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A New Approach to Technical Analysis of Oil Prices

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Abstract. The aim of this study is to investigate the oil prices, which have crucial impact of an economy, using new ratios called Nickel ratios instead of the golden ratios on technical analysis. The Nickel ratios are developed considering Nickel Fibonacci sequence. This study is the first to use Nickel ratios in technical analysis in economics and finance. In this study, graphs comprising of weekly, daily, 4−hour and 30−minute periods are analyzed using Nickel ratios in Fibonacci retracement, fan, arcs and time zones applications, and the results are compared with the golden ratio obtained from the Fibonacci number sequence. In addition, the support and resistance points obtained from Nickel ratios have more significant levels than the golden ratio. The retracement, fan, arcs and time zones graphs with weekly, daily, four hourly and half-hourly data based on the golden and Nickel ratios show that the levels regarding the Nickel ratios confirm more significant points in comparison with the levels regarding the golden ratios. Finally, more efficient results are observed when the ratios of golden and Nickel are considered together.

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Keywords: Technical analysis, Fibonacci retracement, Nickel ratios, oil prices.

1. Literature Review

Oil has been the primary source of energy for all humanity since the end of the nineteenth century. In addition, oil is the most widely used natural resource in energy production. On the other hand, changes in the oil market closely affect the supply and demand of other commodities, [8]. The world economy is dependent on oil due to its intensive use as the main energy source, [15]. In addition, petroleum products are used in transportation, electricity generation and chemical products production. For this reason, oil price is one of the key prices in the global economy, it is even used as a reference value for other energy sources, [17]. The Organization of Petroleum Exporting Countries (OPEC) was established in September 1960 by an agreement signed by five countries: the Islamic Republic of Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. These members are the founding members of the organization. The mission of the Organization of Petroleum Exporting Countries (OPEC) is to coordinate the oil policies of the Member States and

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ensure the stability of the oil markets, provide oil to consumers, a stable income for producers and returns for investors investing in the oil industry (OPEC, 2021).

Making accurate and reliable estimates of the oil price both increases the probability of the accuracy of macroeconomic forecasts and provides reliable data for some sectors of the economy that are directly dependent on oil price estimates. For example, airlines rely on such estimates in determining the prices of airline tickets, automobile companies decide on the product range by taking oil price estimates into consideration and determine product prices. Utility companies use oil price estimates in capacity expansion or new investment decisions, [1]. As Sadorsky points out, changes in oil prices have a significant impact on the economy, but changes in the economic sphere have little effect on oil prices, [26]. As modernization increases in the world, the demand for oil increases significantly. Of course, it is not easy to predict future oil demand, but oil demand in general is closely related to growth in industrial production. As a result, countries experiencing rapid economic growth in the world are more likely to increase their oil demand compared to other countries, [3].

Users of oil price estimates include international organizations, central banks, governments, the public sector and auto manufacturers, etc., [4]. For example, central banks and private sector forecasters use oil price as an indicator in making macroeconomic forecasts and in assessing macroeconomic risks, [1]. Recent theoretical studies show that oil price shocks can affect the macroeconomic negatively both because of the increase in oil prices and the volatility in oil prices, [13]. On the other hand, there is a common view that sudden and large fluctuations in oil prices harm the welfare of both oil-importing and oil-producing countries, [1].

In the literature, it is accepted for global oil production, real economic activity, oil inventory and financial market variables to be the fundamental factors in predicting oil prices, [5, 6, 37]. There are some conflicts relating to the forecasting power of macroeconomic indicators in the literature, which assumes that the forecasting ability of macroeconomic indicators display an in- consistent behaviour. The challenge to be emphasized is to determine truly exogenous instruments to predict oil prices in econometric perspective, [16,35]. The so-called studies found conflicting evidences to the view that oil prices respond immediately to macroeconomic news and indicators, which complicate to specify which macroeconomic indicators are confidential for forecast. So, the need for more reliably predicting of oil prices has become an important issue. As investigated in the literature, it is seen that oil prices are forecasted using various econometric models which deduce efficient information from historical price data and decomposes them into trend, seasonal and random components. The so-called models have a crucial role in evaluating historical trends and predicting future trends definitively in deciding.

