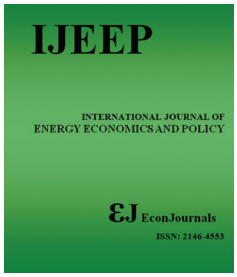

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External Effects of the War in Ukraine: The Impact on the Price of Oil in the Short-term

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ABSTRACT

This paper analyses the short-term impact of the most relevant events of the war in the Ukraine on the price of oil. In order to determine the events to be studied, we propose a methodology based on a study of the news published in two reference newspapers in the markets: The Wall Street Journal and the Financial Times. From this selection, we use an event study model to detect the significance of the events. The main results obtained are: Events that affected daily oil prices were scarce and occurred during very specific phases of the conflict; West Texas intermediate price was more affected than Brent, even though the war took place in Europe; there is no noticeable lagged effect in the events, suggesting that the market assimilated the impact of relevant events very quickly.

Keywords: Oil Price, War, Ukraine, Event Study
JEL Classifications: F51, G14, Q40

1. INTRODUCTION

Wars can have a number of effects on the economies of the countries involved. They can affect economic growth (Hoeffler and Reynal-Querol, 2003), the provision of production factors (Ghobarah et al., 2003; Hoeffler and Reynal-Querol, 2003; Biswas, 2000), the production structure (Mendershausen, 1940), the public budget and public debt (Collier, 1999).

Wars can also impact on the economies of third countries directly involved, causing external effects in these countries. These usually entail two types of effect: On the one hand, direct effects on third countries, usually neighbouring countries, with whom the countries affected have important relationships, and which are usually impacted by large-scale migratory flows (Ghobarah et al., 2003; Salehyan and Gleditsch, 2006; Salehyan, 2008) and substantial changes in commercial relationships (Mendershausen, 1940; Glick and Taylor, 2010; Ianchovichina and Ivanic, 2016); on the other, indirect external effects that spill over into international markets when one or more of the countries involved in the conflict is important enough to alter the equilibrium in international, financial or commodity markets, either directly or by influencing their fundamentals (Brune et al., 2015; Rigobon and Sack, 2005; Schneider and Troeger, 2006).

One of the latter effects includes the impact wars have on oil prices, when one of the countries involved is a major player in the market. These wars lead to what is known as "external shocks" in the oil market, which increase oil prices either because of a disruption in supply or because of a rise in preventive demand (Coleman, 2012; Kilian, 2009; Kilian, 2014). They also lead to greater volatility during the conflict, resulting from the uncertainty and instability that affects the market (Zhang et al., 2009).

In addition to the conflicts linked to the "Arab Spring" (Libya and Syria), recent years have also witnessed war in Europe, the civil war in Ukraine, in which Russia, one of the world's leading oil producers (BP, 2017), was involved.

The crisis in Ukraine started on 23 November 2013, when Ukrainian president Viktor Yanukovich turned his back on a trade deal with the EU and negotiated a $15 billion bailout with Russia. This led to three months of protests in the country, which culminated in the overthrow of Yanukovich on 22 February 2014. Russia considered it an illegitimate coup, refusing to recognize the new government and deploying troops in the Crimean peninsula, where a referendum for secession was held on 16 March, with secession being declared the next day followed by annexation to Russia. Hostilities began on 15 April in the eastern regions of Donetsk and Lugansk between pro-Russian armed groups and forces of the interim Ukraine government. In June 2014, the war intensified, with Russia becoming increasingly involved in the conflict. The armed confrontation continued until 5 September, when the different parties involved signed a ceasefire agreement known as the Minsk Protocol, which has remained in force until today apart from sporadic clashes.

Apart from the initial uncertainty it sparked, this war led to sanctions being imposed on Russia by western countries, led by the USA and the EU, and which was reflected in bans on weapons exports, oil extraction technology exports and access to financial markets (Davis, 2016). As for its effect on oil prices, a recent study concluded that although the war in the Ukraine had no direct effect on oil prices it did affect it through a shift in strategic reserves (Garzon and Hierro, 2018), with some countries increasing their reserves due to their concern regarding how the war might impact on the oil market.

The aim of this paper is to provide further insights into how the war in the Ukraine indirectly impacted on the price of oil by analysing the effect which the most relevant events to occur during the war had on daily oil prices. We employ an event study methodology, used in the oil market to analyse the short-term impact of OPEC announcements and decisions as well as US Strategy Petroleum Reserve announcements (Demirer and Kutan, 2010; Lin and Tamvakis, 2010; Schmidbauer and Rösch, 2012). The method is also commonly used in studies of financial markets.

The main problem we find when applying this methodology to analysing the effects of war is that wars are continuous events in which, apart from outbreak and end of the conflict, it is difficult to determine the relevant events. To solve this problem, we develop a system for identifying days when relevant events take place, by analysing news from two reference newspapers for international markets in the USA and Europe; the Wall Street Journal and the Financial Times, respectively.

The method involves selecting days on which relevant events occurred, applying two criteria: Firstly, there must be news on the front page referring to the war in the Ukraine and in which Russia, the relevant country in the oil market, is mentioned. Secondly, even if the first criterion is not met, there is news that refers to embargoes or sanctions. Furthermore, we also include the formal ceasefire, with the signing of the Minsk Protocol, although strangely enough this failed to appear on the front page of either newspaper. As a result, we obtain a total of 22 days with relevant events for the West Texas intermediate (WTI) market and 23 days for the Brent market.

