



Long-run relationship between commodity prices and economic growth in South Africa

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ABSTRACT

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The study explored the relationship between economic growth and commodity prices in South Africa in the long term using Autoregressive Distributed Lag (ARDL) Bounds Testing. The empirical results show evidence of a stable long-run relationship between commodity prices and economic growth, which supports the resource-led growth hypothesis and export-led growth theories. Specifically, the study found that gold and PGM prices have both positive and significant long-term effects on real GDP; this indicates that South Africa relies heavily on mineral exports to increase total revenue. Additionally, coal prices have a significant but smaller long-run effect, though environmental and transition risks remain important considerations. The findings of the study emphasize the need for macroeconomic stability, which means the South African government should promote value-enhancing and subsequent industrial development in the mining sector; diversify export markets; increase the amount of investment in infrastructure and human capital; and gradually move away from traditional energy sources in favour of cleaner forms of power supply. These measures will provide a foundation for long-term sustainable economic development; however, they are also important preconditions for increasing the resilience of current and future production systems to environmental changes. The study is of significance as it adds empirical evidence on the long-run association between commodity prices and economic growth in South Africa using the ARDL technique. It highlights the differing impacts of gold, PGMs, and coal prices on GDP growth while offering policy insights on industrialization, export diversification, and sustainable economic development.

Contribution/Originality: This study contributes to the existing literature by providing new evidence on the long-run effects of disaggregated commodity prices, gold, platinum group metals, and coal on economic growth in South Africa. Using the ARDL bounds-testing methodology, the study documents heterogeneous commodity-price effects and provides policy insights for sustainable, resource-led economic development.

1. INTRODUCTION

Commodity prices are crucial to the world economy and are particularly significant for economies that export primary commodities, like South Africa (Yating et al., 2022). Global commodity market shocks caused by variations in supply, demand, geopolitical tensions, and technological advancements quickly affect national incomes, export earnings, the real exchange rate, government revenue, and investment choices (International Monetary Fund, 2025). According to Ge and Tang (2020), a resource curse may result from the fact that a small number of primary commodities account for a sizable amount of national revenue in many developing nations. Growth and poverty alleviation strategies in developing nations are thus greatly impacted by the nature and reasons for any long-run fluctuations and short-run fluctuations in prices of primary commodities (Zahonogo, 2018).

Major international agencies reported mixed movements in commodity prices in 2024–2025 following the significant fluctuations during the COVID-19 pandemic and subsequent recovery (International Monetary Fund, 2026; World Bank, 2026). The IMF observed a slight increase in primary commodity prices between August 2024 and March 2025, while multilateral outlooks from the World Bank predicted price declines over 2025–2026 due to weaker global demand (International Monetary Fund, 2026; World Bank, 2026). For macroeconomic policy, revenue forecasts, and sectoral planning, it is crucial to comprehend how these changes in global prices impact South Africa's long-term economic performance.

South Africa's economy is highly dependent on commodity exports, with products such as manganese, iron ore, coal, platinum, and gold accounting for a substantial share of the economy's total export revenue and foreign exchange receipts (Taiwo, 2023). As one of Africa's leading mineral exporters, fluctuations in global commodity prices directly influence South Africa's trade balance, fiscal revenue, employment levels, exchange rate stability, and overall economic growth performance, thereby making the economy particularly vulnerable to external commodity market shocks (Loate, 2025).

According to Abebrese, Pickson, and Abebrese (2017), a study in Nigeria indicates a significant correlation between real gross domestic product and commodity prices. Arif et al. (2022) also indicated that commodity prices are prone to volatility and are often impacted by both nominal and real factors, such as supply stocks and unforeseen demand shocks. According to Ge and Tang (2020), commodity prices are generally regarded as an important indicator of future economic performance, where increases in commodity prices often signal stronger economic expansion ahead. Many Global South countries rely strongly on primary product exports while exporting relatively fewer manufactured or diversified products compared to other regions globally. Research by Akinsola and Odhiambo (2020) provides strong support for the existence of the natural resource curse, although the authors argue that countries with effective institutional structures may overcome its negative effects. The natural resource curse describes a situation in which countries richly endowed with resources such as diamonds and uranium tend to have less development, poor democratic development, and weaker economic growth than economies with fewer natural resources (Arif et al., 2022).

The mining and commodities complex continues to have a substantial impact on South Africa's economy. In recent years, mining and minerals accounted for a disproportionately large part of export revenues and generated between 6 and 6.3% of nominal GDP (Minerals Council South Africa, 2023). Although volumes showed volatility across subsectors, total minerals sales increased from roughly R792.3 billion in 2023 to higher levels in 2024 as prices of some metals improved (Department of Mineral Resources and Energy, 2025; Minerals Council South Africa, 2023). At the same time, South Africa's overall GDP growth has been muted; according to national and World Bank data, growth rates in the early 2020s ranged from low single digits to zero (World Bank, 2025b). South Africa is a suitable case for examining the long-term association between economic growth and commodity prices because of these characteristics: (i) the significant contribution of commodities to export receipts and government revenue; (ii) volatility in international commodity prices; and (iii) slow overall growth. Long-term consequences for output levels, structural change, and macroeconomic stability may result from continuous commodity price shocks and the reactions of investment and public finances, according to empirical data from other commodity-dependent economies (International Monetary Fund, 2025; World Bank, 2025a).

The long-term dynamics connecting changes in commodity prices and overall economic growth in South Africa are still incompletely understood, despite the importance of commodity sectors to the country's fiscal basis and external position (Mohaddes & Pesaran, 2021). Policymakers cannot confidently create fiscal buffers, exchange-rate regulations, or industrial policies that reduce commodity-driven volatility without a solid long-run empirical assessment using methods like the ARDL technique that separate level relationships from short-run dynamics. Therefore, this study explored the gap by determining the short-run adjustment dynamics and transmission channels

that follow commodity price shocks, as well as by calculating whether there is a long-run cointegrating link between global commodity prices and South African real GDP. The specific objectives are as follows:

- To examine the long-run association between gold prices and South Africa's economic growth from 1994 to 2024.
- To analyse the impact of platinum group metal (PGM) price movements on economic growth in South Africa from 1994 to 2024.
- To investigate the long-run effects of coal prices on South Africa's economic growth from 1994 to 2024.

2. REVIEW OF LITERATURE

2.1. Theoretical Literature

The Neoclassical Solow Growth Model, which offers a macroeconomic framework connecting national income to consumption, investment, government spending, and trade, serves as a major foundation for the theoretical literature that explains the relationship between commodity prices and economic growth (Arezki, Lederman, & Zhao, 2022). The model's extended version includes import and export prices, demonstrating how changes in both domestic and foreign pricing affect net exports and investment, which in turn affects domestic output. Higher commodity prices should theoretically increase national income when marginal propensities to export and invest are positive, as developing economies like South Africa typically specialize in primary commodities, making export revenues sensitive to changes in international pricing (Amusa, 2019). Therefore, according to the Solow framework, short-term growth is boosted by rises in export commodity prices, particularly in nations where domestic absorption is less than domestic income (Deaton & Miller, 2020). However, these positive effects may be limited by resource-based economies' high import dependency and poor supply responsiveness, which could lead to erratic growth responses to changes in commodity prices globally (Arezki et al., 2022).

