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The Responsiveness of Liquid Fuel Price towards COVID-19 and Exchange Rate Fluctuations

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ABSTRACT

The petrol price plays an important role in all types of business and economic activities, especially in South Africa. The outbreak of the COVID-19 pandemic and the volatility of the exchange rate are some of the current challenges in the South African economy and these factors might have significant implications on domestic petrol fuel prices. In the last 2 years, the petrol price has experienced a drastic increase in the South African commodity market. The current study investigated the effect of the COVID-19 pandemic and exchange rate fluctuations on petrol prices in South Africa for the period between March 2020 and June 2022. The autoregressive distributed lag (ARDL) model was employed to establish the long-run and short-run relationship between COVID-19 new infections, exchange rate and petrol price in South Africa. The result revealed that both exchange rate and COVID-19 infections negatively influence the petrol price in the long run. However, in the short-run exchange rate has a positive impact on petrol price while the latter is negatively affected by increases in COVID-19 new cases of infection. To maintain a steady state of petrol prices and reduce the impact of petrol price fluctuations, the study recommends the implementation of monetary policies that strengthen the domestic currency accompanied by social awareness programmes on COVID-19 management.

Keywords: COVID-19, Exchange rate, Oil Price, South Africa
JEL Classifications: F31, I15, Q02

1. INTRODUCTION

During the end of the 20th and the beginning of the 21st centuries, humanity experienced marvellous progress in both technology and health care development. However, the world is still undergoing various infectious diseases that characterize substantial challenges to current society and economic development (Jordà et al., 2020). Various empirical research report that both developed and developing countries are facing changes in different diseases and pandemics that cause suffering, loss of human lives and other social issues that generate economic challenges (McKibbin and Fernando, 2020; Umar et al., 2020). The end of 2019 and the beginning of 2020 years were marked by the outbreak of coronavirus, also known as COVID-19, regarded as one of the worst pandemics in human history. This pandemic had and still has high implications on the entire world including countries considered resilient and had strong healthcare systems such as China, the United States of America, Italy, the UK and Spain (Su et al., 2021). In Africa, South Africa is one of the countries most affected socially and economically by the pandemic (Edoka et al, 2021).

Generally, implications of the COVID-19 are not limited to people's morbidity and mortality, it also creates drastic changes in the country's economic performance. To reduce the number of infections, countries imposed a national lockdown and the latter led to a significant decrease in routine activities such as outdoor gatherings, entertainment and travelling. Additionally, various businesses such as restaurants/cafes, retail shops, transport industry, factories and manufacturing firms had to reduce or close their activities. These restrictions on people's mobility and the close of some economic activities led to a decline in transport activities and demand for fuel (Ghazanfari, 2020). Tangible shreds of evidence indicated that the pandemic caused instabilities in the stock markets, travel and tourism, employment, exchange rate and oil prices (Fairlie, 2020). Additionally, due to the COVID-19 outbreak, the world facing a major disturbance in both exports and imports export patterns, good market anomalies and a significant reduction in other economic activities (Baker et al., 2020; Ji and Chu, 2020; Vanov, 2020).

The COVID-19 outbreak cause also significant changes in commodity prices. Owing to a significant decline in demand for industrial inputs, the global oil price drastically declined from $64 a barrel in 2019 to $18 a barrel in April 2020 (Macrotrends, 2020). Similar trends were and are still being experienced in the South African economy. At the begging of the COVID-19 outbreak in early 2020, the coastal fuel price went down from R15.20 to R11.52 per litre and by December 2020 the petrol piece was R13.59 per litre (Wheels 24**,** 2021)**.** Since the beginning of 2021, petrol prices started increasing and in March 2021 the coastal price increased to R15.62 per litter (Woosey, 2021). The petrol price kept increasing and reached R20.35 per litre in November 2021 (Jordan, 2021) and in February petrol price increased by 53 cents which made it remain above R20 per litre (Staff Writer, 2022). As that increase was not sufficient, 1 month later, the petrol price in South Africa increased again by R1.46 per litre. The question here is why the petrol price kept increasing in South Africa when the Brent crude, in the global market, is currently approximately $83.50 per barrel than in 2011 when the Brent crude was $109 per barrel (Staff Writer, 2021; Woosey, 2021)?

