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INVESTIGATION OF THE OIL PRICE VOLATILITY WITH AUTOREGRESSIVE CONDITIONAL VARIANCE MODELS ARCH/GARCH

PETROL FİYATLARI OYNAKLIĞININ OTOREGRESİF KOŞULLU DEĞİŞEN VARYANS MODELLERİ (ARCH/GARCH) İLE İNCELENMESİ

Ersin YENİSU[1]

Abstract

Oil prices have had a significant volatility over the past century as a result of changes in international economic and political balances. Because oil is a major source of energy and is not evenly distributed among countries, it now has a strategic importance for each country. The aim of this study is to analyze the volatility of global oil prices with the Autoregressive Conditional Variance Models (ARCH/GARCH). In this direction, European Brent oil prices based on June 1987- June 2018 business day basis were used as data in the study. According to the results of analysis, it is seen that TARCH (1,1) model is the best volatility estimation model among different ARCH/GARCH type models. According to the model: I) Oil prices are positively affected by the previous period. II) The impact of shocks on oil price return does not spread over a long period. III) Volatility is generally high, so instability is dominant in prices. IV) Negative shocks on oil price return are more effective than positive shocks.

Keywords: *Oil Prices, Volatility, ARCH-GARCH-TARCH Models*

Öz

Petrol fiyatları uluslararası ekonomik ve siyasi dengelerin değişmesi sonucunda son yüzyılda ciddi bir volatiliteye sahip olmuştur. Uluslararası ticarete konu olan mallar içerisinde birinci sırayı petrol almaktadır. Petrol, temel enerji kaynağı olmasından ve ülkeler arasında eşit dağılmamasından dolayı günümüzde her ülke için stratejik bir öneme sahiptir. Bu çalışmanın amacı küresel petrol fiyatlarındaki oynaklığı Otoregresif Koşullu Değişen Varyans Modelleriyle (ARCH/GARCH) analiz etmektir. Bu doğrultuda çalışmada veri olarak 1987 Haziran-2018 Haziran aralığı iş günü esasına dayanan Avrupa Brent petrol fiyatları kullanılmıştır. Analiz sonuçlarına göre farklı ARCH/GARCH tipi modeller içerisinden TARCH (1,1) modelinin en iyi volatilite tahmin modeli olduğu görülmüştür. Söz konusu modele göre: I) Petrol fiyatları getirisi bir önceki dönemden pozitif etkilenmektedir. II) Petrol fiyat getirisi üzerinde şokların etkisi uzun bir döneme yayılmamaktadır. III) Volatilite genel olarak yüksektir yani fiyatlarda istikrarsızlık hâkimdir. IV) Petrol fiyat getirisi üzerinde negatif şoklar pozitif şoklardan daha uzun süre etkilidir.

Anahtar Kelimeler: *Petrol Fiyatları, Volatilite, ARCH-GARCH-TARCH Modelleri*

1. Bağımsız Araştırmacı, ersinyenisu@gmail.com, https://orcid.org/0000-0002-0235-4270

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GENİŞLETİLMİŞ ÖZET

Çalışmanın Amacı: Bu çalışmanın temel amacı uluslararası petrol fiyatlarındaki volatilite (oynaklık) yayılım ilişkilerini açıklamaktır. Çalışmanın ikincil amacı ise ülkelerin etkin makroekonomi politika oluşturma süreçleri için bilgi sunmak ve metodolojik bağlamda literatüre katkıda bulunmaktır.

Araştırma Soruları: Bu çalışmada ele alınan temel soru; "Petrol fiyatlarındaki dalgalanmalar dikkate değer bir benzerlik taşımakta mıdır yoksa petrol fiyatlarında tam anlamıyla bir belirsizlik mi söz konusudur?" sorusudur. Diğer bir ifadeyle petrol fiyatlarındaki hareketlilik tanımlanabilir mi? Tanımlanabilirse bu oynaklığın eğilimi ne yöndedir?

