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The Effect of Fluctuations in Oil Prices and Foreign Reserves on Consumer Price Indices

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Abstract

Iraq mainly depends on oil revenues to finance the general budget, so the fluctuations in its prices affect most economic and financial indicators, as well as the foreign reserves held by the Central Bank. Therefore, the current research aims to study the impact of these fluctuations in the value of foreign reserves and in consumer prices, which affect the life of the citizen directly. For the purpose of achieving the objectives of the research and reaching the results, a number of statistical methods were used, the most important of which is the test (F) and the degree of morality (Sig) to test the significance of the effect.

Keywords: Oil prices, foreign reserves, consumer price index numbers.

تأثير تقلبات اسعار النفط والاحتياطيات الاجنبية في مؤشر اسعار المستهلك

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المستخلص

يعتمد العراق بشكل اساسي على عائدات النفط في تمويل الموازنة العامة، لذلك فان التقلبات في اسعاره تؤثر في معظم المؤشرات الاقتصادية والمالية وكذلك في الاحتياطيات الاجنبية التي يحتفظ بها البنك المركزي. لذا يهدف البحث الحالي الى دراسة تأثير تلك التقلبات في قيمة الاحتياطيات الاجنبية وفي اسعار المستهلك والتي تأثر في حياة المواطن بشكل مباشر. ولغرض تحقيق اهداف البحث والوصول الى النتائج تم استخدام عدد من الاساليب الاحصائية اهمها اختبار (F) ودرجة المعنوية (Sig) لاختبار دلالة التأثير، وتوصل البحث الى مجموعة من النتائج اهمها "تأثير قيمة الاحتياطيات الاجنبية أكبر من تأثير تقلبات اسعار النفط في اسعار المستهلك.

الكلمات المفتاحية: اسعار النفط، الاحتياطيات الاجنبية، اسعار المستهلك.

1. Research Methodology

1-1. Research problem.

Oil revenues are one of the most important sources of financing the general budget of many oil-producing countries. Therefore, fluctuations in

their prices have a direct impact on the value of foreign reserves, as well as on the economic and living situation of the citizen, and this is reflected in the consumer price indices and inflation rates. Here, the research problem appears that It can be formulated through the following question, "The extent of the impact of oil price fluctuations on consumer price indices"

1-2. Research importance: The importance of the research lies in studying the impact of oil price fluctuations on one of the most important economic indicators that show the standard of living of the individual through consumer price indices, in additional the value of foreign reserves maintained by the Central Bank of Iraq, which aims to control exchange rate fluctuations and increase creditors' confidence in the local currency.

1-3. research aims: The research aims to achieve the following:

1. Reviewing the conceptual framework for each of oil prices, reserves and consumer price indices.
2. Measuring the impact of fluctuations in Brent crude oil prices on the value of foreign reserves and consumer price indices, as well as measuring the impact of oil prices and reserves in a collective manner on consumer price indices.

1-4. Research hypotheses: The research is based on four main hypotheses are:

1. There is a statistically significant effect of the fluctuations of Brent crude oil prices on the value of foreign reserves.
2. There is a statistically significant effect of the fluctuations of Brent crude oil prices in the consumer price indices.
3. There is a statistically significant effect of the value of foreign reserves on the consumer price indices.
4. There is a statistically significant effect of fluctuations in Brent crude oil prices and foreign reserves combined in the consumer price indices.

1-5. Duration and field of study: The research took Iraq as a case study and for the period (2016) until the tenth month of the year (2021) at monthly prices.