Trends in oil prices are generally based on a given time intervals which indicates the relationship between econometric models, such as dynamic auto-regressive model, regression with multiple structural breaks, Markov switching regression, fuzzy information particles models, time-varying models, probability density function and K-nearest neighbour algorithm, ARMA models, MIDAS models, are used in prediction of prices, [1, 6, 11, 19, 20, 24, 27, 29, 38, 39]. Besides, the studies considering price prediction have increasingly utilized from machine learning, neural network and deep learning, [2, 7, 10, 12, 36]. Another approach for price forecasting is technical analysis. Technical analysis is a method investigating past price movements to predict further price. The analysis in question aims to determine the buying and selling points of the financial asset by performing formation considering past price movements and volumes, indicator and oscillator analyzes and to predict which direction its price will movement.

Most of the studies in the literature focus on the power of technical indicators in financial markets, [9, 14, 18, 21–23, 25, 30, 34]. However, rather few of the studies suggest to use technical indicators in oil price prediction, [34, 37]. Yin and Yang proposed technical indicators depending on three trading rules, which are moving-average rule, momentum rule and on-balance volume rule, to forecast oil prices, [37]. Also, the robustness of the technical analysis results in the study tested by means of VAR, Bayesian VAR, time-varying VAR, Markov regime switching VAR. They found that technical indicators have better statistically significant in-sample and out- of-sample forecasting power than different regression models and that technical indicators detect the fall in oil prices near business-cycle peaks effectively. This study proposes to forecast oil price by using technical analysis. The so-called analysis involves various forecasting methods, which are chart analysis, cycle analysis and computerized technical trading systems. In general the studies focused on technical analysis is restricted to the methods to be stated in a mathematical form including technical trading systems; however, some recent studies try to analyze visual chart patterns through pattern recognition algorithms. According to the different parameters, a technical trading system comprises a group of trading rules creating long, short, or out of the market trading signals. Moving averages, channels, and momentum oscillators are the most-known technical trading systems, [25].

2. Introduction

In this article, Nickel Fibonacci sequence is used instead of Fibonacci sequence. From this sequence, new ratios called Nickel ratios are obtained and applied in the analysis of oil prices by technical analysis method.We give graphs comprising of weekly, daily, 4−hour and 30−minute periods are analyzed using Nickel ratios in Fibonacci retracement, fan, arcs and time zones applications by compared with the golden ratio obtained from the Fibonacci number sequence. Also, we present the support and resistance points obtained from Nickel ratios have more significant levels than the golden ratio. The retracement, fan, arcs and time zones graphs with weekly, daily, four hourly and half-hourly data based on the golden and Nickel ratios show that the levels regarding the Nickel ratios confirm more significant points in comparison with the levels regarding the golden ratios. Also, a comparison of the Nickel ratios with the golden ratios is given. This study is the first in which the Nickel ratios are used in technical analysis. Today, with the development of technology, algorithms are used while making investment decisions. In this direction, new approaches have emerged in technical analysis. In this study, we developed Nickel ratios as an alternative to the gold ratios that are commonly used in technical analysis. Nickel ratios we developed give more effective results than golden ratios.

In this study, technical analysis of oil prices is made using the golden ratio obtained from the Fibonacci number sequence and the Nickel ratio obtained from the Nickel Fibonacci number sequence. In the study, weekly, daily, 4−hour and half-hourly data are used and drawn such as retracement, fan, arcs and time zones to exhibit efficiency of Nickel and golden ratios. Forex trader web application is used for the technical analysis in this study. The results of the Nickel ratios and the results of the golden ratios are compared. Unlike the literature, in this study the ratios from Nickel Fibonacci sequence is applied in addition to the ratios from Fibonacci sequence. When examined the literature, it is seen for Nickel ratios not to be used in technical analysis. So, this study is the first paper to calculate Nickel ratios used in technical analysis.

