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OIL PRICE FLUCTUATIONS AND THEIR IMPACT ON THE RETURN OF THE IRAQ STOCK EXCHANGE INDEX (ISX60) WITH A TEMPLATE FRAMEWORK (COPULA-COVAR-MODWT) * FOR THE PERIOD (2/1/2020-31/3/2023)

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Abstract

The aim of the research is to explain the impact of crude oil price fluctuations on the return of the Iraq Stock Exchange Index (ISX60), as well as to explain the most important factors that lead to the occurrence of these fluctuations, with the aim of examining the long-term and short-term impact of oil markets on the Iraq Stock Exchange Index (ISX60). This point indicates the importance of understanding the complex relationship between oil prices and stock markets and how they change over time. This can help investors and decision makers develop better investment strategies and understand expected volatility in financial markets as these investigations provide evidence of the impact of crude oil prices on the financial sector.

Some studies were mentioned that focused mainly on the variables of the study, as daily data was collected for the period extending from 1/2/2020 until 3/31/2023, with a number of views (1185), and this research focuses on studying the impact of oil price fluctuations on the return of the index. The Iraqi Stock Exchange (ISX60), as well as measuring and estimating the relationship between oil prices and the (1SX60) index by employing marginal distribution models represented by the Copula-CoVaR model and wavelet analysis represented by the Maximal Overlap discrete wavelet transform model to describe and analyze the model. Dependence (mutual correlation) between the research variables, that is, between oil prices as an independent variable and the returns of the Iraq Stock Exchange Index (ISX60) as a dependent variable. The research concluded that the volatility of the oil market positively and strongly affects the return of the Iraqi Stock Exchange index and that this relationship is moral and statistically significant, i.e., an increase in oil prices is accompanied by an increase in the return of the Iraqi Stock Exchange index and vice versa. Therefore, the fluctuations of oil prices towards the return of the Iraqi Stock Exchange Index are very positive and strong in the short term, but the strength of this positive relationship soon decreases in the long term, according to the changing MODWT values during the different levels.

Introduction

Financial markets and commodity markets have become more integrated due to the increased overall movement of goods, services, technology and capital. This has caused a joint movement in prices in these markets, and this joint movement has clear effects on hedging and diversification, especially during periods of volatility. Therefore, research into the interconnection of commodity markets with financial markets is an important area of research. Crude oil is a commodity that is widely traded in the world. Fluctuations in crude oil prices directly affect the cost of production inputs, and may have a direct impact on the inflation rate and the trade balance. (Hamilton, 2009:216) Since the cash flows and rates of return of most business entities are directly affected by changes in oil prices, they may respond Stock prices for such change.

Crude oil is one of the important commodities whose topics have preoccupied researchers and practitioners in recent decades, as it is no secret to anyone of the great importance that crude oil enjoys in the economies of the countries of the world, which has made them markets that are not free in the traditional economic sense. They are affected to a varying degree by a number of conflicting policies and strategies between interests. The major industrial countries that consume oil each other and also the conflict of interests between those countries and the producing countries with emerging economies in most cases.

Developed countries have realized the importance of oil as an economic weapon that exceeds in importance and influence the largest military weapons. This has forced some of those countries to subjugate oil producers from developing countries through exploration and extraction contracts with the aim of seizing the bulk of the revenues.

As crude oil is used to produce energy, fuel and other energy-related activities, and as the most traded raw material and its price is the most volatile in the commodity market, it plays an important role in the global economy, through the interrelation between macroeconomic variables, as it is always seen as one of the most important determinants of phenomena. global economic (Turhan, Hacihasanoglu, & Soytas, 2013:22). Oil is known as the “economic blood” and is used by almost all industries as a basic raw material. Sharp fluctuations in oil prices directly affect macroeconomics, corporate investments, the stock market, and other economic variables, and we see that effect clearly in the 1973 oil crisis.

In addition, stock markets in emerging countries are more sensitive to external oil price shocks due to real problems in their systems, and in light of the important role of the stock market in maintaining the stability of the country’s financial system, it is therefore of academic and practical importance to study the transfer of risks from oil markets to oil markets. Securities in order to regulate and control the overall economy and optimize the construction of investment portfolios, especially after many countries moved towards financial integration and financing of commodity markets in an effort to find new ways for investors to diversify their investment portfolios. Therefore, taking advantage of these investment opportunities requires a good understanding of how financial markets and commodity markets are related. Basic research, and despite the large amount of research that has been conducted to look into the dynamics of volatility and correlations between stock markets and commodity markets, there are few that have touched on the fluctuations and correlations between stock prices and commodities in emerging markets, but their study was through traditional methods of correlation analysis, so modeling volatility and correlations has become An essential element in modern finance

because accurate estimates of correlation and volatility have become a necessity in pricing derivatives, increasing portfolio optimization, risk management, and hedging.

While investing in commodities is seen as a way to increase risk diversification and hedge against inflation, there are those who argue that if commodities have low or even negative correlations with stocks and bonds, then a portfolio that includes commodities should have better diversification characteristics than a similar portfolio that excludes commodities. Therefore, portfolios that include commodities may lead to higher returns and lower risks than portfolios that do not include commodities, and furthermore, commodities have long been promoted as a way to hedge against inflation. (Greer, 2000:45-50)

However, commodity futures returns are negatively related to stock returns, and this suggests that adding a mix of commodities to a stock portfolio may lead to a better risk-return trade-off than simply investing in stocks.

2- Research methodology

2-1- Research problem:

Many previous studies have indicated the direct effect between oil prices and stock prices. In most studies, the relationship between oil prices and stock prices was analyzed using a linear framework (Morema, 2018); (Kelikume, 2019), (Ali et al, 2020). Recently, some scholars have made the argument that one of the fundamental shortcomings of linear modeling is that it assumes that time series are linear, while in real times, they are nonlinear (Shabbir, Kousar, 2020).

To avoid the problem of inaccurate results when analyzing random variables using linear relationships, the relationship between the independent variables and the dependent variable will be analyzed using marginal distribution models represented by the Copula-CoVaR model and wavelet analysis represented by the Maximal Overlap Discrete Wavelet Transform (MODWT) model.

In order to reach the answer, the following set of questions can be formulated:

1- What is the nature and direction of the relationship between oil price fluctuations and the return of the Iraq Stock Exchange Index (ISX60)?

2- Is there any long-term or short-term impact of oil markets on the return of the Iraq Stock Exchange Index (ISX60)?

