

THE OIL TANKERS' PROSPECTS IN THE INTERNATIONAL SEABORNE TRADE EVOLUTION

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Abstract: The seaborne trade continues to be primarily determined by the evolution of the world economy. Although the relationship between economic output and commodity trade seems to change, with a decline observed in recent years in the growth rate of trade in the total Gross Domestic Product, the demand for maritime transport services remains highly dependent on the performance of the world economy. While the industrial and economic activities, the merchandise trade and shipping expeditions may grow at different rates, these variables remain, however, positively correlated. Today, in the conditions of interdependence and globalization, the seaborne oil trade with regards to efficiency and cost-effectiveness is the engine of economic development and prosperity. The oil and liquefied gas transport market is driven by the world's energy needs, the world economy, demographic situation, industrialization, and most importantly, global energy surplus and shortage. This paper analyzes the latest developments in the oil tanker market, in the light of the historical evolution of oil extraction, oil products transport and, hence, the construction of new types of ships specialized for the transportation of various categories of petroleum products on the sea.

Keywords: oil tanker, seaborne, world trade

1. Introduction

In recent years, international maritime transport has continued to face the prolonged effects of the 2009 recession. The seaborne trade has remained under pressure, the global demand has been weak, and increased uncertainty stemming from factors such as trade policy and prices of the raw materials and oil. Also, several trends with relevant implications for maritime transport have progressively continued to draw attention to the evolution of this field [10], such as digitization, the rapid expansion of electronic commerce systems (e-commerce), increasing concentration on the liner shipping market.

Reflecting the state of the world economy, the demand for maritime transport services moderately increased in 2016. Worldwide the maritime trade grew by 2.6% in 2016, compared to 1.8% in 2015, and is below the average of 3% registered in the last four decades. The total freight volume reached 10.3 billion tons, with over 260 million tons of freight, about half attributed to oil trade. In 2017, the world economy, and commodity trade have improved to some extent. However, uncertainty, but also other factors, both positive and negative, is shaping this outlook in 2018.

UNCTAD projections in the medium term indicate a steady increase in cargo volume transported by sea, with a compound annual growth rate estimated at 3.2% between 2017 and 2022. Freight volumes are on the rise in all segments, containerized, and commodity trade dry bulk will register the fastest growth [10].

2.MATERIALS AND METHODS

The evolution of oil tankers analysis has been carried out in comparison with the evolution of the world oil market, and of the seaborne oil products over a large number of years, using official data of international organizations as well as information published by various private institutions recognized worldwide. The data has been critically analyzed by comparing several alternative sources of information. The data obtained were transposed into tables and graphs, based on which conclusions on the subject were drawn.

The oil tankers were first used by the oil industry to transfer refined bulk fuel from refineries to customers. It was then stored in large tanks on land and delivered in smaller quantities, depending on the requirements. Also, other liquids have begun to be transported in tanks, cheaper transport, even Guinness beer factories used tanks to transport bulk on the Irish Sea. In history, bulk oil was tried in many places and many ways. Modern oil pipelines have existed since 1860. Today it is believed that the MV *Zoroaster* (Figure 1) built in 1878 by Nobel, is the world's first successful oil tanker. He designed the ship in Gothenburg, Sweden, together with Sven Almqvist. The construction contract was signed in January 1878, and she made her maiden voyage after a year, from Baku to Astrakhan [1].



Figure 1 MV Zoroaster - the first oil tanker, 1878

Source: <https://www.marineinsight.com/maritime-history/zoroaster-the-worlds-first-tanker-ship/>

After 100 years, the first oil tanker to exceed 500,000 tdw was Batillus, built in 1976 at Saint Nazaire in France, with a displacement of 555,000 tdw, length 414,22 m, beam 63.1 m, draft 28.5 m, propulsion 64,800 HP, and a speed of 16 knots. In the last years of the twenty-first century, oil supertankers, called Ultra Large Crude Carriers (ULCC), have been built with a transport capacity of up to 500,000 tdw [2].



Figure 2 ULCC *Knock Nevis (Jahre Viking)*:displacement 564,763 tdw, length 458.45 m, beam 68.8 m, draft 24.6 m, speed 16 knots

Source:<http://maritime-connector.com/worlds-largest-ships/>

1. Results

1. The seaborne trade continues to be primarily determined by the world economy's evolution, and the international trade evolution. Although the relationship between economic output and commodity trade seems to change, with a decline observed in recent years in the growth rate of trade in Gross Domestic Product (GDP), demand for maritime transport services remains highly dependent on the performance of the world economy. While industrial activity, economic output,

commodities, commerce, and merchant shipping can grow at different rates, these variables remain, however, positively correlated.

