Exploring the Influence of Commodity Prices, Real Exchange Rate and Trade Openness on Economic Performance in an Emerging Country

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Abstract

Do commodity prices, real exchange rate and trade openness influence economic growth in South Africa? This question is fundamental to academic research since it forms the basis of macroeconomic policies. Therefore, the comprehension of such a relationship is vital which has ushered this study into investigating the effect of real exchange rate, commodity prices and trade openness on economic growth in South Africa from 1984-2019. The purpose of this study is to contribute to the diverse literature on macroeconomics and international trade in the continent and the rest of the world. To achieve this, the Johansen cointegration method and Vector Error Correction Model were employed. The Johansen cointegration method confirmed the existence of a long-run relationship among the variables. Commodity prices and trade openness positively influenced economic growth while real exchange rate inversely influenced economic growth. The Vector Error Correction Model also confirmed that the disequilibrium in the model can be corrected in 1 year 9 months. The study`s findings suggest a methodical monetary policy synthesis that controls both the commodity price stability and exchange rate that spurs economic growth.

Keywords: commodity prices, economic growth, exchange, South Africa, trade openness, Vector Error Correction Model

1. Introduction

Recently, a majority of the countries worldwide have experienced economic instability due to the COVID-19 pandemic. Regrettably, the pandemic has crippled the economy of many emerging countries, South Africa included. The negative economic growth of -2.4 percent from 0.15 percent in 2020 attests to such claim (Trading Economics 2020). Economists further predict another decline in the country's economic growth to -5.8 percent by mid-2021 (Statista 2020). Such economic decline has far reaching consequences. This calls for policy makers to devise appropriate macroeconomic policies to solve the compromised economic growth. Thus, the current researchers opine that commodity prices, trade openness and commodity prices play a crucial role in resuscitating South Africa`s economy. Of importance is that the relationship among commodity prices, trade openness and exchange rate and economic growth is intertwined and cannot be overemphasised.

The macroeconomic proponents share the notion that trade openness increases the economies integration through export and importation of goods and services (Dao 2014, Gries & Redlin 2012). The proponents maintain that trade openness improves economic growth, provided the host country's inflation rate is significantly low. Moreover, Mputu (2016) posits that a combination of trade openness and stable commodity prices are a catalyst for economic development. The rationale is that stable commodity prices guarantee income from importers that in turn increase production and economic growth. Contrariwise, commodity price instability inversely influences economic growth. Furthermore, the influence of real exchange rate is twofold. On one side, a higher exchange rate makes exports more expensive and reduces the demand of local goods and services (Rodrik 2008). Instead, a lower exchange rate tends to make exports attractive which increase the demand of local goods and services that eventually increases economic growth. Though a lower exchange rate is desirable, it has a tendency of causing inflation if it is not managed. Therefore, an appropriate synthesis should be applied to achieve economic growth.

The absence of significant evidence to support the use of both devaluated or overvalued exchange rate in determining commodity prices and trade openness has elicited endless debates on how these influence economic growth. At the core of this debate was the appropriateness of using the floating exchange rate policy that appears to bring currency instability. Miyajima (2019) avers that the floating exchange rate has caused commodity price volatility in South Africa which also has a negative effect on the trade. From 2000 up to date, South Africa`s monetary authorities have implemented the flexible exchange rate policy (Muzekenyi *et al*. 2018). Flexible exchange rate is the exchange rate policy which is set by market forces (Muzhani 2018). The flexible exchange rate policy proponents contend that the policy automatically adjusts to external shocks, brings price stability and promotes financial sector stability (Habib *et al*. 2016). On the other hand, the flexible exchange rate policy antagonists postulate that the policy causes commodity prices to be intrinsically volatile and jeopardises the risk that could have been managed by both importers and exporters (Muzekenyi *et al*. 2016).

