Effects of Oil Price Shock on the Exchange Rate of National Currencies in Oil-Rich Countries: In the Case of some Arab Countries and Azerbaijan

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Abstract: - In the article, the effects of oil price changes on inflation and the exchange rate in Saudi Arabia, Iraq, Kuwait, and UAE, as well as in Azerbaijan, were econometrically assessed. The comparison between Azerbaijan and these Arab countries was made because oil revenues play an important role in the economy of these countries, but its effects are different. Saudi Arabian riyal, Iraqi dinar, Kuwaiti dinar, and UAE dirham depend on oil prices in the world market for the long run. In the short run, there is no such dependence. It is confirmed that Azerbaijani manat is dependent on oil revenues for the long run. Addiction is not felt in the short run. In the oil-rich Arab countries and Azerbaijan, the non-dependence of the national currency on the world market on oil prices is due to the state regulation of the national currency's exchange rate in these countries. In none of these countries is the national currency liberal, and its exchange rate is not determined by supply and demand in the market.

Key-Words: - oil price, exchange rate, inflation, GDP

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1 Introduction

Foreign currency reserves of oil or gas exporting countries depend on both the export volume and the price of one unit in the world market. Increasing or decreasing production, and transporting the product to the world market usually requires a certain period. Therefore, even if the volume changes in any direction affect the rent, it does not create shock effects in the economy. However, price changes in the world market are almost instantaneous. Especially short-term fluctuations of oil prices in the world market are common. Such cases can create a shock effect on the economies of both oil-exporting and importing countries. Such a shock effect is mainly related to the effects on the exporting countries' foreign exchange reserves, [1]. This also affects the foreign exchange reserves of the importing countries, [2], [3]. Thus, the countries that are oil importers spend a lot of their foreign exchange reserves to meet their demand for oil in the conditions of increasing prices in the world market, [4]. In both cases, the increase and decrease of foreign exchange reserves can be considered as the increase and decrease of supply in the financial market. This affects the price of the product (foreign currency) with the national currency, in other words, the exchange rate. Thus, each country tries to make its national currency less dependent on oil price changes in the world market in any direction. Because such changes pose a threat to economic stability.

The impact of the oil price shock on the exchange rate is explained at a certain level by economic theory. However, modern economic theory does not allow to unambiguously assess the direction of the impact of the oil price shock on the exchange rate of the national currency and inflation. So, based on the results of empirical studies, some authors argue the relationship between oil price shock and the exchange rate, [5], and between oil price shock and inflation, [6], depends on the country's economic situation. For oil-exporting countries, an increase in oil prices does not necessarily mean that additional revenues are immediately invested in the country's economy. Such revenues can be collected in oil funds, [7]. Oil funds, as a "financial cushion", can play an important role in making the exchange rate more sluggish. In many cases, the effect of oil funds on stability depends on their quality, and funds with higher ones lead to reduced volatility of prices and lower inflation, [8]. The impact of an oil revenue shock on the exchange rate or other macroeconomic indicators has specific characteristics for each country. The reason for such uniqueness is the dependence of the exchange rate not only on oil revenues or the fluctuation of such revenues but also on a large number of other factors.

Taking this into account, we consider it scientifically and practically important to assess the dependence of the manats (The national currency of Azerbaijan) and some oil-exporting Arab countries' national currencies exchange rates, as well as the inflation rate on the oil price shocks.

2 Literature Review

In the economic literature, there are many studies dedicated to the effect of oil prices on the exchange rate in the case of different countries. Most of these studies claim that there is a long-term relationship between these two indicators. However, the difference between these studies is that it is impossible to come to a general conclusion that such a relationship is causal.

A study conducted by, [9], investigates the effects of oil price shocks on the exchange rate in Middle Eastern countries and shows that the increase in the oil price affects the exchange rate in Tunisia and Saudi Arabia. Also, changes in oil prices in the world market are reflected in changes in the exchange rate. The, [9], used daily data from January 1, 2001, to December 29, 2017, for Egypt, Jordan, Morocco, Saudi Arabia, Tunisia, and the UAE. The research used asymmetric non-causality tests developed by, [10], and asymmetric generalized response impulse developed by, [11]. Also, the non-causality-in-variance test developed by, [12], was used to investigate the existence of the spread of volatility between oil prices and exchange rates.

A study conducted by, [13], assessed the effects of oil price shocks on the national currency of some Asian countries. The quantile regression analysis method was used here. The main result of the study is that positive and negative oil price shocks have an asymmetric effect on exchange rates. A study conducted by, [14], also used asymmetric analysis. In this study, quarterly data were used for the period 1990-2014 in the case of Saudi Arabia. In this investigation, the effects of changes in oil prices on the demand for money are evaluated. The main result of the study is that there are asymmetric effects of the increase or decrease of oil prices on the money supply. Researchers claim that the positive shock of oil prices is felt more prominently than the negative shock. A non-linear autoregressive distributed lag (NARDL) approach was used in this study. This method allows testing the asymmetric response of the demand for money to changes in oil

prices in the short and long run. Here, first, the linear ARDL model was applied for the long run and it was determined that there is no cointegration for the long run. Then, the non-linear ARDL method was applied.

The mentioned problem was studied by applying the SVAR model in the research conducted by, [15], on the example of the G7 countries. The obtained results show that the demand shock causes significant changes in the stock market. However, a shock in the supply of crude oil does not cause changes in the stock market in these countries. The reactions of these countries to both the aggregate demand shock and the oil-related demand shock are approximately the same. But in the long run, there is a difference between these reactions.

A study conducted by, [16], claims that there is a relationship between the price of raw material exports and the nominal exchange rate in the very short run (for example, daily). This relationship is confirmed not only for the sample but also for the population. However, such a relationship is not unambiguously confirmed for monthly or quarterly periods. Research shows that the frequency period of data (e.g. daily, monthly, quarterly, or yearly) is important. The study shows that nonlinearity and cointegration do not significantly improve the simple linear model.