2. Theoretical Framework:

2-1. Oil prices: Oil is an important source of primary energy and a main pillar of the global economy since its discovery until now. Its name is derived from the Latin "peter oleum" which means "peter" rock in the Latin language, and "oleum" is called crude oil or rock oil, and sometime

"Naphtha" which is derived from the word. Naft or "Navata" four the Persian language which means transmissible and for its great importance in the global economy, it is often called black gold (Al Hamwi, 2015: 11). Oil is defined as a dense, highly flammable black liquid composed of a mixture of organic compounds, which consist of the element carbon and hydrogen, and they are known as hydrocarbons, especially the alkanes series, it is one of the natural resources that the major industrialized countries are racing to import from the producing countries (Khairallah, 2014: 16). It is worth noting that many oil producing countries rely heavily on oil export revenues to finance their public budgets such as Iraq which mainly depends on these revenues. Rather, its contribution rate exceeds (90%) in financing the general budget. Therefore, fluctuations in world oil prices greatly effect this budget as well as its balance of payments, and most economic indicators were affected as a result of these fluctuations. As Iraq is the fourth country in the world in terms of production after the United states, Russia and Saudi Arabia, and fifth country in terms of reserves, with a quantity of (147.2) billon barrels and a default life of (88) years (OPIC:2019). And oil was discovered for the first time in Iraq on the fourteenth of October of the year 1927 in the field Kirkuk-1. Historically, the pricing of Iraq crude oils exported to world markets has gone through several stages, as well as follows (Alattar, 2018: 16):

1. The first stage, 1930 to 1951: The fixed price system of (4) four British gold shilling per ton (a ton is approximately 7 barrels).
2. The second stage four 1952 to 1972: The system of price announced by the oil companies and the agreements to share profits about (0.9) per barrel.
3. The third stage 1973 t0 1989: Following production management system and the official pricing for OPEC.
4. The fourth stage, 1989 until now: OPEC the management of production and the system of global market price.

2-1-1. Global market price system: Iraqi oil is sold to three global markets: Europe, America, and Asia for east for each of these markets, there is a signal oil around the world (Market crude), which is used as a basis for pricing one barrel of oil exported from Iraq to each of these markets, as follows (Al attar: 2018):

1. Europe market, the signal oil is the price of a barrel of Brent oil produced from the North Sea.

2. America market, the signal oil is the price of a barrel of ASCI oil produced from the American fields.
3. Asia market: The signal oil is average price of Dubai and Oman oil produced from Oman and the UAE.

The oil marketing company of the Federal Ministry of oil is the executing body for contracts for the sale of crude oil to all three global markets, as this company has a long experience in the field of concluding oil sales contracts and selling controls for choosing the parties to whom oil is sold. This company follows the method of selling crude oil on board the tanker at the Iraq export ports or what is called in the international oil markets (Free on Board FOB) this means that the buyer is the one who bears the transportation and insurance costs to the sender, and in return he gets a discount in the pricing equation equivalent to the cost of transportation and insurance to the home of the signal oil. According to the following equation:

P = (AMC) + / - (Md) +/ - (AP) +/- (W).

If the p: the net price of Iraq crude oil, AMC: signal oil price average (according to global price bulletins and for each market), Md: monthly difference determined by the competent committee in the oil marketing company (positive or negative), and AP is specific density (API Gravity) to the actual shipment for the contractual specifications (positive or negative), w: a percentage of transport charges, insurance and risks to the relevant market (According to the international daily bulletins).

2-2. Foreign reserve: According to the International monetary fund, foreign reserve is defined as "the available balance of foreign assets that are available at the monetary authorities and used by the state to cover imbalances in international payments or to influence the exchange rate or for other purposes (Dominguez, 2015: 4). As the reserve are the external assets at the disposal of the monetary authority and subject to its control to meet the needs of the financing balance of payments or to intervene in the exchange markets to influence in the currency exchange rate, or in addition to maintaining confidence in the local currency and forming a basis for external borrowing, those assets must be in foreign currency and actually exits, and potential assets are excluded from them. The concept of reserve assets is also based on the can concepts of "Controlling" and "allowing use" for the monetary authority. The process of managing foreign exchange

reserves is a very complex matter, as the success in managing these reserves is reflected in the form of increase confidence in the applied economic policies, especially monetary policy, Became it includes a balance between three elements, liquidity, security and profitability, in addition to the opportunity cast of maintaining these reserves. Here, foreign reserves must be a listing wished from back deposits with the central back, it is what is required by the legal reserves ratio that obliges every commercial bank to keep a certain percentage with the central bank, on the other hand, the reserves are owned by the monetary authority and at the disposal of the central bank to be used when necessary and at the required speed to confront the accident al imbalance in the balance of payments or to defend the exchange rate (Jones, 2018: 9). Usually foreign reserves consist of the following (Reza et al., 2014: 6):