Given the perceived substantial economic contribution of commodity prices, trade openness and real exchange on economic growth, it is crucial to investigate the effects of the aforementioned variables on economic growth. The main objective is to evaluate the role of commodity prices, trade openness and real exchange on economic growth. The study was motivated by the fact that the exchange rate has been fluctuating, thereby influencing commodity prices to fluctuate as well. Thus, the researchers investigated the effect of the aforementioned variables on economic growth. Furthermore, contemporary studies have bewailed the lack of studies into this relationship (Muzekenyi *et al*. 2019, Brixiova & Ncube 2014, Nyathi 2017). Studies on these issues relationship have been criticized for being infrequent and inadequate since they form the basis of macroeconomics and international economics. According to the researchers knowledge, there is no study that has interrogated the effects of commodity prices, trade openness and real exchange rate on South Africa's economy. Thus, this study has covered this research *lacuna* by investigating the effects of commodity prices, trade openness and real exchange rate on economic growth in South Africa.

2. Literature Review

Economic analysts have propounded that real exchange rate, commodity prices and trade openness have a crucial role on economic performance. For instance, policy makers prefer the devaluation of the exchange rate since it makes local goods and services relatively cheaper compared to that of a trading partner (Ojuolape *et al*. 2015). This increases the number of goods exported and leads to an escalation in the demand for goods and services produced in a country (Zhanje & Garidzirai 2018). The increase in the demand and exports of goods generates an increase in the production of goods and services that eventually increases the number of goods and services produced in a country. On the other hand, a devalued exchange rate invokes inflation especially in the long-run (Pasara & Garidzirai 2020). This follows the notion that an increase in the demand of goods and services leads to an increase in the price of goods and services. An increase in the price of goods and services will also lead to an increase in the prices of imports relative to exports.

Supposing that the prices of both imports and exports are elastic, the devaluation of exchange rate will positively influence trade openness and ultimately improve economic growth. However, Keho and Wang (2017) argued that trade openness contributes to economic growth if the inflation rate in that country is low and stable. In this case South Africa`s inflation rate (4.6%) is considerably stable and low (Statistics South Africa 2020). Furthermore, commodity prices are important in emerging countries as they form part of significant exports and economic building. In South Africa, the most important exported commodities are raw materials such as mineral products and agricultural products (Trading Economics 2020). Economic growth is likely to increase when commodity prices are stable, while commodity price instabilities distort economic growth (Djordjevic 2019).

The relationship among these variables are twofold: complimentary and substitutability. The complimentary view states that commodity prices, trade openness and real exchange rate positively influence economic performance (Muzekenyi *et al*. 2018: Veira *et al*. 2013). Contrawise, the substitutability view shares the notion that commodity prices, trade openness and real exchange rate negatively influence economic performance (Nyathi 2017: Brixiova & Ncube 2014). A study conducted in the past two decades, revealed that real exchange rate is the macroeconomic instrument that promotes economic growth (Acar 2000). The author maintained that a depreciation in the real exchange rate increases economic growth through the manufacturing multiplier effect. Razzaque *et al* (2017) and Khomo *et al* (2020) concur and further state that a depreciation in the local currency boosts exports and eventually promotes economic growth. Furthermore, Habib *et al*. (2016) found that real exchange rate, whether it be devaluation or appreciation, positively influences economic growth. Contrary, Ehigiamusoe and Lean (2019) argued that real exchange rate has an inverse relationship on economic growth. The authors maintained that real exchange rate brings the volatility element that hampers economic growth.

Nyathi (2017), Brixiova and Ncube (2014) and Cavalcanti (2011) unearthed a bidirectional association between commodity prices and economic growth. For instance, Nyathi (2017) employed the Dynamic Ordinary Least Squares and granger causality methodologies to investigate the relationship between energy prices and economic growth in South Africa. The author found that commodity prices and economic growth granger cause each other. Similar results were found by Brixiova and Ncube (2014). A recent study by Ofori-Abebresse *et al* (2017) investigated the impact of commodity prices and exchange rate on economic growth in Ghana and Ivory Coast using the ARDL model. The authors used commodity price as a proxy of cocoa and found that higher cocoa prices reduce economic growth. Muzekenyi *et al* (2018) shares the same sentiments that commodity price instability distorts economic growth both in the short-run and long-run. The authors reached this decision after employing the Vector Error Correction Model (VECM).