From the discussion above, one could only wonder if the petrol price increase is not influenced by internal factors rather than external factors. Is this high price generated by COVID-19 and the restriction associated with it or other factors are pushing the price to go high? Nonetheless, this growing fuel price cannot be the result of a high inflation rate as the latter is more influenced by the petrol price than it could affect the petrol price (Forlin, 2021). The exchange rate is another economic variable that might influence petrol price, and it has been volatile during the last two decades quite. Given that, to the best knowledge of the author, only one study was conducted in South Africa to analyse the effect of oil price on the exchange rate and this study did not consider the implication of the coronavirus pandemic on fuel price; the current study aims to investigate at which extend the fuel price growth is driven by both COVID-19 and exchange rate. Meanwhile, it is important to note that, in this paper fuel price, oil price and petrol price are used interchangeably. The subsequent part of the paper is structured as follows: section two discusses a review of empirical studies, and the third section represents and elucidates the methodological approach. While the fourth section exhibits empirical results of the study and their discussion the last section, section five, provides a concise summary and recommendations of the study.

2. LITERATURE REVIEW

The relationship between exchange rate and fuel price can sometimes be difficult to understand specifically when the causation is taken into account. The causal relationship between these two variables can either take a positive or negative direction. There exist two fundamental transmission channels through which fluctuation in fuel price can influence exchange rate volatility (Buetzer et al., 2012; Fratzscher et al., 2014). The first channel elucidates how fuel price influences change in an exchange rate through the terms of trade. For fuel importing countries, an upsurge in fuel price causes a decline in trade balance and consequently a depreciation of the domestic currency. In this regard, Backus and Crucini (2000) assert that changes in fuel price determine changes in terms of trade. On the other hand, the fuel price can also be determined by exchange rate volatility. Krugman (1983) states that high fuel price transfers wealth from fuel importing to fuel exporting countries, which results in appreciation of the currency in exporting and depreciation of the currency in importing countries.

Given the power of the US dollar on fuel price and other countries' exchange rates, the latter affects fuel price through its implication on fuel demand and supply. For example, the depreciation of the dollar can push fuel producers to reduce their supply and increase the price to sustain their dollar revenue from fuel export (Wirjanto and Yousefi, 2005). Nonetheless, the depreciation of the US dollar can increase fuel demand as the value of the currency of fuel importers might appreciate in response to the US dollar depreciation (Bénassy-Quéré et al., 2007). The relationship between exchange rate and fuel price was studied by several scholars from different geographical locations and with various approaches. The following paragraphs represent some of their findings.

Using the panel cointegration test, Berument et al. (2014) analysed the relationship that exists between exchange rate and petroleum products within the Mediterranean countries. Their findings suggested an inverse relationship between the exchange rate and petroleum products. In other words, the depreciation of domestic currencies within the analysed countries caused an increase in the price of petroleum products. Another study investigating a nonlinear causality between fuel and exchange rate within oil-importing countries was conducted in China and India. The findings indicated bidirectional causation between oil price and exchange rate in India and unidirectional causality between oil price and exchange rate in China (Bal and Rath, 2015). Nonetheless, another study by Tiwari and Albulescu (2016) in India, revealed that a significant causal relationship between oil price and exchange rate in India exists only for a short term, precisely for 3 months. Further, the study conducted by Nusair and Kisswani (2015) within seven Asian countries namely Indonesia, Japan, Korea, Malaysia, Philippines, Singapore and Thailand; indicated that a causality relationship exists between exchange rate and oil price for all analysed countries except Japan. Using a time-variant vector autoregressive (TVP-VAR) model, Castro and Jiménez-Rodríguez (2020) analysed the exchange rate and oil price in the USA. Their findings revealed an interdependency between the two variables with the exchange rate being more volatile over time compared to the oil price.