3. Methodology

3.1. **Technical Analysis.** Financial investors have to bear a particular risk to make a particular profit. Therefore, they research appropriate methods to be able to control risk and effectively decide their investments. There are many methods which investors use in the decision-making process. One of these methods is technical analysis. Technical analysts use a variety of technical analysis methods to predict price movements in the stock market. The Fibonacci ratio is a well-known method for predicting the market, [31]. Italian mathematician Leonardo Fibonacci created a series of numbers in the 1200s. This series of numbers is generated so that each term is equal to the sum of the two consecutive terms before itself, and the first two terms are 0 and 1. Later, the Fibonacci Number series has been a source of inspiration for many researchers and has been studied in many different areas.

3.2. **Nickel Fibonacci Numbers.** The Nickel Fibonacci number sequence is a sequence with initial values $N_0 = 1$ and $N_1 = 1$. The Nickel Fibonacci sequence is created by adding 3 times the pre-two Nickel Fibonacci number to the previous Nickel Fibonacci number. Thus, it is defined for every integer $n > 2$ as follows:

$$N_{n+1} = N_n + 3N_{n-1},$$

with initial condition $N_0 = 1$ and $N_1 = 1$. Also, this sequence

$$1, 1, 4, 7, 19, 40, 97, 217, 508, 1159, 2683, 6160, 1429, 32689, 75316, ...$$

is given in OEIS with the code A006130, [28] and it is called the second order Nickel Fibonacci sequence or $(1, 3)-$Fibonacci sequence in the literature. The characteristic equation of the second order Nickel Fibonacci sequence is

$$x^2 - x - 3 = 0.$$

The roots of this equation is found as $\alpha = \frac{1+\sqrt{13}}{2}$ and $\beta = \frac{1-\sqrt{13}}{2}$. The number α is called the Nickel Ratio (or Nickel constant), [32]. According to the formula known as the Binet formula for Nickel Fibonacci numbers, for $n \geq 0$ the following equation is obtained: $N_n = \frac{\alpha^n - \beta^n}{\alpha - \beta} = \frac{\alpha^n - \beta^n}{\sqrt{13}}$.

3.3. **The Nickel Ratios.** In this subsection, we introduce the Nickel ratios which will be widely used as support and resistance levels in technical analysis of financial assets as follows:

- $\alpha_{100\%} = (\frac{1+\sqrt{13}}{2})^0 = 1.$

- $\alpha_{43.43\%} = (\frac{1+\sqrt{13}}{2})^{(-1)} \approx 0.4343$. Also, the ratio 0.4343 can be found by dividing any Nickel Fibonacci number by the number first to the right in the sequence, i.e. $\frac{N_n}{N_{n+1}}$.
- $\alpha_{18.86\%} = (\frac{1+\sqrt{13}}{2})^{(-2)} \approx 0.1886$. Also, the ratio 0.1886 can be found by dividing any Nickel Fibonacci number by the number second to the right in the sequence, i.e. $\frac{N_n}{N_{n+2}}$.
- $\alpha_{8.19\%} = (\frac{1+\sqrt{13}}{2})^{(-3)} \approx 0.0819$. Also, the ratio 0.0819 can be found by dividing any Nickel Fibonacci number by the number third to the right in the sequence, i.e. $\frac{N_n}{N_{n+3}}$.
- $\alpha_{0\%} = (\frac{1+\sqrt{13}}{2})^{-\infty} \approx 0$.
- $\alpha_{230.28\%} = (\frac{1+\sqrt{13}}{2})^{1} \approx 2.3028$. Also, the ratio 2.3028 can be found by dividing any Nickel Fibonacci number by the number first to the left in the sequence, i.e. $\frac{N_n}{N_{n-1}}$.
- $\alpha_{530.28\%} = (\frac{1+\sqrt{13}}{2})^{2} \approx 5.3028$. Also, the ratio 5.3028 can be found by dividing any Nickel Fibonacci number by the number second to the left in the sequence, i.e. $\frac{N_n}{N_{n-2}}$.
- $\alpha_{1221.11\%} = (\frac{1+\sqrt{13}}{2})^{3} \approx 12.2111$. Also, the ratio 12.2111 can be found by dividing any Nickel Fibonacci number by the number third to the left in the sequence, i.e. $\frac{N_n}{N_{n-3}}$.
- $\alpha_{2811.94\%} = (\frac{1+\sqrt{13}}{2})^{4} \approx 28.1194$. Also, the ratio 28.1194 can be found by dividing any Nickel Fibonacci number by the number fourth to the left in the sequence, i.e. $\frac{N_n}{N_{n-4}}$...

