Box 1

Determinants of oil price and prospects for 2019

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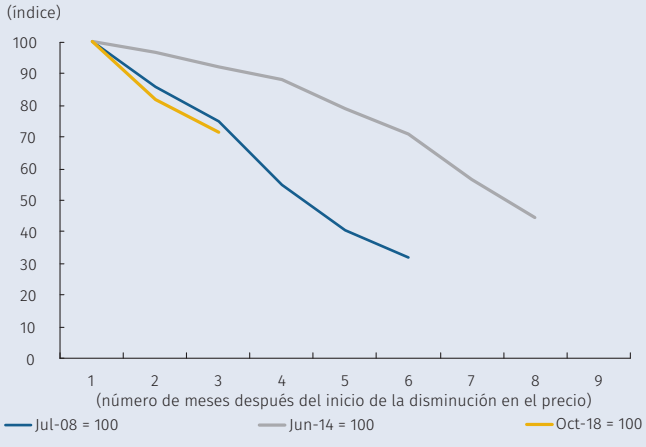
In 2018, there were wide volatility and sudden changes in oil prices[1]. The price of crude oil reached records that had not been observed since 2014, reaching a peak in October of USD 86 per barrel before collapsing to USD 50 in December, which meant a 29% decrease in the average monthly price of oil (Figure B1.1) This fall took place despite the fact that during much of the year the climate of the crude oil market versed on factors that exerted upward pressures such as the expectations of possible sanctions to Iran, the acceleration of the decline of the production in Venezuela, and the discipline by the OPEC countries and their allies to balance the market.

Graph B1.1
Disminuciones pronunciadas recientes del precio del petróleo (Brent)



Source: Bloomberg.

In this sense, understanding the causes behind the movements in the price of oil is important to determine how transitory or permanent they can be, and to what extent they are reflected on market expectations. This should result in better medium-term forecasts. With this purpose in mind, this box analyzes the historical determinants of the price of oil, with emphasis on the most recent situation and the prospects for 2019.

1.1 Historical decomposition of the price of oil

The present work uses the methodology developed in the seminal document by Kilian (2009). In this document, the author proposes a model of autoregressive vectors with a structural specification that allows to identify supply and demand shocks that affect the oil prices. Although the original framework has shown difficulties to explain the movements of recent years (Davig *et al*., 2015), possibly due to the omission of variables that reflect changes in expectations regarding future supply or demand, the econometric technique continues to be widely used in the academic literature, partly because it allows to synthesize the joint effects of macroeconomic aggregates and the price of crude oil.

Useful approaches to select and classify the key determinants in the price of oil can be found in the works by Barsky and Kilian (2002, 2004), Kilian and Murphy (2014), Hamilton (2014), and Fueki *et al*, (2018), among others. On the supply side, a separate oil production between OPEC and non-OPEC is used, along with a series of inventories by the OECD as a *proxy* of their world levels. The first two variables account for the *flow* in production and decision-making processes of country blocs, while the inventories help to synthesize the expectations about the future supply given that oil is a storable commodity. On the demand side, the production of steel as a *proxy* of the economic dynamics is considered, particularly the demand for industrial raw materials (Kilian and Zhou, 2018), besides the price of copper and the nominal exchange rate of the US dollar as indicators of contemporary and future global demand (Hamilton, 2014).

Graph B1.2 presents the historical decomposition for the Brent oil price using the technology described and considering a single lag in the autoregressive vectors. The graph shows the difference in the real price versus a stochastic trend[2] (which we will call *oil gap*), in the last eight years,