Although there is no theoretical literature that explains the relationship between exchange petrol price and the COVID-19 pandemic, some empirical studies conduct on the matter indicate the presence of that relationship. Using the ARMA-EGARCH model Ozturk and Cavdar (2021) analysed the implication of the COVID-19 pandemic on the volatilities of international crude oil prices, gold, exchange rates and Bitcoin. The results indicated that the outbreak of the coronavirus pandemic not on affected the financial market, it also impacted negatively on oil prices. Another study was conducted by Priyono et al. (2022) in Indonesia to assess the impact of COVID-19 daily cases on world oil prices and Rupiah exchange rates. The study findings a short inverse relationship between COVID-19 daily cases and world oil prices but no significant long-run relationship between the two. Contrary to Priyono et al. (2022) finding, the study by Devpura and Narayan (2020) approved a positive and unidirectional relationship between hourly oil price volatility and the COVID-19 new cases of infection. In other words, as the number of people infected increases the oil price also increases. Given the dichotomies between reviewed empirical studies, it is important to conduct another study focussing on the South African case to indicate how the fuel price is related to changes in COVID-19 new cases of infection and exchange rate volatility.

3. DATA AND MODEL

3.1. Data Discussion

This paper focuses on quantitative research built on monthly time series. The main objective is to analyze the effect of both the exchange rate and COVID-19 (represented by the number of new cases of infection) on growing fuel prices in South Africa. The selected sample starts from March 2020 to June 2022. The selection data and its sample were based on two main reasons: firstly, when the South African fuel price increased to R19.18 (before it reached R26.42 per litter on 6 July 2022**)** it was argued that the main cause of an increase of R1.21 per litre was due to the weakening value of Rand against the US dollar. The second reason was the availability of data given the period running between the first person that tested positive in South Africa (March 2020) and this paper's data was collected in July 2022. The relevance of selected variables is grounded on the role they play in the South African economy and their contribution to the social development within the country. All the employed data was acquired from the Quantec EasyData website and the sample period was selected based on the data availability. Before the estimation, variables were transformed into natural logarithms for easy interpretation of findings and to avoid the multicollinearity issue.

3.2. Model Specification

A cointegrating relationship exists between two or more economic and financial variables if the latter possess a long-run relationship amongst them. This relationship is estimated using several cointegration tests that include Engle and Granger (1987) Johansen (1988), Boswijk (1994). Nonetheless, these aforementioned cointegration tests produce reliable results only when applied to a large sample size with the same integration order. Given the sample size of the current study, the Autoregressive distributed lag (ARDL) model introduced by Pesaran (1997) and improved by Pesaran et al. (2001) was selected as the appropriate method for both long-run and short-run analysis. This method has different advantages in econometric analysis and those include differentiation between dependent and independent variables, satisfactory result when applied to variables with different order of integration, production of short-run and long-run results concurrently, and provision of sound results when applied to a small sample. The limitation of this approach is that it cannot be applied to series that are I(2) (Pesaran et al. 2001). The current paper's ARDL model is expressed as follows:

$$\Delta LFP_t = \alpha_0 + \sum_{j=1}^{k} \beta_j \Delta LFP_{t-j} + \sum_{j=1}^{k} \varphi_j \Delta LCOVID_{t-j} + \sum_{j=1}^{k} \delta_j \Delta LEXR_{t-j} + \gamma_1 LFP_{t-1} + \gamma_2 LCOVID_{t-1} + \gamma_3 LEXCH_{t-1} + u_t \quad (1)$$

Where ΔLFP_t, $\Delta LCOVID_t$ and $\Delta LEXR_t$ represent changes in the natural log of fuel price, the number of new infections and exchange rate at period t respectively; while β_j, ϕ_j And δ_j represent the short-run model dynamism. The long-run coefficients are denoted by γ_1, γ_2, and γ_3 and α_0, k and u_t represent the intercept, lag operator and error term respectively.