Having identified these particular events, we apply an event study with a market model that includes the Bloomberg commodity index, a synthetic index which shows the development of commodity markets, as an instrumental variable.

The main results we obtain are: Firstly, few events from the war in the Ukraine had an impact on daily oil prices, which is consistent with the results of Garzon and Hierro (2018); secondly, the WTI price was more affected by these events than Brent prices, despite Brent being the benchmark price in western European markets, in other words closer to where the war was being waged; and thirdly, there is no substantial lagged effect in the events studied, suggesting that the market quickly assimilated the impact of the events and that said impact did not persist even in the very short-term.

The remainder of the paper is organized as follows: Section 2 revises the existing literature. Section 3 discusses the data and methodology. Section 4 reports the estimation results and section 5 contains our conclusions.

2. LITERATURE REVIEW

The existing literature on the impact of wars on oil prices includes a number of works that seek to identify effects both during and after the wars, that is, in the long-term, whereas other studies aim to reflect only the effects during the course of the war. The former group includes the work of Kilian (2009), who studies the impact of war on oil prices through a vector autoregressive model, including oil price, oil production and a proxy for global real economic activity as endogenous variables. In the model, three types of shocks are analysed: Crude oil supply shocks, aggregate demand shocks and oil-specific demand shocks. The latter reflects oil price changes sparked by precautionary demand changes due to uncertainty or market concern about future supply disruption. This work looks at wars fought between 1973 and 2005 (Iranian Revolution in 1978-79; Iraq-Iran war in 1980-88; Persian Gulf War in 1990-91; civil unrest in Venezuela in 2002 and the Iraq War in 2003). Results suggest that supply shocks have smaller and transitory effects on oil prices, whereas increased demand, both aggregate and precautionary, triggers a more intense and persistent effect on oil prices over time.

The same method appears in Kilian and Murphy (2012), where sign restrictions are imposed. Kilian and Lee (2014) and Kilian and Murphy (2014) also use this method, including global and US crude oil stock, respectively, as endogenous variables, in order to pinpoint the possible role played by speculation in the episodes studied. Results from both studies are similar and confirm that the effects of wars on oil prices are more related to increased precautionary demand than to supply disruptions.

Zhang et al. (2009) employ an empirical mode decomposition based-event model to study the Persian Gulf War in 1991 and the Iraq War in 2003. This method involves decomposing the oil price time series into so-called intrinsic mode functions with different time scales, which allow a distinction to be made between short-term and long-term oscillations. Findings are similar for the two wars. Oil prices climb when the war breaks out, remain high during the course of the conflict, and then return to pre-war levels

Table 1: Days where there is news about the Ukrainian war in the wall street journal and the financial times between 1 November 2013 and 30 September 2014

Sample	Wall street journal	Financial times
Analysed days	334	334
Days with news of the war on the front page	86	70
Days with Russian new on the front page	55	47
Selection	21	21

Source: Authors' compilation

Table 2: Descriptive statistics for the variables

Statistics	WTI	Brent	BCI
Mean	−0.000239	−0.000556	0.000234
Median	0.00019	−9.43E-05	−7.93E-05
Standard deviation	0.011956	0.008539	0.00515
Maximum	0.027387	0.021171	0.016547
Minimum	−0.059864	−0.022826	−0.014471
Skewness	−0.855725	−0.017354	0.053809
Kurtosis	6.484335	2.793891	3.411252
Jarque-Bera	143.7896***	0.416833	1.724276

Source: Authors' compilation. *Statistical significance at the 10% level, **Statistical significance at the 5% level, ***Statistical significance at the 1% level. WTI: West Texas intermediate

when it is over. Increased volatility is also in evidence during the war. Finally, by studying the residuals of the model, the authors conclude that long-term oil prices are higher than pre-war levels. The only difference lies in the intensity of the effects, since the results suggest that the Persian Gulf War had a greater impact on oil price than the Iraq War, because the Iraq War had been anticipated and discounted by the market before its outbreak.

The second group of studies includes Coleman (2012), who studies a period spanning 1984 to 2007, which encompasses the Iraq War, the Kuwait invasion, civil unrest in Venezuela and the military attack in Nigeria in 2006. Ordinary least squares (OLS) using White's heteroscedasticity-consistent standard error estimator is employed. In addition to the fundamental variables, a group of dummy variables is included which take a value of one during the course of the events mentioned above. Overall, results suggest that these events led to an increase in the price of crude oil.

Ji and Guo (2015) analyse the short-term impact of the Libyan War on the price of oil. Their aim is to identify the period during which the war impacted on prices. For this purpose, they create an index of public concern about the war, based on searches in "Google Trends." Using this index, they pinpoint the period of the Libyan war when public concern about it reached its height, namely between 20 February 2011 and 2 May 2011. For this period, they estimate the cumulative price increase. According to the results, prices rose by 10% during the period in question.

