Universal Journal of Business and Management, 2021, 1, 22-48
www.scipublications.org/journal/index.php/ujbm
DOI: 10.31586/ujbm.2021.010103

Article

Oil Shocks and the Economic Growth: A Study for Oil-importing and Exporting Countries in the Time of Covid-19

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Abstract: This article discusses the effect of the oil shock on some OECD oil-importing countries such as Canada, France, Italy, China, and the United States and some OPEC oil-exporting countries such as Algeria, Iran, Kuwait, Saudi Arabia, and Venezuela. The model is estimated for the years 1976-2021. five annual variables are used for each country. The variables within the model include real oil prices, GDP growth, inflation, real wages, and real effective exchange rates. Real GDP is the main variable that shows the effects of oil prices on the economy, and the impact of oil prices on other model variables will indirectly affect economic activities. For this purpose, we estimate the vector autoregression model. Estimates obtained for different countries show that oil price shocks are one of the variables affecting economic growth. Also, in oil-exporting countries, oil shocks on economic growth are positive and negative in oil-importing countries. Also, Covid-19 is studied as an effective parameter in creating oil shocks.

Keywords: Real GDP; Effective exchange rate; Real oil prices; Real wages; Inflation, Covid-19.

How to cite this paper: Norouzi, N. (2021). Oil Shocks and the Economic Growth: A Study for Oil-importing and Exporting Countries in the Time of Covid-19. *Universal Journal of Business and Management*, *1*(1), 22–48. Retrieved from https://www.scipublications.com/journal/index.php/ujbm/article/view/61

Received: July 2, 2021
Accepted: August 13, 2021
Published: August 14, 2021

1. Introduction

The dependence of technology on oil has made oil the main factor in the world economic cycle[1]. Fluctuations in production costs in industrialized countries, due to rising or falling oil prices, as well as the implementation of development programs in oil-exporting countries, have increased the sensitivity and concern of both groups of countries to changes in oil prices, so that the success or failure of growth programs Economics, even social and cultural programs, depend on accurate forecasting of oil prices[2]. On the other hand, the people of oil-exporting countries are watching the fluctuations in oil prices because they owe their well-being and lives to rising oil revenues. The global oil market is practically overshadowed by the behavior of the two Organization of Petroleum Exporting Countries (OPEC) and the Organization for Economic Co-operation and Development (OECD), with OPEC holding more than half of its exports and members of the Organization for Economic Co-operation and Development (OECD). With 64% of it consumed, they are the main players in this market. The members of these two organizations have long tried to control this market in their favor by adopting production and consumption policies. OPEC is a major supplier, accounting for 40 percent of production and more than half of the world's oil exports. With this degree of importance, it is clear that any oil shock or disruption in the supply of this vital substance will cause a crisis in the global economic cycle[3]. Declining oil supply could lead to higher oil prices and problems for importing countries, making it much more difficult for underdeveloped oil-importing countries to deal with the crisis. This study focuses on the effect of oil shocks on the economic growth of exporting and importing countries. Research hypotheses are: 1- Oil price shocks are one of the variables affecting economic growth. 2- In oil-exporting countries, the effect of oil shocks on economic growth is positive. 3- In oil-importing countries, the effect of oil shocks on economic growth is negative.

2. Theoretical Framework

In this section, we examine the factors affecting the market and global crude oil prices. Then we define the oil shock. Then we examine the relationship between economic growth and energy prices. A comparison has been made between the share of OECD countries' crude oil and OPEC's global crude oil supply[4, 5].

2.1. Investigating the factors affecting the market and world prices of crude oil

The significant increase in world crude oil prices in recent years and the intensification of price fluctuations in this strategic commodity have more than ever involved various minds in analyzing the reasons for these phenomena[6].

In general, like any other commodity, three categories of factors affect crude oil prices. First - the basic factors mainly include supply and demand and the factors affecting them [7].

Second - political-psychological factors are usually political phenomena with psychological effects and consequences, and as long as there is a political phenomenon, its psychological effects are also present. Oil is not a productive commodity but an extractive material. The major areas of reserves and, of course, the extraction and production of this substance do not match the major areas of consumption, and this fact has turned oil into a geopolitical phenomenon that is affected by any political change, especially in supply areas.

Third - are technical or technical factors. Of course, due to the sensitivity, necessity, and strategic nature of this product, the intensity of the impact of these factors on its price is more than any other product. But there is a fourth factor that is perhaps more applicable to the oil market than any other commodity and complicates the analysis of the oil market and price forecasts, and that is information about supply and demand and the market[8].

2.1.1. The most important factors affecting demand

In demand, it should be noted that crude oil is a commodity that naturally does not have a direct need and should be converted into petroleum products, so any factor that affects the demand for petroleum products indirectly affects the oil demand. Raw is also effective[5].

A. Price elasticity of demand: Crude oil and petroleum products are economically less elastic commodities, i.e., the percentage of quantity changes versus price changes is very limited, and the demand curve tends to be vertical. Econometric studies show that the demand curve has also become more helpful; That is, crude oil has become more and more an essential commodity [9].

B. Economic growth and demand: After the 1970s, the world average economic growth has been relatively high.

C. Energy intensity and demand index: In OECD countries, the energy intensity index decreased sharply after the oil shocks of the 1970s but has not decreased significantly annually in the last decade, although it has almost reached relative stability. (Figure 1. Energy intensity index)

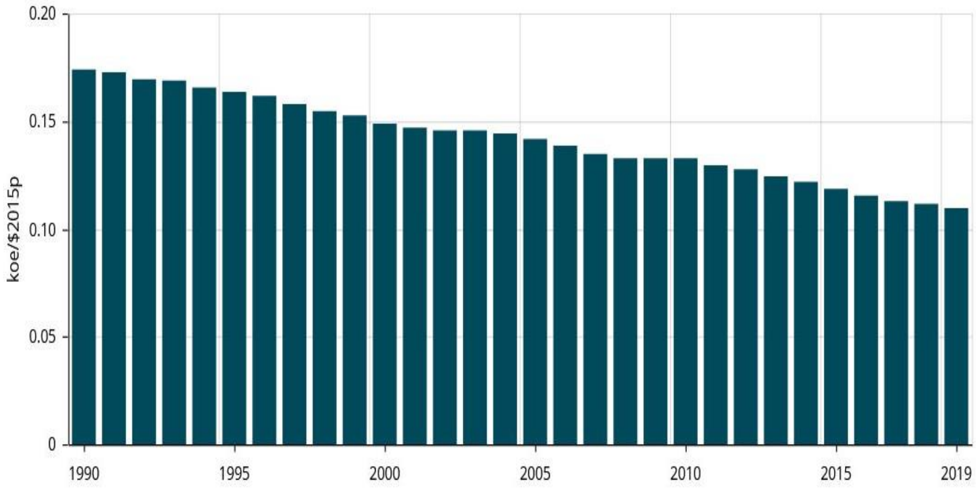


Figure 1. World's Energy intensity from 1990-2019.

D. Alternative energy and oil demand: It is noteworthy that during the last 3 or 4 decades in industrialized countries, a lot of efforts have been made to increase the share of other alternative energy carriers and maintain the share of coal, but despite these efforts, oil Raw still retains its 34% share of the world consumer basket[2].

E. The special position of the transportation sector in oil demand: In the transportation sector, no suitable alternative has been found for petroleum products despite all the efforts made. Were it not for this refinement in refining maneuvers, refineries would naturally only change their refining composition to produce more gasoline, and demand for crude oil would not increase.

G. Engines of economic growth and oil demand: Demand growth is also important in certain countries like the United States, India, and China. If intensified and turned into a recession, the recent decline in US economic growth could change prices in recent years[3].

H. Demand for storage: Industrialized countries after the 1970s and the first oil shock have adopted a policy of storing some crude oil for critical situations, and the International Energy Agency has specific guidelines for OECD member countries in this regard.

D. Fluctuations in the dollar and global oil demand: Given that the vast majority of goods, including energy and crude oil carriers, are priced in dollars when entering markets and global exchanges, so changes in the value of the dollar in particular In contrast, other major international currencies can affect the supply and demand of many commodities, including crude oil[8].

J. Oil demand and stock exchange transactions: Other factors affecting demand and supply are oil exchange markets in which so-called futures trading occurs. Trading volume has been increasing rapidly since the mid-1970s when crude oil entered the stock market.

2.1.2. The most important factors affecting supply

A. Exploration and reserves: The amount of world oil reserves and the status, the number of exploration potentials, the number of discoveries, the level of annual replacement reserves, and the volume of development investments affect the oil market[10](see figure 2).

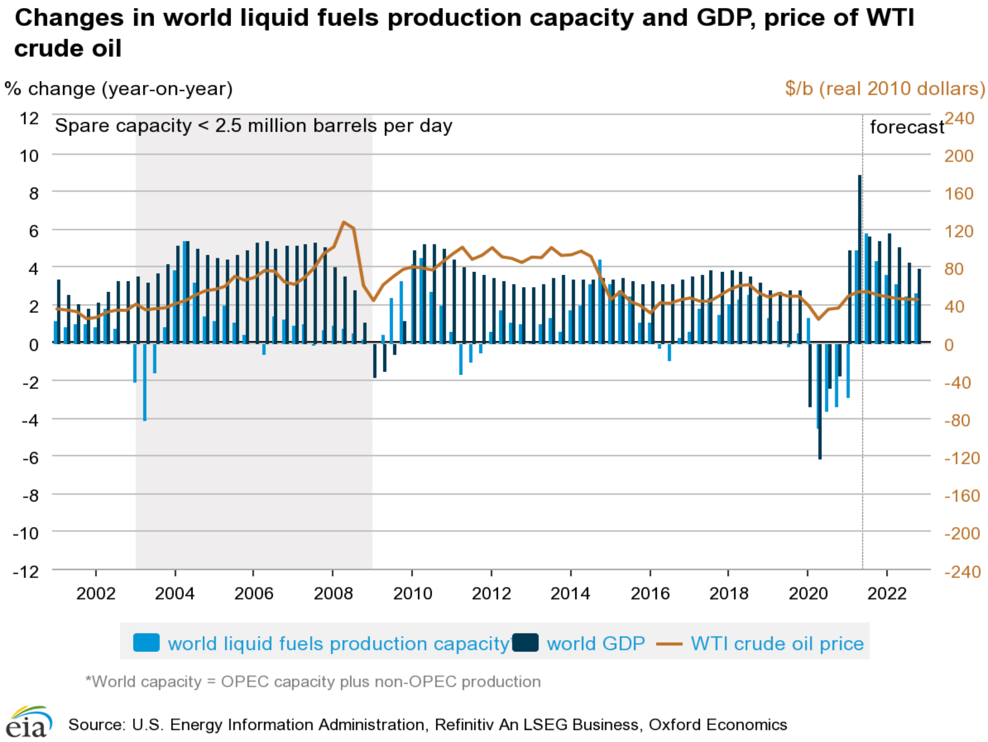


Figure 2. OPEC spare capacity in 2001-2022.