The error correction model for the study cointegrating equation is expressed in equation 2 as follows:

$$\Delta LFP_t = \alpha_0 + \sum_{j=1}^{k} \beta_j \Delta LFP_{t-j} + \sum_{j=1}^{k} \varphi_j \Delta LCOVID_{t-j} + \sum_{j=1}^{k} \delta_j \Delta LEXR_{t-j} + \rho ECT_{t-1} + u_t \quad (2)$$

Where ρ is the coefficient of the error correction (ETC) used to measure the model speed of adjustment towards long-run equilibrium. Akaike Information Criteria (AIC) served in lag length selection.

To determine the long-run effect of the COVID-19 pandemic (represented by new infections) and exchange rate fluctuations on fuel price, the study employed the Wald test that assists in determining the difference between F-statistic and the Pesaran et al. (2001) tabulated bounds. The aforementioned test is used to assess the prevalence of one of the following hypotheses: the null hypothesis suggesting the absence of cointegration and the alternative suggesting the presence of cointegration among variables. If the F-statistic is larger than the upper bound, the null hypothesis is rejected and the conclusion is that variables cointegrate. However, if the F-statistic is smaller than the lower bound, the null hypothesis is not rejected and this implies the absence of a long-run relationship among variables. The rejection of the null hypothesis allows the estimation of the error correction model and both long-run and short-run elasticities. In addition to the ARDL estimation for the long-run relationship among variables, the Toda-Yamamoto is employed to assess the causality.

4. RESULTS ESTIMATION

4.1. Descriptive Statistics

The author analyzed the characteristic of the used data through a descriptive statistic representation. The summary of descriptive information is exhibited in Table 1. In the table, the mean and standard deviation of the natural log of LCOV are higher compared to those of LFP and LEXR. This implies that over the sample period, the COVID-19 new cases of infection significantly deviated from their mean, while exchange rate and fuel prices experienced a steady variation. The skewness of LEXR is negative while the skewness of both LCOV and LFP is positive. This implies that the LEXR is skewed to the left, unlike LCOV and LFP which are skewed to the right. Additionally, the skewness value of 1.329054, higher than 1, suggests that the data of COVID-19 new case of infection is highly skewed (asymmetric) while the LFP and LEXR data seems to be symmetric with the Skewness of 0.493311 and −0.55829 (close to zero). The Jarque-Bera probability suggests a normal distribution in LFP and LEXR data.

4.2. Unit Root Test and Results

The unit root and/or stationarity tests are the starting point that confirms the presence or absence of the unit root within variables of interest and thereafter determine the integration order. The present study employed the s the conventional Augmented Dickey-Fuller (ADF) unit root test and the results are exhibited in Table 2. All variables are stationary after the first difference. Based on their results, either the Johansen test for cointegration through the VAR model or the bounds test for cointegration through ARDL model are appropriate approaches for long-run analysis. However, the ARDL model is selected firstly due to the size of the study sample and secondary owing to the power of the ARDL model to determine a one-way relationship among variables.

4.3. Bound Testing and Long-run Relationship Estimation

The SBIC information criteria indicated that the best ARDL model for the long-run and short-run relationship estimation is ARDL (1,3,3). The bounds test results are displayed in Table 3 and show that the estimated statistic exceeds all the upper bounds critical values. Thus, the null hypothesis for no-cointegration can be rejected even at a 0.01 significant level. In other words, the results imply that a long-run relationship exists between the exchange rate, new COVID-19 cases and the petrol price in South Africa. Equation 3 summarises estimated long-run relationships among variables.

$$LFP = 38.3825 - 0.3174\ LCOV - 3.3923LEXR \tag{3}$$

Equation 3 indicates that both independent variables possess a negative long-run effect on petrol price. The long-run coefficient for LCOV indicates that a one percent increase in the number of COVID-19 cases would cause the petrol price to decline by 0.3174 percent. On one side these results would make sense as, in South Africa, when the country is experiencing growth in new cases of infection, the movements are restricted and this would reduce the petrol demand leading to a decline in petrol price. On the other hand, an increase in COVID-19 might not affect petrol prices as South Africa is an oil importer country and local changes might not affect the global oil market. In addition to the effect of COVID-19 on petrol price in South Africa, the results also show an inverse relationship between exchange rate and petrol price in South Africa. A one percent increase in the level of the exchange rate (appreciation of local currency) causes the petrol price to decline by 3.3923 percent. This implies that the recent rise in petrol price was a result of a weak Rand (South African currency). These results also are justified by an increase in the global price of oil. If South Africa is an oil importer and its currency is weakening compared to the USA dollar it is logical that the local fuel price increases. This study's findings are in line with other study findings (Bénassy-Quéré et al., 2007; Berument et al., 2014; Castro and Jiménez-Rodríguez, 2020) whose findings suggested an inverse relationship between fuel price and exchange rate.