In summary, we give the Golden ratios and the Nickel ratios together in the following Table 1.

Table 1. The Golden and Nickel Ratios

Exponent	Golden Ratio $\frac{1+\sqrt{5}}{2}$	Nickel Ratio $\frac{1+\sqrt{13}}{2}$
0	100%	100%
-1	61.80%	43.43%
-2	38.20%	18.86%
-3	23.61%	08.19%
-∞	0%	0%
+1	161.80%	230.28%
+2	261.80%	530.28%
+3	423.61%	1221.11%
+4	685.41%	2811.94%

4. Empirical Findings

In this part of the study, oil prices is analyzed in different periods by using Nickel and golden ratios and the results is given comparatively.

4.1. **Technical Analysis of Oil Prices with Nickel Fibonacci Retracement.** Support and resistance levels in the prices of financial assets can be determined with the retracement levels commonly used in practice. The retraction rates developed using the Nickel Fibonacci sequence is determined as 8.19% , 18.86% and 43.43%. The retracement levels with these determined rates are shown in Figure 1. The price of a financial asset does not always rise or fall regardless of the direction of the trend. While the trends are forming, sometimes the prices are corrected by retreating. In this study Nickel withdrawal levels is determined as 8.19%, 18.86% and 43.43%. The ratios which will be used in the formation of a downward trend are shown in Figure 1.

Accordingly, in case of possible retracements while a current trend continues, it is predicted that the prices will first retrace by 8.19% (C) of the difference between the points A and B. If the level C is broken upwards, in other words if the prices rise above this level then, it is predicted that the prices will retreat from the level corresponding to 18.86% (D) of the difference between the points A and B. If this level is also broken, it is predicted that the prices will retreat from the 43.43% (E) level.

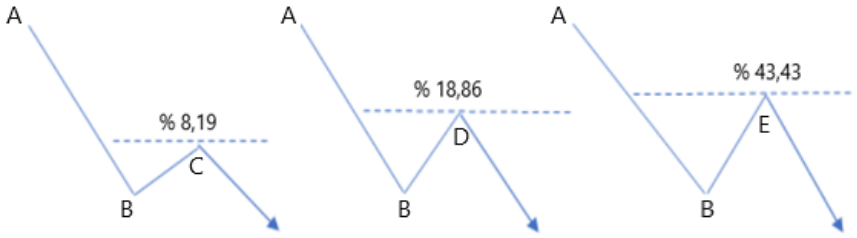

FIGURE 1. Nickel Ratio Retracements in a Downtrend

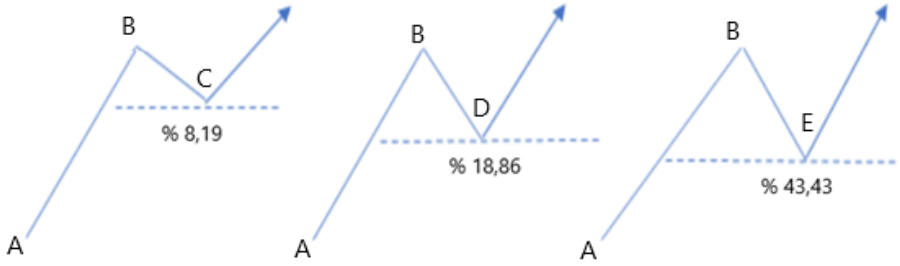

FIGURE 2. Nickel Ratio Retracements in a Uptrend

While an upward trend continues, possible retracement levels are determined as respectively 8.19% (C), 18.86% (D) and 43.43% (E) of the difference between the points A and B, as expressed in the downward trend. The ratios which will be used in the formation of an upward trend are shown in Figure 2. Within the scope of this information, the retracement levels developed by using Nickel ratios in the weekly period oil graph are examined in Figure 3.