B. Production capacities: OPEC and non-OPEC production capacities are other important factors affecting the market. After the 70s in OPEC, the connection between production capacities and real production was almost cut off, resulting from industrialized countries' dependence on OPEC production. This has caused OPEC to always have excess capacity. Figure 2 illustrates the issue.

C. Stocks: Commercial and strategic stocks affect supply as well as demand. In certain circumstances, it may be decided that these stocks will enter the market[10].

D. Production costs: Changes in the structure of production costs are also effective in supply. If technological developments cause a significant reduction in exploration and extraction costs from new areas under the above conditions, it will naturally affect the market [11,12].

E.Political-psychological factors: The psychological sensitivities of the oil market are very high. Political-psychological factors such as wars, terrorist attacks, and even threats put psychological pressure on the oil market and cause prices to rise. Especially in the current market conditions, reducing excess production capacity to close to zero has greatly increased the psychological sense of the market. It should be noted that political and psychological factors do not necessarily work in the same direction as the basic factors, i.e., in many cases, the basic factors may be to push prices down. Still, the political-psychological factors have increasing pressure, and this is market analysis. Complicates[13].

2.1.3. Technical factors

Technical factors such as accidents that damage facilities, storms that close loading docks, or accidents to oil tankers are also influential, but the effects are short-lived. In the last one or two years, with major natural disasters such as the tsunami in South Asia and Hurricane Katrina in Central America, the impact of such factors on the oil market has been significant. Especially when technical factors are combined with other factors, the market and oil prices are doubled[14].

2.1.4. Distorted market information

One of the main reasons for the unpredictability of the oil market, which has received less attention and attention, is statistics. One is that statistics in the oil market are not standard. For example, OPEC, in its definition of crude oil, gas condensate Does not count as part of it. Still, some other authoritative authorities add condensate cultivars to crude oil, and that all market factors, both consumers and producers, for different reasons and with different motives, produce unrealistic figures from production and consumption. They present themselves. The type of misconduct is not such that in a certain direction it is estimated as more or less than real and can be corrected with adjustment coefficients, for example, some OPEC members show their production less than real to cover their violations, and others do not lose their quota, they over-report their production[15].

2.2. An Introduction to the Oil Shocks

Oil shock caused by rising oil prices The rise in oil prices may be slow and gradual and sudden and unexpected. The oil crisis follows the oil shock, called the energy price shock, which increases energy prices. Crude oil, as one of the major energy carriers, directly affects energy prices. As crude oil prices rise in the world market, energy prices rise and vice versa. On the other hand, indirectly, with the increase in oil prices, the demand for other energy carriers increases, and in this case, the cost of producing competing sources for supply for energy sources increases, so competing for energy sources always changes with increasing oil prices. In general, the oil price shock is an energy price shock, and the energy crisis is directly related to the oil crisis.

There are five main oil or energy shocks in 1973 (related to the Arab-Israeli war), 1979 (related to the victory of the Islamic Revolution in Iran), and 1990 (related to the Iraq-Kuwait war)[16, 17], Oil shocks of great economic crisis (2010-2011) and Covid-19 (2020-2021).

2.2.1. The relationship between economic growth and energy prices

In addition to labor and capital, energy is also one of the inputs of production. Therefore, production is a function of labor and capital, energy.

Increasing each of these three factors increases production. On the other hand, energy itself is a function of the price of energy carriers. The relationship between energy consumption and the price of these carriers is inverse. On the other hand, these carriers are substitutes for each other; in other words, the increase in the price of one carrier depends on the extent to which other carriers can be substituted in terms of technology.

If such an alternative is possible, this price increase will have little effect on costs in the long run. To show the direct and indirect effect of energy price change, we do the following[18]:

$$Y=Q-PE.E \tag{1}$$

First, we reduce energy costs from GDP (Q), (Y) economic growth; PE is energy prices. The effect of energy price change on the net product is obtained as follows:

$$\frac{\mathrm{dlnY}}{\mathrm{dlnP_E}}=[\frac{P_K.K}{y}]=\frac{\mathrm{dlnK}}{\mathrm{dlnP_E}}+[\frac{P_L.L}{y}]\left(\frac{\mathrm{dlnl}}{\mathrm{dlnP_E}}\right)-[\frac{P_E.E}{y}] \tag{2}$$

Therefore, the effect of a change in energy prices is expressed by the share of costs of each factor of production and the surrogate effect of energy prices on the amount of labor and capital used in production (the first two sentences). Third sentence: shows the direct effect of the price that the net product related to the share of energy costs in production decreases with increasing energy prices. Because of the increase in energy prices, additional resources are used for intermediate energy inputs. Whether used to compensate for energy imports or for domestic energy production, these resources will, in any case, reduce the net product[19].

In the short run, due to the industry structure, the cross-tension between energy and other factors is negative. As a result, the direct and indirect effects are in the same direction in the short run. In the long run, as energy becomes more expensive, industries may change their structure and replace cheap inputs[20].

2.3. Examining the future trend of global crude oil demand and OECD countries

Forecasts for the future of energy demand by 2025 show that total energy demand will increase from 9008 million tonnes of oil equivalent in 2000 to 14890 million tonnes of oil equivalent in 2025, with an average growth rate of 2% for this period.

Although the current trend indicates an increase in the importance of natural gas and a slight decrease in oil share, oil is still the most important source of energy supply, especially since its use is necessary for some sectors and there is no suitable alternative[21].

Studies show that oil demand growth in developing and transition countries will be much higher than in OECD and industrialized countries. So that the demand for oil in developing countries in 2025 will be more than double this demand in 2002. Although demand growth for this vital substance is very low in developed countries, OECD countries are still the main consumers of oil and in 2025 will consume nearly 48.69% of total oil. Despite the high growth of their demand, the share of transition countries is at a low level, and in 2010 and 2025 will consume 6% and 5.5% of total world oil, respectively. But the share of developing countries will approach the share of OECD countries with a significant increase.

US dependence on crude oil increased from 35 percent in 1973 to 50 percent in 1977. But in the years following the victory of the Islamic Revolution and the outbreak of the imposed war, the United States reduced the index to 27 percent in 1985 by increasing Alaska oil production and reducing US crude demand. Again, in 1986, following a gradual decline in crude oil production and US economic growth, the share of imported crude oil in total domestic consumption rose steadily, reaching 15% in 2001. It is noteworthy that, despite rising global crude oil prices and the events of 9/11, the index fell by only 2% to 53% at the beginning of 2003[22] (see Figure 3).

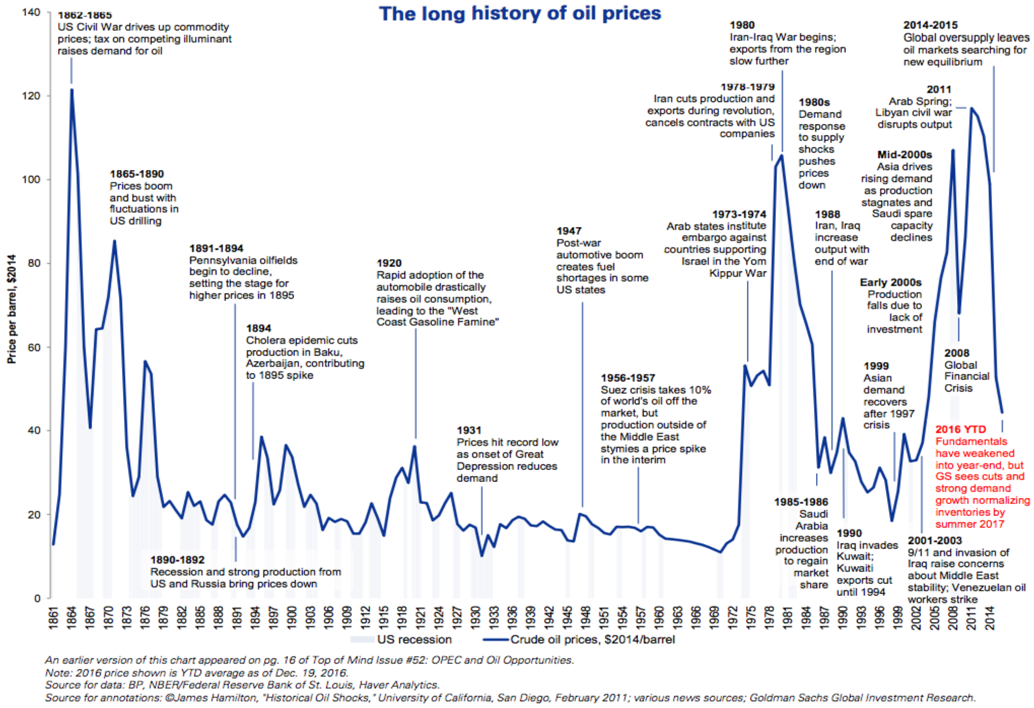


Figure 3. History of Crude oil price changes.

2.3.1. share of imported crude oil from total crude oil consumption

Figure 3 shows the trend in crude oil prices and the degree of dependence of OECD countries on crude oil imports. According to the chart, the share of imported crude oil in total crude oil consumption declined in the 1970s and early 1980s. The decline in the share of imported crude oil in total crude oil consumption from 85% in 1975 to 50% in 1985 was the decline in OECD crude oil production, especially in Alaska and the North Sea[4]. The index rose again to 60 percent in the 1990s, mainly due to OECD economic growth during the period, a relative decline in US crude oil production, and a relatively steady trend in global crude oil prices[12].

With the onset of crude oil prices since 2001, OECD countries have become increasingly dependent on crude oil imports fell to 51 percent at the beginning of 2003, which is a good indicator of the vulnerability of industrialized countries to oil shocks.

However, the degree of vulnerability and degree of dependence on imported crude oil varies among OECD countries. Statistics show that in some countries, such as China, Sweden, and South Korea, almost all of their crude oil is imported, the more vulnerable, and in some other countries, such as the Netherlands and Ireland, the above index (the share of crude oil imported from Total crude oil consumption) is lower than the average level of OECD countries, the degree of vulnerability is lower[17](see figure 4).