The Prebisch-Singer Hypothesis, which offers a structuralist viewpoint and contends that the long-term trend of primary commodity prices is downward in comparison to manufactured items, complements the Neoclassical Solow Growth Model (Baffes & Kabundi, 2020). For economies that rely significantly on commodity exports, this results in worsening terms of trade, suggesting that long-term economic growth may be adversely impacted despite sporadic commodity booms (Taiwo, 2023). The reality that commodity exporters have slower technical advancement, fewer productivity spillovers, and higher price volatility in comparison to manufacturing-based economies lends credence to Prebisch and Singer's argument (Cuddington & Jerrett, 2019).

The Dutch Disease Model, a third theoretical framework, describes how resource discoveries or commodity price changes may paradoxically impede long-term growth by raising real exchange rates and reducing manufacturing sector competitiveness (Mohaddes & Pesaran, 2021). Foreign currency inflows increase when commodity prices rise, boosting the local currency and directing resources away from tradable industries like manufacturing and into the burgeoning commodities sector (Arezki et al., 2022). Dutch disease effects are still common in resource-dependent economies, particularly in Sub-Saharan Africa, where commodity booms have frequently been accompanied by declining manufacturing output and increased macroeconomic volatility (Kojo, 2018). The idea emphasizes that commodity-driven growth may remain unsustainable in the absence of robust institutional frameworks, investments in human capital, and economic diversification initiatives (Mohaddes & Pesaran, 2021).

2.2. Empirical Review

Prior studies examining the link between commodity prices and economic expansion have shown conflicting findings in various economies and eras. According to a number of studies, depending on the kind of commodity, the degree of diversification of the economy, and the short- versus long-term vision, changes in commodity prices can have both positive and negative effects on GDP. Using the ARDL technique, Abebrese et al. (2017) examined Ghana and Côte d'Ivoire and discovered that while commodity prices were mostly irrelevant for both long-run and short-

run growth in Côte d'Ivoire, increased cocoa prices had a significant inverse influence on long-term growth in Ghana. In line with the "resource curse" theory, Collier and Goderis (2012) found that while commodity price booms have a beneficial short-term impact on exporters' output, they have long-term negative consequences for non-agricultural goods. Other studies with an African focus, like Tiawara (2015) and Olakojo (2015) demonstrated that although increases in commodity prices can boost economic growth, the effects are frequently inelastic and transient, underscoring the vulnerability of commodity-dependent economies because of their low diversification and limited ability to adapt to price shocks.

Empirical research in South Africa has concentrated on the fiscal channels through which commodities affect growth, as well as the macroeconomic influences of product-price volatility. Loate (2025) finds that commodity-price booms are linked to fiscal windfalls, particularly in corporate income tax revenues. Taiwo (2023) confirms long-run co-movement between global commodity-market volatility and South Africa's GDP, suggesting that resource dependence can support growth-supporting fiscal capacity. Studies from analogous contexts show that ARDL bounds testing is useful for capturing long-run and dynamic effects with mixed-order integrated variables, despite its limited use in South Africa.

2.3. Gap in Empirical Literature and Development of Hypotheses

Despite there being a solid theoretical basis connecting commodity prices to long-term economic growth in resource-rich economies such as South Africa, empirical research is still equivocal and fragmented, leaving a significant gap that needs to be filled. First, rather than focusing on specific channels like coal, gold, and platinum group metals (PGMs), many current studies concentrate on broad commodity indexes or aggregate volatility, even though various commodities may have quite distinct effects on the South African economy (Wanzala, 2024).

Secondly, this study acknowledges recent South Africa-specific ARDL studies while clarifying how the current research advances the literature. For example, studies such as the one by Wanzala (2024), which examined the relationship between economic performance and energy prices in South Africa using an ARDL bounds testing approach, and Amusa (2019), which investigated the effect of electricity prices on economic growth in South Africa through the ARDL framework, provide important evidence on price-growth dynamics within the South African economy. Additionally, while these previous studies focused mainly on either energy prices or electricity prices, the current study broadens this knowledge by analyzing the long-run relationship between aggregate commodity price movements and the growth of the South African economy, thus delivering a more comprehensive macroeconomic perspective of how fluctuations in commodity prices that are exported internationally affect the growth of a developing country dependent on commodities for its economy. Moreover, past literature has focused on specific sectors when examining the association between price and economic growth; therefore, the current study will include a wider range of products exported on the world market when collecting updated data to examine this relationship through the use of the ARDL bounds testing methodology.

Also, views on the impact of volatility are divided. While some studies (Takentsi, Sibanda, & Hosu, 2022) conclude that long-term growth is adversely affected by commodity price volatility, others contend that the degree of commodity dependence can both boost growth and increase volatility. Lastly, dynamic econometric models rarely incorporate institutional and structural characteristics unique to South Africa, such as the mining sector's diminishing GDP share, deindustrialization, and currency rate pressures (Khobai, Mugano, & Le Roux, 2017). These gaps highlight the need for a more nuanced empirical analysis of how individual commodity prices (gold, PGM, coal) influence growth of the South African economy in the long run, accounting for both levels and volatility, using a robust econometric method such as ARDL bounds testing.

Based on these gaps, the following hypotheses can be developed.

- *H₁: There is a significant positive long-run correlation between the real price of gold and South Africa's GDP.*

- H_2 : The real prices of platinum-group metals (PGMs) are positively cointegrated with South Africa's GDP in the long run.
- H_3 : The price of coal has a long-run, positive, significant impact on South Africa's economic growth.

3. STUDY METHODOLOGY

3.1. Model Specification and Theoretical Framework

Using an empirical framework, this study will present evidence on the long-term relationship between commodity prices (coal, gold, and platinum group metals) and the growth of the South African economy. The theory driving this research is rooted in established economic growth theories, specifically the neoclassical growth theory, which suggests that GDP is determined by capital accumulation, labour, technological advancement, and the pricing of factors of production (Arezki et al., 2022). Therefore, under the neoclassical economic growth model, fluctuations in commodity prices in resource-rich countries like South Africa significantly impact their Gross National Income through the effects of terms of trade, investment incentives, and export revenues (Baffes & Kabundi, 2020). In other words, the neoclassical growth model acknowledges that external price shocks will alter GDP in resource-reliant economies, as demonstrated by research conducted within analyses of commodity and economic growth relationships (Wanzala, 2024).

The model by Hilya (2022), adopted in this study with certain adjustments made as outlined below, is based on the framework of the neoclassical economic growth model. The research employed the Pesaran, Shin, and Smith (2001) ARDL model. The ARDL framework has many advantages over other time-series methods for examining macroeconomic variables, as it can include both types of series (I(0) and I(1)) if they are not I(2), and requires fewer observations to obtain reliable estimates of short- and long-term elasticities.