A study conducted by, [17], assessed the exchange rate effects of oil price shocks on the case of 43 countries. In this investigation, the effects in both directions are studied. Both effects, i.e. the oil price shock effects on the exchange rate, as well as the regulating role of the exchange rate in the economy after the oil price shock have been studied. The study shows that the oil price shock plays the role of a positive shock in terms of trade and income of oil-producing countries. The real exchange rate for the currency of oil-importing countries should fall so that the non-oil trade balance is positive. The VAR method was used in the study to identify the global oil shock. The main scientific innovation in the study is that the existence of a systematic relationship between the oil trade balance and the exchange rate as a result of the oil price shock is not confirmed. The authors point out that the main reason for this is the increased pressure against the increase of the exchange rate in the context of the increase in oil revenues. This is, of course, found in oil-rich countries with a floating exchange rate regime. However, since most of the oil-exporting countries accumulate oil revenues in special oil funds or the national currency is kept at a fixed exchange rate, the oil price shock does not have systemic effects on the exchange rate.

A study conducted by, [18], used monthly data for Saudi Arabia covering the years 1986-2019. Here, the long-term dynamic relationship between oil prices and the exchange rate is analyzed through the cointegration and VEC model developed by, [19]. As well as the presence of significant Granger causal relationships was checked with appropriate tests. The study's main conclusion is that there is a long-run cointegration between the exchange rate and oil prices in Saudi Arabia. And there is convergence to the average price for the equilibrium in the long run. There is a significant Granger causality from oil prices to the exchange rate in the short run. However, there is a bidirectional causal relationship between these indicators in the long run. The reason for the effect of the increase in the exchange rate on oil prices is that as the exchange rate increases, the relative demand for Saudi Arabian oil also increases. Considering the results, the researchers give some recommendations to the decision-makers. These recommendations may be interesting for other oil-exporting countries. So, it is suggested that the economy of the country should be studied separately as an oil and non-oil economy. The development of the non-oil sector should be supported by various means. To increase foreign currency income from the non-oil sector, it is necessary to expand cooperation with other OPEC countries, diversify the economy, and so on.

The interesting aspect of the study conducted by, [20], is that they studied the relationship between real exchange rates and economic growth. This relationship allows us to study the impact of the oil price shock on the real exchange rate, and also give an opinion on the effects of the former on economic growth. The studies, [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], and others have also studied this problem in the case of different countries.

3 Methodology and Data

The dependence of the exchange rate on oil prices and the response of the exchange rate to oil price shocks are measured by different methodologies. We will use the following algorithm in our research. First, the dynamics of oil prices $(O\dot{I}LP_t)$ and the nominal prices of the national currencies of Saudi Arabia, Iraq, Kuwait, UAE, and Azerbaijan in the last 30 years in the world market will be reviewed. In addition to oil prices in the world market, the main purpose of involving the country's oil fund costs in the study is to simplify the mechanism of influence on the national currency. Thus, the mechanism of the impact of oil prices on the

country's economy is more related to the spent part of the income coming into the country. Collecting such revenues into the oil fund and managing them by the state can act as a "shock absorber" for the impact of oil price shocks on the economy. Taking this into account, the evaluation of the interactions between oil prices and the exchange rate of the national currency, as well as the evaluation of the interactions between the costs of the oil fund and the exchange rate of the national currency will be the subject of the study.

Then, the stationarity of the time series of oil prices in the world market ($O\dot{I}LP_t$), oil rent ($O\dot{I}LRENT_t$), and nominal effective exchange rate ($NEER_t$,) will be tested. The stationarity of these time series will be tested with the Augmented Dickey-Fuller test. Stationarity will be checked for level I(0) and level I(1). Then a bound test for cointegration will be performed. The results of the ARDL model for the short-run and long-run periods will allow us to determine the nature of the relationship between oil prices and the exchange rate. Granger tests will allow us to express an opinion about the extent to which such relationships are causal.

The study will also assess the relationship between world oil prices and inflation. The use of panel analysis is important in such evaluations. In our study, we will try to evaluate the relationship between oil prices and inflation both by multiple regression analysis and by panel analysis. At this time, we will use two indicators as inflation indicators, namely consumer price inflation ($CP\dot{I}_t$) and GDP deflator ($GDPD_t$). Both indicators are obtained from the official statistical database of the World Bank. Thus, we can express the pairwise regression equations as:

$$CP\dot{I}_t = \beta_1 + \beta_2 * O\dot{I}LP_t + \varepsilon_t \quad (1)$$
$$GDPD_t = \beta_1 + \beta_2 * O\dot{I}LP_t + \varepsilon_t \quad (2)$$
$$CP\dot{I}_t = \beta_1 + \beta_2 * O\dot{I}LR_t + \varepsilon_t \quad (3)$$
$$GDPD_t = \beta_1 + \beta_2 * O\dot{I}LR_t + \varepsilon_t \quad (4)$$

As well as the single regression equations (1) - (4) will be applied to the differences in oil prices and oil rent. In the study, oil prices for each year were taken as the average price calculated in US dollars in that year. These data were obtained from the official website of, [31]. Considering that oil prices change not only every year or every month but even every day and every hour, using the annual average price can seriously affect the reliability of the obtained results. However, if we take into account that the exchange rate of national currencies in the Arab countries involved in the study and Azerbaijan is controlled by their Central Banks, we will assume that it is not seriously affected by not only hourly or daily but also monthly changes of oil price. We will use the annual price index in the United States to determine the annual average real oil prices.