4.4. Short-run Relationship Analysis

In addition to long-run relationships, the independent variables have also a significant short-run effect on petrol prices in South Africa. Although none of the independent coefficients has an immediate short-run effect on the dependent variable, the lagged coefficients of both exchange rate and COVID-19 influence changes in petrol price. This implies that it takes time for shocks in the exchange rate and new cover-19 cases to stimulate changes in petrol price. Contrary to long-run results (Table 4), the exchange rate has a short-run positive effect on petrol price while growth in COVID-19 cases still negatively influences petrol price.

Table 1: Descriptive statistics

Statistical tendency	LFP	LCOV	LEXR
Mean	7.3123	18.3303	7.4102
Median	7.2945	19.1526	7.3776
Maximum	7.4742	20.0012	7.9835
Minimum	7.04925	9.2238	7.2382
Standard Deviation	0.1156	2.5007	0.1756
Skewness	0.493311	1.329054	−0.55829
Kurtosis	2.013302	4.273931	2.252334
Jarque-Bera	2.920495	13.03266	2.708638
Probability	(0.2321)	(0.0014)	(0.2581)

Table 2: ADF Unit root results

Variables	Model	levels	1st Difference	I (d)
LC0V	intercept	0.9641	0.0055**	I (1)
	intercept and trend	0.1771	----------	
LEXR	Intercept	0.7080	0.0322*	I (1)
	intercept and trend	0.9432	----------	
LFP	intercept	0.8517	0.0182*	I (1)
	intercept and trend	0.1152	----------	

**, * rejection of null hypothesis at 1% and 5% significant level respectively

Table 3: Bound test

Test Statistic	Value	Signif.	I (0)	I (1)
F-statistic	11.9724	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5

Table 4: Short-run regression results

Variable	Coefficient	SE	t-Statistic	Prob.
D (LCOV)	0.0181	0.0646	0.2808	0.7869
D (LCOV(-1))	0.1936	0.0878	2.2060	0.0632
D (LCOV(-2))	−0.1067	0.0235	−4.5414	0.0027
D (LEXR)	−0.0065	0.0460	−0.1426	0.8906
D (LEXR(-1))	1.6132	0.5437	2.9672	0.0209
D (LEXR(-2))	1.4097	0.3482	4.0488	0.0049
C	16.9985	5.1459	3.3032	0.0131

Table 5: ECT results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq(-1)*	−0.722533	0.127206	−5.680020	0.0008

Table 6: T-Y Granger causality test (Chi-square and P values)

	Independent variables			
Excluded	LFP	LCOV	LEXR	All Included
LFP		2.550306 (0.2794)	0.478121 (0.7874)	34.07314 (0.0000)
LCOV	27.73343 (0.0000)		1.173188 (0.5562)	9.682561 (0.0461)
LEXR	17.26042 (0.0002)	9.494876 (0.0087)		3.421754 (0.4899)

( ) denotes probability values

Table 7: Residual diagnostic

Test	H_0	P-value	Decision
J-B	Normal distribution	0.6304	H_0 not rejected
L-M	Serial correlation	0.2120	H_0 not rejected
Breusch-Pagan-Godfrey	Homoscedasticity	0.1158	H_0 not rejected
Ramsey RESET	Model well specified	0.9710	H_0 not rejected