2-2- The importance of the research: Based on the above and in light of the existing disagreement among researchers regarding their inability to definitively reach the relationship between oil prices and stock market returns, the importance of the research is evident from the importance of the topic or problem that it addresses, as the study of crude oil price fluctuations is of high importance. In the global and local markets and the real threat they represent to many countries of the world through influencing the trade balance, economic activity and financial capacity of these countries, and through the use of modern mathematical models for the purpose of highlighting the relationship between oil prices and the financial markets in different financial markets and analyzing Oil market fluctuations on the financial markets and comparing this impact between similar sectors in the markets for a specific period of time and trying to benefit from understanding the relationship in establishing controls and procedures that limit/support the negative/positive impact of oil prices in the event of their fluctuation on the

financial markets and working to find other sources of income that contribute In raising and increasing public revenues.

2-3- Research objective: To examine the long-term and short-term impact of oil markets on stock market performance.

2-4- Research hypothesis: "There is no statistically significant impact relationship between oil price fluctuations and the return of the Iraq Stock Exchange Index (ISX60) within the framework of (COPULA-CoVaR-MODWT) models."

2-5- Research limitations: The research limitations are as follows:

• Spatial boundaries: The spatial boundaries are represented by the Iraq Stock Exchange.

• Time limits: represented by the period (1/2/2020-3/31/2023).

3- Literature presentation: It is interesting to go back to history and see how science has developed over time and identify the main scientific ideas in this development. From this standpoint, previous theoretical and applied studies and research are considered an essential starting point from which the researcher derives the basic points for building the theoretical framework and formulating the basic structure in the applied aspect of the research. Accordingly, it is considered a basic pillar on which the researcher relies and compares his ideas and conclusions with what the researchers who preceded him in the field have reached. Investigating the correlation between stock markets and oil prices is important because it allows investors to hedge portfolio risks from sudden shifts in the market.

(Ågren, 2006) discussed the impact of the fluctuations in oil prices being transmitted to stock prices. The study was done using the BEKK model for weekly data on stock markets in Japan, Norway, Sweden, the United Kingdom, and the United States, for the period extending from the beginning of the first week of 1989 to the seventh week. On the 10th of 2005, the study concluded that the fluctuations that occurred in the stock markets were strongly related to the oil markets.

While (Kilian & Park: 2009) studied the impact of oil price shocks on the US stock market using the percentage change in global crude oil production, the real price of crude oil imported by the United States, the global real activity index, and US stock market returns for monthly data spanning the period from From January 1973 to December 2006, it turns out that the response of real stock returns to oil price shocks in the United States varies greatly depending on the underlying causes of high oil prices.

(Al-Tamimi, 2011) also discussed the impact of crude oil price fluctuations on stock prices. This study sought to explain the impact of crude oil price fluctuations on the movement of stock prices in the financial markets represented by the stock markets. It also sought to explain the most prominent factors that work to cause these fluctuations and what the picture is. Which it has drawn on the global economy. For daily data from 1/1/2008 to 12/31/2009. The study sample was (the United States of America, Canada, Jordan, and the Kingdom of Saudi Arabia). The study concluded that there is a greater impact of crude oil price fluctuations on the stock prices of the crude oil exporting countries (Canada and the Kingdom of Saudi Arabia) than the importing countries (Jordan and the United States of America). The study also found that this effect varies according to the development of the financial and technological structure of the exporting country, the sample of the study. The developing countries of the sample showed a greater correlation than the developed countries.

(Bastianin, et, al, 2016) also investigated the effects of oil price shocks on the volatility of G7 stock markets using a structural Vector Autoregressive (VAR) model, for monthly data from February 1973 to January 2015. The study concluded that there is an effect of oil price shocks In the stock market volatility depends on the origin of each shock.

4- The theoretical framework of the research:

4-1- Crude oil:

4-1-1- The concept of oil: First, it must be pointed out that the term or word "oil" was not unified in the Arab world and internationally, so one part uses the word (oil) and the other uses the word or term (petroleum), where the term "petroleum" is used in Western Europe in the Latin part. Among them, the origin of the word (petroleum) goes back to the Greek origin, which is derived from two words (petr), which means rock, and the word (oleum), which means oil, which was translated from Latin as (rock oil), while Eastern European countries use the word or term (oil) instead of the word (Petroleum) and both terms are used in relation to the Arab region (Abdullah, 2003: 10). Crude oil is one of the types of fossil fuels, and it is a mineral oil consisting of a mixture of hydrocarbons of natural origins and other organic materials that varies between yellow and black in color and has a density and viscosity. Variable (Chen, 2020:12).

Oil is a "commodity," which means that, as an internationally tradable commodity, commercial contracting guidelines conform to the uses and customs included in an international institutional framework that defines the nature of contracts, reference prices, and qualities of the product recognized by all market participants. It is an essential product of great strategic importance to all countries of the world. Petroleum products are an essential element in many fields, such as transportation fuels, such as gasoline, diesel, and asphalt for building roads, and diesel for producing electricity. It is also included in the plastics and petrochemicals industry, and many others. (Gyagri, et al, 2017:8) As it has become the main material for many chemical and petrochemical products such as fertilizers and pesticides (Rasan, 1999: 16).

4-1-2- Factors affecting crude oil prices: Factors affecting crude oil prices

There are many factors that affect crude oil prices, including:

A- Demand and Supply

Lutz (2009) stated that the change in supply and demand can affect the crude oil market either by increasing or decreasing crude oil prices. Crude oil suppliers from around the world adjust the activity of the free market, if supply exceeds demand. Where it is stored, the surplus is for the future, but when demand exceeds supply, the stored surplus can be used to meet the increase in demand. This relationship between the price of crude oil and its suppliers is a two-way solution. Although non-OPEC producers supply 60% of the world's crude oil, they do not have Reserves are required to control prices. They can only respond to international market discrepancies. However, crude oil market prices are mainly under the control of OPEC, especially when supply from non-OPEC countries dwindles. On the other hand, factors can be Related to long-term supply that affect the price are the availability of crude oil reserves, reserve stocks of crude oil, technological progress that produces alternatives and the depletion of the crude oil resource itself has stimulated many countries to possess strategic oil reserves, as

pledged by the International Energy Agency (2012) By retaining crude oil imports for 90 days. But the biggest concern is running out of the resource.

B- Production and refinery capacity: Refinery Capacity Production

Global oil production capacity is an important factor when considering the factors influencing crude oil prices. In the short term, production capacity can be affected by political uncertainties. For example, the decision taken by Western economies to limit oil imports from Iran, which exports more than 5% of the world's total crude oil production, had major repercussions on the price of crude oil. Other complications in crude oil supplies could also arise from the current tensions in Arab countries, leading to disruption of the movement of oil through the Strait of Hormuz. Coleman (2012:324) discusses that with the consumption of more oil, and thus continuing to extract at the same rate, it leads to the depletion of oil, and thus the necessity of constantly finding new alternatives, which has become very expensive. Therefore, production, exploration and refining capacity increases fluctuations in crude oil prices.

