significantly impacted by changes in the prices of commodities like oil, minerals, and agricultural products. A study by Aizenman, Yothin, Gemma, and Shu (2017), posits that exogenous factors such as general prices on non-oil and oil commodities, FDI growth and world financial exchange volatility, have a greater impact on the overall growth of GDP across countries. Notably, due to Ukraine-Russia war, prices on food commodities has increased ultimately and has been the highest hike ever since 2008 crisis (World Bank 2022). According to World Bank report (2022), the present changes in commodity prices could overturn the price boom of 2007/2008. Calderon, Chuhan-pole, and Kubota (2019), also noted that, the European debt sovereign issues experienced in 2011-12, as well as the drop in worldwide prices of oil, have had an impact on general commodity prices.

A study by Murach & Wagner (2021) discovered that a country's growth of gross domestic product could be linked to an unprecedented hike in commodities prices, as well as underinvestment by external investors. Globally, government, investor, and consumer decisions regarding interest rates, investments, and commodity consumption have an outcome on the growth of various sectors in the economy (Ikenna, 2016). Similarly, Fueki, Hiroki, Naoto, Shinsuke, and Yoichiro (2018), external uncertainties such as commodity price shocks can lead to a fall in any country's economic performance.

Reed (2020) suggested that while certain global economic heavyweights have reduced their demand for African goods, the majority of African countries rely on them for existence. Inoue & Okmoto (2017) noted that most nations in Asia benefit from low worldwide food and energy prices, whereas commodity exporters suffer. As a result, the drop in producer pricing has had a detrimental influence on production processes and has sparked concern that must be investigated. From World Bank's (2022) survey of national expansion, the Sub-Saharan region's economic welfare is expected to fall between 4.1% in 2021 and 3.3% in 2022, owing primarily to a decline in growth of economy globally, an abrupt rise in prices causing inflation, increasing distress of debts, and other tight financial instances. Kilaku, Byaruhanga, & Ali, (2023) stated that the political upheaval induced by the Russia-Ukraine challenges has compounded policymakers' issues in African countries, resulting in a decline in foreign capital inflows and an increase in commodities prices.

African nations have experienced some economic advancement over the past ten years; however, comprehending and predicting commodity prices is still challenging due to a lack of understanding, which complicates decision-making (Tiawara, 2015). The UNCTAD (2021) notes that external shocks lead to fluctuations in macroeconomic indicators like general prices, resulting in erratic changes in terms of trade, policies, and overall economic mismanagement. According to Batte & Matovu (2016), African nations must reconsider their strategies, as 70% of total exports consist of commodities with lower value that are vulnerable to price variations. As a result, changes in commodity prices can lead to beneficial impacts on national growth, necessitating a deeper understanding of these dynamics. Calderon et al. (2019) highlighted that, both Sub-Saharan Africa and other nations' welfare have been impacted by external trade shocks, such as the global financial challenges of 2008/09. Following these disturbances, the pandemic crisis also arose, affecting commodity price volatility and capital inflows, which has continued to pose a significant challenge to growth to this day (World Bank, 2021).

According to Deloitte (2022), the GDP growth in the East African Community (EAC) is

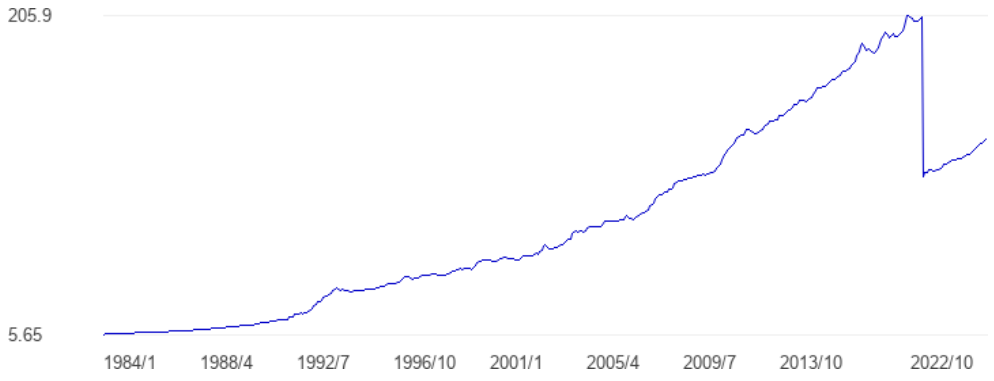
projected to slow down to 5.3% from 6.4% in 2021, primarily due to rising global commodity prices and the depreciation of local currencies. The KNBS (2022) reported that Kenya's GDP decreased by 5.2% in quarter two of 2022, in contrast to a decline of 11.0% in the same quarter of 2021. The International Monetary Fund (IMF) (2019) noted that fluctuations in commodity prices can adversely impact a nation's income distribution, hinder poverty alleviation, and impede overall economic growth. The primary factors influencing this area include volatile global commodity prices and reduced demand for the country's exports resulting from uncertainties in the global economy. These concerns pose significant challenges to economic growth, thus serving as a motivation for conducting this study utilizing time series trends from 2008 to 2022.