1. Foreign currencies: They are the official reserves of strong foreign currencies that are at the disposal of the central Bank.
2. Reserve in the international monetary fund, which means the reserve segment that a member country may with draw from the fund within a short period.
3. Special drawing right, (SCR): It is an international reserve asset created by the international monetary fund in 1969. The value of this asset is determined based on a basket of five major international currencies (the dollar, the euro, the yen, the pound sterling and the Yuan Chinese) and can be exchanged for any of the freely tradable currencies. The share of each country is determined on the basis of its share in the international monetary fund.
4. Monetary Gold: It is the gold that the monetary authorities own and keep as reserve assets, and it consists of gold bars, including gold coins, ingots and bars, which reaches its at least (9.999) parts per thousand.
5. Other reserve assets including liquid assets that are available at the disposal of the monetary authorities.

Through these components, the importance of foreign reserves emerges in terms of improving the country's credit rating and increasing confidence in the local currency by creditors, as well as controlling exchange rate fluctuations (vinals,2016:4).

2-3. Consumer price indices: The index is defined as "a statistical tool for measuring the changes of a set of data compared to a specific basis"

(kazim, 2014: 101). And it is also known as "a statistical measure that measures the change in the value of a phenomenon at a specific level that cannot be directly observed or measured"(Ahmed,2018:3). In other words, the index measures the average changes in the price or group quantities of goods in comparison with a specific time period or with a specific market that is considered a basis for comparison. Therefore, the index is useful in knowing how the price level of a group of goods has changed, or how the volume of its production or consumption has changed over time, and by it is possible to compare the movement of price levels for different groups of goods, or comparing price levels and wage levels, or comparing changes in exports and imports. The indices are one of the oldest and widely spread economic indicators and the degree of interest in it was often related to the intensity inflation, the more sever the inflation the greater the need to find a digital indicator to measure it and to carry out the treatments required by the inflation situation with other economic variables. The consumer price index reflects the development of a budget cost belonging to a particular category of consumers, and it is called by other names such as the cost of living index (Wilson, 2014: 15). There are three main uses for price indices and as following (kazim, 2014: 111):

1. It is used as an indicator to measure the intensity of inflation and follow it up and compare between types of prices (consumer, wholesale, import) or between population groups or between countries and other comparisons.
2. Recalculating some values, such as value-added value or production values, after excluding the effect of inflation, that is, to calculate those values at fixed prices for a certain period.
3. The opposite use of the second use, that is, to recalculate some values such as wages and loans after inserting the effect of inclusion on them to recalculate them at current prices from what they were at prices for a certain period.

There are a number of ways to calculate consumer price indices, including:

1. simple index number: It is simplest of standard number and represent the price or quantity for a particular commodity in the comparison period to its price or its quantity in a fixed year called basis period or the support period so the rate of price:

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$$\frac{pn}{po} * 100$$

If the pn is the item price in the comparison year, and po is the item price in the base year.

2. Simple aggregate index number: This method expresses the prices of a group of commodities in the comparison year as a percentage of their total prices in the base year. The simple the simple aggregate index of prices for a group of commodities is:

$$100\times \frac{\sum Pi}{\sum Po}$$

3. Un weighted average of price index number: There are There are many formulas that depend on the method used to obtain the means of the levels, such as the arithmetic mean, the geometric mean, the harmonic mean, or the proxy mean:

$$\frac{1}{n}\sum \frac{Pi}{Po} * 100$$

4. Weighted price index: In order to get rid of the defects of the simple aggregate method, the prices of each commodity are weighted by using an appropriate coefficient for it. The quantity or volume of the commodity is often used during the base period and the year of comparison. These weights indicate the relative importance of the commodity in question. There are two of the most common formulas:

A. Laspeyres price (base weighted) price index:

$$\frac{\sum p1q0}{p0q0}$$

Where p1 stands for comparison price, p0 stands for the bass price, q1 stands for the comparison quantities, q0 stands for the base quantities. As the price of each commodity in accordance with this law is outweighed by its quantities in the base period, this law is called the law of fixed bass weights but this law equalizes the relative importance between the commodities whose price have decreased and the commodities whose prices have risen and imposed according to the law of supply and demand, the demand for goods that decrease price and less demand for goods whose increase.