4 Results

4.1 Current Status of Some Macroeconomic Indicators for Saudi Arabia, Iraq, Kuwait, UAE and Azerbaijan

The dynamics of oil prices on the world market over the last 30 years (Figure 1) suggest that these prices depend on a large number of factors and change regularly. But in the long run, the increase in nominal prices is certain. In 1986, 1 barrel of oil was sold for 15.05 US dollars, while in 2013, the average price was around 100 dollars. Although there was a sharp decline in the following years, nominal prices continued to rise.

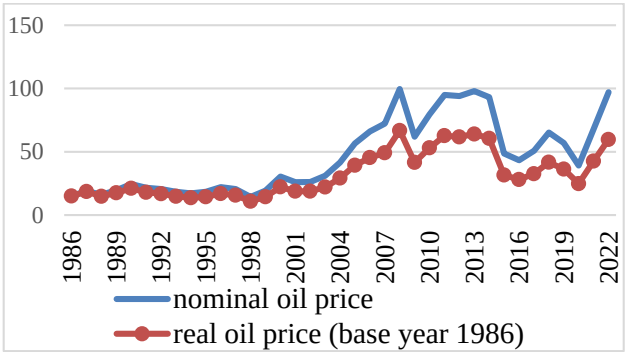

Fig. 1: Nominal and real prices of crude oil on the world market ($1/1brl)
Source: [31]

Undoubtedly, the monetary and fiscal policy implemented by the US government leads to a continuous increase in the money supply and the devaluation of the US dollar. Considering that oil is mainly sold in dollars on the world market, the reasons for the increase in nominal prices become clear. However, calculations show that the real price of oil in the world market does not increase seriously. For example, if 1995 is considered as the base year, calculations show that the real price of oil in 2020 was even around 11 US dollars. In 2008, when annual nominal prices were the highest in the last 30 years, the real price of oil (compared to 1995) was 58.5 dollars.

The importance of oil in the foreign trade relations of the oil-rich Arab countries and Azerbaijan is also reflected in the exchange rate of the countries' national currencies. However, it should be taken into account that the exchange rate, in all cases, depends on the country's balance of payments. But it is a financial mechanism that is easier to regulate and more effective. Therefore, since the exchange rate of the national currency of these countries has been determined by the relevant state body in the last 30 years, the reaction of the exchange rate to oil prices is weak. However, the reaction may not occur until foreign exchange reserves are sufficient and available for use. In other words, through monetary policy, the Central Banks of these countries can change the demand or supply volume of the reserve currency to prevent serious changes in the exchange rate. This can moderate the interaction between the volatility of oil prices and the exchange rate. This is proved by the nature of multiple regression between nominal oil prices ($O\dot{I}LP_t$) and the nominal exchange rate of the national currency ($NEER_t$).

To test for stationarity, we will use the unit root test. The obtained results are given in Table 1 (Appendix). From the data in Table 1 (Appendix), it can be seen that none of the time series we consider is stationary at level I (0). However, their first differences are stationary (Table 1, Appendix). The fact that these indicators are stationary from the degree I (1) allows us to estimate the multiple regression relationship between them (Table 2, Appendix).

$$\Delta \mathrm{NEER_t} = \beta_1 + \beta_2 * \Delta \mathrm{O\dot{I}LP_t} + \varepsilon_t \quad (5)$$

$$\Delta \mathrm{NEER_t} = \beta_1 + \beta_2 * \Delta \mathrm{O\dot{I}LRENT_t} + \varepsilon_t \quad (6)$$

The results obtained based on equations (5) and (6) show that the Saudi Arabian riyal, Iraqi dinar, Kuwaiti dinar, and UAE dirham depend on oil prices in the world market in the long run. In the short run, there is no such dependence. There is a dependence of Azerbaijani manats on oil prices in the world market in a long run. Addiction is not felt in the short run. In oil-rich Arab countries and Azerbaijan, the almost absence of national currency dependence on oil prices in the world market is due to the regulation of the exchange rate of the national currency in these countries. In none of these countries, the exchange rate of the national currency is not liberal, and its exchange rate is not determined by supply and demand in the market.

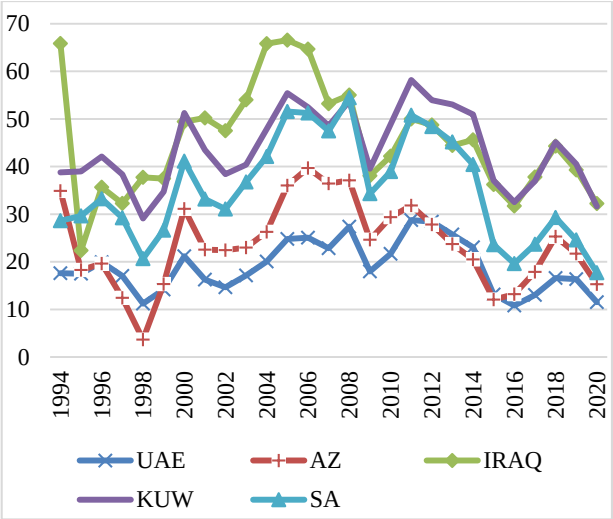

Fig. 2: Share of oil rent in GDP in Saudi Arabia, Iraq, Kuwait, UAE, and Azerbaijan (%).
Source: WB (2022)

Figure 2 shows the share of oil rent in GDP in Saudi Arabia, Iraq, Kuwait, UAE, and Azerbaijan. The similarity of the trends in this graph suggests that the change in the price of oil in the world market leads to the same results in each of these countries. In these countries, the share of oil in GDP has been decreasing in recent years. Only in Iraq and Kuwait, this figure is higher than 30%. In other countries included in the study, the share of oil in GDP has a decreasing trend (Table 3, Appendix).

In Saudi Arabia, Iraq, Kuwait, UAE, and Azerbaijan, the exchange rate of the national currency does not depend on oil prices in the short run, nor does it depend on oil rent. But in the long run, such dependence exists for Iraq and Kuwait. The main reason for this is that the oil rent in these countries does not enter the country's economy directly. Collection of oil rent in any funds (for example, the state oil fund (SOFAZ) operates in Azerbaijan) plays a softening role between the national currency, and both oil prices and oil rent.