FIGURE 3. Technical Analysis of Oil Prices with Nickel Fibonacci Retracement in a Downtrend

In Figure 3, it is seen that there is a downward trend between 2014 and 2016 in the crude oil graph which is analyzed weekly. The difference between the peak and bottom points of this trend is taken. With the return of the downward trend that occurred between June 2014 and January 2016, the support and resistance points are tried to be determined using Nickel ratios.

Critical levels are calculated by using previously determined ratios. On the created graph which shows support and resistance levels Nickel 18.86% rate and critical levels are calculated as follows:

Crude Oil highest price (20.06.2014) : 107.73
Crude Oil lowest price (11.02.2016) : 26.18

$$\begin{aligned} 107.73–26.18 &= 81.55 \\ (81.55 \times 0.0819) + 26.18 &= 32.858 \approx 32.86 \\ (81.55 \times 0.18858) + 26.18 &= 41.559 \approx 41.56 \\ (81.55 \times 0.4343) + 26.18 &= 61.597 \approx 61.60 \end{aligned}$$

The critical levels determined as a result of the calculations are shown in the Figure 3. When the Figure 3 is examined, it is seen that the 18.86% ratio obtained from the Nickel Fibonacci number sequence is an important reversal point as support and resistance. On this figure, oil prices turn back 10 times from levels close to 41.56 dollars, which corresponds to 18.86%. Also, it is seen that 43.43% and 8.19% of the Nickel Fibonacci sequence are considered as support and resistance, although they are not as effective as 18.86%.

FIGURE 4. Technical Analysis of Oil Prices with Fibonacci Retracement in a Downtrend

As seen in Figure 4, the rates of 23.60%, 38.20%, 50% and 61.80% obtained from the Fibonacci sequence in the weekly period and oil prices were technically examined. According to the results obtained from the figure, it is seen that it turned back 6 times from the level of 23.60%.It is seen that 38.20%, 50% and 61.80% levels are also considered as support and resistance. Besides, the $76.58 level that corresponds to the 61.80% level, is seen as a key resistance point. However, when the results of technical analysis are evaluated from an economic point of view, as seen in Figure 3 and Figure 4, the 18.86% level obtained using the Nickel ratio has been tested much more than the other levels obtained using the golden ratio as support and resistance. So, it is clear that using Nickel ratios in accurate predicting oil prices gives better results.

In the study in addition to the weekly period, Nickel retracement levels that occurred in short periods such as 4 hours are also examined. The retracement levels formed in 4-hour periods are shown in the Figure 5. It is seen in the Figure 5 that there is an upward trend between February 1, 2021 and March 8, 2021. When the rates of 8.19%, 18.86% and 43.43% which constitute the Nickel retracement levels and the price movements that have occurred since March 8, 2021 in the chart are examined. It is seen that the level of 8.19% is in the position of important resistance level twice. It is seen that 18.86% and 43.43% levels also play a role as support and resistance levels during fluctuations in oil prices.

As seen in Figure 6, the rates of 23.60%, 38.20%, 50% and 61.80% obtained from the Fibonacci sequence in a 4-hour period and oil prices were technically examined. According to the results obtained from the figure, it is seen that the 23.60% level is about 7 times the support point. It is seen that 38.20%, 50% and 61.80% levels are also considered as support and resistance. Also, the $61.71 level, which corresponds to the 38.2% level between May 19-21, is an important support point.

FIGURE 5. Technical Analysis of Oil Prices with Nickel Fibonacci Retracement in a Uptrend

FIGURE 6. Technical Analysis of Oil Prices with Fibonacci Retracement in a Uptrend

4.2. **Technical Analysis of Oil Prices with Nickel Fibonacci Fan.** The difference between trough and peak point of the upward or downward trend on the graph consisting of Nickel ratios considered in the study and oil prices is taken into account. The starting of trend indicates level of zero while its end point indicates level of 1. After, tangential lines are drawn to Nickel ratio levels based on zero point. These lines are accepted as support and resistance levels, just like Fibonacci fans. Figure 7 shows the example reflecting the so-called situation.