The study utilizes 31 annual observations, which are considered adequate for applying the ARDL technique. According to Pesaran et al. (2001), the ARDL technique performs reliably even in relatively small samples, with a minimum of approximately 30 observations generally regarded as acceptable for mixed I(0)/I(1) processes. Therefore, the sample of 31 observations employed by the study is sufficient despite the inclusion of six regressors ($k = 6$), and it satisfies the minimum requirements for obtaining efficient and unbiased long-run estimates within the ARDL framework.

Formally, a simplified economic growth model is expanded by incorporating commodity price indices and other control variables that are deemed to affect long-term output. The dependent variable in the ARDL model is real Gross Domestic Product (GDP), and the main independent variables are the Real Gold Price (RGP), the PGMs Price Index, and the Coal Price (CP). To account for other macroeconomic factors that also impact long-term economic growth and to eliminate any potential omitted variable bias, standard control variables are included in this study: Trade Openness (TO), Real Investment (RINV), which is gross capital formation, and the inflation rate (INFL) (for the purpose of measuring macroeconomic stability). Each of these control variables is hypothesized to exert an influence on Economic Output in combination with the effects of the commodity prices. The addition of control factors in the ARDL approach is consistent with the consensus in the literature regarding the necessity of using comprehensive model specifications. Also, since the inflation variable is expressed in percentage form and may contain negative or small values, it was not log-transformed in the model specification. Consequently, the estimated inflation coefficient should be interpreted as a semi-elasticity, implying that a one-percentage-point increase in inflation is associated with a proportional change in economic growth, holding other variables constant.

The ARDL representation for this study can be expressed as:

$$\begin{aligned} \Delta \ln \text{RGDP}_t &= \alpha_0 + \sum_{i=1}^p \beta_{1i} \Delta \ln \text{RGDP}_{t-i} + \sum_{i=0}^{q_1} \beta_{2i} \Delta \ln \text{RGP}_{t-i} + \sum_{i=0}^{q_2} \beta_{3i} \Delta \ln \text{PGM}_{t-i} \\ &\quad + \sum_{i=0}^{q_3} \beta_{4i} \Delta \ln \text{CP}_{t-i} + \sum_{i=0}^{q_4} \beta_{5i} \Delta \ln \text{TO}_{t-i} + \sum_{i=0}^{q_5} \beta_{6i} \Delta \ln \text{RINV}_{t-i} \\ &\quad + \sum_{i=0}^{q_6} \beta_{7i} \Delta \ln \text{INFL}_{t-i} + \phi_1 \ln \text{RGDP}_{t-1} + \phi_2 \ln \text{RGP}_{t-1} + \phi_3 \ln \text{PGM}_{t-1} + \phi_4 \ln \text{CP}_{t-1} \\ &\quad + \phi_5 \ln \text{TO}_{t-1} + \phi_6 \ln \text{RINV}_{t-1} + \phi_7 \ln \text{INFL}_{t-1} + \varepsilon_t \end{aligned} \quad (1)$$

Where Δ is the first difference operator, $\ln$ represents the application of a natural logarithm for the interpretation of elasticity; p and q represent the optimal lag lengths based on various information criteria (for example, AIC/BIC); and ε_t symbolises the residual term (error). The variables represent long-term relationships. The coefficients on the lag levels of the variables and the cointegration test done with the bounds test both verified that the variables were cointegrated. Once cointegration was verified, the model could then be reconfigured to an error correction model (ECM) that would provide estimates of their short-term dynamics and response time in adjusting back to long-term equilibrium levels following any shocks.

3.2. Definitions of Variables and Prior Expectations

The Real GDP (RGDP): Gruss and Kebhaj (2019) defined it as the total monetary value of goods and services produced within a country's borders, for instance, in South Africa. In this study, the variable is a dependent variable. Real Gold Price (RGP) is the inflation-adjusted amount of gold received by South African exporters. A long-run positive effect on real GDP is expected with a high global price for gold. South Africa, being a major exporter, provides gold; a high price will lead to greater export income, greater foreign reserves, and an increase in real GDP (Zahonogo, 2018). PGM Price Index is the composite price index of platinum group metals (i.e., Platinum & Palladium), providing the global price value of both metals; PGM prices impact our economy because PGMs are major exports, and any increase in prices represents a corresponding increase in the dollar amount of total national income (Badeeb, Lean, & Clark, 2022). Coal price (CP) refers to the inflation-adjusted international price of thermal or metallurgical coal, with an expected positive impact on RGDP, particularly regarding export revenue and heating markets or energy-sector income in the long-run model (Badeeb et al., 2022). Trade Openness, which was computed as the addition of imports and exports as a percentage of GDP, serves as a proxy for the level of a country's integration into the global marketplace, with an expected positive impact on RGDP, as opening to trade provides opportunities for expanded markets, greater efficiency, and improved technology, although the extent of the positive impacts can vary (Nguyen & Su, 2021). Real Investment (RINV) refers to Gross capital formation (inflation-adjusted), which is investment in physical capital. A positive relationship between RINV and RGDP is expected because the Neoclassical Growth Theory indicates a positive relationship between RINV and Real GDP, as increased physical capital will lead to an increase in productive capacity (Cuddington & Jerrett, 2019). Inflation Rate (INFL), which is a measure of macroeconomic stability. In the long run, high INFL is expected to have a negative impact on GDP growth, due to price distortion from high inflation leading to decreased investment and savings (Kojo, 2018).

3.3. Data Sources

The research was undertaken at a macroeconomic level, utilizing annual data spanning the period from 1994 to 2024. To ensure that research data are both reliable and consistent, they were collected from reliable international and national statistical databases. Annual data include information on real GDP (TO), trade openness, real investment (RINV), and inflation rate (INFL). The secondary data were collected from the World Bank database, which is the most widely used and standardized dataset for macroeconomic time series in South Africa and the world. The real gold price (RGP) and platinum group metals (PGM) price index were from the IMF Database. The coal price (CP) series was taken from the World Bank Global Commodity Markets database and supplemented with data from the International Energy Agency (IEA) to provide consistency between the data collected.

3.4. Techniques of Estimation

The study employed a robust technique to explore the long-term association between commodity prices, specifically gold, platinum group metals (PGMs), and coal, and the growth of the South African economy through the application of the ARDL model. The estimation procedures adopted were guided by the theoretical foundations underlying the relationship, as well as the statistical properties of the variables under investigation. Annual time-

series data for real GDP, used as an indicator of economic growth, together with international commodity prices, were converted into natural logarithmic form to minimise heteroscedasticity, lessen data skewness, and enable the estimated coefficients to be interpreted as elasticities. To provide accurate interpretations of the relationships between the variables, it was necessary first to understand the characteristics of the stochastic properties of the data. Failure to do this could result in misleading conclusions from the analysis or spuriously high results from regression analysis, which are frequently encountered in the analysis of macroeconomic time-series data (Stevens & Vermeulen, 2024).