T- Consumption (depletion of the resource).

The scarcity of energy supplies and the concept of peak oil production are widely accepted by governments and organizations. The International Energy Agency stated in its World Energy Outlook 2008 report that while market imbalances may temporarily lead to a decline in prices, it is clear that the era of cheap oil is over. Crude oil consumption is driven by demand for refined petroleum products. There are large regional differences in consumption rates, as advanced OECD countries such as (Denmark, Germany, Luxembourg, and the United Kingdom) account for about 50% of global demand. Demand for crude oil also comes from several sectors, but two main sectors: transportation and industry cover about 85% of total global demand, and residential, commercial, electrical and heating power generation represents the remaining percentage" (IEA, 2008:49).

It is worth noting that the use of industries may be replaced by other sources of energy such as coal and hydropower, but transportation depends almost entirely on crude oil products for its energy needs. Long periods of low fuel prices have built transportation infrastructure and industry around petroleum products, and even as crude oil prices rise, alternative technologies have had difficulty gaining a foothold. In the industrial sector, oil is mainly used for power generation or heating for industrial purposes. It is also used as a raw material to manufacture products such as plastics, industrial chemicals, and asphalt (Happonen, 2009, 1-24).

D - Organization of Petroleum Exporting Countries (OPEC).

OPEC represents an estimated 42% of global oil production and 73% of the world's "proven" oil reserves, giving OPEC a significant influence on global oil prices. OPEC's decisions have begun to play a prominent and influential role in the oil market and international regulations (Hansen & Lindholt, 2008:2955). In the 1970s, OPEC restrictions on oil production led to significant price increases and far-reaching consequences for the global economy. OPEC began setting production targets for its member countries in 1980, and generally fluctuating production to maintain fixed revenues by OPEC leads to a negative relationship between oil prices and OPEC production (Kaufmann et al, 2004:67).

C- Speculation in the crude oil futures market

Speculative behavior in the crude oil futures market affects fluctuations in crude oil prices in two ways:

First: When some speculators expect the price of crude oil to rise in the future, they will invest heavily in crude oil futures contracts. Other investors will follow suit, which will greatly enhance buyer power in the crude oil futures market and directly lead to higher crude oil futures prices in the current period. Conversely, if some speculators expect crude oil prices to fall, the market will be vulnerable to panic, which will exacerbate the effect of herd behavior in the market and lead to oil price fluctuations (X Gong, Boqiang Lin, 2018:371).

As for the second, from the researcher's point of view: when speculators invest heavily in the crude oil futures market, expectations will arise that crude oil prices will decline in the future. Through the interconnection of the spot and futures markets, this will affect the spot market through a decrease in supply in the spot market, thus stimulating crude oil prices to rise.

H- The US dollar (USD) exchange rate

The US dollar exchange rate greatly affects crude oil prices, mainly through three mechanisms:

First: The US dollar is the main invoicing and settlement currency for trading crude oil, and the dollar exchange rate is the basic channel through which oil price fluctuations are transmitted to the real economy and the US financial markets first, then the global ones. As a result, changes in the US dollar exchange rate will directly lead to changes in oil prices (Wen, etal, 2018: 779).

Second: Changes in the exchange rate of the US dollar will affect the total cost of crude oil, and thus affect the relationship between supply and demand for crude oil, which further affects the price of crude oil (Golub (1983:592)).

Third: When the value of the US dollar declines, investors abandon the US dollar one by one, and are more likely to invest in the international crude oil futures market with a relatively high return, causing crude oil prices to rise. Most studies have concluded that there is a negative relationship between the exchange rate of the US dollar and the price of crude oil, as the decline (increase) of the exchange rate of the US dollar led to an increase (decrease) in the price of oil (WANG, 2012: 103) (Zhang, 2008: 973), (Uddin, 2013:702).

G - The gold markets

Gold and crude oil markets are the two main representatives of commodity markets. Much evidence has pointed to the financial features of the crude oil and gold markets and shown a close interaction between the two markets, and the relationship between oil and gold prices can mostly be explained in two ways:

First - most oil importing countries pay for their oil supply in gold and invest in gold because it is considered a safe investment (86: (Tiwari, 2015).

Secondly, gold is considered a unique tool that acts as a hedge against inflation because there is a negative relationship between oil and inflation: when inflation rises, investors buy gold to hedge their investment portfolios (364: Kanjilal & Ghosh, 2017).

D- The US stock market

The US stock market is one of the most important financial markets and is closely linked to the crude oil market (Xiao et al., 2018:20). Some studies have indicated a significant indirect effect of the US stock market on the international crude oil market. In theory, there is a transmission mechanism from the US stock market to the crude oil futures market. Since it is one of the most important financial markets, when the stock market declines, investors will turn to investing in other financial markets. However, since it is the most traded commodity, the crude oil futures market will be affected by the stock market.
(Thuraisamy, etal, 2013:72); (Salisu & Tirimisiyu, 2015: 9).

I- Natural Factors

Like most commodities, seasonal changes in weather affect the demand for crude oil. For example, in winter, consumption rates for crude oil derivatives for heating purposes rise, while gasoline consumption rates rise in summer due to the increased demand resulting from tourism. Although markets know when to expect these periods of increased demand, the price of oil rises and falls seasonally each year (Al-Hasnawi, 2014: 129).
Severe weather conditions such as hurricanes, tsunamis and thunderstorms, especially in major oil-producing countries, can affect production facilities and infrastructure, disrupt oil supplies and lead to higher prices. When Hurricane Katrina struck the southern United States in 2005, it affected 19% of the US oil supply, and the price of a barrel of oil rose by $3. In May 2011, the flooding of the Mississippi River also caused oil prices to fluctuate (Gyagri, 2017:13).

4-2- Returns on common shares:

Investors often look to achieve the best performance using the financial resources available to them (Moodi & Hajiha, 2013:3925). Based on the basic premise that investors like returns and do not like risk (Brigham & Houston, 2018: 271), therefore, they will invest in risky assets only if those assets provide higher expected returns.
Therefore, various investment activities require making smart and quick decisions in a timely manner in light of the available information. It also takes into account a wide range of factors that help in making investment decisions (Addin, et.al, 2013:925). One of the most important aspects that investors take into consideration when making the decision to invest in available stocks and the available time is stock returns (Chambers, et.al, 2013:279).

4-2-1- The concept of returns:

The expected profit from this investment is often called the return, and the return is the level of profits that investors enjoy for an investment made. Earnings per share are defined as earnings per share (EPS), which explains the amount generated by one dinar invested during a certain period of time (Al-Zubaidi, (2004: 885). Most financial studies include returns on assets instead of prices, as he presented
(Campbell et al., 1997) There are two main reasons for using returns.
First: For ordinary investors, a stock's return is a complete, measure-free summary of the investment opportunity.
As for the second, the return series is less complicated to deal with than the price series because the former has more attractive statistical properties (Campbell, etal., 1997: 154).