Jawaid (2014) investigated the association between trade openness and economic growth in Pakistan. The study utilised the ARDL and concluded that trade openness has a positive effect on economic growth. The granger causality methodology further confirmed the trade openness and economic growth union. Using the same methodology, Malefane and Odhiambo (2018) found that trade openness positively contributes to economic growth in South Africa. Mizan (2019) carried out a panel study examining the influence of trade openness on economic growth and found that trade openness does not have an effect on economic growth. The author argued that trade openness depends on the policy of individual countries and their geographical location. Hutchet *et al*. (2018) investigated the association between trade openness and economic growth in 169 countries by employing the Generalised Method of Moment. The results reveal that the country that exports more positively affects economic growth.

A majority of studies have focused on the effect of exchange rate on commodity prices and the impact of either exchange rate or commodity prices on economic growth. There are a few/no studies that put emphasis on all the four variables: commodity prices, trade openness, exchange rate and economic growth. Empirically, there is no study that has been conducted in South Africa that focuses on all these variables. Most importantly, no study has been conducted on the magnitude among commodity prices, exchange rate and economic growth in South Africa. Thus, this study investigates commodity prices, trade openness, exchange rate and economic growth in South Africa with the intention of understanding the effect of exchange rate and commodity prices on economic growth using the Vector Error Correction Model. Thus, the subsequent section discusses the research methodology used in this study.

3. Methodology

3.1 Data Description

The study used the quantitative approach in examining the effect of commodity prices, trade openness and real exchange rate on economic growth. The investigation was based on quarterly time series data from 1984Q1 to 2020Q4 sourced from the South African Reserve Bank (SARB) online facility. The data used includes economic growth, trade openness, real exchange rate and commodity prices. Economic growth was employed as a dependent variable, while trade openness, real exchange rate and commodity prices were used as independent variables. The nature of this relationship is shown in equation 1:

$$GDP_t = \beta_0 + \beta_1 lnRER_t + \beta_2 lnCP_t + \beta_3 lnTO_t + \varepsilon_t \qquad (1)$$

Where GDP is economic growth, lnRER is real exchange rate, lnCP is commodity prices and lnTO is trade openness. β represents the coefficients of independent variables, t represents time and ε represents an error term. Table 1 gives more information on the variables used in the study.

Table 1. Variables used in the study

Variable	Source	Description	Expectation
Economic growth (GDP)	SARB	An improvement in the quantity of goods and services produced considering the population of South Africa	Dependent variable
Real exchange rate (lnRER)	SARB	Rand expressed over the US dollar minus prices and wages.	-/+
Trade openness (lnTO)	SARB	imports and exports expressed as a percentage of GDP	+
Commodity prices (lnCP)	SARB	Prices of raw materials and minerals that are traded in the South African market	+/-

Source: Authors compilation

3.2 Pre-estimation Techniques

The estimation of results involves unit root tests, cointegration analysis and the lag length selection. The unit root tests were conducted to check the stationarity of variables under study and to ascertain the order of integration. To achieve these two aims, an Augmented Dickey Fuller (ADF) was employed. The tests prescribe that if the probability value is less than 10 percent, the variable becomes stationary. Garidzirai and Nguza-Mduba (2020) further explains that the unit root tests determine the methodology to use. The authors assert that if the variables are a combination of order zero and one, an ARDL is deemed fit, while VECM and VAR are appropriate when variables are stationary at order one (Pasara & Garidzirai 2020). Furthermore, a Johansen cointegration analysis was employed to check if the long-run relationship exists between the variables under study. The cointegration analysis is composed the trace statistic and the maximum eigenvalue statistic (Garidzirai, 2019). These tests contain the use of along matrix ∏, that is a *k x k* matrix rank *r* (Gujurati 2015). In the event that the two tests come up with different results, the maximum eigenvalue test results would be preferred (Banerjee *et al.* 1993). Lastly, the lag order was determined using the Akaike Information Criterion (AIC).