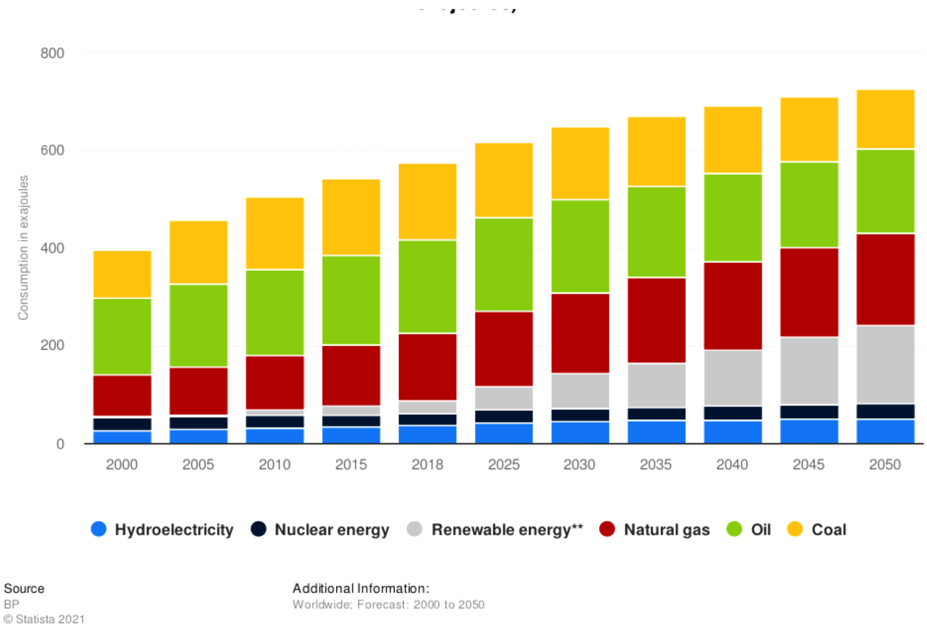


Figure 4. Global final consumption by source.

2.4. OPEC share of global crude oil supply

According to experts, the second indicator of the OECD countries' vulnerability to the suspension of crude oil supply is OPEC's share of global crude oil supply. According to the chart, OPEC's share fell from 56 percent in 1973 to 29 percent at the end of 1985. This rate remained almost constant between 1986 and 1993, then went up until 2000, reaching its highest level since 1980 at 44%. In recent years, OPEC's share has been declining again, reaching 41.7% in 2005.

According to the chart, crude oil surplus capacity is now at its lowest level in 30 years, even lower than during the Arab-Israeli war (1973), the Islamic Revolution of Iran (1979), and the Iraq invasion of Kuwait (1991). Excess crude oil production capacity is currently observed only in some OPEC member countries, mainly in Saudi Arabia[16].

2.5. Covid-19 impacts

The outbreak of COVID-19 disease and the restrictive measures taken to deal with it led to all markets, especially the energy market, facing severe shocks on the consumer side. According to most institutions, the average oil demand in 2020 decreased significantly and most sectors in the energy industry damaged by the pandemic. The oil and gas industry is especially damaged more than any other energy sector during the pandemic's early days. And several prices, demand, and technical shocks hit the hydrocarbon market in several regions (i.e., Negative oil price in April 2020). Reviewing energy reports and other professional oil and gas market essays, this article analyzed the oil and gas market during the COVID-19 crisis. However, it can be studied quantitatively, and many methods can be implemented to study these markets, but lack of data for several parameters of the oil and gas market is the most important limitation of this kind of study, which prevents researchers from comprehensive research in this field. Therefore, this article tried to use a literature review to fill that limitation and illuminate this section of Covid's story in the light of the energy industry. Our results show that the oil industry is rapidly losing investments, and many mega projects in this industry are closing due to a lack of funding. Thus, it can be concluded that the oil industry needs a new strategy to stabilize its funding backups and attractiveness to the FDI.

3. Literature Review

Fereydoun Hosseini used the GDP index as a dependent variable and used investment, employment, oil price, and the wholesale price index of primary goods as independent variables in the model. The study period is from 1970 to 1993. The countries covered in this paper are 11 countries: the United States, Canada, the United Kingdom, Germany, Spain, China, Italy, the Netherlands, Switzerland, Sweden, and France. To test the oil price symmetry, use the Panel data method and apply the weighted least squares method to calculate the effect of rising and falling oil prices on the GDP growth of selected OECD countries. He concluded that the coefficient of the impact of oil prices on economic growth is negative for all countries, but this coefficient is significant only for the United States, Germany, and Italy at 95%. In other words, an increase in oil prices harmed economic growth, while a decrease in oil prices did not have a significant effect on economic growth.

Maryam Keshavarzian examines oil price fluctuations in some industrialized, industrialized countries (OECD), whether exporters such as Norway, the United Kingdom, Canada, or importers such as the United States, Italy, France, and China. The period is 1970 to 2004. For this purpose uses the non-linear specification of oil prices, which is estimated by the GARCH method, and then estimates the VAR model (autocorrelation vector). He concluded that the effect of rising oil prices on the economic growth of selected OECD countries was not the same. First, in most countries, except for certain countries, falling oil prices have not had an effect on economic growth in those countries, while in the case of rising oil prices in all cases this effect is significant, in other words, oil price fluctuations have an asymmetric effect on economic growth. Second, monetary shocks and oil price shocks are major and significant sources of economic growth instability.

Saeed Peighambari examines the effect of oil price fluctuations on the economies of important OECD countries. In other words, this study examines the interaction between the growth rate of oil prices and the economic growth of important OECD countries. The statistical population used in this study is the major OECD countries: the United States, Germany, the United Kingdom, Italy, China, France, and Canada. As for oil prices, it is the OPEC oil basket. From 1980 to 2005 and data are quarterly. Time series analysis models are used to examine the relationship between variables. The findings of this study show that the effect of oil prices on the level of real GDP of OECD countries is limited to the short term. In addition, for the sake of Granger, the growth rate of the OPEC oil basket price to the real GDP growth rate of each of these countries has been established, but the opposite is not the case. There is also a negative effect of oil storage on the price of the OPEC oil basket. Oil storage by OECD countries also has a positive effect on economic growth in the face of oil price shocks.

Anton Kenneth Mork studied real GDP with macroeconomic variables such as real oil prices, imported goods, workers' wages, unemployment, implicit GDP, and quarterly treasury interest rates. They concluded that positive changes in oil prices were negatively correlated with US real GDP. The series of rising oil prices affect and reduces GDP growth. If the fall in oil prices does not affect GDP growth and the HO hypothesis that the coefficient b is zero can not be rejected.

James Hamilton states that the behavior of oil prices has changed radically since 1986 because there had been no major oil declines until then. He pointed out that oil price on his consumption and investment refers to the asymmetric effect of oil prices. The figure is that the increase in oil prices greatly affects regulators, while in the case of lower oil prices, this effect is zero. In 1984-1994 in the United States, the Chow test showed that the relationship between economic growth and rising oil prices is statistically significant. He also concluded that the initial oil shock is effective for the first four seasons based on the instantaneous reaction function obtained. Rising oil prices after 1973 had a smaller effect on the economy than in the years before 1973.

Antoine Mork stated that the linear relationship between oil prices and production, which Hamilton stated in 1983, is inconsistent with recent observations. He cited oil prices as an unreliable factor for macroeconomic analysis from 1986 onwards. In his paper, Antoine Mork used the VAR model for his analysis and entered the oil price variables, quarterly treasury interest rate, GDP index, and import price index. The hypothesis of endogenous oil prices is rejected. He noted that from 1948 to 1973, most macroeconomic variables were not the culprit for oil prices. If in the 1973 to 1994 sample, there is no Granger causality variable for oil prices. Rising oil prices in 1973 had a major impact on the US macroeconomy, while the effects of falling oil prices in the 1980s were smaller and difficult to describe.

In 2003, Jackal Canada and Fernando Perez Garcia examined oil prices on inflation and industrial production in some European countries during 1960-99. They considered correlation and structural failure and also chose a non-linear model for their analysis. They concluded that oil prices have a lasting effect on inflation and a short-term and asymmetric effect on economic growth.

In 2003, James Hamilton sought to examine the non-linear effects of oil prices on GDP growth. In the United States from 1949 to 1980, the non-linear VAR model concluded that rising oil prices affected the economy. If the price reduction does not affect the economy and the price increase that occurs after a period of oil price stability has a greater effect on the economy than the increase that takes place after a period of oil price reduction. An increase in oil prices will cause a recession, and a decrease in oil prices will lead to a boom, i.e., a decrease in oil prices will increase production.

Rebecca Jimenez-Rodriguez and Marcello Sanchez used multivariate analysis (VAR) in 2004 using a non-linear oil model. They examine the effect of oil price fluctuations on actual activities in industrialized countries in 1972-2001. The United Kingdom and Norway are considered two oil exporters, and the United States and the European region and China and Canada and France and Italy and Germany as oil importers. First, the Granger causality test shows that the relationship between oil prices and macro variables is bilateral in most countries and unilateral in some countries. The next step analyzed the variance and stated that oil shocks are a reliable source for further instability of model variables. Oil price shocks along with monetary shocks are the largest source of instability of macro variables. Seven seasonal variables were used for each country studied.

The variables considered for the model are real GDP [4], real effective exchange rate [5], real oil prices, real wages, inflation, and long-term and short-term interest rates. Some variables are defined as logarithms, while others are simply defined in levels. The proposed VAR model creates a monetary sector (with short- and long-term interest rates instead of money supply indices) that can respond to inflationary pressures. Also, the labor market (by the index of real wages) plays an important role in total supply or demand. All variables remained the same with the order of magnitude. To evaluate the effect of shocks on endogenous variables, the instantaneous response functions were tested using Chulsky analysis [6]. Their model considered the following order: real GDP, real oil prices, inflation, short-term interest rates, long-term interest rates, real wages, and real effective exchange rates. They concluded that in net oil-importing countries, the real effect of rising oil prices is negative in the short run. In the case of net oil-exporting countries, they concluded that rising oil prices positively affected economic growth in Norway, while in the United Kingdom, rising oil prices harmed economic growth. The number of countries affected by oil price shocks is greater than the number of countries affected by monetary shocks.

The OPEC+ member strategy to reduce supply to support price recovery now focuses aggressively on stocks and the shape of the oil curve, and the nature of an approach to supporting the short-term market [24,25,26]. Spot prices are higher than futures contracts, allowing refiners and traders to sell off oil inventories [27].

Several references also have provided some preliminary estimates about the behavior of the oil-stock nexus during the COVID-19 pandemic. The results suggested that the probability of having negative oil and stock returns during the pandemic may be due to uncertainty associated with the relevant markets. Also, results in a study, that daily changes in overall reported cases and total cases of daily deaths induced by COVID-19 have a substantial negative impact on stock returns. The negative impact of COVID-19 on stock returns is becoming more prominent; the study uses total cases of deaths to proxy the effect of this infectious disease[28].

A recent review of the literature on this topic, the Brent price curve remains in contagion phases attack, where long-term oil was more expensive than short (18). So, the price difference between contracts for delivery now and in 6 months remains in contagion [29]. However, it has narrowed significantly over the last two months. For the OPEC +, the ideal scenario is to move the curve shape from the current contagion, when comparing prices lower than future prices [31], into a mild backwardation, with spot prices higher than forward ones. OPEC is still focusing on increasing revenues sustainably through a combination of higher prices and a more significant market share [32].