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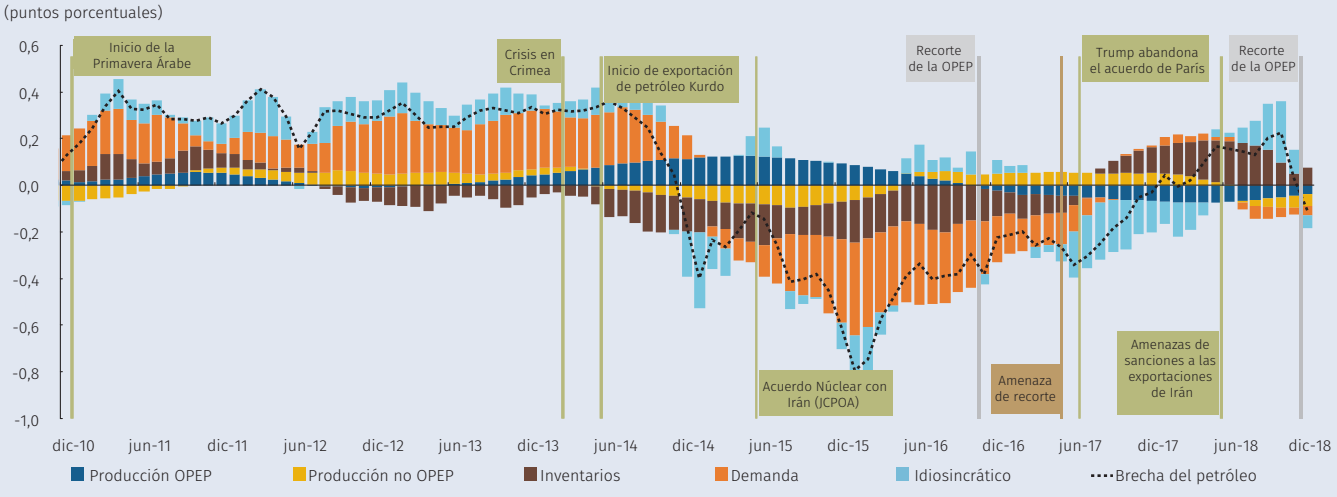
1 The volatility indicator for oil prices (Vstoxx Oil) in 2018 reached values not seen since three years ago; in November 2018, it reached a maximum value of 65.

2 To obtain the stochastic trend, we used the filter by Christiano and Fitzgerald (2003), considering only the real oil price in cycles of over twenty years (Brent price deflated by the CPI in the United States). For a more detailed classification of the cycles in commodity prices, see Zellou and Cuddington (2012), and Erten and Ocampo (2013).

Graph B1.2
Descomposición histórica del precio del petróleo (Brent)
(diciembre de 2010 a diciembre de 2018)



Nota: los eventos destacados corresponden a eventos geopolíticos y a los anuncios de recorte por parte de la OPEP.
Sources: Bloomberg, EIA, FRED y Datastream; cálculos propios.

along with its decomposition by the shocks mentioned above and idiosyncratic innovation in the market. The latter accounts for specific factors different from those of supply and demand considered, such as expectations associated to events at the moment.

1.2 What is there behind the latest movements?

This historical decomposition allows to perform at least two types of analysis: one that reflects the effects of each shock at a certain period, which is shown in Graph B1.2, and another that enables to learn about the contributions of these shocks to the movement of this *gap* between certain dates. Graph B1.3 adopts this latter perspective to explain the contributions of the shocks in each of the quarters of 2018.

Thus, the increase in the price of oil observed at the beginning of 2018 was the result—to a large extent—of the reduction of inventories[3], which fell as a response to a more restricted global supply affected by the OPEC agreements and by the political situations in Libya, Venezuela, and Iran. Added to the above was the good performance of demand due to the good economic dynamism observed in the world, and to the increased consumption of fossil fuels in the United States due to the winter.

In the second quarter, oil prices continued to increase amidst the announcement by the United States of the restoration of sanctions on Iran, following its departure from the Joint Comprehensive Plan of Action, besides the announcement by the OPEC to extend the cuts agreed upon in 2016 until the end of 2018, and the fall of production in Venezuela. However, oil production outside the OPEC block pressed down the prices, partly due to a higher growth rate of shale production in the United States[4].

However, the greatest fraction of the price rally was due to the positive contribution of the idiosyncratic factor in the second and third quarters of the year. This shock, not residing in the fundamental factors, synthesizes the junctural expectations of the market. Particularly, the consequences of sanctions on Iran, the acceleration in the fall of the production in Venezuela, and the decrease of inventories in the United States generated expectations of a rebound in the price of crude oil. This optimism of the markets was reflected in analysts' projections and futures contracts for the last quarter of 2018, which reached USD 76 and USD 72 per barrel, respectively, in September (Table B1.1). Thus, the expectations of higher prices were the ones which led, largely, the increase in the price of oil, outperforming all other structural factors that suggested decreases for the third quarter, instead of the increase observed.

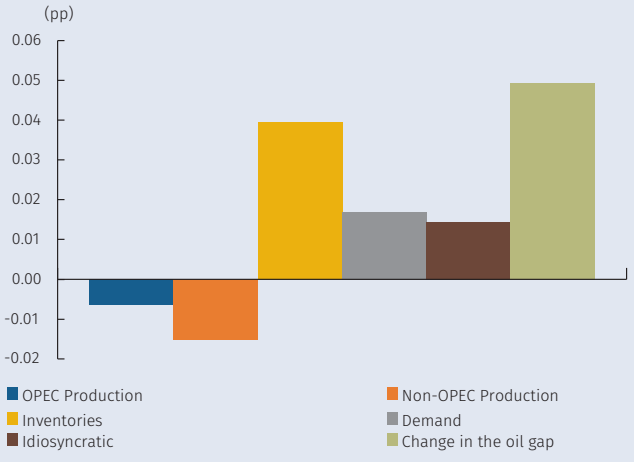
The collapse of the price in the fourth quarter originated in a combination of supply and demand factors, along with the reversal of the market expectations and its consequent reactions on financial markets. A higher supply after the initial decision by Saudi Arabia, Russia, and other producers to offset potential losses of oil from Iran, Libya, and Venezuela, along with a good pace of growth in oil production in the United States, the accumulation of inventories,