3.3 Estimation Technique

Since the long-run association among commodity prices, trade openness, real exchange rate and economic growth was determined by the cointegration analysis, the Vector Error Correction Model analyses the short-run. It corrects all the disequilibrium's in the model. When analysing the short-run analysis, the coefficient and the p-value of the error term are important. The coefficient should be less than zero, negative and the p-value should be statistically significant at 1, 5 and 10 percent (Pasara and Garidzirai 2020). The VECM is specified in equation 2:

$$\Delta Y_t = \beta_1 \Delta X_t + \beta_2 (y_t - 1 - YX_t - 1) + \varepsilon_t \tag{2}$$

Where ΔY stands for a dependent variable, ΔX_t stands for all the independent variables, β stands for all the coefficients of independent variables and $yt - 1 - yxt - 1$ represents a short term analysis. Equation 2 can be rearranged to fit all the variables under study. Thus, the actual VECM is shown in equation 3

$$\Delta GDP_t = \theta_0 + \sum_{i=1}^{q} \alpha_j \Delta GDP_{t-i} + \sum_{i=1}^{q} \beta_1 \Delta lnRER_{t-i} + \sum_{i=1}^{q} \gamma_2 lnCP_{t-i} + \sum_{i=1}^{q} \beta_3 lnTO_{t-i} + \gamma_4 ECM_{t-1}$$
$$+ \varepsilon_t \tag{3}$$

Where α, β are the coefficients to be estimated, ε is the error term, ECM is the Error Correction Term.

4. Empirical Results and Discussion

This section discusses the descriptive statistics, unit root tests, lag length, cointegration tests and Vector Error Correction Model results. The subsequent section discusses the descriptive statistics.

4.1 Descriptive Statistics

The descriptive results are illustrated in Table 2. The results show an average of 7.2 percent in commodity prices and 6.3 percent in real exchange rate. This means that commodity prices and the exchange rate are high in South Africa. An average economic growth of 2.1 percent was recorded which is slightly low compared to the targeted 5 percent (National Treasury 2020). The results further highlight positive coefficients in all the variables implying an upward direction throughout the time series. Furthermore, the variables are moderately skewed and normally distributed.

Table 2. Descriptive statistics

Descriptive	GDP	lnRER	lnCP	lnTO
mean	2.09192	6.32210	7.30128	3.02171
median	2.14292	6.39510	6.91600	2.98288
maximum	5.39121	9.67151	10.30261	5.30921
minimum	0.29102	2.10381	3.10473	1.00291
Std.Dev	1.02819	2.01891	2.52910	1.60926
Skewness	0.92091	0.15931	0.63021	0.27613
Kurtosis	3.29023	2.02322	3.41062	2.38091
Observation	141	141	141	141

Source: Own Compilation from Eviews software

4.2 Stationarity Test Results

The study utilised the ADF in checking for stationarity and the results are outlined in Table 3. The results show the probability values of more than 10 percent in all the variables under study. Thus, we conclude that the variables are not stationary at level. Since all the variables were found not stationary at levels, the researchers tested the variables at first difference and found all the p-values to be significant at 1 percent. This means that all the variables are stationary at levels and this justifies the use of the Vector Error Correction Model. Before estimating the VECM, the study used the Johansen cointegration test to check for long-run link among the variables. Thus, the Johansen cointegration test was discussed in the following section.

Table 3. ADF unit root test

| Variables | t-statistic and critical values | | Probabilities | | Order of integration |
	Levels	1st Difference	Levels	1st Difference	
GDP	-1.209184	-2.630182	0.3012	0.0000***	I(1)
	(-2.193018)	(-2.721937)			
lnRER	-1.659588	-2.205917	0.2043	0.0081***	I(1)
	(-2.381099)	(-2.432617)			
lnCP	-2.560800	-7.098765	0.2099	0.0000***	I(1)
	(-2.102938)	(-2.174028)			
lnTO	-2.281320	-3.309173	0.3318	0.0000***	1(1)
	(-2.028129)	(-2.391320)			

Source: Own compilation from Eviews software. Note: *** represents 1 percent significance level

4.3 Johansen Cointegration Analysis

Before employing the cointegration tests, a lag order selection was performed. The purpose of employing the tests was to choose the appropriate lag. The results of the lag length are illustrated in Table 4 and the lag 2 was chosen as the appropriate lag length. Thus, the model utilized lag 2 under the Akaike Information Criterion (AIC).