Finally, in their work into oil prices during the Great Recession, Garzon and Hierro (2018) include the effects of the wars in Libya, Syria and the Ukraine, employing a vector error correction model. For the wars in Libya and Syria, they use dummy variables which take the value one for the first 3 months. In the case of the war in the Ukraine, the dummy takes the value for the whole period, from the outbreak to the ceasefire. According to the results, none of the conflicts had a direct effect on oil prices. In the case of Libya, however, there is an indirect effect through the drop in OPEC production as a result of a disruption in Libyan oil production and, in the case of the Ukraine, increased OECD oil stocks, which might have indirectly affected changes in oil prices. These increased stocks would not have been triggered by underlying changes in fundamentals, but rather by greater uncertainty, which would have led countries to boost their reserves in order to hedge in the face of the war's possible future impact caused by Russia's involvement.

This overview highlights one of the flaws still inherent in analyses of how wars affect oil prices, namely the lack of studies that explore the immediate effects on daily changes in prices. In the case of oil prices, event studies, which are very common for other markets, remain scarce and always focus on OPEC decisions or meetings (Lin and Tavakis, 2010, Schmidbauer and Rösch, 2012), as well as announcements from the US strategy petroleum Reserve (Demirel and Kutan, 2010). The present paper aims to fill this gap.

3. METHODOLOGY AND DATA

In summary form, our goal is to analyse how the main events of the war in the Ukraine impacted on the daily price of crude. To do this, we adopt a two-stage approach: First, we define a method to identify a selection of standout events from an on going situation, in this case the war in the Ukraine, before then applying an event study model that allows us to pinpoint which events impacted on the price of oil and in what sense.

The key problem involved in our objective is to make an unbiased selection of days in which standout events of the war in the Ukraine occurred, in other words those which could have affected the behaviour of actors in the oil market. As noted previously, Ji and Guo (2015) employ the "Google Trends" search for the term "Libya War" to reveal public concern for the Libyan War. However, the result is a continuous index, since their aim is to identify when this war influenced oil prices, not to pinpoint the key events.

Much the same is true of the method designed by Li et al. (2017), and which seeks to transform economic news into variables that reflect market sentiment. They use news from "investing.com" to create these market sentiment indicators, which are also continuous variables, and apply them to study the extent to which they anticipate oil price changes in the oil market. Obviously, this method does not enable us to identify standout events either.

Faced with this limitation, we propose a new method to select days on which relevant events occurred in the war in the Ukraine that might have had an impact on the oil market. For this purpose, we use the news published in the press during the conflict, between

the outbreak and the ceasefire. Unlike Li et al. (2017), our study focuses on a political event, a war. We therefore feel that the best references may be found in the general media, particularly newspapers seen as reference publications for the economic agents involved in financial markets: The Wall Street Journal and the Financial times.

Although the North American and European oil markets are closely linked, we felt that because the war in the Ukraine was fought on European soil there might be differences, both in terms of relevant events and their consequences. For this reason, we conducted a two-fold study such that, in order to pinpoint events that affected the WTI price, we use news from the Wall Street Journal and, in the case of Brent, news published in the Financial Times.

We study the news from both newspapers in the period spanning 1 November 2013-30 September 2014, a total of 334 days, analysing their content and selecting days where the terms "Ukrainian war" or "Ukraine" appear as front page news, either in the headline or the main body, and then, inside these groups, news that included the terms "Russia" or "Russian," given that the potential influence of this war on the oil market is related with Russian involvement in the conflict. The results from this first selection are shown in Table 1.

From this group of selected days, we removed those in which the reference to the war in the Ukraine and to Russian involvement were not mentioned in the same piece of news. Secondly, in order to avoid distortions, when there are consecutive days that meet the criteria considered a relevant event, we select the 1st day.

We add to the selected days those where, despite not fulfilling the first criterion mentioned above, sanctions against Russia were imposed, which are a relevant economic fact in themselves, since they reflect the spread of the conflict to other areas. We also add the day the ceasefire was signed, since although curiously it failed to make the front page in either of the newspapers in question, it would obviously have influenced oil prices given that it creates a new scenario. Finally, we remove from the sample those days where oil price data is not available.

The hypothesis we propose regarding the behaviour of oil price vis-à-vis the selected key events is that these should have influenced oil prices, by causing them to rise more than what are normal market variations. We employ an event study approach to test this.

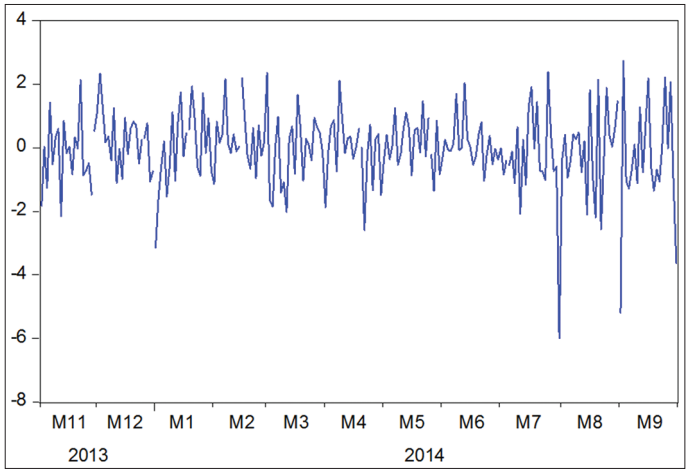
As already pointed out, this method has been employed to analyse the short-term impact of OPEC announcements and decisions concerning production and US Strategy Petroleum Reserve announcements on oil price. Lin and Tavakis (2010) estimate the abnormal returns of oil price as the differences between the real returns and the expected returns in the period considered, which in this work is deemed equal to zero. They use it to calculate the average cumulative abnormal returns in the event window, which covers ten days prior to the event and ten days after it, and then construct a test statistic to ascertain the event's significance. Schmidbaur and Rösch (2012) employ a simple regression model and a GARCH model, introducing a series of dummy variables which represent OPEC meetings, distinguishing between those which announce an increase in production quotas, a cut or no change.