There are many returns that investors may obtain in stocks, the most common of which are:
A - Historical (actual) rate of return: the rate of return that the investor actually obtained by investing in common stocks for previous periods (Brigham and Houston, 2007:294).

B - Required rate of return: It represents the return necessary to compensate the investor for the risk involved in the investment process. The part of the return that the shareholder expects is known through his understanding and information that he obtains from the market. (Ehrhardt, Brigham, 2011:221).

4-2-2- Factors affecting stock returns:

Knowing the factors and variables that affect stock returns will help stakeholders make relevant decisions. In this regard, academics and researchers have conducted studies on the factors that affect stock returns, and whether stock returns can be accurately predicted for years to come. They can be divided into three categories of internal, external and behavioral factors:
A - Internal factors: The internal factors affecting stock returns are as follows:
(Fonseka & Tian, 2011:10910(;) Sharma & Paul, 2015);
- Earnings per share: The amount of profit the company received for shareholders.
- Retained earnings: These are undistributed profits that help the company grow and raise the market price of the stock in the future and thus achieve more capital returns.
- Liquidity: It is the degree to which an asset can be bought or sold in the market without affecting its price.
- Leverage: An investment strategy that allows companies to use debt or any type of external borrowing to expand the business.
- Profit Dividend: Sharing the profits achieved by the company from operations with shareholders as decided by the Board of Directors after allocating a portion to the reserve.

B - External factors: The internal factors affecting stock returns are as follows:
Tandelilin,2010: 432) (Bodie & Marcus,2021:290)
- Inflation: It is a trend of overall increase in product prices, causing a decline in the purchasing power of money.
- Interest rate: It is the amount that the borrower pays as compensation for using the borrowed money. Interest rates are one of the important inputs in investment decisions. If interest rates fall, people tend to choose long-term investment, while when interest rates rise, people tend to Postponing making long-term investments.
- Gross Domestic Product: It is the total monetary or market value of all final goods and services produced within the country's borders in a specific period of time, usually a year. It is one of the tools for measuring the size of the economy of a country by calculating the values of goods and services for that country during a specific period and in a specific currency (O'Neill (2014:103).

C- Behavioral factors: The internal factors affecting stock returns are as follows:
- Overconfidence: is the tendency to exaggerate a person's degree of accuracy (Fischhoff et al., 1977).

- Entrenched bias: Individual predictions based on inherited biases that lead to large prediction errors
(Tversky & Kahneman, 2013:112).
- Herd behavior: Herd behavior in the financial market is defined as the tendency of investors' behaviors to follow the actions of others (Yang et al., 2020:122).

4-2-3- Measuring returns:

The Oxford Dictionary defines a return as a profit on an investment over a period of time, expressed as a proportion of the original investment. Recently, modern studies to calculate the daily return of a stock have been limited to two formulas (arithmetic return and logarithmic return): the (simple) arithmetic return and the logarithmic return.
(The Compound), (Siddikee, 2018:249); (Zivot, 2005:44)
The simple return is calculated with no dividend distribution according to the following formula:

$$R = \frac{\mathbf{p}_t - \mathbf{p}_{t-1}}{\mathbf{p}_{t-1}}$$

The logarithmic return is also calculated with the following formula:

$$\mathbf{R}=\ln\left(\frac{\mathbf{p}_t}{\mathbf{p}_{t-1}}\right)$$

In both forms:
R = daily return per share.
= p_t the price at the end of period t for a stock that pays no dividends.
= p_(t-1) the previous price of the stock.
ln (·) = natural logarithm function.
In the case of dividends, the simple return is calculated according to the formula:

$$R = \frac{(\mathbf{p}_t - \mathbf{p}_{t-1}) + D}{\mathbf{p}_{t-1}}$$

D= Dividends for the period.
The logarithmic return is calculated in the event of dividends by the formula:

$$\mathrm{R}=\ln\left(\frac{\mathbf{p}_t+D}{\mathbf{p}_{t-1}}\right)$$

The stock return can be measured by the logarithm to extract compound returns, that is, when the return on investment is calculated and reinvested again for an infinite number of periods or what is called the continuously compounded return. The current earned return and the accumulated returns are added to the basic amount. When the investor calculates the return, it differs from the annual compounding, which includes a specific number of periods. The number of periods used for continuous compounding is infinite.
The continuous component uses an exponential constant (2.71828 = (e) to represent an infinite number of periods and is extracted with the following equation:(Morgan, 2009: 242)

$$\mathrm{Rit}= \mathrm{LN(Pt)}-\mathrm{LN(Pt-1)}$$

Rit = Earnings on stock (i) in the current month.
LN(Pt)=Current month's closing price.
LN(Pt-1) = closing price of the previous month.

5- The practical aspect:

In the current study, the relationship between the variables under study will be measured, through the copula models method, by linking the statistical distributions of these variables using a specific link function to obtain a joint probability function whose primary function is to analyze binary or multi-dimensional data. The focus was on a group of linking functions (Normal distribution function), Clayton function, Frank, Placket function, Gumbel function, and the student (t) function, and the Static Copula model was studied (according to the linking functions above). This means that the linking function is constant over time, and the Dynamic Copula model was measured (according to the linking functions above). Then, the best copula model was chosen based on (Akaike Information Criterion) (AIC), and then the impact of prices was predicted. Oil on the return of the Iraq Stock Exchange Index (ISX60) under study according to the best copula function that was chosen. The risks of the impact of oil price fluctuations on the return of the index under study were also measured by employing the Value at Risk (VaR) method and the Value at Risk (VaR) method. The conditional value at risk (CoVaR) and their tests were also measured. The change in the conditional value at risk (Delta Conditional Value at Risk) over time was measured, and risks were measured in the short and long term. The relationship of oil prices to the return was also studied. The Iraq Stock Exchange Index (ISX60) across different time frequencies, through wavelet correlation analysis at different levels, by employing the maximum overlap discrete wavelet transform (MODWT) method. The models used in the current study were analyzed through the use of the statistical program - R Programming, through the use of a set of codes and related functions in analyzing the variables of the study, where the (Copula) code, the (VaR) code, the (Wavelets) code, and the (MODWT) function were used, which are located within R-programming environment.