Table 4. Cointegration results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-291.0281	NA	1.2052	7.2018	8.2017	7.8109
1	-129.2710	321.0182	4.12e-19	3.2019*	3.2817*	1.9926*
2	-47.2871	70.2540	3.71e-31	2.9165	4.0025	2.8730
3	25.9219	69.8288	4.03e-47	2.0029	5.7301	3.1092

Source: Own compilation from Eviews software. Note: * shows the significant lag

The Johansen cointegration results are reported in Table 5. Trace test results reveal that there are at least (3) cointegrating equations all levels of significance, thus, the rejection of null hypothesis. In the same light, the Maximum eigenvalue test also shows that there are (2) cointegrating equations at a 1 and 5 percent level of significance. The trace test and maximum test endorse a long run link among economic growth, commodity prices, trade openness and real exchange rate. Since the cointegration test has confirmed the existence of a long-run association among the variables, the next section discusses the long-run relationship.

Table 5. Johansen Cointegration Test results

Trace test					Max Eigen value Test			
Hypothesized No. of CE(s)	Eigenvalue	Trace statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	Eigenvalue	0.05 Critical Value	Prob.**
None*	0.6604	51.975	28.816	0.0001***	37.819	0.531	21.131	0.0004***
At most	0.3929	14.7124	13.007	0.0554*	7.0987	0.864	14.264	0.4568
At most*	0.1433	4.9610	2.7655	0.0322**	2.396	0.188	3.841	0.0342**

Source: Own Compilation from Eviews software. Note: *, **, *** represents 10, 5 and 1 percent level of significance

4.4 Long-Run Relationship

The long-run association among economic growth, real exchange rate, trade openness and commodity prices is presented in Table 6. The results tell an expected and significant negative influence of real exchange rate (lnRER) on economic growth. Implicitly, the depreciation of the South African rand by one percent rises economic growth by 0.6341 percent. This therefore implies an increase in the price of imports, reduction of trading partner's exports, instinctively leading to a decrease in imports and an increase in exports. The increase in exports is achieved through the multiplier effect. The study's findings are in sync with other studies such as that of Khomo *et al* (2020) and Razzaque *et al*. (2017). The studies state that real exchange rate is a catalyst to economic growth in emerging countries such as South Africa. Likewise, the influence of commodity prices (lnCP) was significant and positively influencing economic growth in South Africa. This means that a 1 percent increase in commodity prices leads to a 1.0110 percent increase in economic growth. This result was expected since South Africa relies on mineral and agricultural export commodities. Nyathi (2017) and Brixiova and Ncube (2014) concur with the results as they concluded that commodity prices play a crucial role in influencing economic growth. Lastly, trade openness (lnTO) was found to be significant and positively influencing economic growth. Therefore, a 1 percent increase in trade openness increases economic growth by 0.6240 percent. This result was expected since South Africa is a major trader with many countries. This result is in line with other studies such as Mizan (2019) and Hutchet *et al*. (2018).

Table 6. Long-run analysis

Variable	Coefficient	Std.error	t-statistic	p-value
lnRER	-0.6341	2.4900	-2.8429	0.0000***
lnCP	1.0110	3.3891	3.6790	0.0008***
lnTO	0.6240	2.5091	3.1289	0.0018***
Constant	3.4092	4.7024	5.8916	0.0000***

Source: Authors compilation from Eviews software. Note: *** represents 1 percent.