In addition to OPEC decisions, Demirel and Kutan (2010) also analyse US Strategy Petroleum Reserve announcements. In order to estimate the abnormal return of oil price, they employ three different models (a market model, an ARCH model and a Fama-French model), taking the residuals as the abnormal returns in all of them. In an effort to check the significance of the events, they use a test statistic created from the average cumulative abnormal return in the event window, 20 days before and after the event. In their study, they distinguish between five types of events: OPEC announcements of an increase in production, a reduction, and no change, as well as US Strategy Petroleum Reserve announcements of increases or reductions in strategic oil reserves.

Our model is determined as follows:

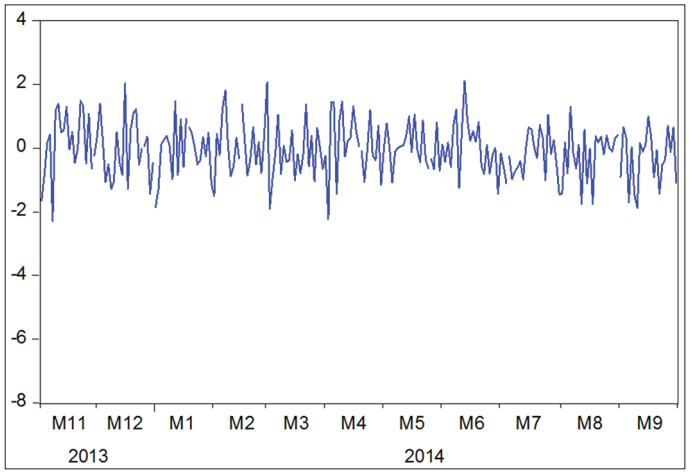
As regards the abnormal return of oil price, we defined it as follows:

Figure 1: West Texas intermediate price returns (%) in the period spanning November 01, 2013–September 30, 2014



Source: Energy Information Administration

Figure 2: Brent price returns (%) in the period spanning November 01, 2013–September 30, 2014



Source: Energy Information Administration

$$AR_{et}=R_{et}-E(R_{et}) \quad (1)$$

Where AR_{et} is the abnormal return in time t, where e indicates a single event. R_{et} is the normal price return in time t and $E(R_{et})$ is the expected return, assuming that the event had not taken place.

We set a 1-day event window, firstly because events in wars tend to be dramatic and therefore lead to impulsive actions, and secondly because wars are ongoing events, such that a larger than one-day event window might lead to overlaps between the different events, the effects of which might even be of a different sign. A third reason is because the oil market is exposed to numerous types of shocks, such that increasing the event window might lead us to mix the impact of the events studied with the impact of other factors, since we do not start from events that have a long-term impact on oil price. However, we also employ a two-day event window, including the event day and the day after the event, in order to check for a possible lagged effect in price related to the events studied.

In order to estimate abnormal return, we opted for a market event study approach, including, as a proxy variable, a commodity index similar to the one used in Demirel and Kutan (2010) where the Dow Jones AIG Commodity Index was applied to represent market oscillations.

To estimate the abnormal price return during the event and to test its significance, we include a dummy variable for each of the key events, as done by Schmidbauer and Rösch (2012). Each variable thus allows us to test for the existence of abnormal price returns on the day of the event. Other studies (Demirel and Kutan, 2010; Lin and Tavankis, 2010) estimate the average cumulative abnormal return in the event window, calculating a test statistic from it to analyse its significance. However, it is not possible to employ this methodology in our work due to the short length of the event window (1 day).

Finally, we include the lagged dependent variable in the equation, as is included in the Falagiarda and Reitz (2015) study of the effects of ECB announcements of non-conventional programmes on the sovereign default risk premium.

The equation to estimate is the following:

$$R_{et} = \alpha + \beta_1 R_{et-1} + \varphi BCI_t + \sum_j^n \mu_j Event_t + \varepsilon_t \quad (2)$$

Table 3: Ukrainian war selected events which meet the criteria in both newspapers