First, when estimating, one needs to check whether variables are stationary using unit root tests. Gujarati and Porter (2014) said that stationarity means a series' mean, variance, and autocovariances do not change over time, which is important for correct econometric analysis. Most economic variables, like GDP and commodity prices, are usually not stationary at first because of trends and changes in the economy. If you use series that are not stationary without changing them first, you might get misleading regression results. You might see high explanatory power even if there is no actual economic link. To avoid this, we use the Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) tests for unit roots. These are commonly used in research. The PP and ADF tests will determine the integration order for each series, i.e., whether a variable contains a unit root or has become stationary after differencing at least once, i.e., becomes stationary after taking first differences ($I(0)$). The null hypothesis of both the ADF and PP tests is that all series have a unit root, while the alternative hypothesis states that all series are stationary.

The ADF Test incorporates lagged differences of the dependent variable to control for higher-order serial correlation, whereas the PP Test applies a non-parametric method to adjust for serial correlation and heteroscedasticity in the error terms across all tests. The ADF Test requires that all errors from the ADF Test are homoscedastic and normally distributed; therefore, the PP Test is used to ensure the validation of the ADF Test. The selection of lag is based on SIC and AIC to balance between the goodness of fit and parsimony of each model. Finally, establishing that there are no variables that are integrated of order two ($I(2)$) is necessary before the existence of cointegration can be established using ARDL bounds testing.

The assessment for cointegration was first determined by establishing whether the series displayed integration properties through the ARDL bounds test established by Pesaran et al. (2001). It has been well established through economic theory that there are multiple ways commodity prices can impact growth, including through export revenues, investment, and employment, especially in primary-resource-endowed economies such as South Africa. Therefore, determining whether such theoretically based dependencies exist in the long term is necessary through cointegration analysis. The ARDL approach was selected for this study as it accommodates variables with mixed orders of integration, $I(0)$ and $I(1)$, and also performs well with small sample sizes that are typically seen in macroeconomic studies of developing economies.

Once cointegration is established, the estimation of the long-run as well as the short-run dynamics is performed using the ARDL model. The coefficients of the long-run elements will reveal the equilibrium relationship between GDP and commodity prices, showing how variation in commodity prices, for example, would affect the level of economic growth over time, which would take into account the long-run effects of price increases/decreases on economic growth due to variations in gold prices, PGM prices, or coal prices. The analysis of the short-run dynamics can be performed using the Error Correction Model (ECM), which includes the term for error correction (ECT). This term will give us the measure of how quickly the errors from long-run equilibrium will be corrected after the short-term disturbance has taken place.

The study investigated the direction of causation between commodity prices and the level of economic activity using Granger Causality Tests. These tests allow the researcher to evaluate whether the previous period's values of commodity prices have any predictive function on the level of GDP or vice versa. As such, determining whether commodity prices cause growth to occur in South Africa will enable the development of a more complete policy interpretation. If the analysis indicates a one-way causal relationship from commodity prices to GDP, then external developments are likely the main driver of growth in South Africa. On the other hand, if there is evidence of a two-

way relationship between the two variables (i.e., GDP has an impact on commodity prices and vice versa), this indicates a feedback effect from commodity prices to GDP; this feedback may occur due to changes in demand, investment, or the value of the exchange rate. As such, the findings of the Granger Causality Tests provide further understanding of how growth and commodity prices impact each other over time and complement the findings of the ARDL estimates.

Finally, the reliability and adequacy of the ARDL model will be assessed through diagnostic and stability testing. These include tests for the normality of residuals using the Jarque-Bera Test, serial correlation using the Breusch-Godfrey LM Test, and heteroscedasticity using the Breusch-Pagan-Godfrey Test. Valid statistical inference requires that the model meet the Classical Regression Assumptions (Gujarati & Porter, 2014). CUSUM stability tests are used to determine whether the estimated parameters are stable throughout the sample period. Stability in models estimating commodity prices is important due to global shocks, structural change, and policy regime shifts. These methods of estimation produce a solid and comprehensive means for determining the effect of commodity price changes on South African Economic Development in both the long and short run.

4. RESULTS AND INTERPRETATIONS

4.1. Descriptive Statistics

Descriptive statistics are depicted in Table 1, which summarises the statistical properties of all factors employed in the research. The table provides details on mode, median, mean, variability, and normality of the data distribution.

Table 1. Descriptive Statistics; 1994–2024.

Statistic	RGDP	RGP	PGM	CP	TO	RINV	INFL
Mean	2.98	1396.42	131.18	94.44	54.62	22.26	5.96
Median	2.84	1288.93	126.54	79.80	50.20	20.02	5.18
Maximum	4.94	2162.34	198.78	159.43	71.82	29.46	12.01
Minimum	-4.37	701.44	72.44	39.86	38.25	14.42	1.96
Std. Dev.	2.39	344.16	39.24	29.32	6.61	3.21	2.32
Skewness	-0.77	0.38	0.68	0.49	0.29	0.22	0.68
Kurtosis	4.12	2.22	2.94	2.46	2.28	1.98	3.64
Jarque-Bera	4.91	2.06	3.28	1.98	0.78	1.18	4.24
Probability	0.067	0.294	0.142	0.296	0.488	0.522	0.043
Sum	95.43	38,842.6	4,012.4	3,256.4	1,687.6	482.2	172.6
Sum Sq. Dev.	169.5	2,984,184	52,082	29,822	1,742	342.6	152.2
Observations	31	31	31	31	31	31	31

Note: The variable labelled “RGDP” in Table 1 represents the annual economic growth rate (%) of real Gross Domestic Product in South Africa rather than absolute real GDP levels. Therefore, the reported negative minimum value (-4.37) and mean value (2.98) reflect fluctuations in yearly economic growth performance over the study period.

The mean Real GDP is 2.98, with a standard deviation of 2.39, indicating moderate dispersion and growth over the long term. Also, commodity price variables typically depict more variability than Real GDP does over time. For example, the PGM price index has a mean value of 131.18 and a standard deviation of 72.44, and the Real Gold Price has an average of 1396.42 and a standard deviation of 344.16. These results are consistent with the well-established cyclical and shock-sensitive nature of mineral market prices. Coal prices show positive skewness (skewness = 0.49) and leptokurtic characteristics (kurtosis = 2.46), which are consistent with the discovery of periods of extreme price spikes in recent years due to worldwide disruptions in the energy markets. The variability of trade openness (mean = 54.62% and standard deviation = 6.61%) and the Jarque-Bera p-value ($p = 0.78$) for trade openness reveal that a near-normal distribution exists.

Inflation has a moderate right skew (value of 0.68), and borderline non-normality ($p = 0.043$) suggests that there was a sample of inflation over a limited time frame. The majority of the variables in this sample have Jarque-Bera probabilities greater than 0.05, indicating approximate normality, thereby establishing reliable estimation properties for ARDL coefficients. Additionally, the observed commodity price volatility (reported standard deviations of all

commodities compared to Real GDP) provides support for the resource-growth transmission theory, which argues that the movement of commodity prices can influence output through export earnings, investment, and government revenue channels (Arezki & Matsumoto, 2023; Badeeb et al., 2022). Furthermore, prior studies have shown that the volatility of mineral prices has had a substantial impact on the growth trajectories of countries that are dependent upon expected mineral resources, such as South Africa (Nkalu & Edeme, 2024; Phiri, 2023).