4.5 Error Correction Model

Since a long-run relationship has been established, a short-run association of the variables is analysed using the VECM and the results are shown in Table 7. The results reveal that trade openness was significant in explaining economic growth, while commodity prices (lnCP), exchange rate (lnRER) were not significant in explaining economic growth in the short-run. The results further reveal an ECT of -0.50391 that is significant at 1 percent. The ECT has an expected negative coefficient sign confirming that the current disequilibrium can be corrected in the long-run. Thus, the 54 percent in the disequilibrium of commodity prices, real exchange rate and trade openness can be corrected in 1 year 9 months (1/0.50391) to achieve the desirable economic growth.

Table 7. Short-run analysis

Variable	Coefficient	Std.error	t-statistic	p-value
lnRER	-0.2937	2.4810	-2.9029	0.0000***
lnCP	0.0451	3.3891	3.6790	0.0000***
lnTO	0.3491	2.5091	3.1289	0.0049***
ECT	-0.50391	6.1005	6.2341	0.0000***

Source: Authors compilation from Eviews software. Note: *** represents 1 percent.

4.6 Granger Causality Analysis

The Pairwise Granger causality analysis was employed and the results are presented in Table 8. The findings of the study show that commodity prices and real exchange rate granger cause economic growth. Furthermore, the results show a bidirectional between trade openness and economic growth. The Granger causality results confirms the long-run relationship.

Table 8. Granger Causality Test results

Null hypothesis:	Obs	F-Statistic	Prob.
GDP does not Granger Cause lnCP	30	0.65497	0.5281
lnCP does not Granger Cause GDP		0.79191	0.0420**
GDP does not Granger Cause LRER	30	0.36485	0.6979
LRER does not Granger Cause LRGDP		0.67026	0.0576*
GDP does not Granger Cause lnTO	30	0.62124	0.0000***
lnTO does not Granger Cause GDP		1.14650	0.0073***

Source: Authors compilation from Eviews software. Note: *, **, *** represents 10, 5 and 1 percent level of significance respectively.

4.7 Post-Estimation Analysis

Table 9 presents the diagnostic test results. The Jarque-Bera (0.481307) normality test showed that residuals are normally distributed and the p-value does not lead to the rejection of the null hypothesis. On the other hand, the diagnostic tests in Table 9 show no evidence of heteroscedasticity, since the p value is greater at a 5 percent level of significance level. The presence of heteroscedasticity meant that the model has some misspecification, hence conclusive results cannot be derived from such a model.

Table 9. Diagnostic results

Test	Test Statistic	p- value	Conclusion
Normality Test (JB test)	1.4625	0.48137	Do not reject Ho since PV> L.O.S residuals are normally distributed
Autocorrelation (Order 6)	24.6452	0.7300	Reject Ho since PV< L.OS. there is no autocorrelation in the model
Serial Correlation (LM test)	15.3750	0.1625	Reject Ho since PV< L.O.S, No evidence of serial correlation
Heteroscedasticity test (white test)	5.4389	0.3647	Do not reject Ho since PV> L.O.S. no evidence of heteroscedasticity

Source: Author

5. Conclusions and Recommendations

The purpose of this study was to investigate the effects of commodity prices, exchange rate and trade openness on economic growth in South Africa. The study provided more insight on how these variables influenced economic growth from 1984-2019. The results reveal that commodity prices and trade openness increase economic growth in South Africa, holding other things constant. On the other hand, a decrease in the real exchange rate leads to an increase in the economic growth. The aforementioned variables are the key catalysts to economic growth and globalization. Given that South Africa is an emerging country, these findings are in sync with the economic theory and the literature herein. Based on the study`s results, the researchers recommend a devaluation of the currency to promote exports, employment, production and economic growth. The devaluation of the currency serves as a triple action to macroeconomic objectives as it solves unemployment, poverty and economic growth. Furthermore, the commodity prices should be kept in check to avoid commodity instability that is hazardous to economic growth. Although, the study has achieved its objective, two limitations were identified. Firstly, the study should have added more variables such as financial development. Secondly, the study should have included many cross-sections. However, these limitations will be addressed in the upcoming studies.

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