Literatür Araştırması: Kasman (2006) çalışmasında GARCH tahmin yöntemini kullanmış ve Türkiye'de hisse senedi piyasası oynaklığı ve temel makroekonomik değişkenler oynaklığı arasındaki ilişkiyi modellemiştir. Söz konusu araştırmadaki değişkenlerden biri de petrol fiyatlarıdır. Çalışmada sonuç olarak hisse senedi piyasası oynaklığı ile petrol fiyatları oynaklığı arasında ilişki bulunamamıştır. İpek (2008) ise çalışmasında petrol fiyatları ile ekonomik büyüme arasında çift yönlü Granger nedensellik olduğunu bulgulamıştır. Diğer taraftan hata düzeltme modelini kullanan Demirbaş vd. (2009) çalışmalarında Türkiye'de cari açık ve petrol fiyatları arasında bir eşbütünleşme ilişkisi olduğunu ortaya koymuşlardır. Cheong (2009) ise ARCH yöntemiyle Batı Texas ve Avrupa Brent Petrol fiyatlarındaki volatiliteyi tahmin etmiştir. Yine İMKB endeksleriyle petrol fiyatları ilişkisini araştıran Güler ve Nalın (2013), kısa dönemde söz konusu değişkenler arasında ilişkinin olmadığını fakat uzun dönemde serilerin beraber hareket ettiklerini açıklamışlardır. Yine metodolojik açıdan bir diğer önemli araştırma Tuna ve İsabetli'nin (2014) ARCH-GARCH tipi modellerle yaptıkları volatilite tahminidir. Buna ek olarak Çelik vd. (2015) çalışmalarında ARMA-GARCH modelleri yardımıyla Brent Petrol fiyatları ile BIST alt endeksleri arasında herhangi bir ilişkinin olmadı sonucuna varmışlardır. Benzer şekilde Abdioğlu ve Değirmenci (2016) petrol fiyatı şoklarının hisse senedi getirileri üzerindeki etkilerini GARCH (1,1) ve VAR modeliyle analiz etmişler ve sonuç olarak reel petrol fiyatları ve reel hisse senedi getirisi arasında çift yönlü nedensellik ilişkisi olduğunu bulgulamışlardır. Diğer taraftan Han ve Sever (2016) petrol fiyatlarındaki dalgalanmaların ekonomik büyümeyi olumsuz etkilediği ve petrol fiyatları üzerinde de GSYİH'nin ve döviz kuru belirsizliğinin etkili olmadığı sonucuna ulaşmışlardır. Bir diğer çalışmada Yılmaz ve Altay (2016) Türkiye'de ithal ham petrol fiyatları ve döviz kuru arasındaki eşbütünleşme ve oynaklık yayılım etkisini incelemişler ve ham petrol fiyatlarından döviz kurlarına doğru oynaklık yayılma etkisinin olduğunu tespit etmişlerdir. Charles ve Darne (2017) ise GARCH, GJR-GARCH ve EGARCH modelleriyle Avrupa Brent Petrol ve Batı Texas (WTI) ham petrol fiyatlarını incelemişlerdir. ARCH/GARCH modelleri ve Yapay Sinir Ağları (YSA) yöntemleriyle petrol fiyatlarındaki oynaklığı araştıran Çam vd. (2017) ise petrol fiyatlarına en fazla etkileyen değişkenlerin Dow Jones ve FTSE endeks piyasaları olduğunu ortaya koymuşlardır. Özer (2017) gelişmekte olan ve gelişmiş ülkelerin hisse senedi piyasaları ile petrol fiyatları arasındaki volatilite yayılma derecesini ölçmüş ve Hindistan ile Brezilya hariç tüm ülkelerde petrol şoklarının anlamlı bir etkiye sahip olduğu sonucuna varmıştır. ARCH/GARCH tipi koşullu değişen varyans modellerini kullanan Pala ve Sönmezer (2017), FED'in niceliksel gevşeme dönemlerinde uyguladığı politikaların petrol fiyatları oynaklığı üzerinde etkide bulunmadığını saptamışlardır. Son olarak Aktaş vd. (2018) EGARCH modelini kullanmışlar ve petrol fiyatlarındaki şokların BIST 100 getirisi üzerinde arttırıcı bir etkiye sahip olduğunu bulgulamışlardır.