B. The passche (current-weighted) price index: The formula for Bash's law corresponding to Lasper's formula is:

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$$\frac{\sum p1q1}{\sum p0q1} * 100$$

According to Bash's Law, the price of each commodity is outweighed by its quantities in the comparison period. Therefore, Bash's Law is called the Law of Variable Comparison Weights, because the weights change in it with the change in the comparison period. This law adopts the idea of the instability of the quantitative pattern of consumer goods and the emergence and disappearance of goods that affect supply and demand. The numerator in Bash's Law equals the sum of the values paid to purchase the comparison quantities, and the denominator equals the sum of the same values, but they are valued at base period prices.

3. Practical Framework

3-1. Analyze the value of the search variables: Appendix (1) shows the values of the research variables represented in Brent crude oil prices, the value of foreign reserves of the Central Bank of Iraq and the general consumer price index during the period (2012-2021) with monthly values.

It was found from the table that the average price of a barrel of Brent crude oil amounted to 53.65 dollars, meaning that it rose by 148% during the research period. We note that the lowest recorded price was in the fourth month of 2020, as it amounted to (18.84) dollars. The reason for this decline is the rapid spread of the (COVID-19) pandemic, which led to the closure of the economy as well as the fear of its future, as it reached the highest price at the end of the period, as it reached (83.57) dollars (https://sa.investing.com/). And since the Iraqi economy depends mainly on oil revenues in financing the general budget, it turns out that the highest value of foreign reserves in the same period was the highest, with a value of (90.99) trillion dinars. We also note from the data that there are clear differences when comparing oil prices and the value of reserves, and this comes for two reasons, one of which is the decrease in the volume of oil exports, whether due to low demand or the (OPIC +) agreement, which reduced Iraq's share by one million barrels per day, and the second reason is that the Central Bank of Iraq By decreasing the value of the Iraqi dinar against the US dollar, as the value of the dollar increased to record (1450) dinars per dollar, after it was (1182) dinars at the end of the year 2020, and this led to a decrease in the value of the currency sold in the currency window, and thus the increase in the value of the reserves. It also appears

that the lowest value of the reserves recorded was in the tenth month of 2016, as it amounted to (54.18) trillion dinars. It is noted that the highest value of consumer prices was recorded at (113) at the end of the period, which corresponds to the highest price of a barrel of oil and the highest value of cash reserves, as well as the value of inflation reached (7) points, as in the eighth month 2021 and with the same number of points, which corresponds to the highest inflation and the value of (8) points. This is logical from an economic point of view, as the increase in the value of oil will lead to an increase in revenues and thus an increase in the money supply and a rise in consumer prices, and thus inflation. And oil prices recorded the highest rise in the fourth month of 2020, as it increased compared to the previous month by (88%), while the highest value of reserves was recorded in the last month of 2020, with an increase of (20%) compared to the previous month, which is the same period in which both the consumer price and inflation were record at it reached (3%) for consumer price and (3) points for inflation.

3-2. Testing the research hypothesis: Table (2) shows the value of the test of correlation and effect between the research variables.