3 According to the Energy Information Administration (EIA), the average commercial inventories of oil by the OECD (excluding strategic reserves) fell in the first quarter of 2018 to 2,807 million barrels, having recorded 2.96 million barrels in 2017.

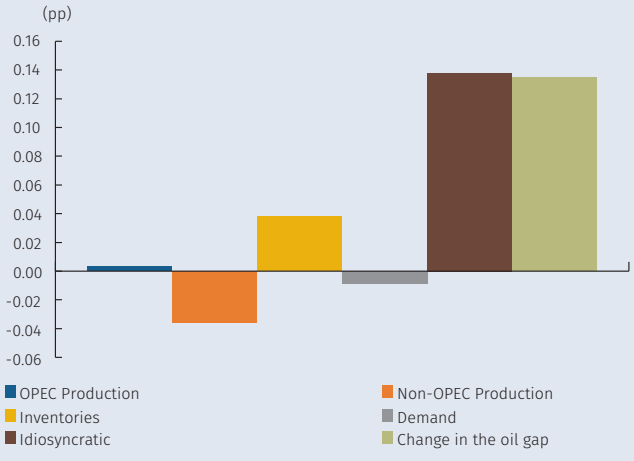
4 Oil production in the United States increased, on average, at a 16% rate in the second quarter of 2018, higher than in the fourth quarter of 2017 (12.8%).

Graph B1.3
Contributions of each estructural shock to the change accumulated for the oil gap.

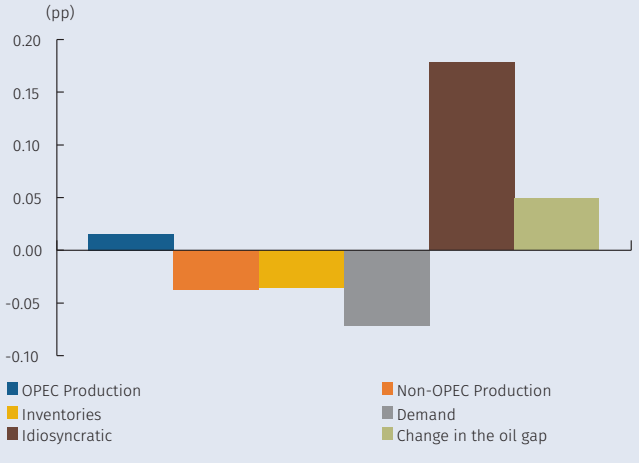
A. First Quarter of 2018



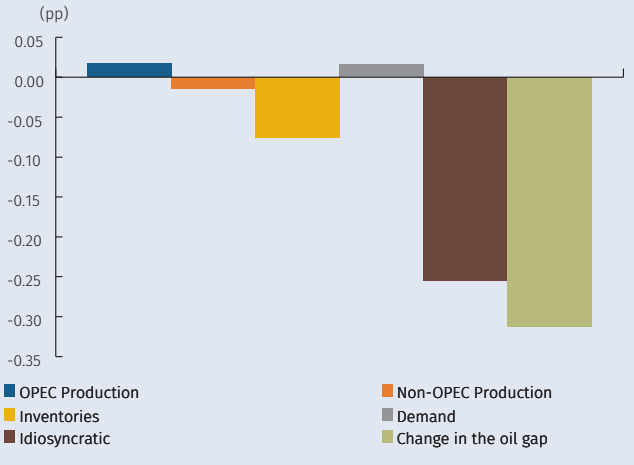
B. Second Quarter of 2018



C. Third Quarter of 2018



D. Fourth Quarter of 2018



Sources: Bloomberg, EIA, FRED, and Datastream; calculations by the author.