The limited activity of the oil-exporting countries in Africa, South America and the Caribbean, Western Asia, and the economies in transition, together with the recession in Brazil and the Russian Federation, continued to grow in the developing economies, as well as in the economies in transition. In LDCs, GDP grew by 3.7% in 2016, well below the growth target of at least 7%, especially in the context of sustainable development objectives.

2. In 2016 the global oil production averaged 1,706 million barrels. Approximately 68% of this production comes from the top ten countries, and 44% from OPEC members. In the last years the first three producers, there have been significant decreases in production over different time periods, but since 2014 all three countries have had a peak of production of 9 to 11 million barrels per day. In 2016 the global oil trade amounted to 218,314 million USD, representing 40.8% of the value recorded in 2011 (Table 1 and Figure 3)

Table 1 The value of world oil trade, 2011-2016, in million USD

Year	Export	Import	Total	% previous year
2011	102.180	431.866	534.046	
2012	111.951	408.509	520.460	97%
2013	123.218	363.141	486.359	93%
2014	127.258	326.710	453.968	93%
2015	85.241	177.445	262.686	58%
2016	75.458	142.856	218.314	83%
Total	625.306	1.850.527	2.475.833	

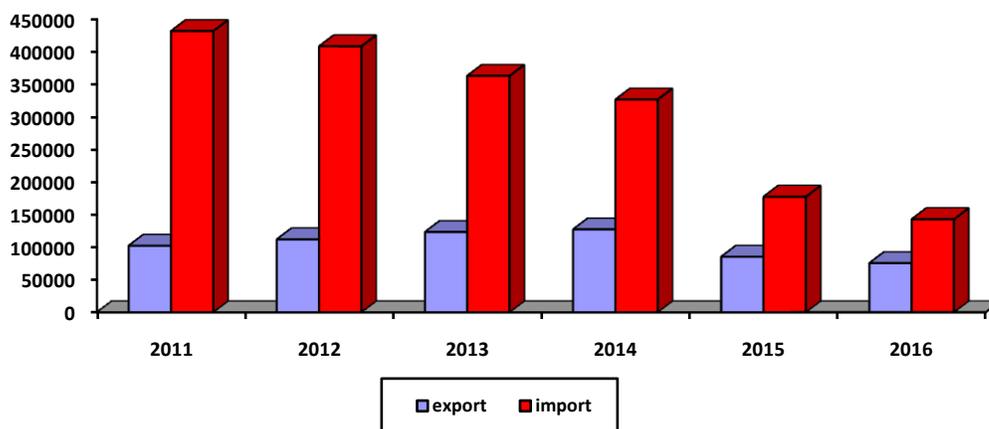


Figure 3 The evolution of the export and import of crude oil between 2011-2016, in a million USD

3. The international trade had a low performance in 2016, with a volume (in value, but adjusted to take account of the evolution of inflation, and exchange rate) up to 1.9% (the average growth rate of import and export) in 2015. Weak trade is both a cause and an effect of slowing down of the global economic activity, given the strong links between investment, growth, and trade. The volume of world export and the import demand accelerated in 2016, as compared to 2015. In 2016, the world's export rose by 1.7%, from 1.4% in 2015, and the world's import demand increased by 2.1% to 1.9%.

4. In line with the development in of the global economy, the demand for maritime transport services improved in 2016, albeit only moderate. The seaborne trade grew by 2.6%, from 1.8% in 2015, which is below the historical average over the last four decades (3%), (Table 2 and Figure 4). The total volumes reached is 10.3 billion tons, reflecting the addition of more than 260 million tons of cargo, about half of which were attributed to tankers. China's strong import demand in 2016 continued to support maritime trade, although global growth was offset by a limited expansion of the import demand from other developing regions.

Table 2 Seaborne crude oil, 1970 to 2016, in millions of tons

1	1970	1440
2	1980	1871
3	1990	1755
4	2000	2163
5	2005	2422
6	2006	2698
7	2007	2747
8	2008	2742
9	2009	2642
10	2010	2772
11	2011	2794
12	2012	2841
13	2013	2923
14	2014	2825
15	2015	2932
16	2016	3055