Research has tended to focus on COVID-19 Cases rather than COVID-19 deaths. The additional problem is that opinion presents a new approach to give an insight into the relationship between oil prices and the number of deaths caused by Coronavirus. Also, the rapid spread of COVID-19 deaths triggers shockwaves on both the stock market and the oil crude, as well, in the real economy. Then, the new economic downturn's depth will impact the policy response to the coronavirus crisis through economic, traffic, trade, financial, and public behavior prevention [33].

Studies that reviewed the long-term relation between GCC stock markets and oil prices also came to the opposite conclusion. Surprisingly, the two studies showed that positive data shows a robust long-term correlation in all countries except Saudi Arabia (is negative)[34, 35].

Nevertheless, Albulescu (26) believes Coronavirus (COVID-19) creates fear and uncertainty, hitting the global economy and amplifying the volatility of the financial market. The study investigates the impact of COVID-19 numbers on crude oil prices while controlling for the impact of financial volatility and the United States (US) economic policy uncertainty. The finding shows that the new cases and new deaths have a marginally negative impact on the crude oil prices in the long run[36].

Concerns have arisen; the increase in the death rate for COVID-19 causes more stagnation and less production, travel, and commercial ties, which explains the decrease in oil prices [37, 38]. That describes the countries implementation of large-scale prevention policy and an attempt to revitalize the economy through the budget and job support, allowing for a slight recovery in the market supported by preventive measures [39].

According to another study, the COVID-19 outbreak is causing shock waves in financial markets and the real economy worldwide, and a policy reaction depends on the depth of the future recession. The study discusses the effect on the uncertainty of the US economic strategy of COVID-19 (measured by the number of new cases and deaths) and oil prices. The study results suggest that new cases in the USA have a substantial impact on the market. However, there are no significant impacts on economic policy uncertainty in death cases. Also, there is a reverse relationship between branch oil prices and political uncertainty, which can boost economic policy uncertainty as branch oil prices decline. A similar relationship was observed between the number of cases and the VIX index [40].

The empirical evidence concerning the correlation between oil prices and Coronavirus disease and the explanations that affected them have positively investigated the impact of the COVID-19 pandemic on the Chinese stock market. The prevalence of COVID-19 has been measured by the daily growth in total confirmed cases and the daily growth in total deaths from COVID-19. Their estimate shows that the reduction in both daily growth in total confirmed cases and total deaths from COVID-19 involves increasing equity returns across all companies. They also demonstrate that the control variables are negative and meaningful[41, 42].

Also used the Swamy-Arora method to analyze panel data to examine the Tunisian stock market's reaction to the current COVID-19 pandemic. COVID-19 is measured by the daily growth of confirmed cases, the daily growth of the death toll, and the daily growth of recovered cases. They concluded that the daily growth of confirmed cases has a positive relationship with inventory returns, while the daily growth of mortality cases adversely affects stock returns performance. On the contrary, the daily growth of recovered cases has a positive but not significant effect. At the same time, they support that the Tunisian authorities have an essential role in combating the spread of the epidemic by taking early preventive measures to protect the population and save the economy[43].

Also, using the daily change in the main stock index and the daily growth in confirmed COVID-19 cases and death data from 64 countries [34] confirms that stock markets respond negatively to the increase in confirmed COVID-19 cases. It also documents a weak stock market response to the number of deaths due to COVID-19[44,45,46,47,48,49,50].

Also, many experts now contend hypotheses regarding COVID-19 deaths appear to be ill-defined debatable. There is a significant negative relationship between the confirmed cases and death cases from COVID-19 and the volume trading on the stock exchange in the world. In the short term, it will be challenging to adapt supply to the possibly faltering demand for recovery because of the recovery of output from non-OPEC (oil prices stability). Despite this interest, no one, to the best of our knowledge, examined the nature of the impact that correlates coronavirus deaths cases with crude oil prices globally and its economy and COVID-19 spillover using ARDL specification[51].

4. Results and Discussion

This study investigates the effect of oil shocks on the economic growth of some oil-importing and exporting countries. The model of this research is taken from the model studied by Rebecca Jimenez-Rodriguez and Marcello Sanchez. The model studied in this research is as follows:

$$rOP=a_0+a_1dlgdp+a_2rcpi+a_3rw+a_4reer+a_5dc \quad (3)$$

rOP is the real price of oil [7]. The real price of oil is the same for all countries. The real price of oil is obtained by dividing the nominal price of British oil by the producer price index [8] of the United States. dlgdp is the differential logarithm of GDP.

rcpi = dlog (cpi) The logarithm of differential GDP is called GDP growth. The logarithm differential of the consumer price index [9] is inflation. rw is the real wage [10]. Real wages are obtained by dividing nominal wages by the consumer price index [11]. reer is the real effective exchange rate. And also, dc shows the logarithm of the number of death cases of the country during the covid-19 period to address the 2020-2021 oil shocks with the model. This statistic does not exist for Kuwait. It should be noted that for each country, its first English letter is used in the model. The study period is 1976-2021.

4.1. Oil exporting countries

In this section, we review some of the OPEC oil exporting countries [12]. The selected countries for this study are Algeria, Iran, Kuwait, Saudi Arabia, and Venezuela. We will also use the method of Rebecca Jimenez-Rodriguez and Marcello Sanchez in this study. The procedure is as follows: In the first stage of the test, the root of each unit of variables is examined in terms of significance and anonymity. Then the vector autoregression pattern is estimated. Optimal interruption is also considered. The instantaneous response function describes the effect of a shock unit of a variable on a period. The cumulative response function shows the effect of a shock unit of a variable up to the nth period. The Chulsky method will be used to obtain the instantaneous and cumulative reaction function. One of the characteristics of this method is that the ranking or sequence between variables is effective in the results. The order of the variables is as follows: GDP growth, real oil prices, inflation, real wages, and real effective exchange rates. Each instantaneous response function describes the effect of a shock unit of a variable on a period, and then the analysis of variance is estimated. In this study, the increase in oil prices has been considered. In the discussion of the analysis of variance, it is stated how effective the model variables were in justifying the changes of a particular variable in the first period. The method of analysis of variance determines the share of impulses entered into different model variables in the variance of the predictive error of a variable in the short and long run. To measure the share of changes in each variable over the changes in other variables over time(see table 1).

Table 1. Results for Algeria and K. of Saudi Arabi.

	Saudi Arabia			Algeria		
Single root test	Significance		Dickey-Fuller test	Significance		Dickey-Fuller test
GDP	1% level	-3.61		1% level	-3.63	
Variable test	5% level	-2.94	-3.38	5% level	-2.94	-3.89
	10% level	-2.61		10% level	-2.61	
Inflation	1% level	-4.27		1% level	-2.64	
Variable test	5% level	-3.55	-7.19	5% level	-1.95	-5.13
	10% level	-3.21		10% level	-1.61	
Exchange rate	1% level	-2.65		1% level	-2.65	
Variable test	5% level	-1.95	-2.71	5% level	-1.95	-1.68-11.68 -1.68
	10% level	-1.61		10% level	-1.60	
Oil price	1% level	-2.63		1% level	-2.63	
Variable test	5% level	-1.95	-4.34	5% level	-1.95	-4.34
	10% level	-1.61		10% level	-1.61	
wages	1% level	-4.21		1% level	-3.61	
Variable test	5% level	-3.53	-3.76	5% level	-2.94	-2.61
	10% level	-3.19		10% level	-2.60	
Covid deaths	1% level	-7.12		1% level	-5.12	
Variable test	5% level	-6.66	-6.72	5% level	-4.66	-5.33
	10% level	-6.57		10% level	-4.57	

In Algeria, the generalized Dickey-Fuller test was performed on model 1 variables. The basis of the work is that the generalized Dickey-Fuller test statistic presented should be greater than the critical values at the desired confidence level. The results show that the generalized Dickey-Fuller test statistic is larger than the critical values. Therefore, these variables are 90% constant. As a result, these variables are I (0). The optimal interval length is Akaike 2 criterion. By performing the cumulative reaction function test, the real oil price shock effect on GDP growth in all periods has a positive upward trend. That is, the effect of the real oil price shock on GDP growth is positive. As shown in Table 2, the cumulative reaction function has an upward trend from the first to the third period. It has a downward trend from the third to the tenth period. In the analysis of variance in the first period, 100% of GDP growth shock is justified by the shock of GDP growth itself, and in subsequent periods, its amount is reduced to about 69% in the tenth period.

Table 2. Results for Kuwait and Iran.

	Iran			Kuwait		
Single root test	Significance		Dickey-Fuller test	Significance		Dickey-Fuller test
GDP	1% level	-3.62		1% level	-3.62	
Variable test	5% level	-2.96	-4.31	5% level	-2.94	-6.31
	10% level	-2.61		10% level	-2.61	
Inflation	1% level	-3.66		1% level	-3.66	
Variable test	5% level	-2.96	-3.84	5% level	-2.96	-4.76
	10% level	-2.61		10% level	-2.61	
Exchange rate	1% level	-2.64				
Variable test	5% level	-1.95	-4.28			
	10% level	-1.61				
Oil price	1% level	-2.63		1% level	-2.63	
Variable test	5% level	-1.95	-4.348	5% level	-1.95	-4.34
	10% level	-1.61		10% level	-1.61	
wages	1% level	-2.62		1% level	-4.21	
Variable test	5% level	-1.94	-1.57	5% level	-3.53	-2.91
	10% level	-1.61		10% level	-3.19	
Covid deaths	1% level	-4.42		1% level	-8.05	
Variable test	5% level	-4.31	-4.36	5% level	-5.88	-5.78
	10% level	-4.05		10% level	-5.32	
Single root test	1% level	-2.62		1% level	-4.62	
	5% level	-1.95	-6.37	5% level	-1.95	-6.69
	10% level	-1.61		10% level	-1.61	

In Iran, the generalized Dickey-Fuller test was performed on model 1 variables. The basis of the work is that the generalized Dickey-Fuller test statistic presented should be greater than the critical values at the desired confidence level. The results show that the generalized Dickey-Fuller test statistic is larger than the critical values. Therefore, these variables are 90% constant. As a result, these variables are I (0). However, because the generalized Dickey-Fuller test statistic is smaller than the critical values, the HO hypothesis of variable anonymity at the 10% level cannot be ruled out. Therefore, this variable is at the Namana level and is larger than the critical values by the one-time difference of the generalized test-Fuller statistic. The null hypothesis that this variable is anonymous is rejected at the 09% confidence level. As a result, this variable means the difference of the first order or I (1). As a result, these variables are I (0). The optimal interval length is Akaike 2 criterion. By performing the cumulative reaction function test, the real oil price shock effect on GDP growth from the tenth period onwards has an increasing trend. The effect of the real oil price shock on positive GDP growth is weak (see table 2).