4.2 Assessment of the Impact of Oil Price Changes on Inflation in Some Arab Countries and Azerbaijan

Changes in oil prices in the world market have a serious impact not only on the economy of oil-exporting countries but also on the economy of oil-importing countries. Since our study examines only the effects of oil price changes on the economies of oil-rich countries, we will not study the possible effects on oil-importing countries. As we mentioned above, changes in the price of oil in the world market in any direction do not seriously affect the exchange rate of the national currency in some oil-

exporting Arab countries and Azerbaijan in the short term. As the main reason for this, we pointed out the state regulation of the national currency in these countries. At the time of such regulation, the possibilities of the relevant state body are wide, and oil revenues are collected in any fund and create a "financial cushion" for the national currency. The relevant state body, for example, the Central Bank, can control the stability of the national currency by using the oil revenue fund to a certain extent during the fall in oil prices. During the increase in oil prices, the additional income can be collected again in the oil ton.

The mechanism of influence of oil prices on the exchange rate of the national currency and the mechanisms of influence of such changes on inflation are different. It is possible that the oil prices will increase and the oil revenues coming to the country will increase. In this case, the national currency may even strengthen. But inflation may also increase. The increase in inflation is related to the size of the money supply, among other factors. Therefore, with the increase in income, inflation can also increase. However, even in this case, as a result of the government's intervention in the economy, certain steps can be taken in the direction of reducing the level of inflation.

Based on the last 25-year dynamics of the consumer price index for the countries included in the study, it can be argued that, except for some years, high inflation was observed in these countries. For example, in the UAE, except for the years 2019-2020, the inflation rate has changed from 8% to 0.66%. Except for 1999, the inflation rate in Azerbaijan changed from 20.8% to 1.07% in the period between 1996 and 2021. The inflation rate in Iraq from 53% to 0% excluding 2008, Kuwait from 10.6% to 0%, and Saudi Arabia from 10% excluding 1998-2001 and 2017 and 2019 changed to 0%. Deflation occurred in these countries in the years we mentioned as an exception.

In Iraq, compared to other countries, inflation was higher. During the global financial crisis in 2008, inflation was high in these countries. In the same year, inflation was around 21% in Azerbaijan, 12% in UAE, 53% in Iraq, 11% in Kuwait, and 10% in Saudi Arabia. Inflation was slightly lower in the following years.

In the countries included in the study, the change in the GDP deflator is much larger than the consumer price index. For example, in the UAE between 2009 and 2020, the annual change of the consumer price index did not exceed 4%, while the GDP deflator changed in the range of (+15; -15). After 2008, this indicator in Azerbaijan mainly changed between (+20; -10), in Iraq (+30; -15), in Kuwait (+18; -26), and in Saudi Arabia (+15; -15).

To check the stationarity of consumer price inflation (CPI) and GDP deflator (GDP) time series for these countries used data from 2008 to 2020 for the UAE and from 1996 to 2021 for the other countries (Table 4, Appendix).

To calculate the effects of oil prices and oil rent on the consumer price index, statistical indicators covering the years 1996-2020 were used for Saudi Arabia, Iraq, Kuwait, and Azerbaijan, and indicators covering the years 2008-2020 for the UAE. The effects of the oil price level or its change are different in different countries. It is even possible to observe the difference in the effects in oil-rich Arab countries and Azerbaijan. Thus, the strong intervention of the state in the financial and commodity market in these countries does not justify the superiority of relations characteristic of a competitive market, at least theoretically.

Table 5 (Appendix) presents the regression analysis of the level of the average price of oil in the world market and the annual change of these prices on the consumer price index and its annual changes respectively in some Arab countries and Azerbaijan. From the results given in Table 5 (Appendix), it is clear that the level of oil prices and their annual changes in the case of Saudi Arabia and Kuwait have a positive effect on the level of the consumer price index and its annual change. In Iraq, the UAE, and Azerbaijan, the effect of the level of oil prices and its annual changes on the consumer price index and its annual changes in the short run is not significant. The analysis of the effects of oil prices and their changes on the GDP deflator and changes in some Arab countries and Azerbaijan, respectively, proves (Table 6, Appendix) that the effects of the level of oil prices on the GDP deflator for these countries are not significant. However, the effects of oil price changes on changes in the GDP deflator are significant in other countries, except for Iraq. As oil prices increase or its positive change increases the GDP deflator in these countries or causes its positive change. Such effects exist to some extent in Iraq. However, in the short run, such a relationship is not significant. Statistical indicators covering the years from 1996 to 2020 for Saudi Arabia, Iraq, Kuwait, UAE, and Azerbaijan were used to calculate the effects of oil prices and oil rent on the GDP deflator.

Based on the results of the analysis of the effects of oil rent and its annual change on the consumer price index and its annual change, respectively, in some Arab countries and Azerbaijan, it can be argued that the level of oil

prices does not significantly affect the consumer price index in these countries. However, the annual change in oil rent has a positive effect on the annual change of the consumer price index (Table 7, Appendix).

The effects of oil rent on the GDP deflator are felt more clearly than the effects of oil prices (Table 8, Appendix). So, except for Iraq, the GDP deflator and its change in other Arab countries and Azerbaijan are positively dependent on oil rent. Of course, it is interesting and expected that the effects of oil rent on the economy of these countries are stronger than the prices of oil on the world market. The effects of oil prices on the economy of oil-exporting countries are not direct. These prices cause oil rents to rise or fall. But considering that oil rent depends not only on prices but also on the volume of exported products. It is possible to achieve an increase in rent as a result of a price decrease, but an increase in volume. OPEC's increase and decrease in production volume not only affects the price of oil but also affects the rise and fall of oil rent.