Yöntem: Otoregresif Koşullu Değişen Varyans Modelleri (ARCH, GARCH,…) zaman serilerindeki oynaklık yayılım ilişkilerini açıklamaktadırlar. Bu çalışmada ARCH, GARCH ve TARCH modelleri kullanılmıştır. ARCH modelinde elde edilen varyans denklemiyle serideki volatilitenin düzeyi belirlenmektedir. ARCH modelinin daha gelişmiş bir versiyonu olan GARCH modeliyle de serideki volatilitenin yüksek ya da düşük olduğu bilgisi elde edilebilir. Son olarak TARCH modeli seri üzerindeki negatif ve pozitif etkileri dikkate alan bir eşik değeri kapsamaktadır.

Sonuç ve Değerlendirme: Çalışmanın bulguları dört maddeyle özetlenebilir: i) Petrol fiyatları getirisi bir önceki dönemden pozitif etkilenmektedir. ii) Petrol fiyat getirisi üzerinde şokların etkisi uzun bir döneme yayılmamaktadır. iii) Volatilite genel olarak yüksektir yani fiyatlarda istikrarsızlık hâkimdir. iv) Petrol fiyat getirisi üzerinde negatif şoklar pozitif şoklardan daha uzun süre etkilidir.

Bu çalışmada elde edilen bulgular, petrol fiyatlarının ülkelerin temel makroekonomik göstergeleri üzerindeki etkilerinin belirlenmesi durumunda daha fazla önem kazanabilir. Diğer bir ifadeyle, uluslararası petrol fiyatlarının temel makroekonomik göstergeler üzerindeki etkisinin yönü veya gücü yapılacak ampirik analizlerle saptanırsa bu çalışmada elde edilen bulgular uygulamacılar için daha kullanışlı hale gelebilir.

1. INTRODUCTION

Today, oil meets most of the global energy demand. According to international sector reports, petroleum will continue to carry this importance in total energy consumption in the near future. The oil, which is used as fuel in the transportation sector, is subjected to chemical processes and is used as an important energy input in many fields. According to BP (2018), by the end of 2017, the total proven oil reserves in the world is 1,69 trillion barrels. In the same period, countries has ranked according to their share in world oil reserves; Venezuela (17.9%), Saudi Arabia (15.7%), Canada (10%), Iran (9.3%), Iraq (8.8%), Russia (6.3%), Kuwait (%) 6), United Arab Emirates (5.8%), USA (2.9%) and Libya (2.9%). However, the share of OECD countries in the total world reserve (14.3%) and the share of the EU (0.3%). From these indicators, it is clearly seen that oil reserves are not distributed equally in the world. For this reason, oil, which is the first commodity of international trade, is a strategically important source of energy for the countries.

Proven oil reserves are certainly important for the future of the oil sector. However, some countries are unable to fully utilize these reserves. Therefore, the refinery capacities and the daily production level of the countries are important. According to BP (2018), daily oil production rankings in the world are as follows: US (13.05 million barrels / day), Saudi Arabia (11.95 million barrels / day), Russia (11.25 million barrels / day), Iran (4,9 million barrels / day), Iraq (4,5 million barrels / day), United Arab Emirates (3,9 million barrels / day), China (3,8 million barrels / day) barrel / day), Kuwait (3 million barrels / day) and Brazil (2.7 million barrels / day). On the other hand, the top ten countries that consume the most oil are in turn; The USA, China, India, Japan, Saudi Arabia, Russia, Brazil, South Korea, Germany and Canada (BP, 2018).

Since oil is one of the main commodities of international trade, price movements are also extremely important. Most of the economic activities of the countries are affected by oil prices, which are the main energy source. This effect may be direct or indirect. As a matter of fact, sudden and unexpected changes in prices can put pressure on basic macroeconomic indicators. This pressure and influence can spread as a result of global domino effect. As oil is one of the main raw materials used in oil production, the increase in oil prices may increase production cost and inflation in oil importing countries (Özer, 2017, s. 655). In short, the volatility in oil prices can have a positive or negative impact on the basic macroeconomic dimensions of a country.

According to the studies, although the oil prices are not directly related to the basic macroeconomic indicators, there are dynamic relationships between these variables. According to Hamilton (1983), the stagnation in the US was due to the developments in oil prices. According to Bernanke et al. (1997), oil prices do not cause stagnation, and macroeconomic policies of central banks against changes in oil prices are the main reason for stagnation.