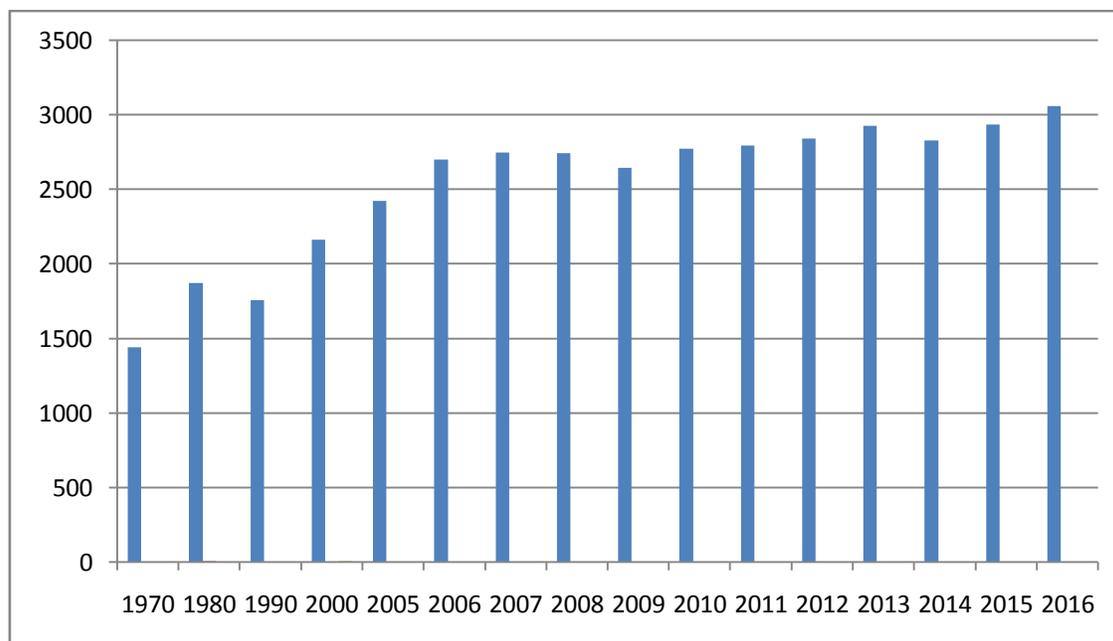


Figure 4 Seaborne crude oil between 1970 and 2016 in millions of tonnes
Source: Review of Maritime Transport 2017

Regarding the volume of oil and oil products transported by sea, the situation is as follows: In 2016, the international trade in crude oil, refined petroleum products, and gas continued to grow

on a surplus supply, and low oil prices. Total volumes reached 3.1 billion tonnes, reflecting an increase of 4.2% over the previous year. The oil import has not been reduced to crude oil, and refined petroleum products, which has led to their storage at a record level. These positive trends were supported by strong demand for crude oil import in China, India and the United States, and a high level of export of petroleum products to China and India. An overview of global players in oil and gas production, consumption and exports in 2016 is presented in Tables 3 and 4, which is reflected in the world seaborne tanker trade – crude oil, refined petroleum products, and gas [10].

Table 3 Major global oil producers and importers,% of the world market (Review of Maritime Transport 2017)

Oil producers	%	Oil consumers	%
West Asia	35	Asia - Pacific	35
North America	18	North America	23
Transition economies	15	Europe	14
Developing America	11	West Asia	11
Africa	9	Developing America	9
Asia - Pacific	9	Transition economies	4
Europe	4	Africa	4
Oil refinery capacity	%	Oil refinery throughput	%
Asia - Pacific	34	Asia- Pacific	34
North America	21	North America	22
Europe	15	Europe	15
West Asia	10	West Asia	11
Economies in transition	9	Transition economies	9
Developing economies in America	7	Developing America	7
Africa	4	Africa	2
World natural gas production	%	World natural gas consumption	%
North America	26	North America	25
Transition economies	22	Asia - Pacific	20
West Asia	18	Transition economies	16
Asia - Pacific	16	West Asia	15
Europe	6	Europe	12
Developing America	6	Developing America	8
Africa	6	Africa	4

Table 4 Oil products world production, 2015 - 2016 (Review of Maritime Transport 2017)

No.	Product	2015	2016	%
1	Crude oil	1761	1838	4,3%
2	Oil and gas products:	1171	1218	4,0%
3	LNG	250	268	7,2%
4	LPG	79	87	10,1%
	Total	2932	3055	4,2%

5. Many types of crude oil are transported at sea, with specific characteristics, depending on the area where it is extracted, so there are light and heavy oil. The classification of crude oil is as follows:

- light oil: mineral composed of a mixture of hydrocarbons of natural origin with variable density and viscosity;

- heavy oil, type of crude oil that exists in areas such as Orinoco (Venezuela), Athabasca (Alberta/Canada), Olenik (Siberia/ Russian Federation), with the following characteristics: near or even higher than water density, high viscosity almost stable at ambient temperature, can not be produced, transported and refined by conventional methods, generally has a high sulfur content and some metals such as nickel and vanadium.

- high-quality heavy oil.

The classification of crude oil by origin is as follows: Europe / North Sea - light product, low viscosity, black; West Africa - thicker than the one in northern Europe, becomes more viscous at temperatures below 19 ° C and volatiles rapidly at temperatures > 27° C; South America - hard, viscous product; The Persian Gulf; Asia/China - very hard product.