Kenya's economy is still quite susceptible to changes in global commodity prices since it depends so heavily on a small number of important exports, including coffee, tea, and horticulture goods. Even if the nation has made an attempt to diversify its economy, external shocks to commodity prices still have a big impact on macroeconomic stability, especially GDP growth. Commodity price volatility has increased due to recent global disruptions, including as the COVID-19 pandemic, geopolitical conflicts, and supply limits brought on by climate change. This has made Kenya's trade imbalances, fiscal deficits, and currency rate highly instable. Therefore, this paper studied an econometric analysis to quantify the effects of commodity price shocks on economic growth in Kenya, offering a timely and evidence-based framework for policy intervention. During the analysis, statistical diagnostic estimations were conducted to test the null hypothesis of the study.

Literature Review

The price of a commodity refers to the average amount paid for each unit of a good, while a commodity price shock signifies a rapid change in the unit price of goods. Due to globalization, economies around the world have increasingly felt the impact of fluctuating commodity prices because of their high level of economic interdependence (Kilaku 2024). Similarly, unstable commodity prices can adversely affect income distribution and poverty alleviation efforts within a country, thus obstructing economic development. Over the last several decades, commodity prices have undergone volatility and significant drops, leading to a decrease in the consumer price index in many economies (Inoue and Okamoto 2017).

Many African nations rely heavily on trade partnerships, making the stability of commodity prices crucial, as fluctuations can have devastating effects on the continent (Lonwabo 2021). According to the World Bank report (2020), the health pandemic had varying impacts on the prices of different commodities. Qi et al.; (2022) noted that variations in commodity prices impact the functioning and macroeconomic inclusivity as well as the overall expansion of the economy. This research used CPI as an indicator to measure the effects of commodity price shocks. Currently, Kenya's CPI has been rising at double the rate (KNBS 2022). The KNBS (2022) quarterly reports indicated that the CPI for general commodity prices reached an unaffordable peak in 2022. The CPI rose to 127.87 points in 2022 October, an increase from 126.73 units in 2022 September. According to KNBS's suggestions regarding price surges, there is a need to revise and reform current economic policies to ease the living costs and diminish



dependence on external economies that have been significantly elevating commodity prices.

Fig 1: CPI previous trends (Kenya)

Source: KNBs, (2022)

The illustration presents the trends of the CPI as revealed by the KNBS. It is evident from the figure that the CPI was on the rise, followed by a decline in 2019 when the global pandemic of COVID-19 affected economies, after which it began to increase steadily in 2022. This clearly indicates that intervention is necessary; otherwise, the nation risks reverting to earlier years with an index point of 205.

Prior analyses conducted by UNCTAD (2021) indicate that external trade shocks stem from the interdependence of nations. UNCTAD categorized developing nations as commodity-dependent developing countries (CDDCs). Consequently, when commodity prices rise more than anticipated, it restricts policy options and fiscal stability, resulting in reduced public investment in crucial social initiatives, which ultimately hampers efforts to reduce poverty and foster economic growth. Reviewed literature indicates that reliance on imported commodities in least developed countries (LDCs) can lead to inflation of the imported commodities because of rising prices, which diminishes earnings and heightens poverty levels. Lonwabo (2021) conducted a research on the effects of international trade uncertainties in South Africa's economic growth. Findings of this particular research revealed that shocks in commodity prices, like changes in oil rents, significantly affect the country's economy.