In first section of paper, related literature will be reviewed. Afterwards, the data set and method used will be mentioned. In the fourth section, analysis findings are given. Finally, the fifth part of the study is the conclusion part.

2. LITERATURE REVIEW

There are many studies in the literature that examine the oil sector from various perspectives. Many studies have been carried out on oil price volatility.

Kasman (2006) has used GARCH estimation method. In this study, the relationship between the volatility of the stock market and the volatility of the basic macroeconomic variables is modeled. One of the variables in this research is oil prices. As a result, the relation between the volatility of the stock market and the volatility of oil prices could not be found. In his study, İpek (2008) found bi-directional Granger causality between oil prices and economic growth. On the other hand, Demirbaş vd. (2009) have demonstrated that the cointegration relationship between current account deficit and oil prices. Cheong (2009) estimated volatility in West Texas and European Brent Oil prices by ARCH method. Güler and Nalın (2013), who investigated the relationship between IMKB indices and oil prices, has stated that there was no relation between these variables in the short term but that the variables moved together in the long term. Another important methodological study was Tuna and Hitama's (2014) estimate of the volatility of ARCH-GARCH type models. In addition, Steel et al. (2015) have found no relationship between Brent Oil prices and BIST sub-indices with the help of ARMA-GARCH models. Similarly, Abdioğlu and Değirmenci (2016) have analyzed the effects of oil price shocks on stock returns with GARCH (1,1) and VAR models and found that there was a bidirectional causality relationship between real oil prices and real stock returns. On the other hand, Han and Sever (2016) concluded that the fluctuations in oil prices had a negative impact on economic growth and that the oil prices and the exchange rate uncertainty were not effective on oil prices. In another study, Yilmaz and Altay (2016) in Turkey between imported crude oil prices and exchange rate volatility cointegration and studied the effect of radiation and they have determined that the volatility spillover effect of the exchange rates of the crude oil prices. Charles and Darne (2017) examined crude oil prices in Europe Brent Oil and Western Texas (WTI) with GARCH, GJR-GARCH and EGARCH models. In this study, ARCH / GARCH models and Artificial Neural Networks (ANN) methods are used to investigate the volatility of oil prices. (2017) showed that Dow Jones and FTSE index markets were the most influential variables in oil prices. Özer (2017) has measured the extent of volatility spread between stock markets and oil prices in emerging and developed countries and concluded that oil shocks have a significant effect in all countries except India and Brazil. Using the ARCH / GARCH type variant variance models, Pala and Sönmezer (2017) has found that the policies implemented by FED during quantitative relaxation periods did not affect the oil volatility. Finally, Aktaş et al. (2018) used the EGARCH model and found that shocks in oil prices had an increasing effect on the return on BIST 100.

3. DATA SET AND METHOD

3.1. Data Set

In this study, the characteristics of the movements in prices to learn the structure of the fluctuations in oil prices were examined with the ARCH / GARCH type volatility estimation models. International oil prices were obtained from the Energy Information Administration (EIA) website for these analyzes. The data is based on 7888 observations and workdays between June 1987 and June 2018. Analyzes were made on the current prices of the data. In terms of unit and content, the daily Brent oil prices per barrel in Europe are included analysis as USD / barrel.

The course of oil prices in the period between June 1987 and June 2018 is shown in Graph 1.

