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Deep learning models for the early detection of maize streak virus and maize lethal necrosis diseases in Tanzania

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Deep learning models for the early detection of maize streak virus and maize lethal necrosis

Introduction

The aim of the paper is real-time macroeconomic monitoring and forecasting of crude oil trade flows in exporting countries based on the structure of the economy and raw material export potential. The falling prices for crude oil, as history shows, almost inevitably lead to a drop in real GDP growth, investment, and exports.

The higher net household income due to lower oil prices led to an increase in consumer spending of 0.61%, while a decrease in drilling volumes reduced the inflow of investments by 0.62%, negating almost all the advantages of the low oil price period. Shale oil production is still crucial for the United States economy. This again underscores the important role that the oil industry plays in the United States economy and what benefits the country has received from the slate revolution (Zhai et al., 2017; Xu et al., 2019; Zhang M. et al., 2020; Zhang Q. et al., 2020; Wang et al., 2020; Wang and June 2020; Wang et al., 2021).

It is obvious that without the slate revolution, the United States economy's reaction to the recent decline in oil prices would have been different, had it not been for the low level of oil and gas production for GDP. A question that is of real interest to the authorities is will the growth of investments in the oil sector help offset the negative impact on private consumption in the future recovery of real oil prices.

Deep decarbonization modeling is an initiative to limit carbon emissions into the atmosphere. The drive is under the initiative of a variety of inter-governmental agencies to improve the world's climate and atmosphere. Since the world environment is slowly threatened by pollution from industrial facilities, the condition of the atmosphere starts to deteriorate. The main reason behind this is the increasing number of carbon molecules that are now suspended in the atmosphere, which makes the quality of the air poor. With the advent of technology, there are new facilities that are developed to improve the quality of air in the world's atmosphere to prevent negative or harmful consequences. Deep decarbonization is regarded as one of the most promising solutions to prevent the growing harmful effects of air pollution.

Developing countries are some of the most affected areas due to the increasing concentration of carbon in their own atmospheres. These are the countries that are still under the process of rebuilding their economic, political, and infrastructure developments to stabilize trade, peace, and governance. Government units are busy concentrating on rebuilding their infrastructure developments, which prompts several public officials to neglect environmental awareness and preservation. The growing negative environmental effects of ecological neglect and preservation are now prompting several government institutions to establish a new plan to preserve the environment. Deep decarbonization modeling is one solution

$$\text{norm Fi}_i = \frac{Fi_i}{\sum_j Fi_j}. \quad (11)$$

The final step is as follows:

$$\text{TFi}_i = \frac{\sum_j normFi_{ij}}{T}, \quad (12)$$

where TFi_i is the impact of feature I from all the trees and T is the quantity of trees.

We investigated the effect of oil prices in oil-exporting countries (the United States and Russia) and found that positive shocks in oil prices negatively affect macroeconomic indicators. After random forest modeling, the system of econometric equations is deployed, which consists of Eqs 13–15. The regression model is presented in a log-linear form.

$$GDP = C_1 + C_2 \ln(consu_t) + C_3 \ln(inv_t) + C_4 \ln(\exp_t), \quad (13)$$

$$INV = C_5 + C_6 \ln(inv_{t-1}) + C_7 \ln(oil_t) + C_8 \ln(gdp_t - gdp_{-1}), \quad (14)$$

$$Exp = C_9 + C_{10} \ln(oil_{t-1}) + C_{11} \ln(consu_t) + C_{12} \ln(inv_t - inv_{t-1}), \quad (15)$$

where *GDP* is the gross domestic product in real terms, *INV* is the investment in real terms, *C* is the constant, *consu* is the consumption in real terms, EXP is the export in real terms, *oil* is the price of crude oil, and *t* is the index of the year.

Eq. 15 specifies the value of real GDP, the size of which, in the author's opinion, consists of three basic pillars: domestic consumption, export value, and investment. As the main factors of formation of the volume of exports, the level of oil prices and the exchange rate of the ruble against the U.S. dollar are considered (assuming that the weakening of the ruble stimulates exports).