5-1- Statistical description and some time series tests

After collecting data from its sources (the Iraq Stock Exchange), which was a daily time series of returns of the Iraq Stock Exchange Index (ISX60). With a sample size equal to (1185) observations, from the beginning of January 2, 2020 until the end of March 31, 2023. Since the data is a time series, the time series must be tested with a set of tests, and before presenting these tests, we will focus on some important statistical indicators as shown in Table (73):

	Stock returns of (ISX60)
Mean	0.0002266446
Standard Devision	0.00641891
Max	0.06858342
Min	-0.03843704
Skewness	1.666549
Kurtosis	21.18514
Jarque–Bera	2912921 (0.0000)

Augment Dickey-Fuller (ADF)	-21.336 (0.000)
Ljung–Box test residual ($Q(Lags)$)	10.124 (0.0000)
ARCH-LM statistic ($Lags$)	37.324 (0.0000)

Table No. (73) shows the statistical description and some tests for the return of the Iraqi Stock Exchange index

From the results presented in the table above, we find that the average return of the Iraq Stock Exchange index reached a value of (0.0002266446) dinars, with a standard deviation of (0.00641891). It is noted that the arithmetic mean values in the stock returns variable for the Iraq Stock Exchange Index (ISX60) are a positive value close to zero, and in general, these returns have achieved profits. From the results of (Jarque-Bera), we find that the time series data for the variable stock returns of the Iraq Stock Exchange index does not follow a normal distribution (i.e., accepting the alternative hypothesis which states that the data for a variable in the Iraq Stock Exchange index does not follow a normal distribution). From the results of skewness and skewness, we find that the return of the Iraqi Stock Exchange index has the characteristic of a heavy tail. Also, from the results of the Augment Dickey-Fuller (ADF) test, we find that the time series of the stock returns variable for the Iraq Stock Exchange index is stable at the first level. As for the results of the Ljung–Box test residual (Q(Lags)), which is related to the test statistic Q (6), which is distributed according to the Chi-Square distribution, we find that the values of Q (6) are large, so the variable return of the Iraqi stock market index It has autocorrelation coefficients, that is, the hypothesis that says (the presence of autocorrelation coefficients) is accepted. It is possible to test heterogeneous conditional variance (ARCH), by employing the ARCH-LM statistic (Lags). We notice that the values of (LM) are large. In this case, we accept the hypothesis that says (the presence of heterogeneous conditional variance). Since the units of the variables are different as a statistical treatment in this case, the standard formula for the variables is relied upon.

5-2- Static and dynamic copula model

The results listed in Tables (74) and (75) represent the estimates of the static and dynamic copula models, respectively.

5-2-1- Static Copula Model

This model assumes that the values of the joint distributions of the data under study are constant over time, as shown in the tables below:

Types of copula models (connection functions)	Estimated landmarks	Relation oil price and stock returns (ISX60)
Normal	θ_1	0.654
	Sig	0.000
	AIC	-387.234
Clayton	θ_2	0.765
	Sig	0.000

	AIC	-345.647
Placket	θ_3	0.572
	Sig	0.000
	AIC	-354.345
Frank	θ_4	0.794
	Sig	0.000
	AIC	-428.634
Gumbel	θ_5	0.653
	Sig	0.000
	AIC	-357.157
Student (t)	θ_6	0.873
	Sig	0.000
	AIC	-543.183

Table (74) shows the parameter estimates for the fixed (copula) model of the impact of oil prices on the return of (ISX60).

From the results listed in the chart (74), we find that the values of the copula models have a positive impact on all the link functions used. In a link function with a normal distribution, we find that the price of oil has a positive and strong effect on the return of the Iraqi stock market index, and the amount of this amounted to the positive relationship (0.654) and this relationship is significant and statistically significant, i.e., an increase in oil prices is accompanied by an increase in the return of the Iraq Stock Exchange index. In Clayton's link function, we find that the price of oil has a strong positive impact on the stock returns of the Iraq Stock Exchange index, and the amount of this positive relationship reached (0.765), and that this relationship is moral and statistically significant, that is, an increase in oil prices is accompanied by an increase in the return of the Iraq Stock Exchange index. Finance. In the Placket link function, we find that the price of oil has a positive and strong impact on the return of the Iraq Stock Exchange index, and the amount of this positive relationship reached (0.572), and that this relationship is moral and statistically significant, meaning an increase in oil prices is accompanied by an increase in the return of the index (ISX60). In Frank's link function, we find that the price of oil has a positive and strong impact on the return of the Iraqi Stock Exchange index. The amount of this positive relationship reached (0.794) and that this relationship is moral and statistically significant. That is, an increase in oil prices is accompanied by an increase in the return of the Iraqi Stock Exchange index. In the Gumbel link function, we find that the oil price has a positive and moderate effect on the return of the Iraqi stock market index. The amount of this positive relationship reached (0.653) and that this relationship is moral and statistically significant. That is, an increase in oil prices is accompanied by an increase in the return of the Iraqi stock market index. In the Student (t) link function, we find that the oil price has a positive and strong impact on the return of the Iraqi stock market index. The amount of this positive relationship reached (0.873) and that this relationship is moral and statistically significant, that is, an increase in oil prices is accompanied by an increase in the return of the index. Through the results shown in the table above, we find that the best linking function to evaluate the relationship between oil prices and the index return is the Student (t) linking function, where the value was (543.183 AIC=-), which is the smallest value compared to the rest of the other linking functions. The

figure below shows the direction of the relationship between oil price fluctuations and the index return when the Student (t) link copula function.

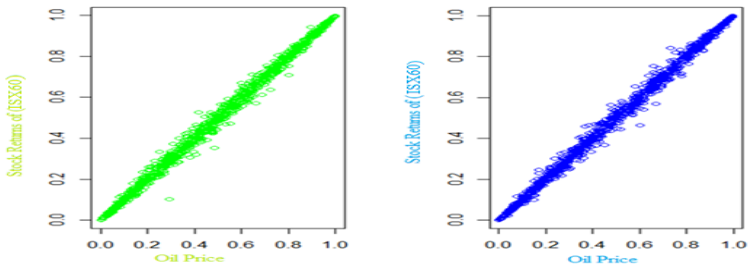

Figure No. (41) shows the relationship between oil prices and the return of the Iraqi Stock Exchange index

5-2-2- Dynamic Copula Model

This model focuses on changes in the values of joint distributions of the data under study over time:

Types of copula models (connection functions)	Estimated landmarks	Relation oil price and Stock returns of (ISX60)
TVP-Normal	μ_1	0.768**
	δ_1	0.704**
	ϑ_1	**0.862
	AIC	438.642-
TVP-Clayton	μ_2	0.676**
	δ_2	0.734**
	ϑ_2	**0.864
	AIC	429.661-
TVP-Placket	μ_3	0.719**
	δ_3	0.637**
	ϑ_3	**0.766
	AIC	425.637-
TVP-Frank	μ_4	0.642**
	δ_4	0.529*
	ϑ_4	**0.673
	AIC	464.655-
TVP-Gumbel	μ_5	0.848**
	δ_5	0.774**
	ϑ_5	**0.524
	AIC	422.349-
TVP-Student (t)	μ_6	0.816**
	δ_6	0.767**
	ϑ_6	*0.866
	AIC	**618.077-**

Table (75) shows the parameter estimates for the dynamic (copula) model of the impact of oil prices on the return of (ISX60)

From the results shown in the table above, we note that the number of features of the copula model for most of the estimated link functions is three features, and that now the common functions of the copula models were measured at three different times over time.