Therefore, the impact of oil rent on the country's economy seems more important. On the other hand, in most oil-exporting countries, the presence of oil funds where oil revenues are collected and used when necessary, successfully protects the country's economy from both oil price fluctuations and oil rent increases and decreases. Nevertheless, since the non-oil economy is weakly developed in most oil-exporting countries, both oil prices and oil rents affect macroeconomic indicators in the long run.

5 Discussion

The results obtained during the empirical assessment of the effects of changes in oil prices on inflation and exchange rates in oil-rich Arab countries and Azerbaijan are significantly different from the effects of such changes on economic growth in these countries, [32]. Empirical evaluations conducted above on the case of some oil-rich Arab countries confirm the results obtained in the studies conducted on the case of these countries and other oil-rich countries. For example, according to the results of a study conducted by, [33], in the case of Russia, a 1% increase (or decrease) in oil prices causes a 0.44% increase (or decrease) in real GDP. On the other hand, in the short run (within 1 year), the increase in oil prices not only stimulates inflation but also affects the real effective exchange rate. According to the results of the research conducted by, [34], when oil prices are low, their change in any direction has a weak effect on the consumer price index in Russia. In a study conducted by, [35], on the case of Iran, it is noted that the effects of oil prices on inflation are non-linear. On the other hand, a decrease in oil prices leads to an increase in inflation, but an increase in oil prices does not affect the level of inflation.

According to the results of a study conducted by, [35], an increase in oil prices does not have a significant effect on inflation in Iran, but a decrease in oil prices has a noticeable effect. A study conducted by, [36], assessed the asymmetric effects of oil prices on inflation in Algeria, Angola, Libya, and Nigeria. Three types of oil prices were used in the study. The first is the actual wholesale price in each country, the second is the price imposed by OPEC, and the third is Brent, WTI, and Dubai oil prices. According to the obtained results, when oil prices fall, their effects on inflation become stronger.

In the study performed by, [37], the effects of oil prices on inflation were evaluated in the period between 1995 and 2017. The result obtained in the study shows that the relationship between oil prices and inflation is quite significant in the long run. A 1% change in oil prices changes inflation by 0.58%.

6 Conclusion

The nature of the relationship between these two indicators for Iraq differs from that for S. Arabia and the UAE. However, for the long run period, dependence on oil prices in this country is strong. In Iraq, consumer spending also responds positively to oil prices. With the increase in oil prices, consumer spending also increases. In Iraq, the share of oil rent in GDP is very high. In recent years, this share is higher than 30%. The dependence of the volume of consumer spending on oil prices also depends on this fact.

The importance of oil in Azerbaijan's foreign trade relations is also reflected in the exchange rate of the country's national currency. However, it should be taken into account that the exchange rate, in all cases, depends on the country's balance of payments, but it is a financial mechanism that is easier to regulate and more effective. Therefore, since the exchange rate of the manat in Azerbaijan has been determined by the relevant state body in the last 30 years, there is no reaction of the exchange rate to oil prices. However, the reaction may not occur until foreign exchange reserves are sufficient and available for use. In other words, through monetary policy, the Central Bank can change the supply or demand of the reserve currency to prevent serious changes in the exchange

rate. This can moderate the interaction between the volatility of oil prices and the exchange rate.

The similarity of the trends of the share of oil rent in GDP in Saudi Arabia, Iraq, Kuwait, UAE, and Azerbaijan suggests that the change in the price of oil in the world market leads to the same results in each of these countries. In these countries, the share of oil in GDP has been decreasing in recent years. Only in Iraq and Kuwait, this figure is still higher than 30%. In other countries included in the study, the share of oil rent in GDP has a decreasing trend.

In Saudi Arabia, Iraq, Kuwait, UAE, and Azerbaijan, the exchange rate of the national currency does not depend on oil prices in the short run, nor does it depend on oil rent. But in the long run, such dependence exists for Iraq and Kuwait. The main reason for this is that the oil rent in these countries does not enter the country's economy directly. Collection of oil rent in any fund, for example, in the State Oil Fund of Azerbaijan plays a mitigating role between the national currency and both oil prices and oil rent. As a result, the exchange rate of the manats in Azerbaijan was quite strong in 2000-2015. The state monopoly in the country's electricity sector was strictly maintained, and prices were not allowed to rise, [38]. The stability of the banks' activities was ensured, [39]. During the devaluation of 2015, the exchange rate of the manats compared to the dollar weakened more than twice, but in the following years, the Central Bank managed to maintain the exchange rate again.

In the case of Saudi Arabia and Kuwait, the level of oil prices and their change have a positive effect on the level of the consumer price index and its annual changes. As oil prices rise, so does the consumer price index, which means inflation rises. In other countries, that is, Iraq, the UAE, and Azerbaijan, the effect of the level of oil prices and its changes on the consumer price index and its changes in the short run is not significant.

For these Arab countries and Azerbaijan, the effects of the level of oil prices on the GDP deflator are not significant. However, the effects of oil price annual changes on the GDP deflator annual changes are significant in these countries, except for Iraq.
The level of oil prices does not significantly affect the consumer price index in these countries. However, the change in oil rent has a positive effect on the change in the consumer price index. The effects of oil rent on the GDP deflator are felt more clearly than on oil prices. The effects of oil prices on the economy of oil-exporting countries are not direct.