In order to take into account the seasonality of export deliveries, quarterly dummy variables are introduced in Eq. 16.

$$\sum (S_n{}^* T_n) = \sum \left[\frac{M_n + 2}{3}\right], \quad (16)$$

where *M* is the coefficient of change of the export duty on oil products.

This paper used a qualitative research design throughout its discussion to support the empirical analysis of real-time macroeconomic monitoring and forecasting of crude oil trade flows in developing countries.

Results

Based on the results of the verification of significance, we can say with confidence that the real values of the significance level of the consumption factor and investment are less than 0.05. This means that we cannot discard these factors in the equation under consideration.

The impact of these factors on GDP is significant. The coefficients under the factors are positive, that is, the relationship of indicators is direct. At the same time, the factor of domestic consumption is of overwhelming importance (Table 1).

Figure 1 shows that the ruble export price of Urals oil even increased compared to 2014, that is, the ruble tax base for income should not suffer much as a result of such sharp changes in asset prices.

Based on the results of the verification of significance, we can say with confidence that the real significance level of the significance of all factors is less than 0.05. This means that we cannot discard any of the factors in the equation under consideration. Also, the impact of these factors on investment is significant. The coefficients under the factors are positive, that is, the relationship of indicators is direct. We draw attention to the fact that the price of oil has a direct impact on investment, which confirms our hypothesis. In particular, when the price of crude oil is increased by 1%, the investment will increase by 5.2% (Figure 2,3).

The obtained results confi

TABLE 1 Impact of factors on GDP.

Parameter	Consumption	Investment in real terms	Export in real terms	Price of crude oil
Significance	0.02	0.03	0.06	0.07

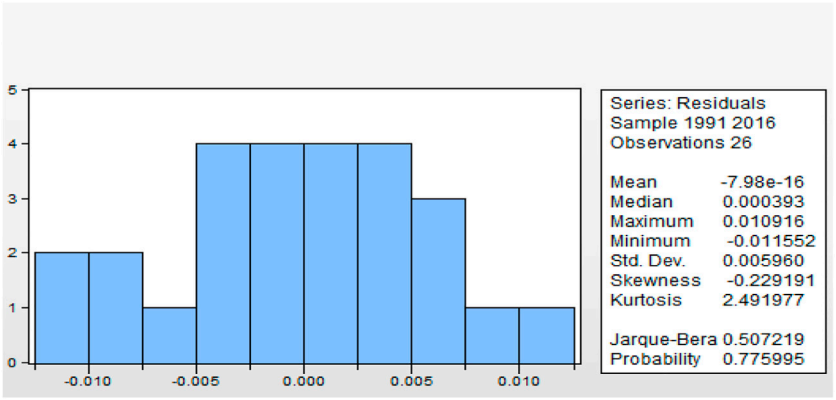

FIGURE 2
Check for normality by the Jarque–Bera method.

following forecast values: 1) the average annual price for Urals oil is 96 dollars per barrel. 2) The average rate of the dollar is 37 rubles to U.S. dollar. 3) Oil and gas revenues at the level of 6818 bln. Russian rubles. Taking into account the preservation of structural proportions, revenues from the production and export of petroleum products were projected at 5,420 bln. Russian rubles and revenues from gas production and export at 1,398 bln Russian rubles (Figure 4).

Figure 5 indicates the forecast for deep decarbonization modeling in developing countries for the next 30 years until 2050.

The result of paper also proves that the use of fuel has been responsible for converting it into gaseous substances in order to generate energy that is applicable for the developing countries in the next couple of decades. Fuel is the most dominant source of energy generation, allowing countries with the largest petroleum reserves to profit from the worldwide demand. The problem with fuel is that it produces a significant amount of energy that is responsible for saturating the atmosphere with a high amount of carbon emissions. The changes may take place after a couple of decades and after a series of approvals and disapprovals. This is brought about by the gradual changes with the supply of energy and the presence of renewable energy facilities that are installed by government institutions.