Table B1.1
Oil (Brent) Price Forecasts for the fourth quarter of 2018

Date	Analysts' Forecasts	Futures Contracts
Dec-17	57.9	58.8
March-18	63.2	64.0
June-18	66.6	72.5
Sept-18	72.1	75.6
Average Price observed to the Fourth Quarter	68.6	

Note: Analysts' forecasts correspond to the median of Bloomberg, and those of futures contracts correspond to the average of contracts..
Source: Bloomberg.

and the relaxation of sanctions on Iranian crude exports contributed to the downside. Added to the above were the increased concerns regarding global economic growth that resulted in weaker demand prospects, which could lead to a possible future oversupply in the oil market. All this contributed to the adjustment of the price to more sustainable levels consistent with the current state of supply and demand (Figure B1.2).

1.3 Prospects for 2019

As stated before, besides supply shocks and structural demand shocks, the price of oil may be influenced by idiosyncratic shocks, which itself represents an additional difficulty in the price forecast exercise. However, supply and demand flows are factors that might suggest sustainable levels of oil prices. Here are the prospects for these two variables in 2019 and their possible effects on the price of oil.

On the supply side, the good performance in production would continue, especially in the United States. Particularly, the revolution in crude oil production from shale turned the United States into the world's largest oil producer. This has resulted to a large extent from the increase in its efficiency[5]. This should be taken into account because, although the minimum price at which investments are profitable varies among American fields, the Permian Basin enjoys the lowest minimum price and has better infrastructure, with estimates that set this price within a range between USD 45-50 per barrel. However, the current restrictions on the capacity for crude oil transportation from production areas in Texas and Oklahoma are expected to persist until the middle of 2019[6], although an earlier-than-expected improvement in logistics can positively impact oil supply.

The evolution of the cut agreement by the OPEC and its allies reached on 7 December 2018, along with the supply reduction by other member countries (e.g. Iran, where the exemptions granted to eight oil-consuming countries from this country are not expected to continue after May 2019), could counterweight global oil supply. Added to this, there could be a further fall in oil production in Venezuela plus the planned reduction of production in Canada.

On the demand side, as shown in chapter 1 of this *Report*, the growth prospects of global economy have deteriorated with a declining risk balance. According to the IMF, global economy would expand in 2019 at a pace of 3.5%[7], which would imply a decrease compared to 2018 (3.7%). This weakening of the economic activity and its impact on global demand for *commodities* have resulted in a downward revision of the projections by some specialized agencies[8]. However, the forecasts still show no consensus on what effect prevails over growth of crude oil demand, whether global growth or lower prices that would stimulate oil consumption[9].

Table B1.2 presents analysts' forecasts of international oil prices, which reflect, to some extent, the information described earlier. In general, a decline in oil prices is projected for 2019 *vis-à-vis* the average observations for 2018, in line with the forecast of the average price by the technical staff for this *Report* (USD $63 per barrel). It is likely that the daily and monthly prices vary versus this forecast while there are still risks regarding economic growth, not to mention potential geopolitical events that may affect price dynamics.

Thus, oil prices are expected to recover slightly versus the data from December 2018 (USD $57 per barrel), on account of the cut agreement by the OPEC and its allies, the planned reduction of production in Alberta (Canada), and the full implementation of sanctions on Iranian crude oil. However, this reduction in supply would be offset largely by the strength of oil production in the United States, which, added to a weaker global demand, would result in a lower average price level than observed in 2018 and more sustainable than the one estimated in the previous Report.

5 Before 2014, producers required 1,600 platforms to produce nine million barrels per day. Current levels could be sustained with half of those platforms (IIF, 2018).

6 Particularly, the EIA forecasts that the differential between Brent and WTI be USD $6 per barrel in 2019, and that it reduces to USD $4 per barrel in 2020.

7 At the same time, this growth rate implies a downward revision of 0.2 pp *vis-à-vis* the October 2018 Report.

8 In its January report, the EIA projected global crude oil demand for 2019 at 101.45 million barrels per day, less than the figure projected in its previous report (101.54).

9 The International Energy Agency (IEA) expects an acceleration in the annual growth rate for global crude oil demand in 2019 of 1.4% (1.3% in 2018), while the Institute of International Finance (IIF) forecasts a slowdown in 2018 from 1.3% to 1.1% in 2019.

Table B1.2
Analysts' Oil Price Forecasts for 2019 and 2020.

Reference	Observed in 2018	Forecast		
		Institution	2019	2020
Oil	68.6	FMI	58.95	58.74
		World Bank	67	67
Brent	71.6	EIA	61.03	62
		Bloomberg[a/]	66.87	70
		IIF	67	n/a
WTI	64.8	EIA	54.79	58
		Bloomberg[a/]	60.47	63
		IIF	59	n/a

n/a: Not available.
a/ Corresponds to the median of analysts' forecasts to 31 January 2019.
Note: the IMF's forecast corresponds to the combination of Brent, Dubai, and WTI.

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