4.5. The Error Correction Model (ECT)

When a long-run relationship exists between study variables, it is important to introduce the ECT to establish the model speed of adjustments towards the long-run equilibrium. The rule of thumb is that the error correction coefficient (ECT) from the ECT analysis must be negative and statistically significant (Chudik and Pesaran, 2013). The result in Table 5 shows that the ECT coefficient is negative with the value of −0.722533 and statistically significant with a T-statistic of 0.722533 in absolute values. The high value of ECT suggests the presence of long-rung stability amongst the study parameters (Waliullah and Rabbi, 2011). Thus, the ECT coefficient of 0.722533 suggests that approximately 72% of shocks in the model are adjusted each month and only 1 month (1/0.722533) is needed for the model to revert to long-run equilibrium. In this regard, policies that support and strengthen the South African currency are important to reduce the effect of fuel prices on most local economic activities and prices on other goods and services.

4.6. Analysis of Causation among Variables

The Toda-Yamamoto approach was employed to analyse the short-run causation between variables. As depicted in Table 6, two unidirectional causations exist between the dependent (LFP) and independent (LCOV, LEXR) variables. In other words, both exchange rate volatility and COVID-19 cases can cause short-term changes in petrol price levels. These causation results confirm the shorn-run outcome in Table 3 suggesting that changes in LCOV and LEXR influence petrol price in the short term.

4.7. Model Robustness Check

To check the robustness and ensure that the estimated ARDL (1, 3, 3) met the econometric requirements, residual tests were performed. The model was found to be robust as it passed all performed diagnostic tests. The null hypothesis of serial correlation, no normality and no homoscedasticity were rejected in favour of the alternatives. Additionally, the result from the Ramsey RESET indicates that the estimated model is well specified while the CUSUM) and the CUSUM squares of recursive residuals stability tests suggest the model stability as coefficients of the estimated model lie within the 5 percent critical bounds. Table 7, Figures 1 and 2 display the results of performed tests and their results.

Figure 1: CUSUM residual test

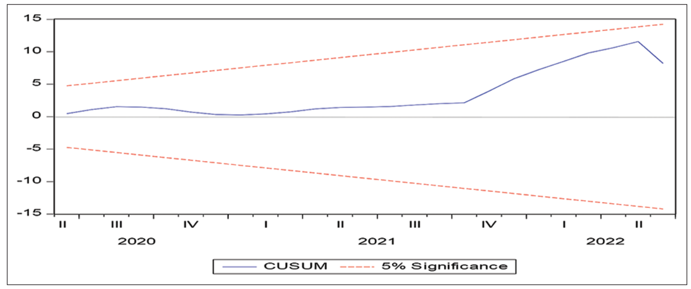
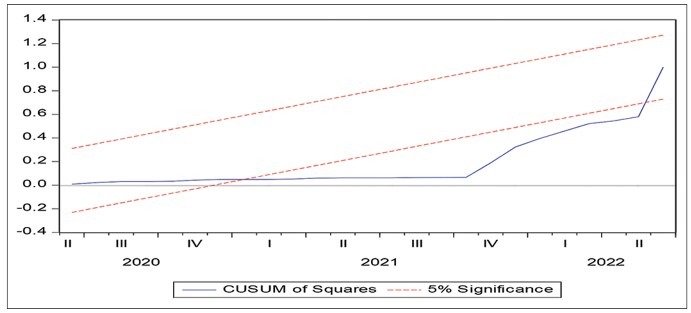


Figure 2: CUSUMsq residual test



5. CONCLUSION

This study aimed to assess the effect of both COVID-19 and the exchange rate vitality on the rise of petrol prices in South Africa. The ARDL-bounds test was employed to determine the presence or absence of long-run relationship among variables while the Toda-Yamamoto approach was used to investigate the causality among variables. The results revealed a significant inverse relationship between the dependent variable (petrol price) and independent variables (COVID-19 new cases of infection and exchange rate). Additionally, in the long run, the effect of the exchange rate on petrol price is higher compared to the one of COVID-19. Although the short-run findings and causality analysis indicated a significant impact on the exchange rate and COVID-19; there is no immediate effect of the independent variables on the dependent variable in the short run. Additionally, while a positive short-run relationship exists between the exchange rate and petrol price, the latter is inversely related to COVID-19 new cases of infection. Implications of this study are that it shows that the South African economy would benefit from strengthening the domestic currency as it harms petrol price which is one of the major causes of the South African growing inflation. To maintain a steady state of domestic petrol price and reduce the negative effects of petrol price fluctuations, the author recommends the implementation of new monetary policies that strengthen the domestic currency accompanied by social awareness programmes on COVID-19 management and changes in working conditions.