As shown in Table 2, the cumulative reaction function has a decreasing trend from the first period to the second period. It has an increasing trend from the second to the third period. From the third to the fourth period, it has a decreasing trend. It has an increasing trend from the fourth to the fifth period. It has a decreasing trend from the fifth to the sixth period. It has an upward trend from the sixth to the tenth period. In the analysis of variance in the first period, 100% of GDP growth shock is justified by the shock of GDP growth itself, and in subsequent periods, its amount is reduced to approximately 66% in the tenth period.

In Kuwait, the generalized Dickey-Fuller test was performed on model 1 variables. The basis of the work is that the generalized Dickey-Fuller test statistic presented should be greater than the critical values at the desired confidence level. The results show that the generalized Dickey-Fuller test statistic is larger than the critical values. Therefore, these variables are 90% constant. As a result, these variables are I (0). However, because the generalized Dickey-Fuller test statistic is smaller than the critical values, the HO hypothesis of variable anonymity at the 10% level cannot be ruled out. Therefore, this variable is at the Namana level and is larger than the critical values by the one-time difference of the generalized Dickey-Fuller test statistic. The null hypothesis that this variable is anonymous is rejected at the 09% confidence level. As a result, this variable means the difference of the first order or I (1). As mentioned earlier, Kuwait does not have real effective exchange rate statistics. We estimated the model without this statistic. The optimal interval length is Akaike 1 criterion. By performing the cumulative reaction function test, the effect of real oil price shock on GDP growth has a positive upward trend in other periods except for the second period. That is, the effect of the real oil price shock on GDP growth is positive. As shown in Table 2, the cumulative reaction function has a downward trend from the first period to the second period. It has an upward trend from the second period to the fourth period. It has a positive upward trend from the fourth to the tenth period. In the analysis of variance in the first period, 100% GDP growth shock is justified by the GDP growth shock itself, and in subsequent periods, its amount is reduced and reaches about 80% in the tenth period.

In Saudi Arabia, the generalized Dickey-Fuller test was performed on model 2 variables. The basis of the work is that the generalized Dickey-Fuller test statistic presented should be greater than the critical values at the desired confidence level. The results show that the generalized Dickey-Fuller test statistic is larger than the critical values. Therefore, these variables are 90% constant. As a result, these variables are I (0). As a result, these variables are I (0). The optimal interval length is Akaike 2 criterion. By performing the cumulative reaction function test, the real oil price shock effect on GDP growth in all periods is increasing. That is, the effect of the real oil price shock on GDP growth is positive. As shown in Table 2, the cumulative reaction function has a negative upward trend from the first to the second. From the second period to the third period, it has a negative decreasing trend. It has a negative upward trend from the third to the sixth period. It has a negative decreasing trend from the sixth to the seventh period. It has an upward trend from the seventh to the twelfth period. In the analysis of variance in the first period, 100% of GDP growth shock is justified by the GDP growth shock itself, and in subsequent periods, its amount is reduced to about 39% in the tenth period(see table 1).

In Venezuela, the generalized Dickey-Fuller test was performed on model 1 variables. The basis of the work is that the generalized Dickey-Fuller test statistic presented should be greater than the critical values at the desired confidence level. The results show that the generalized Dickey-Fuller test statistics are larger than the critical values. Therefore, these variables are 90% constant. As a result, these variables are I (0). However, because the generalized Dickey-Fuller test statistic is smaller than the critical values, the H_O hypothesis of variable anonymity at the 10% level cannot be ruled out. Therefore, this variable is at the Namana level and is larger than the critical values by the one-time difference of the generalized Dickey-Fuller test statistic. The null hypothesis that this variable is anonymous is rejected at the 90% confidence level. As a result, this variable means the difference of the first order or I (1)(see table 3). The optimal interval length is Akaike 1 criterion. By performing the cumulative reaction function test, the real oil price shock effect on GDP growth has an increasing trend in all periods except the second period. That is, the effect of the real oil price shock on GDP growth is positive. As shown in Table 2, the cumulative reaction function has a downward trend from the first period to the second period. It has an upward trend from the second to the tenth period. In the analysis of variance in the first period, 100% of GDP growth shock is justified by the GDP growth shock itself, and in subsequent periods, its amount is reduced to about 41% in the tenth period.

Table 3. Results for Canada and Venezuela.

Single root test	Canada			Venezuela		
	Significance		Dickey-Fuller test	Significance		Dickey-Fuller test
GDP	1% level	-4.22		1% level	-4.22	
Variable test	5% level	-3.53	-3.67	5% level	-3.53	-4.26
	10% level	-3.20		10% level	-3.20	
Inflation	1% level	-4.27		1% level	-3.65	
Variable test	5% level	-3.55	-2.01	5% level	-2.95	-2.61
	10% level	-3.21		10% level	-2.61	
Exchange rate	1% level	-2.64		1% level	-2.64	
Variable test	5% level	-1.95	-5.27	5% level	-1.95	-6,798441
	10% level	-1.61		10% level	-1.61	
Oil price	1% level	-2.63		1% level	-4.37	
Variable test	5% level	-1.95	-4.26	5% level	-3.60	-3.65
	10% level	-1.61		10% level	-3.23	
wages	1% level	-2.63		1% level	-2.63	
Variable test	5% level	-1.95	-4.34	5% level	-1.95	-4.34
	10% level	-1.61		10% level	-1.61	
Covid deaths	1% level	-7.61		1% level	-5.64	
Variable test	5% level	-6.94	-7.12	5% level	-4.66	-4.53
	10% level	-6.60		10% level	-4.11	

4.2. Oil importing countries

In this section, we review some of the oil-importing countries that are members of the OECD. The countries selected for this study are Canada, France, Italy, China, and the United States, respectively. The process is the same as for oil-exporting countries, as described in the previous section.

In Canada, the generalized Dickey-Fuller test was performed on model 1 variables. The basis of the work is that the generalized Dickey-Fuller test statistic presented should be greater than the critical values at the desired confidence level. The results show that the generalized Dickey-Fuller test statistic is larger than the critical values. Therefore, these variables are 90% constant. As a result, these variables are I (0). However, because the generalized Dickey-Fuller test statistic is smaller than the critical values, the H_O hypothesis of variable anonymity at the 10% level cannot be ruled out. Therefore, this variable is at the Namana level and is larger than the critical values by the one-time difference of the generalized Dickey-Fuller test statistic. The null hypothesis that this variable is anonymous is rejected at the 90% confidence level. As a result, this variable means the difference of the first order or I (1). The optimal interval length is Akaike 1 criterion. By performing the cumulative reaction function test, the effect of real oil price shock on GDP growth in all periods has a negative downward trend. That is, the effect of the real oil price shock on GDP growth is negatively strong. As shown in Table 3, the cumulative reaction function has an increasing trend from the first period to the second period. It has a decreasing trend from the second period to the third period. It has a negative downward trend from the fourth to the seventh period. From the seventh to the tenth period, it has a negative upward trend. In the analysis of variance in the first period, 100% GDP growth shock is justified by the GDP growth shock itself, and in subsequent periods, its amount is reduced to about 85% in the tenth period(see tables 4 and 5).

Table 4. Results for Italy and France.

Single root test	Italy			France		
	Significance		Dickey-Fuller test	Significance		Dickey-Fuller test
GDP	1% level	-4.22		1% level	-4.22	
Variable test	5% level	-3.53	-4.44	5% level	-3.53	-2.76
	10% level	-3.20		10% level	-3.20	
Inflation	1% level			1% level	-2.63	
Variable test	5% level			5% level	-1.95	-9.20
	10% level			10% level	-1.61	
Exchange rate	1% level	-2.63		1% level	-2.63	
Variable test	5% level	-1.95	-1.90	5% level	-1.95	-4,966797
	10% level	-1.61		10% level	-1.61	
Oil price	1% level	-2.63		1% level	-2.63	
Variable test	5% level	-1.95	-4.86	5% level	-1.95	-6.09
	10% level	-1.61		10% level	-1.61	
wages	1% level	-2.63		1% level	-2.63	
Variable test	5% level	-1.95	-4.34	5% level	-1.95	-4.34
	10% level	-1.61		10% level	-1.61	
Covid deaths	1% level	-8.12		1% level	-7.63	
Variable test	5% level	-7.94	-7.99	5% level	-6.98	-7.55
	10% level	-7.60		10% level	-6.55	

Table 5. Results for USA and China.

Single root test	USA			China		
	Significance		Dickey-Fuller test	Significance		Dickey-Fuller test
GDP	1% level	-4.22		1% level	-4.23	
Variable test	5% level	-3.53	-4.66	5% level	-3.54	-4.00
	10% level	-3.20		10% level	-3.20	
Inflation	1% level	-2.63		1% level	-2.63	
Variable test	5% level	-1.95	-1.02	5% level	-1.95	-3.31
	10% level	-1.61		10% level	-1.61	
Exchange rate	1% level	-4.39		1% level		
Variable test	5% level	-3.61	-4.77	5% level		
	10% level	-3.24		10% level		
Oil price	1% level	-4.27		1% level	-2.63	
Variable test	5% level	-3.55	-2.79	5% level	-1.95	-4.52
	10% level	-3.21		10% level	-1.61	
wages	1% level	-2.63		1% level	-2.63	
Variable test	5% level	-1.95	-4.34	5% level	-1.95	-4.34
	10% level	-1.61		10% level	-1.61	
Covid deaths	1% level	-7.11		1% level	-8.21	
Variable test	5% level	-6.94	-6.97	5% level	-7.53	-7.99
	10% level	-6.60		10% level	-7.19	

In France, the generalized Dickey-Fuller test was performed on model 1 variables. The basis of the work is that the generalized Dickey-Fuller test statistic presented should be greater than the critical values at the desired confidence level. The results show that the generalized Dickey-Fuller test statistic is larger than the critical values. Therefore, these variables are 90% constant. As a result, these variables are I (0). However, due to the smaller generalized Dickey-Fuller test statistic than the critical values, the HO hypothesis of variable anonymity at the 10% level cannot be ruled out. Therefore, this variable is at the nominal level and is larger than the critical values by the one-time difference of the generalized Dickey-Fuller test statistic. The null hypothesis that this variable is anonymous is rejected at the 90% confidence level. As a result, this variable means the difference of the first order or I (1). The optimal interval length is Akaike criterion 1.

By performing the cumulative reaction function test, the effect of the real oil price shock on GDP growth in all periods has a negative upward trend. That is, the effect of the real oil price shock on GDP growth is negatively strong. As shown in Table 3, the cumulative reaction function has a downward trend from the first to the fourth. It has an increasing trend from the fourth to the fifth period. It has a decreasing trend from the fifth to the sixth period. It has an increasing trend from the sixth to the seventh period. It has a decreasing trend from the seventh period to the eighth period. It has an almost constant trend from the eighth to the tenth period. In the analysis of variance in the first period, 100% of GDP growth shock is justified by the GDP growth shock itself, and in subsequent periods, its amount is reduced to about 82% in the tenth period.