Date	Event description	WTI return ($) event day	WTI return ($) 2 days cumulative	Brent return ($) event day	Brent return ($) 2 days cumulative
March 03, 2014	Senior US official threaten with implementing future economic sanctions on Russia for his interference in Ukrainian Crisis and the Crimea invasion	2.46	0.76	2.28	0.19
March 06, 2014	UE political leaders discuss potential sanctions on Russia. German government oppose to implementing hard sanctions, whereas Estern's countries defend tough measures	0.07	1.07	−0.16	0.99
March 17, 2014	Crimea vote to secede and join Russia in a Referendum, with the support of Russia. US and the EU condemned the Referendum as illegal and set the first round of sanctions on Russian officials	−0.80	0.85	−1.09	−1.29
April 15, 2014*	EU foreign ministers condemn the Russian operation in the Ukrainian borders and ask for the withdrawing of troops. They also extend the sanctions list to four new Russian officials	−0.35	−0.34	1.42	2.03
April 17, 2014	Ukraine accused Russia of carrying out military raid in his territory. BP warns European governments of the economic consequences of imposing harder sanctions on Russia and his oil company Rosneft	0.62	0.64	0.08	−0.02
April 28, 2014*	US and the EU extend the scope of sanctions to seven Russian officials and executives, as well as seventeen Russian firms through US visa bans and asset freezes. Among those sanctioned are Rosneft senior high executive	0.28	0.71	−0.41	0.36
May 08, 2014	President Putin softens harsh tone on Ukraine, calling for a delay in the independence referendum in the Eastern regions and assuring the withdrawal of Russian troops from the Ukrainian border	−0.54	−0.74	0.02	0.09

Source: Authors' compilation. * Selected events according to the second criterion (news about sanctions on Russia) For the purposes of assessing the price variations, bear in mind that the average daily variation rate in absolute value for the period is 0.86 dollars for WTI and 0.72 dollars for Brent WTI: West Texas intermediate

Table 4: Ukrainian war selected events which meet the criteria only in the wall street journal

Date	Event description	WTI return ($) event day	WTI return ($) 2 days cumulative
February 28, 2014	Ukraine former president, Yanukovich, ask for protection and help to Russia government. US Secretary of State, John Kerry, ask Russia not to interfere in the conflict and to respect its border with Ukraine	0.20	2.76
March 10, 2014	Russia president shows his support for Crimea secession. Crimean official, supported by Russia, claims that the region could join Russia in a month	−1.43	−2.53
March 21, 2014	US Extend the sanctions to the inner circle of Putin. The EU meet to agree on future sanctions	0.29	0.37
March 31, 2014	John Kerry, US Secretary of State and his Russian counterpart meet to address the Ukranian issue, without reaching any agreement, increasing the política crisis. Kerry remark that Russia does not ensure the withdrawal of its troops, settled on the border with Ukraine	−0.16	−2.04
April 10, 2014	Ukranian officials denounce the operation of Russian agents in Eastern of Ukraine. Russian government deny any interference in the Ukrainian situation. Top finance officials from the G-7 meet to consider new sanctions on Russia	−0.18	0.13
April 23, 2014	Joe Biden, Vice President of the US warns to withdraw his troops from Ukraine, whereas Secretary of Defence of the US officials describe a plan to send 600 soldiers to Ukraine as NATO members with the aim of controlling the Russian operations	−0.22	0.51
July 08, 2014	Putin ignore the requirement to send troops against Ukrainian forces by the Ukranian separatists	−0.13	−1.26
July 23, 2014	US intelligence officials detected a surface to-air-missile launch in the separtist-controlled area in Eastern Ukraine and that there has been a growing flow of weapons from Russia to separatists over the last month	−0.78	−1.83
August 08, 2014	Russia bans imports of a wide range of US and European foods in respond to penalties impose on Russia over the crisis in Ukraine	0.27	0.75
August 29, 2014	Kiev again accuses Russia of sending troops to Eastern Ukraine to fight for the Ukrainian separatists, removing any hope of a diplomatic solution and provoking the imposition of new sanctions by US and the EU	1.42	−3.52

Source: Authors' compilation. For the purposes of assessing the price variations, bear in mind that the average daily variation rate in absolute value for the period is 0.86 dollars for WTI and 0.72 dollars for Brent. WTI: West Texas intermediate

Where BCI_t is the bloomberg commodity index, a proxy variable that represents the development of commodity markets. Through this variable, we try to estimate the normal progress of oil price, since, in the short-term, its variations are mainly caused by changes in the financial and commodity markets. R_{t-1} is the lagged dependent variable. $Event_t$ is a group of dummy variables with which we try to obtain abnormal oil price returns during the events studied. These variables represent the previously highlighted events, taking the value one for the day of the event (or for the day of the event and the day after in the case of a 2-day event window) and 0 for the rest of the period. In addition, in the WTI estimation, we include a dummy to control for three unusual values which appear on the following days: 2 January 2014, 22 April 2014 and 2 September 2014. These unusual values are not related to events that occurred in the war and might distort the estimation results.

All the variables employed in this work, with the exception of the dummy variables for events, are expressed in logarithm changes, since the interest of our work lay in price returns, not absolute values. The variables therefore show daily proportional changes.

As pointed out, the dependent variables of the model are the main benchmark prices in the oil market: The WTI, referred to in the model as WTI, which is the benchmark in the American oil market; and Brent, referred to in the model as Brent, which is the benchmark price in the European oil market. The data for both variables are provided by the US Energy Information Administration.

The proxy variable, BCI, takes its values from the Bloomberg Commodity Index, a synthetic index that charts the price of 24 different commodities from seven groups, including crude oil. Given that developments in financial markets in recent years have led to the financialization of commodity markets, thereby increasing the volume of investment in the commodity index, there is a greater correlation between the different commodity prices (Tang and Xiong, 2012). This allows us to employ BCI as a proxy for market movements, since it captures the returns in oil prices that are triggered by changes in the commodity market and, therefore, are not caused by specific changes in the oil market. The data is compiled from the website "investing.com."