Hegerty (2016) investigated how changes in commodity prices affect individual nations by combining data from nine different economies with varying results. D'Angelo (2020) conducted a study on commodity prices and their relationship with global economic activity, seeking to understand the correlation and synchronicity between growth rates and commodity prices on a global scale. Likewise, Tiawara (2015) employed panel modeling to assess the effects of price shocks in Africa, creating impulse responses based on trends observed from 1999 to 2014. The impulsive response indicates that increases in commodity prices are possible to benefit, rather than harm, developing nations.

Research Methodology

The research adopted descriptive and correlational methodology to determine direction and degree of relationship of commodity price shock and expansion of Kenyan economy. CPI was used to indicate commodity price shock, while economic growth was indicated by GDP and trends were obtained from KNBS and World Bank data portal for fourteen-years (2008-2022). This period allowed the researchers to analyze the impact of commodity price shock as an external force pre and post key economic events such as geopolitical tensions, COVID-19, and the Ukraine-Russia war affecting macroeconomic indicators around the world. This study gathered quarterly data on both the consumer price index (CPI), which measures commodity prices, and GDP, which measures growth of the economic.

Econometric Approach

To explore the connection between commodity price shocks and growth of the economy in Kenya, the study adopted econometric approach that depicted economic growth as a function of commodity price shock. The analysis was carried out using statistical software (E-views version 10). To avoid problems with excessively large or too small values, the variable was converted into natural logarithms.

Table 1: Variable Description

Variable	Identifier	Measurements (Using Natural Logs)	Description	Priori Expected sign

Commodity Price Shock (CP)	CPI (quarterly %)	LNCPI	Sudden change in prices per unit of goods	+/-
Economic Growth (EC)	Gross Domestic Product (quarterly %)	LNGDP	Increase in size of economy. (Percentage change in real GDP)	Dependent variable

Source: Author's compilation (2024)

Multivariate model was as follows:

$LNEC_t = \beta_0 + \beta_1 LNCP_t + \mu$ ……i

Where:

LNEC- Natural logarithm of Economic growth; **LNCP**- Natural logarithm of commodity price shock; **β0**-constant; **β1**-parameter; **t-** Time; μ- Noise value.

Findings and Discussions

Descriptive Analyses

Use of descriptive statistics helped find outliers and identify potential associations between variables. The analysis utilized quarterly dataset from the World Bank and KNBS. The standard deviation measured the data's difference from the mean, while the mean calculated the relative frequency distribution centre. Table one shows descriptive features of the variables of interest.

Table 2: **Summary of Descriptive Analysis**

Details	**LNEC**	**LNCP**
Mean	0.6371	1.903622
Median	0.6812	1.913228
Std. Dev.	0.2026	0.130
Skewness	-1.2613	-0.297481
Kurtosis	4.8114	1.867541
Jarque-Bera	0.1062	4.091109
Prob	0.0702	0.129308

Source: Author's compilation (2024)

LNEC- Economic growth in natural log, indicated by GDP %.

LNCP-Natural log of commodity price shock.

From the findings, the mean represents the dataset's average distribution of a variable, and the standard deviation replicates how far the dataset varies from the average. A small STD Dev states that the set of the data happen to be closely grouped, high STD dev signifies that the trends are more dispersed (Gujarati, 2009). Mean of the commodity price shock (LNCP) is 1.904. It indicates that, on average, the LNCP is approximately 1.9036. The natural Log results also show a STD dev of 0.130, suggesting that trends are fairly next to the average, with variance of about 0.130 units on mean. Consequently, LNEC had an average distribution of 0.637137, indicating the mean growth of the economy during study and a STD dev of 0.2026, indicating the change from the mean.

Normality Analysis

As stated by Maniagi (2018), a set of data is considered regularly distributed if the skewness value is less than two, the kurtosis value is under six, and the pv from the Jarque-Bera test exceeds the 0.05 significance level. The skewness reflects the distribution of a random variable, indicating both the direction and intensity of the skew, whereas kurtosis reveals the height and position of the peak. The summary table 1 above indicates that the skewness levels are below 2 and the kurtosis values are below 6, providing clear evidence of a regular distribution among all the variables examined. According to table 1, the variables assessed have a pv greater than 0.05, which signifies a normal dispersion of the data throughout the study period.

Correlational Analysis

To assess the direction and strength of the nexus, analyses of correlation as applied. This technique also calculates the R coefficient between positive and negative ones. The aim here was to investigate the connection between the regressed variable (economic growth) and the main regressor (commodity price shock). Table 2 displays the correlational statistical results.