Table (2): The results of the correlation and effect between the research variable

independent variable	Idependent variable	Test s value			
		R	R^2	F	Sig
Brent crude oil price	foreign reserves	0.25	0.06	4.32	0.040
	Consumer price indice	0.46	0.21	17.84	0.000
foreign reserves	Consumer price indices	0.64	0.41	46.33	0.000

It was found that all the correlations between the research variables have recorded direct relationships between them, as positive values were recorded that ranged between (0.25-0.64). As we note that the value of the correlation between the price of Brent crude oil and the value of foreign reserves has reached (0.25), and the value of the interpretation coefficient (R2) (0.06) was recorded, meaning that (6%) of the changes that occur in the value of foreign reserves is because the changes that occur In oil prices, this result may be very low, especially in Iraq, as it depends mainly on oil revenues in financing the budget. The reason for this may be the large fluctuations in the volume of currency sales in the window, which is

approved by the Central Bank. Thus, the value of (F) (04.32) and the value (Sig) calculated (0.04) which is lower than its tabular value of (0.5)and with a confidence level of (5%), and thus these results prove the existence of a significant effect of Brent crude oil price on the value of foreign reserves, and this proves the acceptance of the first main hypothesis. . The value of the correlation of oil prices with indices was recorded (0.46) and with a direct relationship, and this relationship is of medium strength, and this is evident from the value of the interpretation coefficient (R2), which amounted to (0.21) and this explains that (21%) of the changes that occur in the consumer price indices are Because of changes in oil prices. Thus, the value of (F) (17.84) and the calculated value of (Sig) were recorded (0.000), which is lower than its tabular value, and thus the second main hypothesis is accepted. As for the correlation and effect of the second independent variable, which is cash reserves, in the consumer price indices, it may be found that a correlation coefficient between them was recorded (0.64), that is, there is a strong direct relationship between the two variables, and therefore the value of the interpretation coefficient was recorded (0.41) and this explains that (41%) One of the changes in consumer price indices are because to changes that occur in the value of reserves, it also recorded that value of (Sig) calculation (0.000), which is lower than its tabular value of (0.05) and with a confidence level of (5%), and this proves the acceptance of the third main hypothesis, which states that “there is a significant, statistically significant effect of the value of foreign reserves in the consumer price indices". In the case of testing each of the oil prices and foreign reserves as independent variables and their impact on the consumer price indices using the multiple regression method, the results appeared as follows:

Table (3): The results of testing the impact of oil prices and foreign reserves on consumer price indices

independent variable / **Brent crude oil prices**	**dependent variable**	**Test results**			
	Consumer price indices	R	R^2	F	ig
foreign reserves		0.71	0.50	33.59	0.000

Source: Prepared by researchers using SPSS-V25.

It is clear from the table in the case of testing the relationship and the impact of each oil prices and foreign reserves as independent variables

(instead of a single effect) in the consumer price indices, the correlation coefficient recorded a value that exceeded the correlation coefficient recorded by each variable separately, as it reached (0.71). The value is a strong direct relationship between the variables, as the value of (R2) was recorded (0.50), and this explains that (50%) of the changes that occur in the consumer price indices were because of the changes that occurred in both oil prices and foreign reserves. The value of the calculated (Sig), which shows the significance of the effect, was (0.000), which is less than its tabular value, thus proving the significance of the effect and the acceptance of the fourth main hypothesis.

Conclusions and Recommendations

A. Conclusions

1. Oil revenues contribute to a large percentage of financing the general budget in Iraq, often reaching more than 90%, and therefore fluctuations in oil prices directly affect the Iraqi economy.
2. Iraq exports its oil production to three important markets in the world, namely Europe, America and Asia, and the price of oil is determined according to the reference oil price approved in those markets, which are Brent oil, ASCI, Oman and UAE oil, respectively.
3. The rise in consumer price indices after changing the exchange rate of the Iraqi dinar against the US dollar from 1182 to 1450 dinars.
4. The results showed that the effect of oil price fluctuations on consumer price indices recorded a value higher than its effect in indices, as the value of the coefficient of determination reached (R2) (0.21) and in foreign reserves (0.06).
5. Foreign reserves recorded an effect on the indices, a value greater than the effect of fluctuations in oil prices in the indices, as the value of the coefficient of determination reached (0.41).
6. The combined effect of oil price fluctuations and the value of reserves recorded in the indices a value greater than the value of the single effect.

B. Recommendations

1. Creating new sources of funding to finance the general budget and not to rely heavily on oil revenues to avoid the impact of oil price fluctuations on the Iraqi economy.