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Appendix

Table 1. Testing stationarity with the unit root test

	without intercept and trend		without intercept and trend		without intercept and trend	
	Level	The first difference	Level	The first difference	Level	The first difference
$OILP_t$						
t-statistics	-0.2967	-6.2133	-1.5862	-6.1783	2.2013	-6.0554
P-value	0.5717	0.0000	0.4789	0.0000	0.4742	.0001
$OILRENT_t$	**Saudi Arabia**					
t-statistics	-0.7021	-4.8989	-1.6675	-4.8089	-1.6321	-4.3766
P-value	0.4028	0.0000	0.4353	0.0008	0.7518	0.0114
$NEER_t$						
t-statistics	1.0948	-34.3687	-18.7488	-33.5966	-2.3178	-31.7243
P-value	0.9256	0.0000	0.0001	0.0001	0.4137	0.0000
$OILRENT_t$	**Iraq**					
t-statistics	-1.2239	-9.3946	-3.0577	9.1469	-2.9828	-9.3193
P-value	0.1968	0.0000	0.0426	0.0000	0.1555	0.0000
$NEER_t$						
t-statistics	0.7379	-1.4059	-1.1923	-1.9638	-2.1502	-1.7485
P-value	0.8693	0.1458	0.6664	0.3006	0.5007	0.7071
$OILRENT_t$	**Kuwait**					
t-statistics	-0.5654	5.5344	-2.4359	-5.4032	-0.5654	-4.5592
P-value	0.4625	0.0000	0.1422	0.0002	0.4625	0.0078
$NEER_t$						
t-statistics	0.3053	-6.5979	-1.9552	-6.5763	-1.9542	-6.4553
P-value	0.7683	0.0000	0.3043	0.0000	0.6045	0.0000
$OILRENT_t$	**UAE**					
t-statistics	0.7534	-4.7635	-2.0198	-4.6724	1.9268	4.6601
P-value	0.3802	0.0000	0.2770	0.0011	0.6120	0.0053
$NEER_t$						
t-statistics	0.9997	-5.6568	1.3720	-5.7446	-1.6089	-5.7230
P-value	0.9127	0.0000	0.5842	0.0000	0.7683	0.0002
$OILRENT_t$	**Azerbaijan**					
t-statistics	-1.2579	-5.1815	-2.3795	-5.0652	-2.3372	-4.9339
P-value	0.1863	0.0000	0.1569	0.0004	0.4010	0.0029
$NEER_t$						
t-statistics	0.3471	-3.6711	-1.6710	-3.9246	-2.5413	-3.8616
P-value	0.7789	0.0006	0.4352	0.0054	0.3076	0.0268

Note: calculated by the authors

Table 2. Regression relationship of oil prices $O\dot{I}LP_t$ and its change ($\Delta O\dot{I}LP_t$) with the exchange rate of national currencies in some Arab countries and Azerbaijan

		Saudi Riyal	Iraqi dinar	Kuwait dinar	UAE dirham	Azerbaijani manats
$\boldsymbol{NEER_t}$						
R^2		0.10727	0.41502	0.278984	0.40958	0.009343
$\boldsymbol{\beta_1}$	coefficient	3.74280	375.702	0.302024	3.67127	0.148881
	St. error	0.00237	122.140	0.002766	0.00017	0.151321
	t-statistics	1575.58	3.07597	109.1780	20706.3	0.983875
	P-value	0.0000	0.0041	0.0000	0.0000	0.3330
$\boldsymbol{\beta_2}$	coefficient	9.20E-	11.4894	-0.000191	1.64E-05	0.001451
	St. error	4.55E-05	2.339343	5.35E-05	3.43E-06	0.002728
	t-statistics	2.021265	4.911418	-3.573342	4.784644	0.531903
	P-value	0.0512	0.0000	0.0011	0.0000	0.5987
DW coefficient		0.951484	0.202715	0.426658	0.403530	0.211138
$\Delta\boldsymbol{NEER_t}$						
R^2		0.000587	0.016637	0.483558	0.007440	0.314879
$\boldsymbol{\beta_1}$	coefficient	0.001325	40.35626	-	4.53E-05	0.041592
	St. error	0.001238	13.37227	-	4.47E-05	0.027277
	t-statistics	1.069878	3.017906	-	1.012585	1.524786
	P-value	0.2924	0.0049	-	0.3189	0.1381
$\boldsymbol{\beta_2}$	coefficient	1.21E-05	0.702278	-0.00036	-1.62E-0	-0.006636
	St. error	8.70E-05	0.939873	6.59E-05	3.30E-06	0.001818
	t-statistics	0.13917	0.74720	-5.582385	-0.48977	-3.650793
	P-value	0.8902	0.4602	0.0000	0.6276	0.0010
DW coefficient		1.053218	0.673722	1.99062	2.058218	2.422447

Note: calculated by the authors

Table 3. Effects of the annual differences of the oil rent share in GDP ($\Delta O\dot{I}LRENT_t$) on the exchange rate of national currencies in some Arab countries and Azerbaijan

		Saudi Riyal	Iraqi dinar	Kuwaiti dinar	UAE Dirham	Azerbaijani manat
$\boldsymbol{NEER_t}$						
R^2		),0957	),429072	),739482	),081075	),311936
$\boldsymbol{\beta_1}$	coefficient	3,7495	651,1457	0,337053	3,672121	1,296364
	St. error	0,00136	195,8143	0,007752	0,000399	0,196293
	t-statistics	2756,443	3,325323	43,47943	9196,333	6,604224
	P-value	0.0000	0,002729	0.0000	0.0000	0.0000
$\boldsymbol{\beta_2}$	coefficient	-1,8E-05	9,91759	-0,00096	8,23E-06	-0,01272
	St. error	3,69E-05	4,175642	0,000174	2,02E-05	0,007748
	t-statistics	-0,48071	2,375105	-5,49248	0,406712	-1,64159
	P-value	0,634905	0,025528	0.0000	0,687681	0,113197
$\Delta\boldsymbol{NEER_t}$						
R^2		),208461	),173967	),577429	),253605	),259804
$\boldsymbol{\beta_1}$	coefficient	0,000177	31,32959	0,000213	5,38E-05	0,05193
	St. error	0,000275	14,5747	0,001107	5,7E-05	0,034366
	t-statistics	0,643159	2,149587	0,19287	0,943448	1,511093
	P-value	0,526219	0,04188	0,848684	0,354853	0,143821
$\boldsymbol{\beta_2}$	coefficient	-3,6E-05	1,131871	-0,00051	-1,7E-05	-0,00611
	St. error	3,45E-05	1,307829	0,000147	1,29E-05	0,004638
	t-statistics	-1,04419	0,865458	-3,46481	-1,2844	-1,31803
	P-value	0,306802	0,395357	0,00201	0,211264	0,199935