4.2. Correlation of Variables

Results are presented below. Table 2 presents the association of specified factors in the model.

Table 2. Correlation Matrix.

Variables	RGDP	RGP	PGM	CP	TO	RINV	INFL
RGDP	1						
RGP	0.58	1					
PGM	0.60	0.64	1				
CP	0.39	0.29	0.33	1			
TO	0.49	0.34	0.38	0.46	1		
RINV	0.69	0.49	0.44	0.37	0.52	1	
INFL	-0.29	-0.22	-0.18	0.05	-0.27	-0.31	1

As per the results of Table 2 above, Real GDP has a strong positive relationship across a majority of commodity price variables & growth controls. Real GDP and gold prices are positively correlated ($r=0.58$), and Real GDP is also positively correlated with the PGM price index ($r=0.60$), which leads one to conclude that as gold prices increase, Real GDP increases in South Africa, and the same can be said for PGMs; therefore, they have a high correlation or co-movement effect on each other. Coal prices are positively associated with GDP ($r=0.39$), but do not have as large a co-movement with GDP as gold prices and PGMs do. Real investment is positively correlated with Real GDP ($r=0.69$), indicating that, per growth theory, capital formation is a primary driver of long-run output. Additionally, trade openness is positively associated with Real GDP ($r=0.49$), thereby providing support for the openness-growth linkages. Inflation is negatively correlated with Real GDP ($r=-0.29$); therefore, as macroeconomic instability increases, growth performance decreases. Correlations between commodity prices are moderate (Gold-PGM = $r=0.64$) because there is commonality between their global demand and financial markets; however, all of the above correlations are below multicollinearity concerns ($r<0.80$). These results support theories of commodity price movements having a positive influence on output via export earnings, investment growth, and fiscal channels (Arezki & Matsumoto, 2023).

4.3. PP and ADF Unit Root Test Results

The study utilized the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to examine the stationarity properties of the time series data. The findings at both levels and first differences are presented in Tables 3 and 4.

Table 3. At Level Series: PP and ADF.

Variables	ADF Test Statistic	ADF p-value	PP Test Statistic	PP p-value	Order of Integration
LRGDP	-1.99	0.19	-1.92	0.22	(Non-stationary)
LRGP	-2.18	0.17	-2.30	0.19	(Non-stationary)
LPGM	-2.01	0.274	-1.97	0.256	(Non-stationary)
LCP	-2.30	0.194	-2.26	0.189	(Non-stationary)
LTO	-3.44**	0.015	-3.51**	0.010	I(0)
LRINV	-1.95	0.241	-2.02	0.229	(Non-stationary)
INFL	-3.35**	0.009	-3.41**	0.012	I(0)

Note: ** denote significance at the 5% level.

Table 4. First Difference: PP and ADF.

Variables	ADF	p-value ADF	PP	p-value PP	Integration Order
Δ LGDP	-4.97***	0.001	-4.89***	0.001	I(1)
Δ LRGP	-5.04***	0.001	-4.92***	0.001	I(1)
Δ LPGM	-4.78***	0.000	-4.99***	0.001	I(1)
Δ LCP	-5.14***	0.000	-5.19***	0.000	I(1)
Δ LRINV	-5.25***	0.001	-5.12***	0.001	I(1)

*Note: Δ denotes first difference. *** denotes significance at the 1% level.

According to both Phillips-Perron and ADF tests for unit roots, most series, including real GDP, gold prices, platinum group metal prices, coal prices, and real investments, are non-stationary at levels but stationary when first differenced; therefore, they are I(1), whereas the series for trade openness and inflation are I(0). Since the results of the ADF and PP tests agree with each other, this gives further credence to the stationarity classification and indicates that none of the variables are I(2), which provides justification for using the ARDL bounds-testing approach. ADF test results show mixed orders of integration, which fit with the theory of ARDL, allowing for estimation where regressors have a mixture of I(0) and I(1) processes (Balsalobre-Lorente, Shahbaz, Roubaud, & Farhani, 2023). The resource-growth relationship and the transmission of commodity prices indicate that both macroeconomic and commodity-price time series are generally dominated by trend components and become differenced, or stationary, due to changes in global pricing cycles and structural changes in resource markets (Mensah & Adu, 2021).

4.4. ARDL Regression Model

The choice of the appropriate lag length when estimating an autoregressive distributed lag (ARDL) model is a major step because the number of lags chosen has a direct impact on the reliability and stability of the short-run and long-run estimates of the model. If the selected lag length has too few lags, then the ARDL model may be subject to omitted dynamic structure and autocorrelation in the residuals, while too many lags will result in a reduction in the degrees of freedom and inefficient parameter estimates. The best lag structure for the variables in this study was determined using the AIC, which is the best measure of model fit because it provides a good balance of fit and parsimony, especially when working with relatively small sample sizes (e.g., $n = 31$) (Pesaran et al., 2001). After establishing the optimal maximum lag length for each variable, the subsequent stage in estimating the long-run equilibrium relationship involves performing the F-test of the ARDL technique to determine cointegration. This test evaluates the joint significance of the lagged level terms to determine whether a stable long-run relationship exists among the variables. Cointegration is established when the calculated F-statistic is greater than the upper-bound critical value.

Table 5. Bounds Test results.

F-statistic	Value=15.18	K=6
Critical Value Bounds (k = 6)		
Significance Level	I(0) Bound	I(1) Bound
At 10%	2.12	3.23
At 5%	2.45	3.61
At 2.5%	2.75	3.99
At 1%	3.15	4.43

F-test ARDL bounds test results presented in Table 5 show that the estimated F-statistic of 15.18 exceeded the upper-bound critical values for $k = 6$ at the 1%, 2.5%, 5%, and 10% significance levels. Next, one can estimate the coefficients of the long-run and Error Correction Models (ECM), which depict the short-run dynamics and the rate of adjustment to long-run equilibrium.

Table 6. Long-Run ARDL Results.

Variables	Coefficient	Std. Error	t-Statistic	Probability
RGP	0.242	0.059	2.67***	0.002
PGM	0.321	0.082	3.65***	0.004
CP	0.114	0.049	1.98**	0.028
TO	0.133	0.051	3.32***	0.003
RINV	0.346	0.072	3.66***	0.002
INFL	-0.088	0.031	-3.42***	0.000
Constant	1.278	0.546	3.59	0.002

Note: The signs ** and *** denote statistical significance at the 5% & 1% levels, respectively.

The results presented above in Table 6 show that RGP, PGM, CP, TO, RINV, and INFL significantly impact economic growth. These long-run estimates of the ARDL model indicate that commodity prices are an important factor in determining the growth of South Africa's economy. This result supports the hypothesis outlined by commodity-led growth theory, as well as the terms of trade. A rise in the gold price will have a significant positive impact on South Africa's GDP (real gold price coefficient = 0.242). This finding is coherent with the commodity-expert-led growth hypothesis, which states that a higher price of exported commodities leads to an increase in national income, government revenue, and foreign exchange earnings (Gruss & Kebhaj, 2019).