Figure 6 presents the top six carbon-emitting countries and regions, including the EU (European Union), as of 2014. China ranks first as the country with the largest carbon emissions than any other country around the world with over 10 million tons of carbon dioxide emissions. The United States ranks second with at least five million tons of carbon dioxide. The EU nations account for at least three million tons of carbon dioxide particles. The Russian Federation ranks fourth, while Japan ranks fifth with one million tons of carbon dioxide each. India is the rising star in this position with at least two million tons of carbon dioxide emissions as of 2014. Both India and China are expected to increase their carbon emissions due to the growing manufacturing and other industrial developments across their nations.

It is obvious that even though China is considered one of the richest countries in the world in terms of nominal gross domestic product, the whole economic situation of the country is still under a developing status. This is similar to India's economic situation, wherein it is still tagged as a developing nation. There are still numerous areas across these two nations that have a significant number of people living below the poverty line. The increasing number of carbon emissions each year indicates China and India's developing status. This means that the government in these two nations has yet to create a concrete solution to control the country's growing concern over carbon emissions.

As a strategy, one important aspect is the identification of the countries responsible for causing a concern in terms of increasing carbon emissions. Countries with the largest area, population, and industrial capacity to produce numerous commodities have one of the highest carbon emission rates. Identifying the factors responsible for causing several environmental hazards through

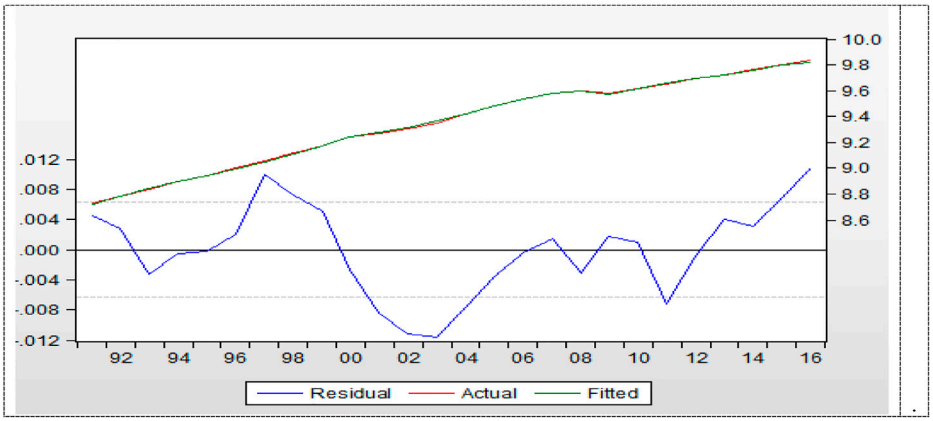

FIGURE 3
Check for heteroscedasticity.

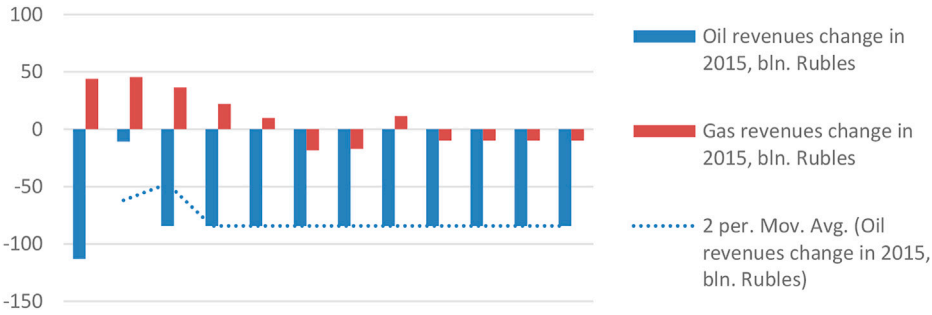

FIGURE 4
Revenue change in 2015, bln Russian rubles.

TABLE 2 Model efficiency summary.

MAPE	MAE	RMSE
0.0072	0.0662	0.0764

the emission of carbon particles enables the development of an efficient and accurate deep carbonization modeling. Identifying the main product of concern responsible for emitting high amounts of hazardous carbons in the atmosphere will be applied. Technological developers may soon convert it into a decarbonized compound.