Table 2 shows the descriptive statistics of the variables used in the model. Even though the WTI and Brent are very similar, there are some differences in their behaviour. Brent shows less variability in the period studied, reflected in a smaller standard deviation, as well as in a maximum and minimum of smaller magnitude.

Both show negative skewness, meaning that falls in oil prices prevail over increases during this period. Figures 1 and 2 show the evolution of both prices and clearly evidence that WTI displays more unsteady behaviour than Brent, and undergoes more noticeable downturns at specific moments. This makes it even more necessary to perform the estimates separately, rather than by an aggregate price index.

Table 5: Ukrainian war selected events which meet the criteria only in the financial times

Date	Event description	Brent return ($) event day	Brent return ($) 2 days cumulative
February 27, 2014	Russia put armed forces on alert in a show of military strength over the political direction of Ukraine. John Kerry, US Secretary of State warns Russia that any sign of intervention will be unacceptable for US	−0.85	−0.41
March 20, 2014	UK urges EU to discuss a new energy security plan to reduce the dependence from Russian natural gas, increasing the imports from another sources like US or Iraq	−0.22	1.25
May 02, 2014	Ukraine's interim prime minister say that the country is entering its most dangerous 10 days since independence in 1991 and acusse Moscow of conspiring to promote more clashes and help pro-Russian separatists	0.85	0.85
May 13, 2014	US and the EU prepare new sanctions on Russian economy and discuss a ban of exports of high-tech energy equipment if Moscow is seen to have disrupted Ukraine's presidential elections on May 25	0.41	1.50
June 06, 2014	G-7 leaders prepare to impose tougher sanctions against the Kremlin unless it halts its provocations inside Ukraine and convince pro-Russian rebels to lay down their arms	0.78	2.12
July 14, 2014	Russian government accuses the Ukrainian military of killing one of its citizens in the border and warns of irreversible consequences. NATO leaders plot cyber fightback after Russian propaganda coup	−1.04	−1.04
August 06, 2014	Russia increase the number of troops on the Eastern border of Ukraine, increasing fear of an invasion. Russia demand a humanitarian mission in Eastern Ukraine, where pro-Russian are being attacked	1.35	1.20
August 13, 2014	Russian government send a humanitarian aid convoy to rebel-held city of Lugansk. Ukrainian government refuses entry to this convoy, since it's considered as an attempt to enter Ukrainian territory by Russia	0.59	−0.53
August 22, 2014	Oil company Rosneft loose a $2bn deal with Vitol due to sanctions imposed by the EU and US Ukraine claim to have captured two Russian troops carriers in Ukrainian territory	−0.19	0.21
August 26, 2014	NATO chief comment that Russian humanitarian convoy could be a guise to distract the west from a build-up of regular Russian forces in Ukraine	0.01	−0.09
September 03, 2014	UE diplomat considers to sanction Russia by boycotting 2018 football World Cup, among other sporting events	0.67	1.00

Source: Authors' compilation. For the purposes of assessing the price variations, bear in mind that the average daily variation rate in absolute value for the period is 0.86 dollars for WTI and 0.72 dollars for Brent. WTI: West Texas intermediate

Table 6: Unit root tests

Variable	ADF	P-value	KPSS	PP	P-value
WTI	−16.2549***	0.0000	0.2028	−16.25788***	0.0000
Brent	−14.9897***	0.0000	0.2579	−14.9886***	0.0000
BCI	−13.1209***	0.0000	0.594064**	−13.2316***	0.0000

Source: Author's compilation. *Statistical significance at the 10% level, ** Statistical significance at the 5% level, *** Statistical significance at the 1% level. ADF: Augmented Dickey-Fuller, WTI: West Texas intermediate

4. RESULTS

Applying the process of determining major events, as described above, the key moments selected for the war in the Ukraine are shown in Tables 3-5.

Before carrying out the model estimation, we examine the stationarity of the variables. To do this, we use the following unit root tests: Augmented Dickey-Fuller test, the Phillips-Peron test (PP) and the Kwiatkowski–Phillips–Schmidt–Shin test (KPSS). The first two tests set as the null hypothesis the existence of a unit root, whereas in the last the null hypothesis is the stationarity of the time series. Results are shown in Table 6, and all the variables are stationary, enabling us to carry out the model parameter estimation by OLS.

We perform the estimation for the daily data of the selected variables for a period spanning 1 November 2013–30 September 2014. Results for both WTI and Brent are shown in Tables 7 and 8, respectively. We observe that crude oil price shows a negative relationship with its lagged values, meaning that the price exhibits a mean reversion, where returns in the following period offset previous returns. However, this parameter is not significant for the Brent price. Furthermore, the relationship between oil price and BCI, which represents the development of the commodity market and is employed to reflect normal changes in crude oil price, is positive and significant, as expected.