Table 3: Analysis Results for the Correlation test

Details	**LNEC**	**LNCP**
LNEC	1.000000	
LNCP	-0.263873*	1.000000
	[-2.083437]	
	(0.0416)	

Note: PV is in parenthesis (), Values in [] represent t-Statistic
Source: Author's compilation (2024)

Table 2 presents the outcomes of a pairwise correlation analysis that was conducted before testing for stationarity. The commodity price index (CPI) exhibits a noteworthy negative correlation with LNEC (-0.264, pv<0.05). It indicates a shock in commodity prices leads to a decrease in economic growth in Kenya, with an increase of one percent in commodity prices resulting in a 26.4% decline in economic growth. Likewise, research conducted by Ipeleng & Rufaro (2021); Jinan & Apostolos (2021); Babar & Kanwal (2017); and Nyang'oro (2017) points to a negative association between commodity price shocks and economic growth, which aligns with the findings of the current research.

Test for Unit Root

Data in time series often faces issues with unit roots due of its unit root characteristics. It indicates that dataset is not stable at levels, making predictions impossible and potentially leading to incorrect regression results. Thus, achieving stationarity is essential for the model to forecast future occurrences.

Table 4: **Stationarity Output**

Augmented Dickey-Fuller statistics				
Details	**t-stat**	**PV**	**1% criticalstat**	**Conclusion**
LNEC	-2.60	0.10	-3.56	Unit root

LNCP	-1.75	0.40	-3.55	Unit Root

Source: Author's compilation (2024)

The outcomes of the Augmented Dickey-Fuller (ADF) were displayed in the above summary. H_0 revealed a unit root problem in the dataset, whereas the alternative hypothesis contends that the time series data is unit root-free. The variables presented unit root issues at the following levels: LNEC (p-value 0.0986 > 0.0500) and LNCP (PV 0.4036 > 0.0500). The findings supported the H_0 that stationarity problem exists. Nevertheless, the probability values indicate that the non-stationary variables achieved stationarity following the first differencing, as presented in Table 4.4 below. The LNCP showed pv < 0.0500 and Z-test values that surpassed the thresholds of 1% and 5%, as indicated in Table 4.

Table 5: Differencing

Augmented Dickey-Fuller test Statistics				
1st difference	**t- stat**	**PV**	**1% criticalValue**	**Conclusion**
DLNEC	-4.16	0.002	-3.568308	Stationary
DLNCP	-6.23	0.000	-3.548208	Stationary

Source: Author's compilation (2024)

The P-value for both variables in their logarithmic form is below 0.05, and the t-statistics surpass all critical values (at both 1% and 5%), suggesting stationarity. As a result, the null hypothesis was dismissed after the 1st differencing, while the H_1 was upheld.

Simple Regression Analysis

Determining the impact of commodity price uncertainty on economic growth rate in Kenya was primary goal of the study. Commodity price shock, which was the explanatory variable used in the pre-diagnostic calculations, was revealed to be statistically significant in explaining Kenya's economic growth.

Table 6: Summary on Simple Regression analysis

DLNEC, OLS			
Variable	**Coefficient**	**t-Stat**	**Prob**
DLNCP	-0.203	-2.150	0.0321

From the findings, the DLNCP lowers DLNEC at 20.19%.

Discussion Summary

According to the regression output displayed in the above, the coefficients for commodity price shocks is (-0.203), and the pv is 0.0321, which is less than 0.05. It suggests that the influence of commodity price shocks on economic growth significant and exhibits a negative trend. The diagnostics indicates that a rise in product prices will lead to a decrease of 20.1914 units in the growth rate of Kenya's economy, all else being equal. Thus, this research rejected the H0 that proposes there is no significant relationship between commodity price shocks and economic growth. This is because a sudden surges in commodity prices correlate with diminished economic

growth. The model indicates that commodity price shocks, as measured by the indicated by CPI, have an adverse effect on the economic expansion. The negative relationship is understood in recognizing that rising commodity prices contribute to inflation, which obstructs FDI inflows into Kenya, thereby causing economic growth to stagnate (Shah, Aleem, & Arshed, 2014).

The impact could be linked to the relationship between commodity prices and rising inflation, which has resulted in increased living costs in developing nations. Due to a high dependency on external economies, developing countries face challenges when these external economies raise their product prices, thereby placing significant pressure on third-world nations. Individuals in lower-income brackets in these countries are disproportionately impacted by rising commodity prices from their international trading partners. As noted by Shah, Aleem, and Arshed (2014), the inflation level rises largely due to the costs of food and non-alcoholic beverages. Price shocks in commodities contribute to inflation, which hampers economic growth and exacerbates poverty levels among Kenyans (Kiganda, 2014).