Note: calculated by the authors

Table 4. Testing stationarity with the unit root test

	without intercept and trend		without intercept and trend		without intercept and trend	
	Level	The first difference	Level	The first difference	Level	The first difference
$CP\dot{I}_t$	Saudi Arabia					
t-statistics	-1.7443	-7.2426	-2.2723	-7.1143	-2.3818	-6.9480
P-value	0.0769	0.0000	0.1880	0.0000	0.3791	0.0000
$GDPD_t$						
t-statistics	4.0604	-7.1743	-4.7339	-7.0070	4.6583	-6.8331
P-value	0.0003	0.0000	0.0009	0.0000	0.0054	0.0000
$CP\dot{I}_t$	Iraq					
t-statistics	-2.7111	-8.6694	3.7343	-8.4709	-4.7630	8.2097
P-value	0.0088	0.0000	0.0098	0.0000	0.0042	0.0000
$GDPD_t$						
t-statistics	-4.8515	5.9189	-6.0247	-5.7463	7.4580	-5.6443
P-value	0.0000	0.0000	0.0000	0.0001	0.0000	0.0007
$CP\dot{I}_t$	Kuwait					
t-statistics	-1.4795	-6.1445	-2.6366	-6.0079	-2.6328	-5.8828
P-value	0.1270	0.0000	0.0993	0.0000	0.2701	0.0004
$GDPD_t$						
t-statistics	-3.9593	-5.2937	-4.0663	-5.1581	-4.0888	5.5418
P-value	0.0004	0.0000	0.0047	0.0006	0.0191	0.0014
$CP\dot{I}_t$	UAE					
t-statistics	6.4211	-3.2655	-6.2271	-5.9166	-5.5707	-3.6165
P-value	0.0000	0.0042	0.0004	0.0008	0.0046	0.0896
$GDPD_t$						
t-statistics	3.8970	-6.1291	-4.3469	-5.9620	-4.3922	-5.8296
P-value	0.0004	0.0000	0.0023	0.0001	0.0096	0.0005
$CP\dot{I}_t$	Azerbaijan					
t-statistics	3.0432	-4.5236	-3.8002	-4.3925	-3.8549	-4.2740
P-value	0.0038	0.0001	0.0084	0.0023	0.0301	0.0135
$GDPD_t$						
t-statistics	-3.7529	-6.6186	5.2210	-6.4251	-4.8479	-6.2644
P-value	0.0006	0.0000	0.0003	0.0000	0.0037	0.0002

Note: calculated by the authors

Table 5. Regression analysis of the effects of oil prices ($O\dot{I}LP_t$)) and its change ($\Delta O\dot{I}LP_t$) on the consumer price index ($CP\dot{I}_t$) and its annual change ($\Delta CP\dot{I}_t$) respectively in some Arab countries and Azerbaijan, respectively

		Saudi	Iraq	Kuwait	UAE	Azerbaijan
$CP\dot{I}_t$						
R^2		0.5228	0.0256	0.3638	0.1391	0.0644
	coefficient	2.0488	15.0971	0.2992	-2.0687	2.3330
β_1	St. error	0.8707	6.9244	0.7955	3.2163	2.9649
	t-statistics	-2.3530	2.1803	0.3760	-0.6432	0.7869
	P-value	0.0275	0.0397	0.7103	0.5333	0.4394
β_2	coefficient	0.0723	-0.0891	0.0477	0.0576	0.0617
	St. error	0.0144	0.1145	0.0132	0.0432	0.0490
	t-statistics	5.0196	-0.7779	3.6265	1.3331	1.2579
	P-value	0.0000	0.4446	0.0014	0.2094	0.2211
DW coefficient		1.4380	1.30321	1.1498	0.9633	1.1074
$\Delta CP\dot{I}_t$						
R^2		0.17111	0.0076	0.2054	0.1674	0.1161
β_1	coefficient	0.0465	0.6289	-0.1025	0.8316	-0.8169
	St. error	0.4866	3.6330	0.3957	1.00010	1.4152
		0.0955	0.1731	-0.2590	-0.8315	-0.5772
		0.9248	0.8641	0.7980	0.4251	0.5697
β_2	coefficient	0.0650	0.0938	0.0591	0.0719	0.1508
	St. error	0.0305	0.2277	0.0248	0.0507	0.0887
	t-statistics	2.1311	0.4118	2.3845	1.4179	1.7003
	P-value	0.0445	0.6844	0.0262	0.1866	0.1032
DW coefficient		2.3778	2.5387	1.9903	1.3764	1.7199

Note: calculated by the authors

Table 6. Analysis of the effects of oil prices ($O\dot{I}LP_t$) and its change ($\Delta O\dot{I}LP_t$) on the GDP deflator ($GDPD_t$) and its change ($\Delta GDPD_t$), respectively, in some Arab countries and Azerbaijan