The PGMs price index has the largest positive long-run coefficient (0.321) of any of the commodity variables, which is economically logical because South Africa has an internationally dominant position in PGM production. The increase in the price of PGMs tends to increase mining output, export receipts, employment, and investment in infrastructure related to extraction. Recent results similar to those of this study have found that strategic mineral price booms positively contribute to long-term output levels in resource-abundant countries, as shown by findings from panel as well as country-specific studies (Zahonogo, 2018).

Coal prices also show positive long-run effects (coefficient = 0.114), although the effect is much smaller, suggesting that energy-based commodity exports play a supporting role in economic growth. Real investment (gross capital formation) has the largest positive coefficient of 0.346 among the control variables; this supports endogenous growth theory, which claims that capital accumulation is a primary contributor to long-term growth (Badeeb et al., 2022). Trade openness also produces a positive and significant coefficient of 0.133; this supports open-economy growth theory by claiming that integration into the international economy supports growth through increased productivity and technology transfer (Nguyen & Su, 2021). The coefficient for inflation is negative at -0.088, while still proving to be significant, thereby implying that macroeconomic inflation is detrimental to future economic growth; this is consistent with the findings of monetary growth theory as well as empirical data from newly developing countries.

Table 7. Short-Run results using ARDL.

Variables	Coefficient	Std. Error	t-Statistic	Probability
Δ RGP	0.069	0.031	2.38**	0.021
Δ PGM	0.109	0.032	2.63**	0.012
Δ CP	0.095	0.041	2.23***	0.005
Δ TO	0.078	0.031	2.41**	0.022
Δ RINV	0.131	0.041	3.82***	0.001
Δ INFL	-0.038	0.023	-2.36**	0.021
ECM(-1)	-0.59	0.10	-8.00***	0.000

Note: Symbols *** and ** indicate levels of significance at 1% & 5%, respectively.

In the short term, higher prices for gold, platinum group metals (PGMs), and coal all have a positive effect on GDP growth, although these responses are less than those in the long term. This shows that there is a partial, but not immediate, adjustment in the association of economic growth and commodity prices. Short-term impacts are

usually through: (i) fiscal, (ii) mining sector profit, and (iii) export earnings (Shahbaz, Balsalobre-Lorente, & Sinha, 2022). Also, $ECM = -0.59$ shows that it is negative and highly statistically significant, indicating that there is co-integration and a 59 percent adjustment each period back to long-term equilibrium following a shock.

The relatively fast speed of adjustment indicates that shocks to commodity prices will quickly affect South African economic performance because of the strong institutional and financial linkages of the mining industry to the rest of the economy.

According to Badeeb et al. (2022), macroeconomic stability and capital formation are both important conditions for converting gains in commodity prices into real growth outcomes. The short-run results are coherent with modern extensions of the resource-based growth model, which suggest that institutions, macroeconomic stability, and investment channels determine the growth benefits from commodity price booms (Badeeb et al., 2022).

4.5. Diagnostic Checks

The diagnostic results are presented in Table 8. They were undertaken to verify the reliability and robustness of the statistical inferences derived after establishing long-term and short-term associations among the study variables. For the normality assessment, the Jarque–Bera test was applied, yielding a probability of 0.80321, which means there is a normal distribution and leads to the acceptance of H_0 . In addition, serial correlation (Breusch–Godfrey test) was employed to examine autocorrelation.

The results (Observed R-squared = 2.64214; probability = 0.24251 > 0.05) show that there is no serial correlation, and H_0 was accepted. The results of the heteroskedasticity-White test produced an Observed R-squared value of 30.1821, $P(\text{Chi-squared}) = 0.5214 > 0.05$, whereby the acceptance of H_0 constitutes homoscedastic residuals and indicates that misspecification is not present in the estimated model.

In relation to testing for constant variance, homogeneity of variance was concluded, as H_0 of having equal variances can be accepted based on the test results.

Table 8. Diagnostic Tests.

Test	H_0 hypothesis	Test statistic	P-Value	Conclusion
Normality Test (Jarque-Bera)	H_0 : Normally distributed Residuals	0.84532	0.80321	Normally distributed Residuals.
Breusch-Godfrey Serial Correlation LM Test	H_0 : Residuals are not autocorrelated	Observed $R^2 = 2.64214$	Probability $\text{Chi}^2 = 0.24251$	No auto-correlation dictated from the residuals.
White Test: Heteroskedasticity	H_0 : No heteroscedasticity	Observed $R^2 = 30.1821$	Probability $\text{Chi}^2(31) = 0.5214$	No heteroscedasticity

4.6. Stability Test

The results from two stability tests were analyzed, namely, the CUSUM test and the CUSUM of squares test. The results are presented in Figure 1 and Figure 2, respectively. The model is reported to be stable at the 5% significance level based on both tests (CUSUM squares and CUSUM) because the cumulative sum remained inside the critical lines in Figure 1 and Figure 2.

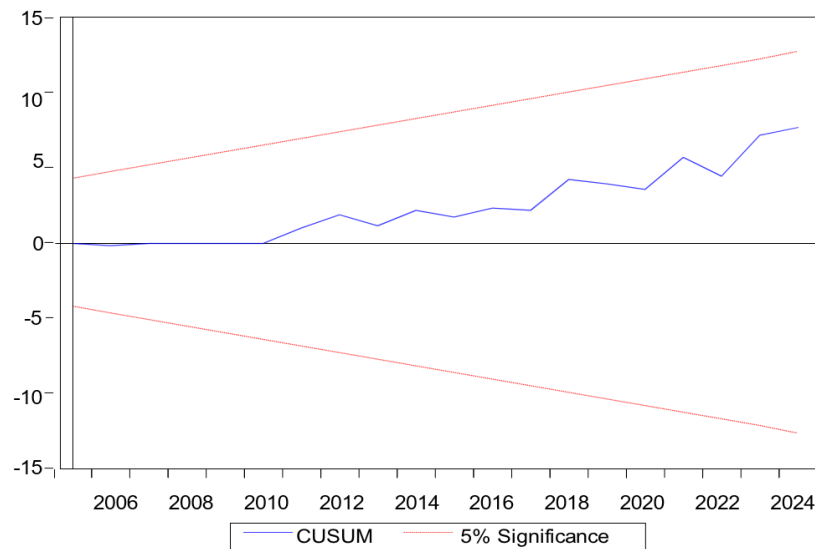


Figure 1. CUSUM test.