Graph 1: Daily international oil prices from June 1987 to June 2018

Source: EIA

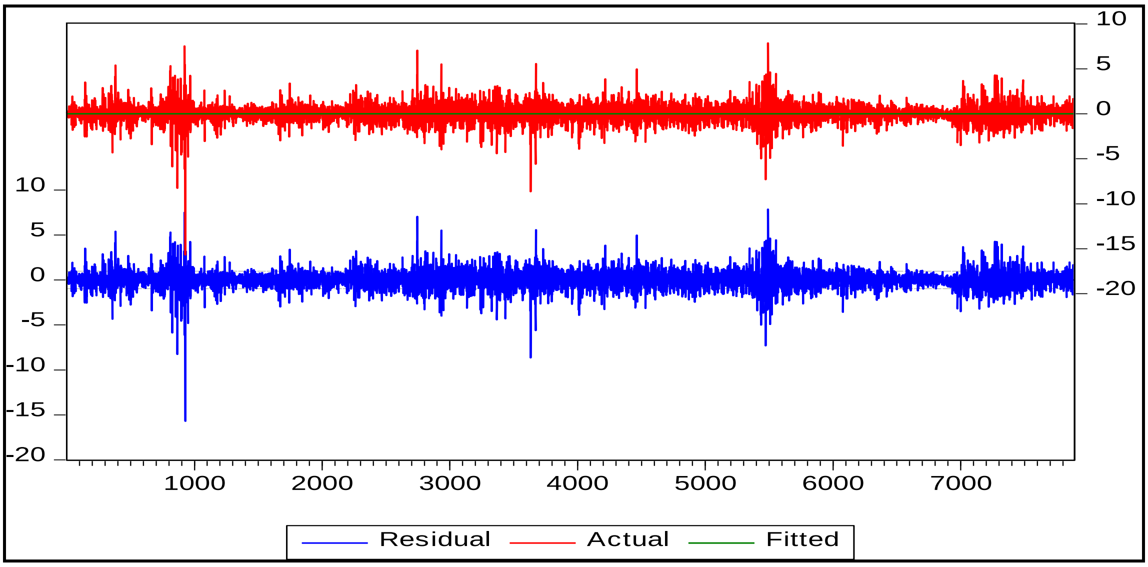
In order to see the volatility in oil prices, the return of the price series has calculated. Measure the returns of series is frequently used in literature in volatility evaluation. The daily rate of return is calculated by the following formula:

$$R_t = \text{Log}\left[\frac{P_t}{P_{t-1}}\right]*100$$

In the above formula; Rt: shows the return of international oil prices, Pt: the price of oil in t time, Pt-1: the price of oil in t-1 time.

The return index of the oil prices series is shown in Graph 2.

Graph 2: June 1987-June 2018 daily oil prices return series



Source: EIA

The descriptive statistics of the oil price return series are presented in Table 1.

Table 1: Oil price return series descriptive statistics

Variable	R
Number of Observation	7888
Minimun	-15,687
Maximun	7,873
Mean	0,007
Standart Deviation	0,986
Skewnes	-0,540
Kurtosis	16,685
Jarque-Bera (Prob.)	61943,72 (0,000)

When the descriptive statistics of oil prices are examined, it is observed that the minimun value is -15,687 and the maximum value is 7,873. However, the Jarque-Bera test statistic shows that the series is not distributed normally.

3.2. Method

ARCH type models are composed of two parts as mean and variance equations. In the estimation of the average price equation, one period lagged oil price return is included as an explanatory variable. The average equation of oil price returns is as in equation (1).

$$R_t = d_0 + d_1 R_{t-1} + \varepsilon_t \quad (1)$$

In the equation (1), Rt-1 shows the oil price return in the period t-1. The ARCH model was developed by Engle (1982). The variance equation of the error terms obtained from the above mean equation is calculated. The level of volatility in oil prices is determined by the obtained variance equation. P. degree ARCH (p) model is as follows.

$$\sigma_t^2 = a_0 + \sum_{i=1}^{p} a_i \, \varepsilon_{t-i}^2 \tag{2}$$

The generalized conditional autoregressive model (GARCH) was introduced to the literature by Bollerslev (1986). GARCH (p, q) model is shown as in equation (3).

$$\sigma_t^2 = a_0 + \sum_{i=1}^{p} a_i \, \varepsilon_{t-i}^2 + \sum_{j=1}^{q} \beta_j \, \sigma_{t-j} \tag{3}$$

In equation (3) σ_t^2 is calculated by the p lagged error terms square and with its q lagged conditional variance. The variance equation here reveals the price volatility. If $\alpha+\beta < 1$ is the low volatility, if $\alpha+\beta > 1$ is the excessive volatility and in the case of $\alpha+\beta = 1$ means high volatility (Rahayu, Chang, Anindita, 2015, s. 43-44). In this model, it is also possible to capture slow changes in variances according to ARCH model by adding the lags of variance (Stock and Watson, 2011, s. 675).