As regards standout events, we notice that very few of these impacted on oil prices in the short-term and that those which did do not concur for the two benchmark prices. On the one hand, Brent, the European benchmark price, shows an abnormal return with a one-day event window on the following days: 3 March 2014, corresponding to the first threat of sanctions being imposed on Russia by the US; and 15 April 2014, which coincided with EU condemnation of Russian intervention in the Ukraine and

Table 7: Impact of relevant events of Ukrainian war on WTI price

1 day event window			2 days event window		
Variable	Coeficient	P-value	Variable	Coeficient	P-value
WTI(−1)	−0.156835***	0.0030	WTI(−1)	−0.241283***	0.0000
BCI	1.03595***	0.0000	BCI	1.04575***	0.0000
28-February	−0.0040	0.6585	-	-	-
03-March	0.0129	0.1559	03-March	−0.0016	0.8074
06-March	−0.0112	0.2228	06-March	0.0006	0.9336
1-0-March	−0.0071	0.4324	10-March	−0.0099	0.1359
17-March	−0.0016	0.8628	17-March	0.0040	0.5439
21-March	0.0033	0.7118	21-March	0.0011	0.8736
31-March	0.0004	0.9634	31-March	−0.0063	0.3454
10-April	−0.0046	0.6082	10-April	0.0012	0.8588
15-April	0.0008	0.9275	15-April	−0.0011	0.8697
17-April	0.0008	0.9315	17-April	0.0037	0.5741
23-April	−0.0084	0.3580	23-April	−0.0044	0.5128
28-April	0.0020	0.8279	28-April	−0.0008	0.9089
08-May	−0.0017	0.8552	08-May	−0.0003	0.9609
08-July	−0.0003	0.9751	08-July	−0.0032	0.6351
17-July	0.018903**	0.0376	17-July	0.014635**	0.0296
21-July	0.0133	0.1425	21-July	0.0067	0.3159
23-July	−0.0119	0.1872	23-July	−0.012219*	0.0667
25-July	0.01963**	0.0308	25-July	0.013821**	0.0382
31-July	−0.056952***	0.0000	31-July	−0.034845***	0.0000
08-August	0.0062	0.4954	08-August	0.0042	0.5232
29-August	0.0131	0.1465	29-August	0.0050	0.4937
05-September	−0.016323*	0.0720	05-September	−0.011626*	0.0817
Control	−0.033249***	0.0000	Control	−0.034801***	0.0000
R^2	0.4952		R^2	0.4559	
Adjusted R^2	0.4333		Adjusted R^2	0.3922	
Jarque Bera	2.8251	0.2435	Jarque Bera	2.3757	0.3049
Breush-Godfrey	0.3316	0.7182	Breush-Godfrey	0.4687	0.4944
Breush-Pagan	0.4604	0.9880	Breush-Pagan	1.953629***	0.0068

Source: Author's compilation. *Statistical significance at the 10% level, **Statistical significance at the 5% level, ***Statistical significance at the 1% level, WTI: West Texas intermediate

with further sanctions being imposed on high-ranking Russian officials. Both events show an increase in oil price. In the case of the WTI price, traded in the US, the significant events are: 17 July 2014, corresponding to the sanctions imposed on Russian firms by the US; 25 July 2014, when the EU imposed further sanctions on Russian officials and firms; and 31 July 2014, corresponding to the third round of sanctions imposed on Russia by the US and the EU. In the case of the first two events, an increase in oil price is observed, whereas in the latter case the abnormal return shows a sharp fall.

Only on 05 September 2014 did the reactions of the two markets coincide. This was the day on which the ceasefire was signed in Minsk and when a price reduction occurred which the model detects as an abnormal variation for both WTI and Brent.

The estimation results show one peculiarity for 31 July 2014 when news about forthcoming sanctions, which should be followed by an increase in oil price, in fact caused it to drop. It should be borne in mind that news about the Ukraine coincided with important domestic news from the US concerning the shutdown of a major refinery in Kansas due to a fire. The plant consumed 115,000 barrels per day and its closure would have sparked an adjustment in demand and led to an understandable fall in oil price this day. It should be remembered that dummy variables in event study approaches capture the abnormal return on the day studied, but do not detect the source of this abnormality. It therefore seems reasonable to consider that the drop in oil price that day was not related to the war but to the oil refinery fire.

In comparative terms, the events caused by the war in the Ukraine had a greater effect on WTI price, quoted in the US market, than on Brent, despite the fact that the war was waged in Europe. However, in general, we are not able to assert that the war in the Ukraine had any major impact on oil prices other than at specific moments that coincided with the US and EU acting against Russia.

To test the estimates and to enable the model to reflect a possible lagged effect, we extended the event window to two days. Results are also shown in Tables 7 and 8. For the WTI price, the relevant events of the one-day event window estimation remain, although their significance and impact on price diminish. In addition, a new relevant event is added on 23 July 2014, coinciding with the US request for Russia to withdraw its troops from the border, although it is seen to have little effect and a negative impact on price. In the case of Brent, only the event which occurred on 15 April 2014 is maintained from the one-day event window estimation. However, the following days are added: 20 March 2014, corresponding to the EU proposal to reduce Russian natural gas imports; 6 June 2014, corresponding to fresh sanctions being prepared by the G-7 group; and 31 July 2014, although these latter two have little significance.