In Italy, the generalized Dickey-Fuller test was performed on model 1 variables. The basis of the work is that the generalized Dickey-Fuller test statistic presented should be greater than the critical values at the desired confidence level. The results show that the generalized Dickey-Fuller test statistic is larger than the critical values. Therefore, these variables are 90% constant. As a result, these variables are I (0). The optimal interval length is Akaike 1 criterion. By performing the cumulative reaction function test, the effect of real oil price shock on GDP growth in all periods has a negative upward trend. That is, the effect of the real oil price shock on GDP growth is negatively strong. As shown in Table 3, the cumulative reaction function has a downward trend from the first to the third. It has an upward trend from the third to the tenth period. In the analysis of variance in the first period, 100% GDP growth shock is justified by the GDP growth shock itself, and in subsequent periods, its amount decreases and reaches approximately 81% in the tenth period.

In China, the generalized Dickey-Fuller test was performed on model 1 variables. The basis of the work is that the generalized Dickey-Fuller test statistic presented should be greater than the critical values at the desired confidence level. The results show that the generalized Dickey-Fuller test statistic is larger than the critical values. Therefore, these variables are 90% constant. As a result, these variables are I (0). The optimal interval length is Akaike 2 criterion. By performing the cumulative reaction function test, the real oil price shock effect on GDP growth, except for the first five periods, has a negative upward trend. That is, the effect of the real oil price shock on GDP growth is negatively weak. As shown in Table 3, the cumulative reaction function has an upward trend from the first period to the second period. It has a downward trend from the second to the seventh period. It has an increasing trend from the seventh period to the ninth period. It has an almost constant trend from the ninth to the tenth period. In the analysis of variance in the first period, 100% of GDP growth shock is justified by the GDP growth shock itself, and in subsequent periods, its amount is reduced to about 78% in the tenth period(see Table B1).

In the United States, the generalized Dickey-Fuller test was performed on model 1 variables. The basis of the work is that the generalized Dickey-Fuller test statistic presented should be greater than the critical values at the desired confidence level. The results show that the generalized Dickey-Fuller test statistic is larger than the critical values. Therefore, these variables are 90% constant. As a result, these variables are I (0). However, because the generalized Dickey-Fuller test statistic is smaller than the critical values, the

HO hypothesis of variable anonymity at the 10% level cannot be ruled out. Therefore, this variable is at the Namana level and is larger than the critical values by the one-time difference of the generalized Dickey-Fuller test statistic. The null hypothesis that this variable is anonymous is rejected at the 09% confidence level. As a result, this variable means the difference of the first order or I (1). The optimal interval length is Akaike 2 criterion.

By performing the cumulative reaction function test, real oil price shock on GDP growth from the thirteenth period onwards has a negative decreasing trend. That is, the effect of the real oil price shock on GDP growth is negatively weak. As shown in Table 3, the cumulative reaction function has a positive upward trend from the first period to the second period. It has a downward trend from the second period to the eighth period. It has an increasing trend from the eighth period to the eleventh period. It has a downward trend from the 11th to the 16th period. In the analysis of variance in the first period, 100% of GDP growth shock is justified by the shock of GDP growth itself, and in subsequent periods, its amount decreases and reaches about 70% in the tenth period(see figure A1 and figure A2.

Results showed that the covid-19 death cases are effective on the oil market in every studied country. However, this impact is more significant in the oil-exporting countries than the hybrid or non-oil exporting countries.

With the spread of the COVID-19 epidemic, growth, travel, and trade stagnated, and the price of oil decreases. So, it explains the interest conflict of debt producers with different budget requirements, fiscal deficits, and market expectations, substantiating previous findings in the literature[31-35].

There has been some disagreement concerning main OPEC member's hopes to keep oil prices high, and Russia seeks to achieve a share of world oil markets and their impact on prices. Moreover, later spending in China and Europe, once the epidemic is under control, will ultimately promote economic recovery since the effect of better monetary policy and targeted fiscal responses from governments will lead to recovery. As such, oil prices are likely to reach new lower levels, but a medium-term recovery is in sight.

We have found that investors changed their investment strategy as oil spot prices reported a first decline that contributed to high volatility in the future commodity market during the first cycle of coronavirus spread. Our results are consistent with a theory of future expectations on the market, which shows that speculators can predict future price patterns as economic agents [36-42].

We believe that the quick spread of COVID-19 deaths causes a shock wave of the economy, oil, and real estate of the financial market and the depth of the economic downturn depends on the political response to the crises of the Coronavirus by opening up the markets, investment, trade, industrial growth, and public prevention. The excess oil stocks would weigh the oil price in the short term; strict OPEC discipline will need to clear these stocks over the next few years, faced with a slow rebound in demand [32] has provided some preliminary estimates about the behavior of oil-stock nexus during COVID-19 pandemic[43-51]. The results suggested that the probability of having negative oil and stock returns during the pandemic may be due to uncertainty associated with the relevant markets. Unexpected situations such as a pandemic can significantly affect market fundamentals in the short term, and there have been correlations with indexes and oil[52-55].

Our study provides additional support; OPEC must also handle the recovery of crude oil output as demand and oil prices increase. The analysis calls for the two possibilities to involve OPEC Crude Oil. In the middle of 2020, in the negative case, the demand for OPEC crude oil increased to 32 MMbpd in 2024 and then fell to 31 MMbpd. The market for OPEC oil grew in the 2030s, following secular declines of several major non-OPEC producers, especially Russia. The plant remarkably counts from the main basins for the two Covid-19 scenario models in the spring of 2020, the delays due to both falling and rising oil prices[56-61].

This result was not anticipated; the reason for this is probably, after the Covid-19 pandemic, the widening gap between oil demand and supply in the US, triggered by the high death rate in the mid-2020s. The fundamental explanation expected for this is the decline in US production from 2020 to 2024. In the early 2020s, net oil imports are projected to hit 3–4 MMbpd. Coronavirus has a significant effect on the global economy, and thus oil demand, particularly in the most likely cause of a deep and sustained recession, is linked to a prolonged pandemic. Until mid-2023, the average crude oil price will remain below $50/bbl without active OPEC action.

The results indicate that the COVID-19 deaths toll has a significant impact on oil prices. However, it mainly influences the situation reported in the United States. If we evaluate the case outside the United States, we can see the positive impact on oil prices of the estimates of the COVID-19 death. Hence the amplification of mortality risks in the stock market and the real economy caused by the increasing economic instability in the United States.

The evidence from this study suggests the impact of the pandemic will surely reach oil prices, which will continue to decline, at least in the short term, as a result of lower demand for crude oil. Here comes the role of OPEC, a central element in reducing oil price losses through the consent of OPEC members. The reduction in market production thus promotes crude oil prices and improves cash resources.

Our work has led us to conclude several oil-exporting and importing countries are confronted with daunting tasks to challenge group unity. If OPEC manages effectively this decade, the quality of research, strategy, and decision-making must be significantly improved. In the short term, it will be challenging to adapt supply to the possibly faltering demand for recovery because of the recovery of output from non-OPEC.

5. Conclusion

Oil price shocks are one of the variables affecting economic growth. We confirmed this hypothesis in the analysis of variance, which is one of the variables affecting economic growth is oil price shocks. In oil-exporting countries, the effect of oil shocks on economic growth is positive. In Algeria, the shock effect of real oil prices on GDP growth is strong. In Iran, the effect of real oil price shocks on GDP growth is positively weak. In Kuwait, the shock effect of real oil prices on GDP growth is positive. In Saudi Arabia, the shock effect of real oil prices on GDP growth is positive. In Venezuela, the shock effect of real oil prices on GDP growth is strong. In oil-importing countries, the effect of oil shocks on economic growth is negative. In Canada, the effect of real oil price shocks on GDP growth is strong. In France, the shock effect of real oil prices on GDP growth is negative. In Italy, the effect of the real oil price shock on GDP growth is negative. In China, the effect of the real oil price shock on GDP growth is negative. In the United States, the effect of the real oil price shock on GDP growth is negative. Also, Results showed that the covid-19 death cases effectively affect the oil market in every studied country. However, this impact is more significant in the oil-exporting countries than the hybrid or non-oil exporting countries, and these impacts are negative, meaning rising in death cases negatively impacts the real oil price.

Therefore, providing effective solutions to ensure the security of crude oil supply and reduce the vulnerability and dependence on imported crude oil is of great importance for OECD countries. According to the results, they adopted various strategies to deal with the future energy crisis and ensure supply security. Among the most important of these strategies, divided into two general parts, demand-side strategies and supply-side strategies, the following can be mentioned.

A) Demand-side strategies

Managing energy consumption in various economic sectors is one of the most important ways to deal with the energy crisis among OECD countries, reducing the intensity of energy in various sectors such as industry, agriculture, transportation, home, and trade, etc., which are the first steps in this regard. According to the EU Energy Security Document, it started in 2000.

B) Supply-side strategies

- Various sources of energy supply for OECD members

To reduce dependence on crude oil, complete and comprehensive studies have started replacing other types of renewable and new (non-fossil) energy.

- Diversification of crude oil supply sources

As the Gulf region has historically been regarded as one of the world's most politically unstable regions, OECD countries seek new energy sources outside the Persian Gulf region.

- Effective and close interaction with oil-exporting countries

The policies and guidelines of OECD member countries must be adopted to engage and engage seriously with oil-producing countries and create appropriate solutions to bring peace and stability to sensitive and oil-rich regions.

The following orientations are presented to improve the management of oil resources of OPEC countries:

Restructuring the tasks of OPEC governments to empower and improve the efficiency of OPEC governments in the development process, because of the developments in the global economy and explaining the new role of OPEC governments and concentrating OPEC governments' spending on quality public goods with OPEC member countries with infrastructure and Skills with higher production technology should be able to use the opportunities and benefits of oil revenues to provide the necessary ground for productive investment in society.

OPEC member countries must have a well-planned and forward-looking plan for how to use oil revenues, be more productive of these oil revenues, be more productive of these revenues in productive and infrastructure investments in society, and create added value and use in Produce more diligence.

One hundred years of experience in the production and export of crude oil has clearly shown that economic development can not be achieved with the revenues from crude oil export because economic development is not a commodity that can be bought in world markets. The dynamism of R&D activities and the appropriate allocation of R&D budgets in OPEC member countries must be achieved.

Supplementary Materials: the data and material can be available through an official request from the corresponding author.

Author Contributions: "Conceptualization, NN and NN; methodology, NN; software, NN; validation, NN, NN, and NN; formal analysis, NN; investigation, NN; resources, NN; data curation, NN; writing—original draft preparation, NN; writing—review and editing, NN; visualization, NN; supervision, NN; project administration, NN; funding acquisition, NN. All authors have read and agreed to the published version of the manuscript."