Another type of ARCH model is TARCH (Threshold ARCH) installed with a threshold value. The TARCH model was introduced by Glorasten, Jagannathan and Runkle (1993) and Rabemananjara and Zakoian (1993). The TARCH model covers a threshold value that takes into account the negative and positive effects on the price series (Franses, 1998, s. 172). Said model is shown in equation (4).

$$\sigma_t^2 = a_0 + \sum_{i=1}^{p} a_i \, \varepsilon_{t-i}^2 + \delta I_{t-i}[\varepsilon_{t-i} < 0]\varepsilon_{t-i}^2 + \sum_{j=1}^{q} \beta_j \, \sigma_{t-j} \tag{4}$$

In the above TARCH model I_{t-i}, if ε_{t-i} is negative 1, if $\varepsilon_{t-i} \geq 0$ is 0. This is a dummy variable. If δ is statistically significant, the effect of positive and negative shocks on variance is different. Indeed, if x = 0, the effect of negative shocks on volatility is higher than positive shocks (Franses, 1998, s. 172).

4. FINDINGS

The basis of econometric applications is regression analysis based on the classical least squares method. Indeed, many theoretical and applied studies are based on regression analysis. However, significant developments have taken place especially in the last half century in econometrics science. It has been suggested that the classical regression model is invalid for most of the time series, that is, there may be a problem of spurious-regression. One of the assumptions of regression analysis is that the series are stationary, in other words, the series do not contain trends. In practice, however, many time series contain trends that are not stationary. Therefore, in most time series analysis, the series is tested in terms of stationary by means of unit root tests as a pre-test. In the ARCH / GARCH type models in our study, the series should be stationary at the level as a prerequisite.

One of the most commonly used methods in the literature for testing stationary is the Augmented Dickey-Fuller (ADF) unit root test. The ADF unit root test results of the oil price return series are given in Table 2.

Table 2: Results of ADF stationarity test

Variable	Level	First Difference	Result
R_t	-85,99575***	-30,68041***	I (0) (The series is stationary at level.)

Note: (***) is statistically significant at 1% significance level. The maximum lag is 35. Schwarz Information Criteria (SC) was used to determine the lag length.

According to Table 2, the oil prices return series are stationary at level. Thus, it can be determined whether the series has an ARCH effect.

Table 3: ARCH effect test

Variable	F Value	$T*R^2$	Result
R_t	98,06776***	96,88762***	There are ARCH effect.

Note: (***) is statistically significant at 1% significance level.

According to Table 3, oil prices have an ARCH effect according to ARCH-LM test. According to this, different ARCH / GARCH models can be used to examine the oil prices series.

Table 4 shows the results of the volatility estimation performed with different ARCH / GARCH type models of the oil price return series. Here, the best ARCH / GARCH type model is determined by the Akaike Information Criteron (AIC) and Scwarz Crititerion (SC), which is the best estimate of the volatility in the oil price return series.

Table 4: Oil price return series (Rt) volatility forecast results (1987: 06-2018: 06)

	ARCH (1)	GARCH (1,1)	GARCH (0,1)	TARCH (1,1)
Mean Equation				
d_0	0,017719*	0,013202	0,008452	0,007214
R_{t-1}	0,070899***	0,042993***	0,032422***	0,042484***
Variance Equation				
α_0	0,757880***	0,006422***	0,008756***	0,006611***
α_1	0,244205***	0,070575***	-	0,925267***
β_1	-	0,925638***	0,991123***	0,057042***
δ	-	-		0,0271460***
$\alpha_1+\beta_1$	0,244205	0,996213	0,991123	0,982309
AIC	2,758544	2,547506	2,803928	2,545928
SC	2,762080	2,551926	2,807464	2,551232

Note: (***) 1%, (**) 5% and (*) 10% significance level is statistically significant.

According to the AIC and SC criteria, the best of the four models in Table 4 is the TARCH (1,1) model, which has the lowest criterion values. Oil price return equation according to TARCH (1,1) model;

$$R_t= 0,007214+ 0,042484R_{t-1} + \varepsilon_t \quad (5)$$

as shown. According to the mean oil price return equation, one lagged oil price return (R_{t-1}**)** is significant at 1% significance level. According to this result, current oil prices are affected by previous year oil prices. According to the equation (5), as a result of an increase in oil price return in the period of t-1, the next period will cause an increase in the rate of oil price of 0.042 units. Although the power of this dependence seems weak, it is important to show that the trend is positive.