When using the link function with a normal distribution (TVP-Normal), we find that the values of the impact of oil price fluctuations on the return of the Iraq Stock Exchange index were estimated by three parameters, where the value of the first parameter was (0.768), the value of the second parameter was (0.704), and the value of the third parameter was (0.862). We note All three of these values were positive, which indicates that there is a strong to moderate positive correlation between oil price fluctuations and the return of the Iraq Stock Exchange index. In general, we find that the correlation is strong between these two variables at all times.

When using the TVP-Clayton link function, we find that the values of the impact of oil price fluctuations on the return of the Iraq Stock Exchange Index share were estimated by three parameters, where the value of the first parameter was (0.676), the value of the second parameter was (0.734), and the value of the third parameter was (0.864). We note that each These three values were positive, which indicates that there is a strong positive correlation between oil price fluctuations and the share return of the Iraqi Stock Exchange index. In general, we find that the correlation is strong between these two variables at all times.

When using the connection function (TVP-Placket), we find that the values of oil price fluctuations on the stock return of the Iraq Stock Exchange index were estimated by three parameters, where the value of the first parameter was (0.719), the value of the second parameter was (0.637), and the value of the third parameter was (0.766). We note that all of these the three values were positive, which indicates that there is a very strong positive correlation between oil price fluctuations and the index share return. In general, we find that the correlation is strong between these two variables at all times.

When using the TVP-Frank link function, we find that the values of the impact of oil price fluctuations on the stock return of the Iraq Stock Exchange Index were estimated by three parameters, where the value of the first parameter was (0.642), the value of the second parameter was (0.529), and the value of the third parameter was (0.673). We note that All three of these values were positive, which indicates that there is a strong to moderate positive correlation between oil price fluctuations and the market index return. In general, we find that the correlation is strong between these two variables at all times.

When using the TVP-Gumbel link function, we find that the values of the impact of oil price fluctuations on the index return were estimated by three parameters, where the value of the first parameter was (0.848), the value of the second parameter was (0.774), and the value of the third parameter was (0.524). We note that all of these three values were Positive, which indicates that there is a strong positive correlation between oil price fluctuations and the stock return of the Iraq Stock Exchange Index. In general, we find that the correlation is strong between these two variables at all times.

When using the TVP-Student (t) link function, we find that the values of the impact of oil price fluctuations on the stock return of the Iraq Stock Exchange index were estimated by three parameters, where the value of the first parameter was (0.816), the value of the second

parameter was (0.767), and the value of the third parameter was (0.866). We note that all three of these values were positive, which indicates that there is a strong positive correlation between oil price fluctuations and the return of the Iraqi Stock Exchange index. In general, we find that the correlation is strong between these two variables at all times.

We find that the best link function in the Dynamic Copula Model is the link function that follows the TVP-Student (t) distribution, and this is clear from the value of the AIC (Akaike information criterion), which is the lowest value at Connection function, (TVP-Student)(t), as shown in the table below.

The relationship between variables using copula models	Copula model is the best	Joint function specification
Relation oil price and stock returns of (ISX60)	TVP-Student (t)	The tail of the function is symmetrically linked

Table (76) shows the best dynamic copula model for the impact of oil price fluctuations on the return of the Iraqi Stock Exchange index.

From the results presented in the table above, we find that the direction of the correlation is positive between the price of oil and the share return of the Iraqi Stock Exchange Index, and it is the same whether it is in the left or right tail, meaning that the relationship between these two variables tends to move together, rising or falling.

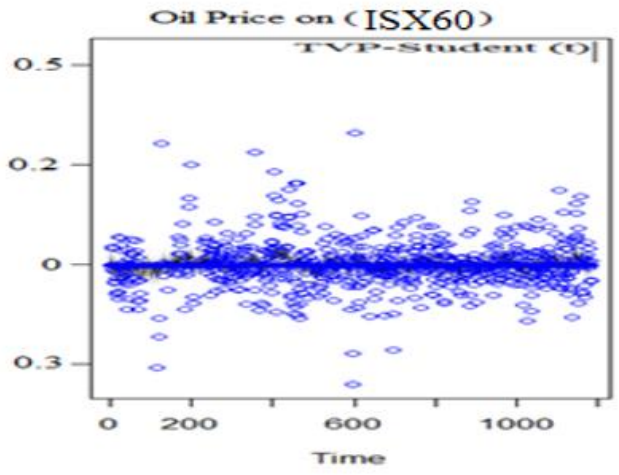

Figure No. (42) shows the kinetic copula model at the TVP-Student link function (t)

5-3- Value at Risk (VaR) and Conditional Value at Risk (CoVaR)

Oil price fluctuations are accompanied by potential risks at a specific significant level. The table below is an estimate of the risks (VaR) and (CoVaR) of the impact of oil price fluctuations on the return of the Iraqi Stock Exchange index.

	Downside risk			Upside risk		
Variable	VaR	CoVaR	test (VaR VS CoVaR)	VaR	CoVaR	test (VaR VS CoVaR)
Oil price on stock returns of (ISX60)	.624** 0-0.672 (0.392)		-1.768 (0.825)	.675**01.654 (0.515)		2.751 (1.674)

Table No. (77) shows the estimate of the value at risk and the conditional value at risk of the impact of oil price fluctuations on the return of the Iraq Stock Exchange index.

-The result in parentheses represents the standard deviation values for (VaR) and (CoVaR)

From the results shown in the table above, which represent the lower (Downside Risk) and upper (Upside Risk) limits for the Value at Risk. We note that the minimum value of (VaR) is equal to (-0.672) and the maximum value of (VaR) is equal to (1.654). This means that oil price fluctuations cause risks ranging between (0.672-1.654) to the return of the Iraqi Stock Exchange Index share with a probability of 5%. From observing the values shown above, we find that oil price fluctuations have a significant impact on the return of the Iraqi Stock Exchange index. It is known that VaR does not take into account all potential risks. To overcome this problem, it is possible to use (CoVaR) (Conditional Value at Risk), as (CoVaR) is considered a more comprehensive measure of risk than (VaR).