Figure 7 illustrates five considerable questions to determine an effective deep carbonization modeling procedure. The first is the electricity mix that mixes renewables, nuclear, and fossil fuels with CCS (carbon capture and storage). The alternative use of biomass supply is a promising decarbonizing solution to replace diesel resources that produce high amounts of carbon. This is similar to the balancing of fuel or the application of fuel switching. Petroleum products are now under the process of being converted into a safer emission of other gas components other than carbon.

The most interesting fact about deep carbonization modeling is the application of CCS, which is essential for improving the carbon density of the atmosphere. The carbon capture and coal consumption may result in penalties with the energy sector of communities. The use of CCS is one of the most efficient alternative solutions to ensure that there will be less carbon released into the atmosphere once new emissions are released by factories. Developing countries are conscious of the pricing of CCS due to their limitation of carbon sources responsible for improving the environment. This is because some highly developed countries are also having similar problems with regard to the increasing carbon emissions brought about by fuel sources.

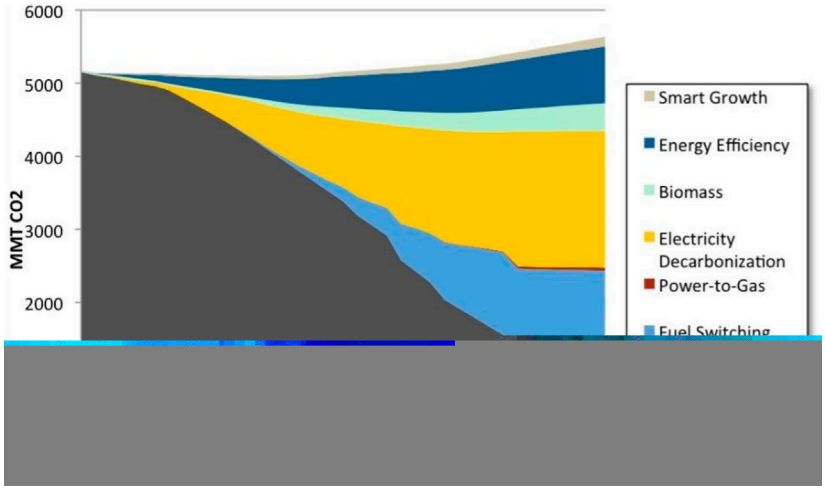

FIGURE 5
Deep carbonization forecast modeling in developing countries.

FIGURE 6
Top five CO_2 emissions from fossil fuel-using countries.

Discussion

Deficits in technical capacity

There are significant deficits in technical capacity as related to the measurement of carbon emissions brought about by fuel and electric resources. In developing countries, it has been revealed that most industries heavily use fossil fuels and petroleum deposits. These are the raw materials responsible for producing large amounts of carbon in the atmosphere. At first, developing countries are benefiting the resourceful impacts of fossil fuels that provide energy resources to their industries. The only problem is the increasing carbon particles that are now disposed into the atmosphere. For as long as there will be new industries that are fully developed, this will be the time that developing countries will attempt to diversify their existing energy resources to alternative products. The deficits in this observation from the presentation of graphs are the lack of alternative renewable resources.

Developing countries are heavily relying on traditional energy-producing products that are potentially hazardous to their environment. Fossil fuels are relatively cheaper than generating alternative renewable resources. Government officials of developing countries perceive alternative energy fuels that are not a practical solution to decrease carbon emissions. The main reason is due to the cost of each raw material, construction, and the maintenance of each facility. Most developing countries still prefer the cheapest form of energy resource to power and produce energy supply and concentrate on more serious political and economic issues (Pye and Bataille, 2016; Robalino-López et al., 2016; Rodríguez and Pena-Boquete, 2017; Raza et al., 2019; Rana et al., 2020).

Changes in the economic structure

Developing countries that already industrialized most of their neighborhoods and communities are now starting to consider the deep decarbonization process (Van Mathiesen, 2015). As some of the countries are already industrialized enough that they are now capable of developing a long-term solution to save the environment, there are numerous companies that are now willing to participate in decarbonizing the atmosphere using alternative energy sources. As there are more companies that are willing to participate in the introduction of new decarbonization facilities, it signifies that there is a promising change in the economic structure of a