In Figure 7, it is seen that there is an upward trend between February 2016 and October 2018. As seen in this chart, which is formed by taking into account daily price movements, support and resistance levels can be determined with the help of fans created by using Nickel ratios. It is seen that all of the 8.19%, 18.86% and 43.43% Nickel ratio levels between 0 and 1 points play a very significant role as support and resistance levels. It is seen that the prices contact and retreat the support and resistance levels indicated by yellow arrows on the chart. It is also seen on this chart that the support, which is commonly seen in technical analysis, turns into resistance after it is broken, and that a broken resistance turns into support in the future. As seen in Figure 7, oil prices are analyzed with Nickel fans as in Fibonacci fans. According to the examinations, it is seen that the levels corresponding to the rates of 8.19%, 18.86%, 43.43% (the yellow arrows indicate key support and resistance points at these levels) are defined as support and resistance. It is seen that prices retreat as they approach these levels or move sharply when these levels are exceeded. Prices are returning to the points close to the determined levels and it is seen that the reverse movement is more severe with the breaking of the levels. In other words, it is accepted as a support and resistance point in the market.

FIGURE 7. Technical Analysis of Oil Prices with Nickel Fibonacci Fan

FIGURE 8. Technical Analysis of Oil Prices with Fibonacci Fan

As seen in the Figure 8, oil prices are analyzed with the ratios obtained from 23.6%, 38.20%, 50% and 61.8% Fibonacci sequence. According to this, it is seen that the 38.20% level is an important support point. It is seen that the other levels are not taken into account by the market too much. Nickel Fibonacci fans and Fibonacci fans are examined separately in Figure 7 and Figure 8 on the same graph. When these two figures are compared, it is seen that the fans created using Nickel ratios are considered more as support and resistance than the golden ratio. From an economic point of view these results show that Nickel Fibonacci fans is useful in technical analysis like Fibonacci fans while making investment decisions.

4.3. **Technical Analysis of Oil Prices with Nickel Fibonacci Arcs.** In technical analysis which are made by using Fibonacci ratios, arcs can be drawn with circles which are formed on downward or upward trends. While calculating the arcs, a trend line is drawn between the bottom and the peak that is determined 0 and 1 levels between on the chart. The level where this drawn trend line and the ratios intersect is determined as the radius of the circle to be created. From this point, arcs can be drawn as semicircles. It is possible to encounter support and resistance at the points where the prices come into contact with the drawn arc lines. In the study, the springs are calculated with the help of Nickel ratios determined as 8.19%, 18.86%, 43.43%, 100%, 230.28% and 530.28%, just as in the technical analyzes related to Fibonacci ratios. The graph created as a result of the calculations is as follows.

FIGURE 9. Technical Analysis of Oil Prices with Nickel Fibonacci Arcs

In Figure 9, it is seen a graph of 30−minute periods between the dates of May 3, 2021 and May 5, 2021. As seen in the graph, there is an upward trend. While the crude oil price is \$62.91 at the bottom of the trend, the crude oil price is \$66.72 at the peak of the trend. In arcs drawn from these levels, it is seen that from the point where the trend immediately turns the level formed with a Nickel rate of 8.19% in the first half hour assumes a support role in the determined range. After that it is seen that the 18.86% level was broken and immediately after this break, the 18.86% became resistance level. Next, it is seen that the arc which corresponds to the level of 43.43%, play role first as a support and then as a resistance.

Figure 10 shows a graph of 30-minute periods between May 3, 2021 and May 5, 2021. There is an upward trend as seen in the chart. While the crude oil price is \$62.91 at the bottom of the trend, the crude oil price is \$66.72 at the peak of the trend. In the arcs drawn from these levels, it is seen that the level formed with the Fibonacci ratio of 23.60% from the point where the trend returns, acts as a support. Afterwards, it is seen that the same level is an important resistance point.