2. Maintaining the stability of the Iraqi dinar exchange rate against the US dollar in order to maintain the consumer price indices as it is an influential factor in the living life of the citizen.
3. Establishing a high-quality control system to monitor the prices of foodstuffs and the prices of other consumer items, thus maintaining the stability of consumer price indices.
4. Maintaining the level of foreign reserves in the Central Bank of Iraq.

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Appendix (1)

The values of the research variables for the period (2016) until (1/11/2021) with monthly values

Time	Brent oil price (Dolar)	Foreign Reserves (ID)	Consumer price (point)	Base inflation (point)
1- 2016	33.62	60.787	105	-1
2-2016	33.75	59.144	105	2
3-2016	38.34	59.399	104	2
4-2016	45.92	59.285	104	2
5-2016	49.1	58.487	104	3
6-2016	48.33	56.608	104	0
7-2016	41.6	56.638	104	0
8-2016	44.7	56.522	104	0
9-2016	48.24	55.663	105	0
10-2016	46.86	54.181	104	0
11-2016	49.44	52.957	104	-1
12-2016	53.72	53.106	104	-1
1-2017	52.81	53.871	104	-1
2-2017	54.01	53.837	104	-1
3-2017	50.6	53.780	105	0
4-2017	49.33	53.741	105	1
5-2017	48.32	54.415	104	0
6-2017	46.04	54.241	103	0
7-2017	50.17	54.160	104	1
8-2017	47.23	55.173	105	0
9-2017	51.67	55.611	105	0
10-2017	54.38	55.915	104	0
11-2017	57.4	56.313	104	1
12-2017	60.42	57.893	105	1
1-2018	64.73	59.227	104	0
2-2018	61.64	59.262	104	0
3-2018	64.94	60.441	104	-1
4-2018	68.57	62.323	104	-1
5-2018	67.04	62.780	105	1

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Time	Brent oil price (Dolar)	Foreign Reserves (ID)	Consumer price (point)	Base inflation (point)
6-2018	74.15	64.931	105	2
7-2018	68.76	66.875	106	2
8-2018	69.8	68.889	105	0
9-2018	73.25	69.159	105	0
10-2018	65.31	71.590	106	1
11-2018	50.93	73.960	105	1
12-2018	45.41	76.017	105	0
1-2019	53.79	75.288	105	1
2-2019	57.22	76.800	104	0
3-2019	60.14	77.692	105	1
4-2019	63.91	77.399	104	1
5-2019	53.5	77.227	104	-1
6-2019	58.47	79.444	104	-1
7-2019	58.58	80.001	104	-2
8-2019	55.1	81.129	105	0
9-2019	54.07	80.158	104	-1
10-2019	54.18	80.512	105	-1
11-2019	55.17	80.408	105	0
12-2019	61.06	79.918	105	0
1-2020	51.56	79.376	105	1
2-2020	44.76	79.238	105	1
3-2020	20.48	79.698	106	1
4-2020	18.84	80.804	105	0
5-2020	35.49	79.567	105	1
6-2020	39.27	77.515	104	0
7-2020	40.27	78.570	104	0
8-2020	42.61	76.797	105	0
9-2020	40.22	69.814	105	1
10-2020	35.79	68.032	106	1
11-2020	45.34	65.132	105	0
12-2020	48.52	78.293	108	3
1-2021	52.2	80.285	109	3

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Time	Brent oil price (Dolar)	Foreign Reserves (ID)	Consumer price (point)	Base inflation (point)
2-2021	61.5	81.609	110	4
3-2021	59.16	84.778	110	4
4-2021	63.58	86.406	110	6
5-2021	66.32	88.642	110	6
6-2021	73.47	87.020	111	7
7-2021	73.95	87.085	112	7
8-2021	68.5	86.781	113	8
9-2021	75.03	86.409	112	7
10-2021	83.57	90.985	113	7
average	53.65	69371.3	106	1.11

Source: Prepared by the researcher based on the data of the Central Bank.