REFERENCES

Baker, S.R., Bloom, N., Davis, S.J., Kost, K., Sammon, M., Viratyosin, T. (2020), The unprecedented stock market reaction to COVID-19. The Review of Asset Pricing Studies,10(4), 742-758.

Backus, D.K., Crucini, M.J. (2000), Oil prices and the terms of trade. Journal of International Economics, 50(1), 185-213.

Bal, D.P., Rath, B.N. (2015), Nonlinear causality between crude oil price and exchange rate. Energy Economics, 51, 149-156.

Bénassy-Quéré, A., Mignon, V., Penot, A. (2007), China and the relationship between the oil price and the dollar. Energy Policy, 35(11), 5795-5805.

Berument, M.H., Sahin, A., Sahin, S. (2014), The relative effects of crude oil price and exchange rate on petroleum product prices: Evidence from a set of Northern Mediterranean countries. Economic Modelling, 42, 243-249.

Boswijk, H.P. (1994), Testing for an unstable root in conditional and structural error correction models. Journal of Econometrics, 63(1), 37-60.

Buetzer, S., Habib, M.M., Stracca, L. (2012), Global Exchange Rate Configurations: Do Oil Shocks Matter? Working Paper. Germany: European Central Bank.

Castro, C., Jiménez-Rodríguez, R. (2020), Dynamic interactions between oil price and exchange rate. PLoS One, 15(8), e0237172.

Devpura, N., Narayan, P.K. (2020), Hourly oil price volatility: The role of COVID-19. Energy Research Letters, 1(2), 1-5.

Edoka, I., Fraser, H., Jamieson, L., Meyer-Rath, G., Mdewa, W. (2021), Inpatient care costs of COVID-19 in South Africa's public healthcare system. International Journal of Health Policy and Management, 11(8), 1354-1361.

Engle, R.F., Granger, C.W. (1987), Cointegration and error correction: Representation, estimation and testing. Econometrica, 55, 251-276.

Fairlie, R.W. (2020), The Impact of COVID-19 on Small Business Owners: Evidence of Early-stage Losses from the April 2020 Current Population Survey (No. w27309). Massachusetts: National Bureau of Economic Research.

Forlin, M. (2021), Rising Oil Prices and Inflation. Available from: https://www.moneyweb.co.za/financial-advisor-views/rising-oil-prices-and-inflation [Last accessed on 2022 Feb 02].

Fratzscher, M., Schneider, D., Van Robays, I. (2014), Oil Prices, Exchange Rates and Asset Prices. Working Paper no. 1689. Germany: European Central Bank.

Ghazanfari, A. (2020), The impact of the COVID-19 pandemic and crude oil price crisis on the price of automobile fuels in European countries. Diverse Journal of Multidisciplinary Research, 2(6), 10-19.

Ji, X., Chu, Y. (2020), A target-oriented bi-attribute user equilibrium model with travellers' perception errors on the tolled traffic network. Transportation Research Part E Logistics and Transportation Review, 144, 102150.

Johansen, S. (1988), Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control, 12, 231-254.

Jordà, Ò., Singh, S.R., Taylor, A.M. (2020), Longer-run Economic Consequences of Pandemics? The Review of Economics and Statistics. Working Paper 26934. p.1-29.

Jordan, B. (2021), Fuel Hikes a Stretch too Far for Stressed Consumers: Experts. Available from: https://www.timeslive.co.za/news/south-africa/2021-11-30-fuel-hikes-a-stretch-too-far-for-stressed-consumers-experts [Last accessed on 2022 Feb 02].