This reappears on 31 July 2014, again with a fall in oil price, which we understand to be in line with what was explained above, such

Table 8: Impact of relevant events of Ukrainian War on Brent price

1 day event window			2 days event window		
Variable	**Coeficient**	**P-value**	**Variable**	**Coeficient**	**P-value**
Brent(−1)	−0.0256	0.6820	Brent(−1)	−0.0748	0.2360
BCI	0.6382***	0.0000	BCI	0.6655***	0.0000
27-February	−0.0065	0.4082	27-February	−0.0025	0.6599
03-March	0.0149*	0.0608	03-March	−0.0022	0.6932
06-March	−0.0064	0.4208	06-March	0.0038	0.4916
17-March	−0.0057	0.4656	17-March	−0.0049	0.3782
20-March	0.0060	0.4522	20-March	0.0112**	0.0470
15-April	0.0163**	0.0390	15-April	0.0116**	0.0394
17-April	−0.0015	0.8525	17-April	0.0014	0.8017
28-April	−0.0022	0.7836	28-April	0.0008	0.8843
02-May	0.0065	0.4098	02-May	0.0038	0.5003
08-May	0.0021	0.7884	08-May	0.0033	0.5575
13-May	0.0032	0.6853	13-May	0.0066	0.2391
06-June	0.0056	0.4795	06-June	0.0094*	0.0946
14-July	−0.0093	0.2344	14-July	−0.0028	0.6227
17-July	0.0056	0.4728	17-July	0.0055	0.3238
21-July	−0.0029	0.7141	21-July	0.0041	0.4589
25-July	0.0095	0.2282	25-July	0.0045	0.4209
31-July	−0.0114	0.1490	31-July	−0.0107*	0.0587
06-Auguest	0.0084	0.2858	06-Auguest	0.0056	0.3175
13-Auguest	0.0089	0.2612	13-Auguest	0.0011	0.8503
22-Auguest	−0.0009	0.9085	22-Auguest	0.0022	0.6877
26-Auguest	−0.0017	0.8247	26-Auguest	−0.0010	0.8551
03-September	0.0076	0.3312	03-September	0.0074	0.1827
05-September	−0.0172**	0.0290	05-September	−0.0068	0.2216
R^2	0.2517		R^2	0.2489	
Adjusted R^2	0.1600		Adjusted R^2	0.1568	
Jarque Bera	1.4049	0.4954	Jarque Bera	0.2429	0.8856
Breush-Godfrey	0.3804	0.6841	Breush-Godfrey	0.7875	0.4564
Breush-Pagan	0.5337	0.9676	Breush-Pagan	1.6108**	0.0388

Source: Author's compilation. *Statistical significance at the 10% level, **Statistical significance at the 5% level, ***Statistical significance at the 1% level

that the effect of the refinery fire would have hit Europe with a one-day lag. However, the increase in the number of significant events in the two-day event window for Brent might indicate that the Brent price reacts more slowly to events than the WTI.

5. CONCLUSIONS AND DISCUSSION

The aim of this paper is to study the impact of the war in the Ukraine on the price of oil as a result of Russia's involvement and, in particular, to go beyond previous studies and to examine the very short-term effects of certain relevant events that took place during the conflict by defining a method to pinpoint specific standout incidents from an ongoing event such as a war. We do this by analysing public news on the front page of the Wall Street Journal and the Financial Times, as well as news referring to sanctions. This allows us to isolate 33 days during which the aforementioned newspapers paid close attention to the conflict and to Russia's involvement, highlighting 22 days for the WTI market and 23 for the Brent market, 12 of which coincided. Having pinpointed the events, we employ a market model event study with a one-day and a two-day event window with a proxy variable, the Bloomberg Commodity Index, and introduce the key events through dummy variables.

As regards the results obtained, it can first be said that key events in the war had little impact on oil prices, and were generally confined to the times when Russia and the US were involved. This result is consistent with the findings of Garzon and Hierro (2018). Despite Russia's involvement, at no time did the conflict compromise the country's oil supply, and the effects were restricted to changes in market agents' expectations which, at most, affected strategic reserves, as the cited study suggests.

As for events that affected price, we see that in the European market the relevant events that had a major impact occurred in the early days of the war, while in the US the relevant events took place a few months before the ceasefire. One possible explanation for this difference is that the European market initially reacted because of its geographical proximity to the conflict and its possible spread, while the US market, distant from the warzone, would have reacted to events that were less related to the war and more linked to the US and the EU's relationship with Russia as well as sanctions imposed due to the war.

When we include the two-day event window, we see that the impact of relevant events is less in both markets. In other words, the events impact on the same day, given the general trend of the market to correct daily oscillations as evidenced by the negative sign of the coefficient of the lagged price. In relation to this issue, it should be remembered that we are dealing with highly volatile markets, exposed to many internal as well as external shocks, and which cause any fresh information to quickly exhaust the effect of the previous information, such that it is difficult to grasp what effect an event has if we extend the window.

As regards volatility, we see that the WTI price evolves in a more unstable manner than the price of Brent, evidencing that the significant impacts pinpointed were greater in the case of the WTI, even though the war took place in Europe.

In sum, the work presented allows us to explore further the external effects of the war in the Ukraine on oil prices during the 2014 conflict, with results consistent with previous works, and proposing a novel methodology to identify relevant events within an ongoing situation such as a war, and which enables us to expand the use of the event study method.

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