Funding: "This research received no external funding."

Data Availability Statement: Data will be available by an official request from the corresponding author.

Acknowledgments: Author Thanks kind supports of the Amirkabir university of technology.

Conflicts of Interest: "The authors declare no conflict of interest."

Appendix A

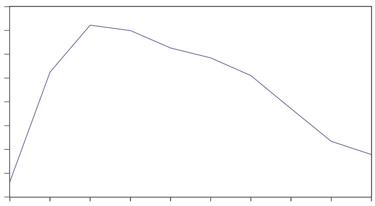
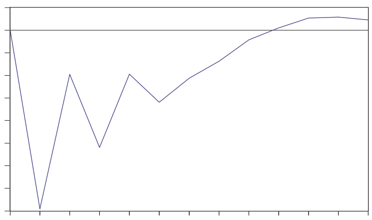
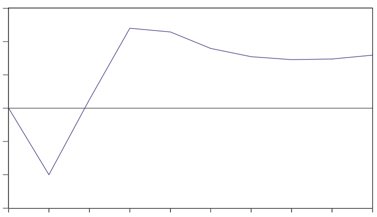
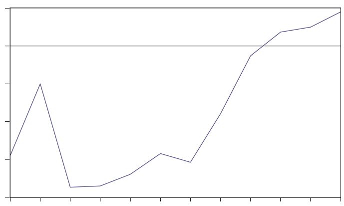
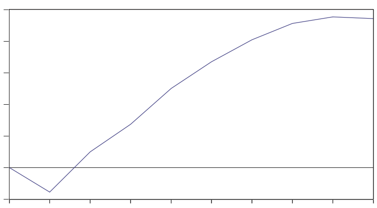
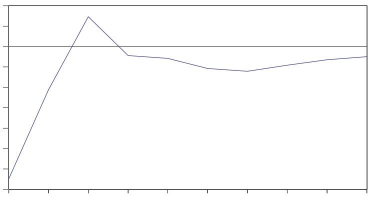
Algeria Accumulated Response of ADLGDP to Cholesky One SD. DLROP” Innovation 	**Iran** Response of IRDLGDP to Nonfactorized One SD. DLROP” Innovation 
Kuwait Accumulated Response of KDLGDP to Nonfactorized One SD. DLROP Innovation 	**Suadi arabia** Response of SDLGDP to Cholesky 
Venezula Accumulated Response of VDLGDP to Cholesky One SD. DLROP Innovation 	

Figure A1. Oil exporting countries Accumulated Response.

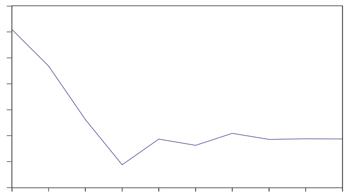
Canada

Response of CDLGDP to Cholesky



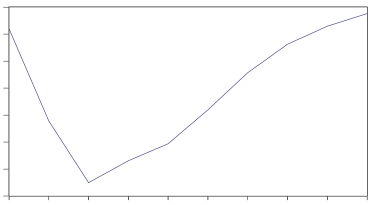
France

Accumulated Response of FDLGDP to Generalized One SD. DLROP Innovation



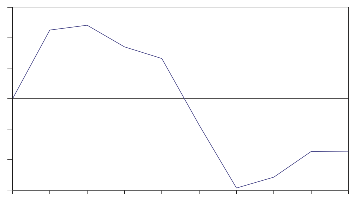
Italy

Accumulated Response of ITDLGDP to Generalized One SD. DLROP Innovation



China

Response of CDLGDP to Nonfactorized One Unit DLROP Innovation



USA

Response of USDLGDP to Nonfactorized One SD. DLROP Innovation

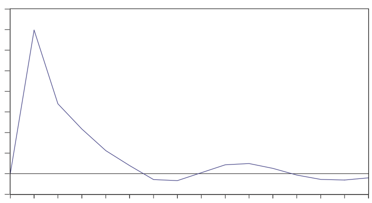


Figure A2. Oil importing countries Accumulated Response.

Appendix B

Table B1. Oil exporting countries variance analysis.

Algeria

Period	SE.	DLROP1	ADLGDP	RACPI	ARW	AREER1
1	0.024	0	99	0	0	0
2	0.036	3.433	84.549	7.478	2.945	0.595
3	0.04	4.233	78.682	11.566	3.604	0.914
4	0.043	3.784	70.217	10.455	12.468	2.076
5	0.044	3.768	69.119	10.916	13.216	1.981
6	0.044	3.741	69.57	10.688	12.642	2.358
7	0.045	3.772	69.32	10.595	12.681	2.632
8	0.045	3.718	69.465	10.253	13.068	2.496
9	0.045	3.833	68.933	10.733	13.061	2.439
10	0.046	3.857	68.483	11.011	13.141	2.508

Iran

Period	S.E.	DLROP1	IRDLGDP	RIRCPI	IRRW	DLIRREER1
1	0.039	0	99	0	0	0
2	0.041	12.587	72.074	0.796	0.377	13.166
3	0.043	12.729	72.438	0.851	0.406	12.576
4	0.044	13.516	68.126	1.87	0.541	14.946
5	0.045	13.282	66.726	2.567	1.001	15.425
6	0.046	13.779	65.987	2.799	1.135	15.3
7	0.047	13.939	65.683	2.957	1.194	15.226
8	0.047	14.041	65.615	2.966	1.192	15.187
9	0.048	14.037	65.568	2.972	1.238	15.184
10	0.048	14.005	65.477	3.003	1.361	15.154

Kuwait

Period	S.E.	DLROP1	KDLGDP	RKCPI	KRW
1	0.037	0	99	0	0
2	0.04	5.708	87.441	5.832	0.019
3	0.041	7.454	85.89	5.368	0.287
4	0.042	8.142	82.073	6.428	2.357
5	0.043	8.396	80.647	6.637	3.32
6	0.043	8.779	80.218	6.579	3.424
7	0.044	8.872	80.11	6.577	3.44
8	0.044	8.9	80.068	6.578	3.454
9	0.044	8.909	80.038	6.578	3.474
10	0.044	8.907	80.013	6.576	3.504

Arabia

Period	S.E.	DLROP1	SDLGDP	RSCPI	SRW	DLSREER1
1	0.042	0	99	0	0	0.042
2	0.045	0.114	69.652	21.459	7.761	0.045
3	0.049	2.153	50.286	17.016	29.387	0.049
4	0.051	2.308	50.201	24.193	22.146	0.051
5	0.052	2.587	39.881	36.886	18.749	0.052
6	0.053	4.149	39.625	35.645	17.74	0.053
7	0.053	5.706	39.445	34.465	17.322	0.053
8	0.054	5.974	38.419	34.711	17.747	0.054
9	0.054	5.918	38.243	34.264	18.342	0.054
10	0.054	5.786	38.798	34.351	17.878	0.054

Venezula

Period	S.E.	DLROP1	VDLGDP	RVCPI	VRW	VREER1
1	0.045	0	99	0	0	0.045
2	0.049	1.012	79.354	7.429	0.91	0.049
3	0.051	3.199	68.132	10.153	4.46	0.051
4	0.052	3.359	57.109	8.441	3.781	0.052
5	0.053	4.06	49.959	8.64	3.195	0.053
6	0.053	4.342	45.861	8.308	2.938	0.053
7	0.053	4.441	43.099	7.859	2.926	0.053
8	0.053	4.497	41.708	7.686	3.336	0.053
9	0.053	4.488	41.494	7.617	3.696	0.053
10	0.053	4.466	41.506	7.697	3.843	0.053

References

[1] Mensi, W. Global financial crisis and co-movements between oil prices and sector stock markets in Saudi Arabia: A VaR based wavelet. Borsa Istanb. Rev. 2019, 19, 24–38.

[2] Blas, J.; Kennedy, S. For Once, Low Oil Prices May Be a Problem for World's Economy—Bloomberg. Available online: https://www.bloomberg.com/news/articles/2016-02-02/for-once-low-oil-prices-may-be-a-problem-for-world-s-economy (accessed on 16 March 2021).

[3] Tagliapietra, S. COVID-19 Is Causing the Collapse of Oil Markets: When Will They Recover? | Bruegel. Available online: https://www.bruegel.org/2020/04/\protect\unhbox\voidb@x\hbox{COVID-19}-is-causing-the-collapse-of-oil-markets-when-will-they-recover/ (accessed on 30 April 2020).

[4] Yahoo Yahoo Finance—Stock Market Live, Quotes, Business & Finance News. Available online: https://finance.yahoo.com/ (accessed on 25 April 2020).