Therefore, the lower limits (Downside Risk) and upper limits (Upside Risk) for the conditional value at risk (Value at Risk Conditional). We note that the lower limit of the value of (CoVaR) is equal to (-1.768) and the upper limit of the value of (CoVaR) is equal to (2.751). This means that oil price fluctuations cause conditional risks ranging between (1.768-2.751) in the return of the Iraqi Stock Exchange index with a probability of 5%. From observing the values shown above, we find that oil price fluctuations affect the return of the Iraqi Stock Exchange index. In testing the impact difference between value at risk (VaR) and conditional value at risk (CoVaR), we will focus on testing the following null hypothesis: H_0=CoVaR=VaR against the alternative hypothesis H_0=CoVaR≠VaR. From the test results shown in the table above.

We note that there is a fundamental difference between (VaR) and (CoVaR) regarding the impact of the risks of oil price fluctuations on the return of the Iraqi Stock Exchange Index at the lower limits. We note that there is a fundamental difference between (VaR) and (CoVaR) regarding the impact of the risks of oil price fluctuations on the return of the Iraqi Stock Exchange Index share at the upper limits. The lower and upper limits of (VaR) and (CoVaR) can be clarified through the following chart:

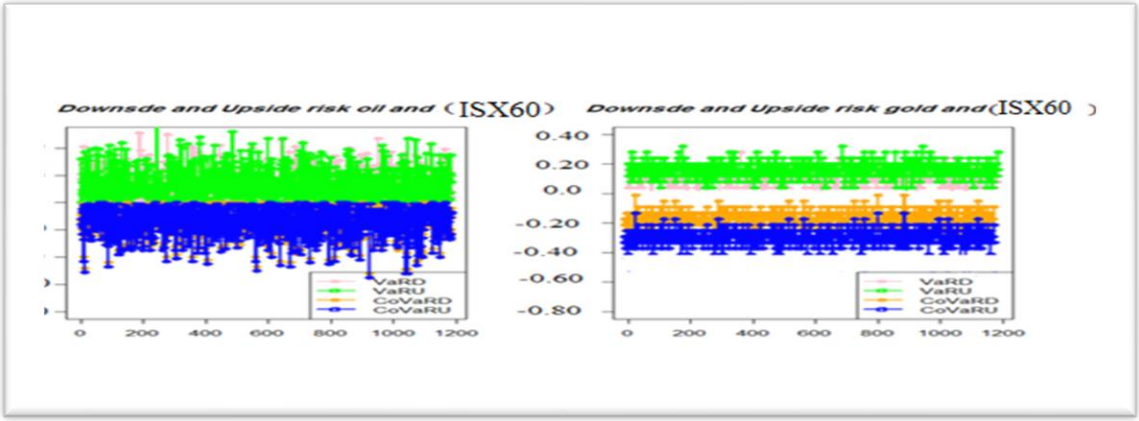

Figure No. (43) shows the lower and upper limits for (VaR) and (CoVaR)

5-4- Change in conditional value at risk (Delta Conditional value at Risk)

Variable	Downside	Upside
Oil price on stock returns of (ISX60)	867.1 (0.845)	0.816 (0.428)

Table No. (78) shows the estimate of the change in the value at risk (Delta conditional value at risk) (ΔCoVaR)

-The result in parentheses represents the standard deviation values of CoVaR Delta)

It is noted that the values of the upper limits (Upside) are smaller than the lower values (Downside) of the change in the conditional VaR in all the impact risks studied. We note that the minimum value of (Delta CoVaR) is equal to (1.867) and the maximum value of (Delta CoVaR) is equal to (0.816). This means that oil price fluctuations cause risks ranging between (1.8670.816) in the return of the Iraq Stock Exchange Index share with a probability of 5 %. Therefore, fluctuations in oil prices cause risks to the return of the Iraqi Stock Exchange index. The figure below shows the risks of oil price fluctuations in the stock return of the Iraq Stock Exchange index using Delta CoVaR .

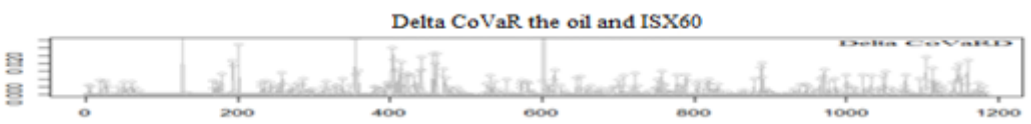

Figure (44) shows the effect of the minimum and maximum value of the change in conditional value at risk (Delta CoVaR) of oil price fluctuations on ISX60 returns.

		Downside risk		Upside risk
Variable	CoVaR	test (CoVaR VS VaR)	CoVaR	test (VaR VS CoVaR)
Oil price on stock returns of (ISX60)	-0.764	0.852** (0.417)	0.865	0.854** (0.462)

Table No. (79) shows the estimate of the conditional value at risk for oil price fluctuations and their impact on the return of the Iraqi stock market index in the long term.

-The result in parentheses represents the standard deviation values of (CoVaR)

From the results shown in the table above, which represent the lower limits (Downside Risk) and upper limits (Upside Risk) for the conditional values at risk (Value at Risk Conditional) in the long term. We note that the minimum value of (CoVaR) is equal to (-0.764) and the upper limit The value of (CoVaR) equals (0.865). This means that oil price fluctuations cause conditional risks ranging between (0.764-0.865) in the return of the Iraqi Stock Exchange Index with a probability of 5% in the long term.

From observing the values shown above, we find that oil price fluctuations pose a risk to the stock returns of the Iraq Stock Exchange index. In testing the impact difference between values at risk (VaR) and conditional values at risk (CoVaR), we will focus on testing the following null hypothesis: H_0=CoVaR=VaR against the alternative hypothesis H_0=CoVaR≠VaR. From the test results presented in the table above, we note that there is a fundamental difference between (VaR) and (CoVaR) regarding the impact of the risks of oil price fluctuations on the return of the Iraqi Stock Exchange Index share at the minimum levels and in the long term. We note that there is a fundamental difference between (VaR) and (CoVaR) regarding the impact of the risks of oil price fluctuations on the return of the Iraqi Stock Exchange Index share at the upper limits in the long term.

		Downside risk	Upside risk	
Variable	CoVaR	test (CoVaR VS VaR)	CoVaR	test (VaR VS CoVaR)
Oil price on stock returns of (ISX60)	-0.759	0.825** (0.385)	0.658	0.925** (0.396)

Table (80) shows an estimate of the conditional value at risk (for the impact of oil price fluctuations on the return of the Iraq Stock Exchange index in the short term)

-The result in parentheses represents the standard deviation values of (CoVaR)

From the results shown in the table above, which represent the lower (Downside Risk) and upper (Upside Risk) limits for the Value at Risk Conditional in the short term, we note that the minimum value (CoVaR) It is equal to (-0.759) and the upper limit of the value of (CoVaR) is equal to (0.658). This means that oil price fluctuations cause conditional risks ranging between (0.759-0.658) in the return of the Iraq Stock Exchange Index with a probability of 5% in the short term. From observing the values shown above, we find that oil price fluctuations pose a risk to the return of the Iraqi Stock Exchange index. In testing the impact difference between value at risk (VaR) and conditional values at risk (CoVaR), we will focus on testing the following null hypothesis: H_0=CoVaR=VaR against the alternative hypothesis H_0=CoVaR≠VaR. From the test results presented in the table above, we note that there is a fundamental difference between (VaR) and (CoVaR) regarding the impact of the risks of oil price fluctuations on the return of the Iraqi Stock Exchange Index at the lower limits and in the short term. We note that there is a fundamental difference between (VaR) and (CoVaR) regarding the impact of oil price fluctuation risks on the index return at the upper limits in the short term.