The output was concurrence with studies by Filippo et al (2020); Inoue & Okimoto (2017); Ofori, Becker & Grace (2017) and Jinan & Apostolos (2021), who identified a negative effect of commodity price shocks leading to inflation that impacts manufacturers. These results in fluctuations in input costs, creating economic uncertainty and hindering growth, thus affecting the volume of goods produced. Likewise, elevated commodity prices decrease the likelihood of saving, making it challenging for investors and hindering innovation within firms in Kenya, which ultimately leads to diminished economic growth. Conversely, the results of this study challenge the findings of Tawara (2015); Lonwabo (2021); and Ipeleng & Rufaro (2021), who indicated that commodity prices has positive-statistically significant influence on growth of the economy. Additionally, Jinan & Apostolos (2021) determined no significant statistics between commodity prices and economic growth. This implies that the scholars employed different methodological designs and accounted for confounding variables.

Output on post-estimation diagnostic tests

To verify the validity of the estimated model, post-estimation diagnostic evaluations were conducted. These evaluations examined whether the essential assumptions of the regression analysis are satisfied, thereby strengthening the findings' robustness. Specifically, diagnostic assessments for autocorrelation, residual normality, and model specification stability were carried out. Findings from these assessments are presented and interpreted below to validate the suitability of the model for policy inference and forecasting.

Autocorrelation

Uyanto (2019) indicated the presence of autocorrelation in the error terms goes against the OLS assumption that the error terms in regression analysis are not correlated. Autocorrelation occurs when an error term is incorporated into new time series data. In other words, the error term for one dataset may be influenced by the error of the other dataset. Flick (2020) revealed that significance of residuals in OLS is anticipated to be explanatory in the future. The existence of autocorrelation was examined using the Breusch-Godfrey serial correlation Langragian Multiplier test. The H_1 posits that autocorrelation exists, while the H_0 claims no autocorrelation. The summary is presented in the table below.

Table 7: Autocorrelation output

H0: Absence of autcorrelation			
F-stat	3.51	Prob. F(4,52)	0.14

Obs $*R^2$	5.76	Prob.(4)	0.053

The R-squared value observed showed a probability of 0.053, exceeding 0.05, hence suggesting that we accept the H0 stating that there was absence serial connection and reject the alternative hypothesis.

Normality Test

In econometric analysis, the residuals ought to adhere to a normal distribution. To explore the regularity of the regression model, this study employed the Jarque-Bera test. Okamoto, Koizumi, and Seo (2009) proposed that the residuals were distributed normally. This means that the probability value needs to exceed 0.0500; however, the alternative hypothesis presented a pv of less than 0.0500. The results from the Jarque-Bera test regarding normality are displayed in Figure 2 below.

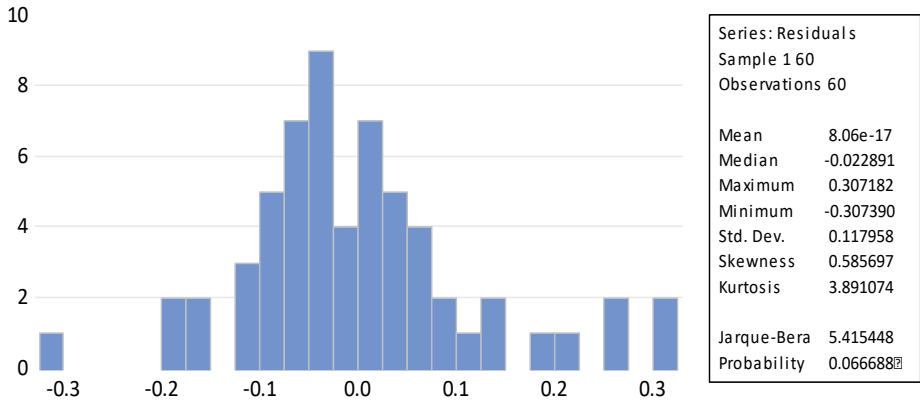


Fig 2: Normality Test

The histogram revealed that the Jarque-Bera test's pv is 0.067, and was high than 0.05 level of significance. As a result, this outcome supports the null hypothesis.