FIGURE 10. Technical Analysis of Oil Prices with Fibonacci Arcs

4.4. **Technical Analysis of Oil Prices with Nickel Fibonacci Time Zones.** The ranges are created on the charts by using the Nickel Fibonacci number sequences continuing as $1, 1, 4, 7, 19, 40, \cdots$. It is expected that there will be significant changes in the prices of financial assets in regions with vertical lines as in Fibonacci time frames. After determining the specific bottom and specific peak points, the interval between points $1, 1, 4, 7, 19, 40, \cdots$ is determined

by drawing a line from the bottom to the top or from the top to the bottom. In the study, Nickel Fibonacci time periods are determined on the crude oil graph created with 1−week intervals, and the graph created is as follows.

FIGURE 11. Technical Analysis of Oil Prices with Nickel Fibonacci Time Zones

In Figure 11, it is seen that there is a graph consisting of weekly periods between January 18, 2016 and June 6, 2021. As seen in the graph by using Nickel Fibonacci number sequences continuing as $1, 4, 7, \cdots$ the intervals were created with blue vertical lines on the designated points. It is observed that the changes in crude oil prices change direction immediately after the levels formed by the vertical line and move rapidly in the opposite direction.

In the Figure 12, there is a graph consisting of weekly periods between 18 January 2016 and 6 June 2021. As seen in the graph, using Fibonacci number sequences continuing as 0,1,2,3,5,8,13…, spaces are created with blue vertical lines on the determined points. As in Nickel Fibonacci sequences, it is seen that the vertical line created by using Fibonacci sequences at some points changes direction immediately after the levels it is in and moves rapidly towards the opposite direction. At some points, it moves in the same direction without changing any direction.

FIGURE 12. Technical Analysis of Oil Prices with Fibonacci Time Zones

Nickel Fibonacci time zones and Fibonacci time zones are applied separately on the same graphic. When the results obtained are evaluated from an economical point, it is seen that prices move more violently in the opposite direction

than the Fibonacci time zone immediately after the Nickel Fibonacci time zones. When evaluated in this context, it is seen that Nickel Fibonacci time zones capture the return time in prices better, although Fibonacci time zones are seen at more frequent intervals on the chart. In this case, Nickel Fibonacci time zones should be taken into account when making investment decisions.

5. Conclusion

In this study, we investigate the support and resistance levels for oil prices in terms of the ratios from the Nickel Fibonacci sequences and to compare Nickel ratio with the golden ratio from the Fibonacci sequences based on technical analysis. In this context, the weekly, daily, hourly and half-hourly data are used and drawn such as retracement, fan, arcs and time zones to exhibit efficiency of the Nickel and golden ratios. As investigated the literature, it is seen that any ratios except for golden ratios not to be used in technical analysis. This study is the first paper to use the Nickel ratios in technical analysis. The analysis reveals that the support and resistance levels determined by using Nickel ratios have an important role on changes in oil prices and investment decisions. As compared to golden ratio, the support and resistance points from Nickel ratios are determined to be more significant levels. Also, retracement, fan, arcs and time zones graph generated by golden and Nickel ratios using weekly, daily, four hourly and half-hourly data indicate that the levels based on Nickel ratios detect more important points than the levels based on golden ratios. However, the obtained results are observed to be more effective when golden and Nickel ratios are used together. These ratios have a more effective result than gold ones used commonly in technical analysis.

In summary, the Nickel ratios are used like the golden ratio obtained from the same Fibonacci number sequence in the technical analysis of oil prices, and it enabled the determination of more important levels than the golden ratio. In financial studies, the findings we find give important informations to the investors in the risk aversion.

In future works, this study will give researchers working in the field of technical analysis the idea that the ratios obtained from different number sequences can be used more effectively.

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Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Authors Contribution Statement

All authors have contributed sufficiently in the planning, execution, or analysis of this study to be included as authors. All authors have read and agreed to the published version of the manuscript.

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