Number of levels	Relation oil price and Stock returns of (ISX60)
Levels 1	0. 76854
Levels 2	0.72156
Levels 3	0.63454
Levels 4	0.42157
Levels 5	0.32975
Levels 6	0.05349
Levels 7	0. 01620

Table (81) shows the MODWT values of oil and gold price fluctuations on the return of the Iraqi Stock Exchange index at 7 levels

Through the results shown in the table above, we find that the value of MODWT at the first level of the relationship between oil price fluctuations and the return of the Iraq Stock Exchange Index reached 76854), which is a very strong positive relationship in one direction.

We note that the MODWT value at the second level of the relationship between oil price fluctuations and the return of the Iraq Stock Exchange index reached (0.72156), which is a strong positive relationship with one direction. The MODWT value at the third level of the relationship between oil price fluctuations and the return of the Iraq Stock Exchange index reached (0.63454), which is a somewhat strong positive relationship in one direction. The MODWT value at the fourth level of the relationship between oil price fluctuations and the return of the Iraq Stock Exchange index reached (0.42157), which is a somewhat weak positive relationship in one direction. Also, the value of MODWT at the fifth level of the relationship between oil price fluctuations and the return of the index (ISX60) reached (0.32975), which is a weak positive relationship with one direction. The MODWT value at the sixth level of the relationship between oil price fluctuations and the ISX60 return reached (0.05349), which is a weak, positive relationship in one direction. The value of MODWT at the seventh level of the relationship between oil price fluctuations and the return of the Iraqi Stock Exchange index reached (0.01620), which is a weak positive relationship with one direction. Therefore, the fluctuations of oil prices towards the return of the Iraqi Stock Exchange Index are very positive

and strong in the short term, but the strength of this positive relationship quickly decreases in the long term, according to the changing MODWT values during the different levels. This can be seen from the discontinuous sine wave transformation, which divides the time series into wave components with different frequencies across the seven levels. As shown in the figure below:

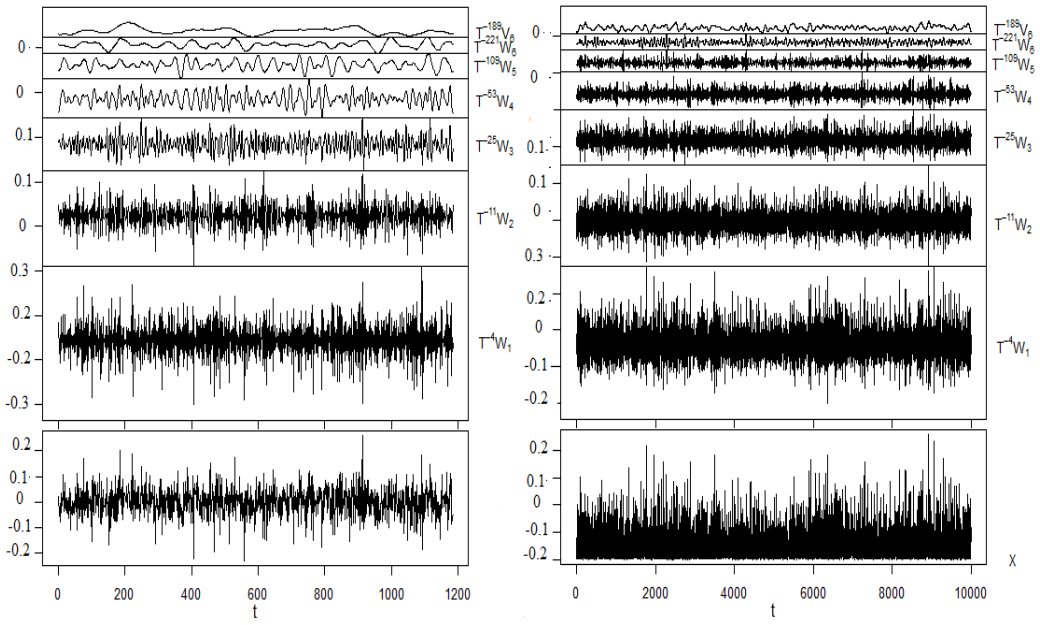

Figure No. (45) shows the MODWT frequencies for wave components with different frequencies across the seven levels of the impact of oil price fluctuations on the return of the Iraqi Stock Exchange index.

6- Conclusions:

A - The price of oil positively and strongly affects the return of the Iraq Stock Exchange Index, meaning that an increase in oil prices is accompanied by an increase in the return of the Iraq Stock Exchange Index, meaning that the relationship between these two variables tends to move together, rising or falling.

B - There is a strong to moderate positive correlation between oil price fluctuations and the return of the Iraqi Stock Exchange index. In general, we find that the correlation is strong between these two variables at all times.

T- Fluctuations in oil prices cause risks to the return of the Iraq Stock Exchange index.

D - The fluctuations in oil prices towards the return of the Iraq Stock Exchange Index are very positive and strong in the short term, but the strength of this positive relationship soon decreases in the long term, according to the changing MODWT values during the different levels.

C- The development of government policies or stimulating investments that reduce the economy's dependency on oil prices.

H- Improving the sustainability of the economy and its reliance on other sources of revenue and growth.

7-Recommendations:

A - Financial market management must work by all means available to exploit the effect of this almost complete connection between oil and financial markets to create sustainable growth opportunities, especially countries that export crude oil, including Iraq.

B- The government and financial authorities must issue regulations and laws that regulate the oil market and limit sharp fluctuations in prices. Mechanisms can be implemented to prevent manipulation and improve market transparency.

T- Encouraging investors to diversify their investments instead of relying on oil as the main source of returns. Investment in a variety of financial assets can be enhanced to reduce the negative impact of oil price fluctuations.

D- Establishing multiple investment funds that invest in a variety of assets, including oil. These funds can be useful to mitigate volatility and offer diversified investment options to future investors.

C - Applying these measures can help reduce the impact of sharp fluctuations in oil prices on financial markets and achieve a better balance between supply and demand for oil.

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