Cumulative Sum Output

Phong (2021) identifies the series of cumulative output as an effective feature for identifying issues in a control chart method. If, after several rounds of recursive regression, the sequence exceeds either the lower or upper critical limit (0.05), it indicates that the model contains a defect. A model that remains stable should lie between top and bottom boundaries of the 0.05 significance. The Cumulative Sum Test was conducted to evaluate the final model's stability. The CUSUM test enhances estimations and offers insights regarding the model (Talas, Kaplan, & Ali 2013). The output below demonstrates that both parameters remain within the 0.05 significance threshold of upper and lower limits.

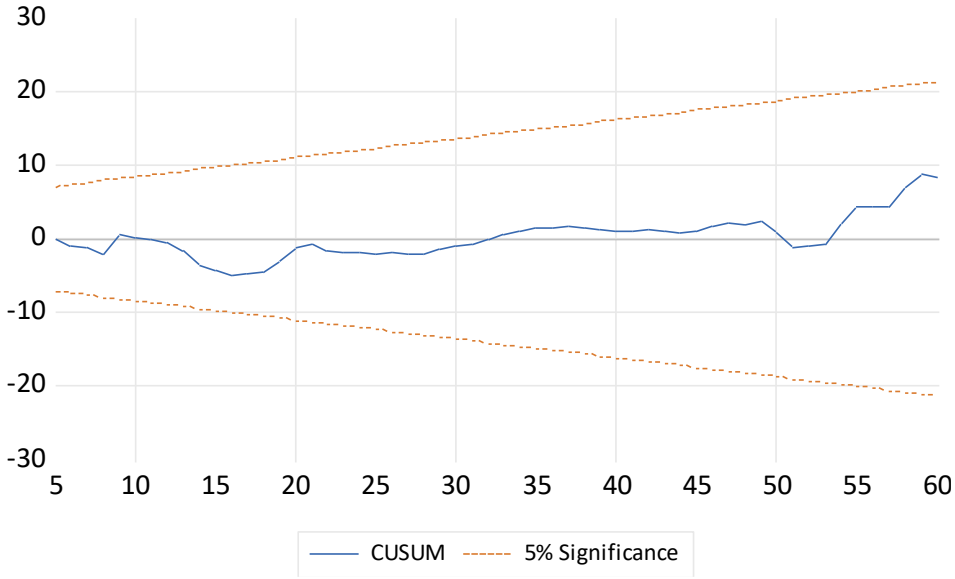


Fig 3: Cumulative Sum Test stability Output

Conclusion

In this objective, the null hypothesis assumed that commodity price shocks does not significantly influence economic growth. From the secondary data, quarterly analysis, economic growth decreases as commodity prices increase. This is attributed to the negative correlation between commodity price shocks and the economy's growth rate. When general commodity prices fall rapidly, it significantly stimulates imports while posing challenges for producers and exporters in developing countries. As a result, a swift increase in general prices leads to diminished profits due to lowered consumer spending, which drives inflation higher. In conclusion, commodity price shocks have had a significantly adverse results on economic growth in Kenya, leading to the rejection of the H0.

Recommendation

A shock in commodity prices has shown to have a significant negative influence on Kenya's growth. Consequently, this research implies that the government must encourage the formation of clusters of related industries across various geological areas to attain economies of scale, synergies, and a supportive environment for growth and innovation. Additionally, focusing on specialization within these industrial clusters will foster resilience and competitiveness, enabling domestic industries to work together to lessen the risks linked to external trade disruptions.

In light of the findings, the Central Bank of Kenya should implement monetary policies aimed at regulating commodity prices in the country. This is important because mitigating commodity shocks can enhance economic stability by reducing inflation, which subsequently boosts consumer spending and raises the overall need for goods and services within the economy. The researcher also recommends that the Kenyan government focus on revitalizing and creating local industries to reduce dependence on foreign economies that are subject to rising prices.

To increase productivity, encourage creativity, and fortify supply chains, the authority may encourage cooperation and alliances amongst regional industries. Businesses can more successfully negotiate obstacles and grasp opportunities in the home market by promoting industry collaboration, resource sharing, and information sharing, which will support Kenya's economic expansion. Central Bank must collaborate with fiscal entities to ensure a cohesive approach to managing inflation. This may involve aligning monetary policy with fiscal policy objectives, to enhance efficiency as well as competition in key sectors.

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