[5] Mensi, W.; Sensoy, A.; Vo, X.V.; Kang, S.H. Impact of COVID-19 outbreak on asymmetric multifractality of gold and oil prices. Resour. Policy 2020, 69, 101829.
[6] Sharif, A.; Aloui, C.; Yarovaya, L. COVID-19 pandemic, oil prices, stock market, geopolitical risk and policy uncertainty nexus in the US economy: Fresh evidence from the wavelet-based approach. Int. Rev. Financ. Anal. 2020, 70, 101496.
[7] Shehzad, K.; Xiaoxing, L.; Arif, M.; Rehman, K.U. Investigating the Psychology of Financial Markets During COVID-19 Era: A Case Study of the US and European Markets. Front. Psychol. 2020, 11, 1–13.
[8] Bashir, M.F.; MA, B.; Shahzad, L. A brief review of socio-economic and environmental impact of COVID-19. Air Qual. Atmos. Health 2020, 13, 1403–1409.
[9] Salisu, A.A.; Ebuh, G.U.; Usman, N. Revisiting oil-stock nexus during COVID-19 pandemic: Some preliminary results. Int. Rev. Econ. Financ. 2020, 69, 280–294.
[10] Prabheesh, K.P.; Padhan, R.; Garg, B. COVID-19 and the Oil Price—Stock Market Nexus: Evidence From Net Oil-Importing Countries. Energy Res. Lett. 2020, 1, 1–6.
[11] Nyga-łukaszewska, H. Energy Prices and COVID-Immunity: The Case of Crude Oil and Natural Gas Prices in the US and Japan. Energies 2020, 13, 6300.
[12] Aloui, D.; Goutte, S.; Guesmi, K.; Hchaichi, R. COVID 19′ s impact on crude oil and natural gas S & P GS Indexes. SSRN Electron. J. 2020.
[13] Salisu, A.A.; Vo, X.V.; Lawal, A. Hedging oil price risk with gold during COVID-19 pandemic. Resours. Policy 2020, 70, 101897.
[14] Mishra, P.K.; Mishra, S.K. Corona Pandemic and Stock Market Behaviour: Empirical Insights from Selected Asian Countries. Millenn. Asia 2020.
[15] Bocca, R. In the Wake of COVID-19, Is It Time for a New Energy Order?|World Economic Forum. Available online: https://www.weforum.org/agenda/2020/04/energy-oil-gas-electricity-sustainability-economy-covid19-coronaviruspandemic-market-stability/ (accessed on 30 April 2020).
[16] Shehzad, K.; Xiaoxing, L.; Kazouz, H. COVID-19's disasters are perilous than Global Financial Crisis: A rumor or fact? Financ. Res. Lett. 2020, 36, 101669.
[17] Adam, T. How Coronavirus almost Brought down the Global Financial System. Available online: https://www.theguardian.com/business/2020/apr/14/how-coronavirus-almost-brought-down-the-global-financial-system (accessed on 17 April 2020).
[18] Yousfi, M.; Ben Zaied, Y.; Ben Cheikh, N.; Ben Lahouel, B.; Bouzgarrou, H. Effects of the COVID-19 pandemic on the US stock market and uncertainty: A comparative assessment between the first and second waves. Technol. Forecast. Soc. Chang. 2021, 167, 120710.
[19] Akhtaruzzaman, M.; Boubaker, S.; Sensoy, A. Financial contagion during COVID–19 crisis. Financ. Res. Lett. 2021, 38, 101604.
[20] Georgieva, K. IMF Managing Director Kristalina Georgieva's Statement Following a G20 Ministerial Call on the Coronavirus Emergency. 2020. Available online: https://www.imf.org/en/News/Articles/2020/03/23/pr2098-imf-managing-directorstatement-following-a-g20-ministerial-call-on-the-coronavirus-emergency (accessed on 30 April 2020).
[21] Just, M.; Echaust, K. Stock market returns, volatility, correlation and liquidity during the COVID-19 crisis: Evidence from the Markov switching approach. Financ. Res. Lett. 2020, 37, 101775.
[22] Rudden, J. Impact of COVID-19 on the Global Financial Markets—Statistics & Facts|Statista. Available online: https://www.statista.com/topics/6170/impact-of-\protect\unhbox\voidb@x\hbox{COVID-19}-on-the-global-financial-markets/ (accessed on 30 April 2020).
[23] Noy, I.; Doan, N.; Ferrarini, B.; Park, D. The Economic Risk from COVID-19 Is Not Where COVID-19 Is|VOX, CEPR Policy Portal. Available online: https://voxeu.org/article/economic-risk-\protect\unhbox\voidb@x\hbox{COVID-19}-not-where\protect\unhbox\voidb@x\hbox{COVID-19} (accessed on 19 March 2021).
[24] Kubálek, J.; Cˇ ámská, D.; Strouhal, J. Personal Bankruptcies from Macroeconomic Perspective. Int. J. Entrep. Knowl. 2018, 5, 78–88.
[25] Kliestik, T.; Misankova, M.; Valaskova, K.; Svabova, L. Bankruptcy Prevention: New Effort to Reflect on Legal and Social Changes. Sci. Eng. Ethics 2018, 24, 791–803.
[26] Kovacova, M.; Kliestik, T.; Valaskova, K.; Durana, P.; Juhaszova, Z. Systematic review of variables applied in bankruptcy prediction models of Visegrad group countries. Oecon. Copernic. 2019, 10, 743–772.
[27] Choudhry, T. Day of the week effect in emerging Asian stock markets: Evidence from the GARCH model Day of the week e ect in emerging Asian stock markets: Evidence from the GARCH model. Appl. Financ. Econ. 2010, 37–41.
[28] Kiymaz, H.; Berument, H. The day of the week effect on stock market volatility and volume: International evidence. Rev. Financ. Econ. 2003, 12, 363–380.
[29] Bhuyan, R.; Robbani, M.G.; Talukdar, B.; Jain, A. Information transmission and dynamics of stock price movements: An empirical analysis of BRICS and US stock markets. Int. Rev. Econ. Financ. 2016, 46, 180–195.
[30] Daniel, B. Nelson Conditional Heteroskedasticity in Asset Returns: A New Approach Author(s): Daniel B. Nelson Reviewed Work(s); Conditional Heteroskedasticity in Asset Returns; The Econometric Society: Cleveland, OH, USA, 1991; Volume 59, pp. 347–370. Available online: http://www.jstor.org/stable/2938260 (accessed on 30 April 2020).
[31] Sikhosana, A.; Aye, G.C. Asymmetric volatility transmission between the real exchange rate and stock returns in South Africa. Econ. Anal. Policy 2018, 60, 1–8.

[32] Bollerslev, T. A Conditionally Heteroskedastic Time Series Model for Speculative Prices and Rates of Return. Rev. Econ. Stat. 1987.
[33] Mensi, W.; Hammoudeh, S.; Nguyen, D.K.; Kang, S.H. Global financial crisis and spillover effects among the US and BRICS stock markets. Int. Rev. Econ. Financ. 2016, 42, 257–276.
[34] Kupiec, P.H. Techniques for Verifying the Accuracy of Risk Measurement Models. J. Deriv. 1995.
[35] Christoffersen, P.F. Evaluating Interval Forecasts. Int. Econ. Rev. 1998, 841–862.
[36] Dickey, D.A.; Fuller, W.A. Distribution of the estimators for autoregressive time series with a unit root. J. Am. Stat. Assoc. 1979, 74, 427–431.
[37] Phillips, P.C.B.; Perron, P. Testing for a unit root in time series regression. Biometrika 1988, 75, 345–346.
[38] Bouazizi, T.; Lassoued, M.; Hadhek, Z. Oil Price Volatility Models during Coronavirus Crisis: Testing with Appropriate Models Using Further Univariate GARCH and Monte Carlo Simulation Models. Int. J. Energy Econ. Policy 2021, 11, 281–292.
[39] Shehzad, K.; Xiaoxing, L.; Bilgili, F.; Koçak, E. COVID-19 and Spillover Effect of Global Economic Crisis on the United States' Financial Stability. Front. Psychol. 2021, 12, 104.
[40] Sahoo, P. Ashwani COVID-19 and Indian Economy: Impact on Growth, Manufacturing, Trade and MSME Sector. Glob. Bus. Rev. 2020, 21, 1159–1183.
[41] Okorie, O.; Subramoniam, R.; Charnley, F.; Patsavellas, J.; Widdifield, D.; Salonitis, K. Manufacturing in the Time of COVID-19: An Assessment of Barriers and Enablers. IEEE Eng. Manag. Rev. 2020, 48, 167–175.
[42] Valaskova, K.; Throne, O.; Kral, P.; Michalkova, L. Deep learning-enabled smart process planning in cyber-physical system-based manufacturing. J. Self Gov. Manag. Econ. 2020, 8, 121–127.
[43] Peters, E.; Kliestik, T.; Musa, H.; Durana, P. Product decision-making information systems, real-time big data analytics, and deep learning-enabled smart process planning in sustainable industry 4.0. J. Self Gov. Manag. Econ. 2020, 8, 16–22.
[44] Kliestik, T.; Nica, E.; Musa, H.; Poliak, M.; Mihai, E.-A. Networked, Smart, and Responsive Devices in Industry 4.0 Manufacturing Systems. Econ. Manag. Financ. Mark. 2020, 15, 23–29.
[45] Vochozka, M.; Rowland, Z.; Suler, P.; Marousek, J. The influence of the international price of oil on the value of the EUR/USD exchange rate. J. Compet. 2020, 12, 167–190.
[46] Sharif, A.; Aloui, C.; Yarovaya, L. COVID-19 Pandemic, Oil Prices, Stock Market and Policy Uncertainty Nexus in the US Economy: Fresh Evidence from the Wavelet-Based Approach; Elsevier: Amsterdam, The Netherlands, 2020.
[47] Dedi, L.; Yavas, B.F. Return and volatility spillovers in equity markets: An investigation using various GARCH methodologies. Cogent Econ. Financ. 2016, 4, 1–18.
[48] Shehzad, K.; Liu, X.; Tiwari, A. Analysing time difference and volatility linkages between China and the United States during financial crises and stable period using VARX-DCC-MEGARCH model. Int. J. Financ. Econ. 2020, 26, 1–20.
[49] Ramalho, V.; Ricardo, D. Predictive Performance of Value-at-Risk Models: COVID-19 "Pandemonium". Ph.D. Thesis, Instituto Superior de Economia e Gestao, Lisboa, Portugal, 2020.
[50] Engle, R.F. Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation. Econometrica 1982, 50, 987.
[51] Breusch, T.S.; Pagan, A.R. A Simple Test for Heteroscedasticity and Random Coefficient Variation. Econometrica 2006, 1287–1294.
[52] Narayan, P.K. Oil price news and COVID-19—Is there any connection? Energy Res. Lett. 2020, 1, 1–5.
[53] Mzoughi, H.; Urom, C.; Uddin, G.S.; GUESMI, K. The Effects of COVID-19 Pandemic on Oil Prices, CO2 Emissions and the Stock Market: Evidence from a VAR Model. SSRN Electron. J. 2020, 1–8.
[54] Besley, T.; Ghatak, M. Property rights and economic development. Handbook of Development Economics 2020, 5, 4525–4595.
[55] Norouzi, N.; Fani, M. The impacts of the novel corona virus on the oil and electricity demand in Iran and China. Journal of Energy Management and Technology 2020, 4(4), 36-48. doi: 10.22109/jemt.2020.222593.1232
[56] Norouzi, N.; Zarazua de Rubens, G.; Choubanpishehzafar, S.; Enevoldsen, P. When pandemics impact economies and climate change: Exploring the impacts of COVID-19 on oil and electricity demand in China. Energy Research and Social Science 2020, 68.
[57] Norouzi, N.; Zarazua de Rubens, G.Z.; Enevoldsen, P.; Behzadi Forough, A. The impact of COVID-19 on the electricity sector in Spain: An econometric approach based on prices. Int J Energy Res. 2021, 45, 6320– 6332. https://doi.org/10.1002/er.6259.
[58] Behzadi Forough, A.; Norouzi, N.; Fani, M. More Secure Iranian Energy System: A Markal Based Energy Security Model for Iranian Energy Demand-side. Iranian (Iranica) Journal of Energy & Environment 2021, 12(2), 100-108. doi: 10.5829/ijee.2021.12.02.01.
[59] Norouzi, N. Post-COVID-19 and globalization of oil and natural gas trade: Challenges, opportunities, lessons, regulations, and strategies. Int J Energy Res. 2021, 1– 19. https://doi.org/10.1002/er.6762.
[60] Norouzi, N.; fani, maryam. COVID-19 and Management Models in SMEs of the Energy Industry. Majlesi Journal of Energy Management 2021, 9.
[61] Norouzi, M.; Norouzi, N.; Norouzi, N.; Khalili, M. Environmental Evaluation of Magnetic Flux Density With Infinitesimal Frequency in a Thermal Power Plant. Majlesi Journal of Energy Management 2021, 9.