Krugman, P. (1983), Oil shocks and exchange rate dynamics. In: Exchange Rates and International Macroeconomics. United States: University of Chicago Press. p.259-284.

Macrotrends. (2020), Brent Crude Oil Prices. Available from: https://www.macrotrends.net/2480/brent-crude-oil-prices-10-yeardaily-chart [Last accessed on 2020 Dec 21].

McKibbin, W.J., Fernando, R. (2020), The Global Macroeconomic Impacts of COVID-19: Seven Scenarios. Brookings Institution Report. Brookings Institution. Available from: https://www.brookings.edu/wp-content/uploads/2020/03/20200302_COVID19.pdf

Nusair, S.A., Kisswani, K.M. (2015), Asian real exchange rates and oil prices: A cointegration analysis under structural breaks. Bulletin of Economic Research, 67(1), 1-25.

Ozturk, M., Cavdar, S.C. (2021), The contagion of the COVID-19 pandemic on the volatilities of international crude oil prices, gold, exchange rates and Bitcoin. The Journal of Asian Finance Economics and Business, 8(3), 171-179.

Pesaran, M.H. (1997), The role of economic theory in modelling the long run. The Economic Journal, 107(440), 178-191.

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.

Priyono, A.A. (2022), The influence of COVID-19 daily cases, world oil prices, world gold prices and rupiah exchange rates. Jurnal Manajemen Strategi dan Aplikasi Bisnis, 5(1), 1-16.

Staff Writer. (2021), Expect more Petrol Price Increases in South Africa over the Coming Months. Available from: https://www.businesstech.co.za/news/energy/534088/expect-more-petrol-price-increases-in-south-africa-over-the-coming-months

Staff Writer. (2021), More than 50% of the Petrol Price in South Africa is now made up of Taxes. Available from: https://www.businesstech.co.za/news/energy/534524/more-than-50-of-the-petrol-price-in-south-africa-is-now-made-up-of-taxes [Last accessed on 2022 Feb 02].

Staff Writer. (2022), Here is the Official Petrol Price for February. Available from: https://www.businesstech.co.za/news/energy/554076/here-is-the-official-petrol-price-for-february-3 [Last accessed on 2022 Feb 02].

Su, C.W., Dai, K., Ullah, S., Andlib, Z. (2021), COVID-19 pandemic and unemployment dynamics in European economies. Economic Research-Ekonomska Istraživanja, 35, 1-13.

Tiwari, A.K., Albulescu, C.T. (2016), Oil price and exchange rate in India: Fresh evidence from continuous wavelet approach and asymmetric, multi-horizon Granger-causality tests. Applied Energy, 179, 272-283.

Umar, M., Xu, Y., Mirza, S.S. (2020), The impact of COVID-19 on Gig Economy. Economic Research-Ekonomska Istra-Zivanja. p.1-13. Available from: https://www.tandfonline.com/doi/abs/10.1080/1331677X

Vanov, D. (2020), Predicting the impacts of epidemic outbreaks on global supply chains: A simulation-based analysis on the coronavirus outbreak (COVID-19/SARS-CoV-2) case. Transportation Research Part E Logistics and Transportation Review, 136, 101922.

Wheels 24. (2021), The numbers are in: Here's how much you Paid for Fuel in South Africa in 2020. Available from: https://www.news24.com/wheels/fuel_focus/the-numbers-are-in-heres-how-much-you-paid-for-fuel-in-south-africa-in-2020-20210110-3#:~:text=According%20to%20the%20automobile%20association,2020)%2C%20dropping%20to%20R11 [Last accessed on 2022 Feb 02].

Wirjanto, T.S., Yousefi, A. (2005), A stylized exchange rate pass-through model of crude oil price formation. OPEC Energy Review, 29(3),

177-197.
Woosey, J. (2021), Here's how South African Fuel Prices have Changed in the Last 10 Years. Available from: https://www.iol.co.za/motoring/industry-news/heres-how-south-african-fuel-prices-have-changed-in-the-last-10-years-5acb2415-3cf9-47df-8923-3a06c8b07bd9 [Last accessed on 2022 Feb 02].