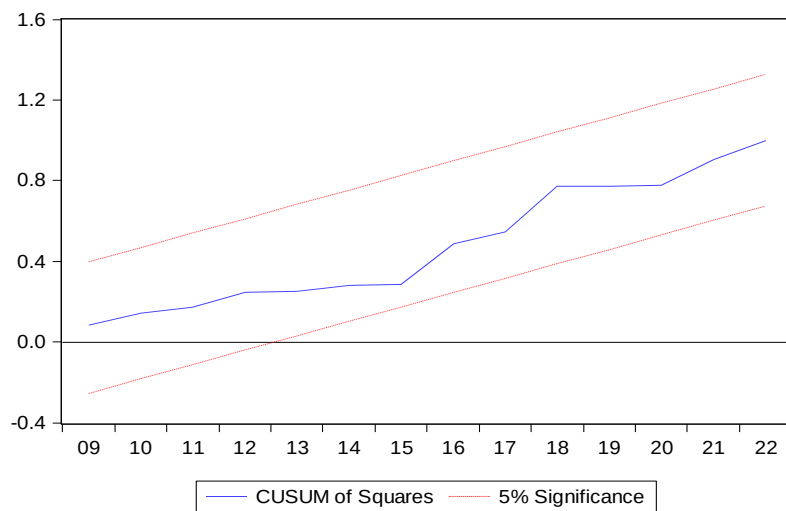


Figure 2. CUSUM of Squares Test.

Table 9. Causal Relationships between Commodity Prices and Economic Growth.

H ₀ Hypothesis (Short-Run Causality)	Statistic	Prob. Value	Decision	Direction of Causality
RGDP is not Granger-caused by RGP	5.21	0.021	Reject H ₀	RGP → RGDP
RGP is not Granger-caused by RGDP	1.52	0.267	Fail to reject H ₀	No reverse causality
RGDP is not Granger-caused by PGM	4.87	0.002	Reject H ₀	PGM → RGDP
PGM is not Granger-caused by RGDP	1.02	0.344	Fail to reject H ₀	No reverse causality
RGDP is not Granger-caused by CP	3.67	0.041	Reject H ₀	CP → RGDP
CP is not Granger-caused by RGDP	0.81	0.412	Fail to reject H ₀	No reverse causality
RGDP is not Granger-caused by TO	5.41	0.022	Reject H ₀	TO → RGDP
RGDP is not Granger-caused by RINV	6.42	0.003	Reject H ₀	RINV → RGDP
RGDP is not Granger-caused by INFL	4.34	0.033	Reject H ₀	INFL → RGDP

4.7. Granger Causality Results

According to the Granger causality results from Table 9, commodities (real gold prices, platinum group metals (PGM), and coal) lead to South Africa's RGDP through strong unidirectional short-term effects but do not experience reverse causality effects from GDP to commodity prices. Thus, commodities can be characterized as exogenous drivers of growth in a resource-dependent economy consistent with the hypotheses of either commodity-led growth or export-led economic growth. The evidence of long-run Granger causation of commodities (price movements) and

macroeconomic control variables (trade openness, real investment, and inflation) indicates a permanent long-term equilibrium relationship between commodities and GDP. The findings are consistent with several recent studies that demonstrate the impact of mineral and energy price cycles on commodity-producing countries via trade revenue, fiscal flow, and investment responses (Arezki et al., 2022; Baffes & Kabundi, 2023; Demirer, Ferrer, & Shahzad, 2021). Furthermore, these results are consistent with structural growth theory and frameworks describing dependence on resources found in minerals and energy markets, which contend that the price shocks resulting from commodity cycles have a direct impact on the formation of capital, foreign exchange earnings, and macroeconomic stability, all of which shape the long-term growth path of emerging markets, such as South Africa (Shahbaz et al., 2022).

5. CONCLUSION AND RECOMMENDATIONS

It has been concluded that there is a long-term relationship between GDP and the prices of commodities (RGP, PMG and CP) in South Africa. The results support the Resource Growth Nexus and Export-Led economic growth theories, whereby RGP and PMG have a positive long-run impact on RGDP (Ndoricimpa, 2017). This supports South Africa's dependence on mineral exports for foreign exchange, tax revenue, and jobs. Coal prices also show a significant long-run effect on GDP, underscoring coal's role in supporting industrial production and energy security, although this effect is increasingly constrained by environmental considerations and global energy transitions. Trade openness and real capital investment contribute positively to economic growth and are consistent with the Endogenous growth theory, whereas inflation has a negative influence and reflects the importance of having a stable macroeconomic environment in place to foster the growth of the South African economy (Bekun, Alola, & Sarkodie, 2021).

To continue leveraging commodity price increases for long-term economic growth in South Africa, policymakers must take into consideration the risks associated with commodity dependence and therefore must pursue a value-added approach, along with the development of downstream industries in the Gold and PGM sectors, for not only developing industrial linkages but also reducing overall exposure to external price shocks, as demonstrated in the structural transformation literature (Apergis & Payne, 2022). In addition, although price increases in the Coal sector are expected to contribute to short- and long-term economic growth, the government should redirect investment toward cleaner, more sustainable forms of energy to create an increased growth pattern and meet long-standing global climate obligations (United Nations Conference on Trade and Development, 2023). It is also highly recommended that enhancing trade openness with diversified export markets and improved logistics efficiency will add to the economic growth resulting from increased commodity exports (Hausmann, Hwang, & Rodrik, 2007).

The positive effects of real investment and the negative impact of inflation create a clear necessity to have complementary macroeconomic policies in place. Developing infrastructure, mining technology, and human capital through sustained public and private investment is critical to transform commodity price increases into long-run economic growth (Asiedu & Lien, 2011). Additionally, developing credible monetary and fiscal policies that target low and stable inflation will build investor confidence and promote economic stability. Overall, the study proposes a balanced policy framework designed to maximize the dynamics surrounding commodity prices while providing diversification, macroeconomic stability, and sustainability to create resilient, long-run economic growth in South Africa.