		S.Arabia	Iraq	Kuwait	UAE	Azerbaijan
$\boldsymbol{GDPD_t}$						
R^2		0.0537	0.0064	0.0326	0.0760	0.0244
$\boldsymbol{\beta_1}$	coefficient	-0.4786	15.6167	-0.8030	-1.7483	4.2960
	St. error	4.7177	12.5121	6.0715	4.1337	5.0384
	t-statistics	-0.1014	1.2481	-0.1323	-0.4229	0.8526
	P-value	0.9201	0.2245	0.8959	0.6763	0.4026
$\boldsymbol{\beta_2}$	coefficient	0.0891	-0.0796	0.0884	0.0941	0.0633
	St. error	0.0780	0.2070	0.1004	0.0684	0.0833
	t-statistics	1.1422	-0.3847	0.8802	1.3754	0.7590
	P-value	0.2651	0.7040	0.3879	0.1822	0.4555
DW coefficient		1.7342	2.4019	1.5501	1.3903	1.6920
$\boldsymbol{\Delta GDPD_t}$						
R^2		0.4007	0.1191	0.3813	0.5308	0.3780
$\boldsymbol{\beta_1}$	coefficient	-1.0958	-0.5496	-1.7021	-1.1206	-1.8158
	St. error	2.3825	8.4034	2.9064	1.7061	2.5007
	t-statistics	-0.4599	-0.0654	-0.5857	-0.6568	-0.7261
	P-value	0.6501	0.9484	0.5641	0.5181	0.4754
$\boldsymbol{\beta_2}$	coefficient	0.5727	0.9083	0.6708	0.5335	0.5730
	St. error	0.1493	0.5267	0.1821	0.1069	0.1567
	t-statistics	3.8352	1.7246	3.6826	4.9890	3.6562
	P-value	0.0009	0.0986	0.0013	0.0001	0.0014
DW coefficient		2.3124	2.8667	1.8749	1.9846	1.7984

Note: calculated by the authors

Table 7. Analysis of the effects of oil rent ($O\dot{I}LR_t$) and its change ($\Delta O\dot{I}LR_t$) on the consumer price index ($CP\dot{I}_t$) and its change ($\Delta CP\dot{I}_t$), respectively, in some Arab countries and Azerbaijan

		S.Arabia	Iraq	Kuwait	UAE	Azerbaijan
$\boldsymbol{GDPD_t}$						
R^2		0.0537	0.0064	0.0326	0.0760	0.0244
	coefficient	-0.4786	15.6168	-0.8030	-1.7483	4.2960
$\boldsymbol{\beta_1}$	St. error	4.7177	12.5121	6.0715	4.1338	5.0384
	t-statistics	-0.1014	1.2481	-0.1323	-0.4229	0.8526
	P-value	0.9201	0.2245	0.8959	0.6763	0.4026
$\boldsymbol{\beta_2}$	coefficient	0.0891	-0.0796	0.0884	0.0941	0.0633
	St. error	0.0780	0.2070	0.1004	0.0684	0.0833
	t-statistics	1.1422	-0.385	0.8802	1.3754	0.7590
	P-value	0.2651	0.7040	0.3879	0.1822	0.4555
DW coefficient		1.7342	2.4019	1.5501	1.39028	1.6920
$\boldsymbol{\Delta GDPD_t}$						
R^2		0.4007	0.1191	0.3813	0.5308	0.3780
	coefficient	-1.0957	-0.5496	-1.7021	-1.1206	-1.8158
$\boldsymbol{\beta_1}$	St. error	2.3825	8.4034	2.9064	1.7061	2.50068
	t-statistics	-0.4599	-0.0654	-0.5857	-0.6568	-0.7261
	P-value	0.6501	0.9484	0.5641	0.5181	0.4754
$\boldsymbol{\beta_2}$	coefficient	0.5727	0.9083	0.6708	0.5335	0.5730
	St. error	0.1493	0.5267	0.1821	0.1069	0.1567
	t-statistics	3.8352	1.7246	3.6826	4.9890	3.6562
	P-value	0.0009	0.0986	0.0013	0.0001	0.0014
DW coefficient		2.3124	2.8667	1.8749	1.9846	1.7984

Note: calculated by the authors

Table 8. Analysis of the effects of oil rent ($O\dot{I}LR_t$) and its change ($\Delta O\dot{I}LR_t$) on the GDP deflator ($GDPD_t$) and its change ($\Delta GDPD_t$), respectively, in some Arab countries and Azerbaijan

		S.Arabia	Iraq	Kuwait	UAE	Azerbaijan
$GDPD_t$						
R^2		0.3356	0.0306	0.3304	0.3853	0.2188
β_1	coefficient	-15.370	-10.008	-37.449	-16.796	-6.0513
	St. error	6.0466	25.6249	12.5028	5.5125	5.7874
	t-statistics	-2.5420	-0.3906	-2.9953	-3.0469	-1.0456
	P-value	0.0182	0.6997	0.0065	0.0057	0.3066
β_2	coefficient	0.5504	0.4674	0.9378	1.0515	0.5846
	St. error	0.1615	0.5486	0.2784	0.2769	0.2303
	t-statistics	3.4088	0.8520	3.3688	3.7970	2.5378
	P-value	0.0024	0.4030	0.0027	0.0009	0.0184
DW coefficient		1.9447	2.4124	1.5255	1.5204	1.6917
$\Delta GDPD_t$						
R^2		0.4057	0.0009	0.4394	0.4698	0.3821
β_1	coefficient	0.0329	0.1215	-0.5818	-0.1275	-1.1686
	St. error	2.3775	8.9423	2.7682	1.8172	2.4906
	t-statistics	0.0138	0.0136	-0.2102	-0.0701	-0.4692
	P-value	0.9891	0.9893	0.8355	0.9447	0.6435
β_2	coefficient	1.1150	0.1841	1.4745	1.7562	1.3273
	St. error	0.2877	1.2855	0.3550	0.3977	0.3598
	t-statistics	3.8753	0.1432	4.1529	4.4156	3.6887
	P-value	0.0008	0.8874	0.0004	0.0002	0.0013
DW coefficient		2.7407	2.9824	2.3080	2.4884	2.3982

Note: calculated by the authors

Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

- Gulaliyev M.: Writing - review & editing& methodology
- Musayeva J.: Data curation and resources
- Musayeva F.: Writing - original draft;
- Jabbarova A: Formal analysis and project administration
- Hatamov F.: Investigation

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