The variance equation of the model TARCH (1,1) is given in the following equation.

$$\sigma_t^2 = 0,006611 + 0,925267\varepsilon_{t-i}^2 + 0,027146 I_{t-i}[\varepsilon_{t-i} < 0]\varepsilon_{t-i}^2 + 0,057042\sigma_{t-j} \quad (6)$$

All coefficients of the variance equation (6) in the TARCH (1,1) model are statistically significant at 1% significance level.

The β_1 coefficient showing the GARCH parameter in Table 3 shows the degree of continuity in volatility. When the this coefficent is close to one, it means that volatility will be effective for a long time if any shock occurs. As can be seen from Table 3, in TARCH (1.1) model which is the best model, this coefficient is quite distant from the reference value. Accordingly, the impact of shocks on oil price return does not extend over a long period.

The coefficient α_1, which shows the ARCH parameter in Table 3, shows the variance varying conditionally. According to TARCH (1,1) model estimation, α_1 coefficient is greater than β_1 coefficient. According to this view, the effect of the shocks that have been realized has come to an end after a short time.

On the other hand, the fact that α_1+β_1 is close to one means that the volatility in oil price return is high. According to the estimation results, oil prices have a high volatility and this uncertainty has a negative impact on oil producers and consumers.

However, in the TARCH model (1.1), the threshold coefficient δ is positive and 1% is statistically significant. The fact that the coefficient in question is significant means that the effect of negative and positive shocks on variance may be different on oil price returns. As a matter of fact, the positive coefficient of the threshold coefficient shows that negative shocks on oil price return are more effective than positive shocks. As a result, sudden decreases in oil prices are more effective than sudden increases in increasing price volatility.

5. CONCLUSION

According to the global reports on the oil sector, it is estimated that the world's proven oil reserves will be depleted in about half a century. Today, however, oil is the first commodity of international trade and it seems to continue to be important also in the near future. In short, although scientific and technological developments are likely to eliminate the indispensability of oil, which is the main energy source in the coming years, the oil is still a very strategic sector for all countries in terms of being economical. Moreover, since the world's oil reserves are not distributed according to the needs of the countries, it makes the sector more important. As a matter of fact, the ever-increasing demand for energy in developed countries and in developing countries has caused the international power centers to make economic and perhaps political savings on oil production, trade and consumption. For this reason, international oil prices are constantly affected by external shocks. As a result the oil sector has high volatility.

In this study, oil price return volatility is estimated by using high quality European Brent oil prices with the assumption that it represents international oil prices the best. For this, ARCH / GARCH models, which are one of the most ideal methods in the literature, have used for the estimation of volatility. In the analyzes, it is concluded that TARCH (1,1) model is the model that best describes the return on oil prices by performing different experiments with ARCH / GARCH type models. With these volatility estimation models, it is possible to obtain information about whether the price volatility is high or continuous, whether the prices are affected by the previous period,whether the effects of external shocks are short-term or long-term. Additionally with theese models, it is possible to obtain information about whether the positive shocks are more permanent or the negative shocks are more permanent.

In fact, ARCH / GARCH models have been widely used in estimating volatility, especially in the field of financial time series. Similarly to this study; Kasman (2006), Cheong (2009, Tuna and Hit (2014), Çelik (2015), Abdioğlu and Değirmenci (2016), Charles and Darne (2017), Çam et al (2017) and Aktas et al. (2018) have used ARCH / GARCH models in their study.

The findings of the study can be summarized with four items: I) The oil prices return is positively affected by the previous period. II) The impact of shocks on oil price return does not extend over a long period. III) Volatility is generally high, so the instability in prices is dominant. IV) Negative shocks on oil price return are effective longer than positive shocks.

The findings of this study may be more important if the effects of oil prices on the basic macroeconomic indicators of the countries are determined. In other words, if the direction or strength of the effect of international oil prices on basic macroeconomic indicators is determined by empirical analysis, the findings obtained in this study may become more useful for the practitioners.

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