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REFERENCES

- Abebrese, J., Pickson, R., & Abebrese, D. (2017). Commodity prices, exchange rate and economic growth: Evidence from Ghana and Côte d'Ivoire. *Journal of African Economies*, 26(5), 619–638.
- Akinsola, M. O., & Odhiambo, N. M. (2020). Asymmetric effect of oil price on economic growth: Panel analysis of low-income oil-importing countries. *Energy Reports*, 6, 1057–1066. <https://doi.org/10.1016/j.egy.2020.04.023>
- Amusa, H. (2019). Commodity price cycles and the J-curve phenomenon in South Africa. *South African Journal of Economics*, 87(3), 345–362.
- Apergis, N., & Payne, J. E. (2022). Renewable and non-renewable energy consumption–growth nexus: Evidence from a panel of countries. *Energy Economics*, 108, 105934.
- Arezki, R., Lederman, D., & Zhao, Y. (2022). Commodity prices and growth in developing economies: Reassessing the evidence. *Journal of Development Economics*, 156, 102839.
- Arezki, R., & Matsumoto, A. (2023). Commodity price cycles and economic performance in resource-rich countries. *Journal of Development Economics*, 162, 103048.
- Arif, A., Vu, H. M., Cong, M., Wei, L. H., Islam, M. M., & Niedbała, G. (2022). Natural resources commodity prices volatility and economic performance: Evaluating the role of green finance. *Resources Policy*, 76, 102557. <https://doi.org/10.1016/j.resourpol.2022.102557>
- Asiedu, E., & Lien, D. (2011). Democracy, foreign direct investment and natural resources. *Journal of International Economics*, 84(1), 99–111. <https://doi.org/10.1016/j.jinteco.2010.12.001>
- Badeeb, R. A., Lean, H. H., & Clark, J. (2022). The evolution of the natural resource curse thesis: A critical literature survey. *Resources Policy*, 79, 102992.
- Baffes, J., & Kabundi, A. (2023). Commodity price cycles and economic growth in emerging markets. *World Bank Economic Review*, 37(2), 312–330.
- Baffes, J., & Kabundi, A. (2020). Primary commodity price cycles and long-term economic performance in Sub-Saharan Africa. *World Bank Economic Review*, 34(3), 654–673.
- Balsalobre-Lorente, D., Shahbaz, M., Roubaud, D., & Farhani, S. (2023). Commodity prices, economic growth and environmental sustainability: Fresh evidence from resource-dependent economies. *Resources Policy*, 82, 103118.
- Bekun, F. V., Alola, A. A., & Sarkodie, S. A. (2021). Toward a sustainable environment: Nexus between CO₂ emissions, resource rent, renewable and nonrenewable energy in South Africa. *Science of the Total Environment*, 784, 147190.
- Collier, P., & Goderis, B. (2012). Commodity prices and growth: An empirical investigation. *European Economic Review*, 56(6), 1241–1260. <https://doi.org/10.1016/j.eurocorev.2012.04.002>
- Cuddington, J., & Jerrett, D. (2019). The long-run behavior of commodity prices: A re-examination. *Resources Policy*, 61, 13–23.
- Deaton, A., & Miller, R. (2020). Commodity prices, macroeconomic volatility, and economic development. *Journal of Economic Perspectives*, 34(2), 23–46.
- Demirer, R., Ferrer, R., & Shahzad, S. J. H. (2021). Oil price shocks, global financial markets and their connectedness. *Energy Economics*, 99, 105278.
- Department of Mineral Resources and Energy. (2025). *Report R141/2025: South Africa's mining performance 2024*. Pretoria, South Africa: Government Printer.
- Ge, Y., & Tang, K. (2020). Commodity prices and GDP growth. *International Review of Financial Analysis*, 71, 101512. <https://doi.org/10.1016/j.irfa.2020.101512>
- Gruss, B., & Kebhaj, S. (2019). *Commodity terms of trade: A new database*. IMF Working Paper No. 19/21. Washington, DC: International Monetary Fund.
- Gujarati, D. N., & Porter, D. C. (2014). *Basic econometrics* (5th ed.). Boston, Massachusetts: McGraw-Hill Education.
- Hausmann, R., Hwang, J., & Rodrik, D. (2007). What you export matters. *Journal of Economic Growth*, 12(1), 1–25. <https://doi.org/10.1007/s10887-006-9009-4>

- Hilya, N. L. (2022). An investigation on the relationship between commodity prices and economic growth in Namibia. Master's Thesis, University of Namibia. University of Namibia Repository.
- International Monetary Fund. (2025). *World Economic Outlook, April 2025: Commodity special feature—Market developments and the impact of AI on energy demand*. Washington, DC: International Monetary Fund.
- International Monetary Fund. (2026). *World economic outlook, April 2026: Global economy in a new era*. Washington, DC: International Monetary Fund.
- Khobai, H., Mugano, G., & Le Roux, P. (2017). Exploring the nexus of electricity supply and economic growth in South Africa. *International Journal of Energy Economics and Policy*, 7(4), 240–251.
- Kojo, N. (2018). Managing resource booms in developing countries: The Dutch disease revisited. *International Economics*, 155, 92–109.
- Loate, M. (2025). Commodity price booms and fiscal windfalls in South Africa: Implications for economic growth. *Development Southern Africa*, 42(1), 101–120.
- Mensah, I. A., & Adu, G. (2021). Commodity price shocks and economic growth in resource-rich African economies. *Energy Policy*, 152, 112176.
- Minerals Council South Africa. (2023). *Integrated annual review 2023*. Johannesburg, South Africa: Minerals Council South Africa.
- Mohaddes, K., & Pesaran, H. (2021). Commodity price shocks and long-run economic growth in resource-rich economies. *Energy Economics*, 97, 105181.
- Ndoricimpa, A. (2017). Threshold effects of inflation on economic growth: Is Africa different? *International Economic Journal*, 31(4), 599–620. <https://doi.org/10.1080/10168737.2017.1380679>
- Nguyen, C. P., & Su, T. D. (2021). Trade openness and economic growth: A study of developing countries. *Journal of International Trade & Economic Development*, 30(2), 1–20.
- Nkalu, N., & Edeme, R. (2024). Commodity price shocks and macroeconomic performance in African resource economies. *Resources Policy*, 88, 104210.
- Olakojo, S. A. (2015). *Export commodity prices and long-run growth of primary commodities-based African economies*. CSEA Working Paper No. WPS/15/02. Centre for the Study of the Economies of Africa.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289–326. <https://doi.org/10.1002/jae.616>
- Phiri, A. (2023). Mineral price dynamics and economic growth in South Africa: New time-series evidence. *Mineral Economics*, 36(2), 215–229.
- Shahbaz, M., Balsalobre-Lorente, D., & Sinha, A. (2022). Foreign direct investment–growth nexus and the role of natural resources. *Journal of Environmental Management*, 302, 113965.
- Stevens, M., & Vermeulen, C. (2024). Derivative markets and economic growth: A South African perspective. *Economies*, 12(11), 312. <https://doi.org/10.3390/economies12110312>
- Taiwo, O. (2023). Macroeconomic fluctuations in response to commodity price shocks: Evidence from South Africa. *Economic Modelling*, 116, 105775.
- Takentsi, R., Sibanda, M., & Hosu, I. (2022). Long-run impact of energy prices on South African economic performance: An ARDL approach. *Energy Economics*, 108, 105868.
- Tiawara, H. N. O. (2015). The effect of commodity prices on African economic growth. Master's Thesis, St. Cloud State University. St. Cloud State University Repository.
- United Nations Conference on Trade and Development. (2023). *Commodities and development report 2023: Inclusive diversification and energy transition*. Geneva, Switzerland: United Nations.
- Wanzala, R. W. (2024). Sustainability implications of commodity price shocks and economic growth in South Africa. Unpublished Master's Thesis, University of Johannesburg.
- World Bank. (2025a). *Commodity markets outlook*. Washington, DC: World Bank.
- World Bank. (2025b). *South Africa country overview*. Washington, DC: World Bank.

World Bank. (2026). *Commodity markets outlook, April 2026*. Washington, DC: World Bank Group.

Yating, Y., Mughal, N., Wen, J., Ngan, T. T., Ramirez-Asis, E., & Maneengam, A. (2022). Economic performance and natural resources commodity prices volatility: Evidence from global data. *Resources Policy*, 78, 102879. <https://doi.org/10.1016/j.resourpol.2022.102879>

Zahonogo, P. (2018). Trade and economic growth in developing countries: Evidence from Sub-Saharan Africa. *Journal of African Trade*, 5(1–2), 41–56.

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