A wide variety of refined oil products are also transported: white products (petrol; oil; airplane fuel; gasoline; aromatic); black products (diesel; oils; asphalt).

6. The transportation of these types of goods by sea is subject to very stringent international rules under the MARPOL Convention and is done with specialized oil tankers with specific technical facilities. Tankers or oil tanks are used in the transport of crude oil, derived products, liquefied natural gas, chemicals, and other liquids. They play a vital role in international transportation, namely 3,055 million tons out of a total of 10,287 million tons, approximately 30% of the total cargo carried by sea in the world in 2016. Oil tankers are classified by destination and size. However, the oil tanker is a generic name that also includes vessels carrying petrol, gasoline, kerosene, and paraffin. Oil tankers are divided into two main types: tankers for oil products, and crude oil tankers: oil tankers (product tankers) are intended for the transportation of petroleum-based chemical substances; crude oil tankers are correctly used to transport crude oil from the extraction site to the crude oil refining plant.

Oil tankers, due to their constructive specificity, are equipped with the following facilities: the cargo facility; the cargo heating installation; tank ventilation installation; the cargo tank cleaning and washing installation; segregated ballast system; inert gas installation; the stripping plant. In addition to maritime oil tankers, there are specialized tankers for inland waterways, operating on rivers and canals, with an average capacity of thousand tonnes.

7. The oil tankers market analyses show that in the last decades very large vessels have been built, with unique constructive characteristics (Table 5).

Table 5 Top 10 largest oil tankers

No.	Ship	Displacement (tdw)	Length (m)	Service period
1	Seawise Giant	564.763	458,46	1979-2009
2	Pierre Guillaumat	551.051	454,42	1977-1983
3	Prairial	555.046	412,22	1979-2003
4	Batillus	553.662	414,22	1976-1985
5	Bellamya	553.662	414,22	1976-1986
6	Esso Atlantic	516.891	406,57	1977-2002
7	Esso Pacific	516.421	406,57	1977-2002
8	TI Class (TI Europe, TI Africa, TI Asia, TI Oceania)	441.893	380	2002-present
9	Berge Emperor	423.697	381,82	1975-1986
10	Berge Empress	423.697	381,82	1976-2004

8. Current trends in the construction of oil tankers present new solutions, including one very interesting: the double active tank. The MV *Tempera* (Figure 5) is the first dual-use tanker (DAT). It was built at the Sumitomo Heavy Industries yard in Japan for the Finum group, Fortum Oil and Gas, and operates mainly in the Baltic Sea area. The DAT design used for this ship was developed by Kvaerner Masa-Yards. The DAT acts on the principle of using a double hull structure - a typical structure and an armed form of the bottom of the aft area. The modern design and the technical solution are used to ensure a period of operation of the ship for about 40 years. For this, a double bottom was provided along with a double cofferdam that also offers greater protection for the pump room.



Figure 5 MV *Tempera* the first double acting tank

<https://www.marineinsight.com/types-of-ships/tempera-the-first-tanker-with-double-acting-tank-design/>

9. Given the projected increases in the world GDP, and in the oil products trade, as well as the risks that may arise in the world economy and trade policy, different estimates give a future growth rate of maritime trade since the 2009 crisis. The latest UNCTAD reports [10] show an increase in the number of ships and freight volumes traded between 2017 and 2022. Also, the International Monetary Fund in the global GDP projection for the period 2017-2022 [11] shows that it is expected to increase maritime trade on all segments. Trade in bulk oil products is expected to decline, reflecting the impact of significant oil production cuts by primary producers in early 2017, as well as rising oil prices. Trade in crude oil is expected to grow by less than 1%, while refined petroleum products and gas are projected to increase by 2%.

The medium-term outlook is also positive. UNCTAD estimates growth in global maritime trade with a compound annual growth rate of 3.2% and is consistent with the 3% actual yearly growth rate expected by UNCTAD between 1970 and 2016. Between 2017 and 2022, commodity trade is projected to grow by 5.6%. These rising freight volumes will continue to be supported by significant infrastructure projects such as One Belt, One Road Initiative (China), The North-South International Transport Corridor (India, Russian Federation, and Central Asia). Financing these initiatives remains, however, an urgent desideratum. China has provided initial funding, but more resources are needed to complete the project. The projected increase in volumes of oil products is estimated to remain relatively modest between 2017 and 2022 [24]. The volume of crude oil, refined petroleum products, and natural gas is expected to increase in the coming years by 1.2% and 1.7%, respectively. Future developments in oil trade remain uncertain due to trends in shale gas production and crude oil production and imports in the United States. However, the prospects for gas trade seem to be more positive [23].

10. The evolution of the world tankers fleet over the past two years (2016 and 2017) shows an increase in the displacement of these vessels (Table 6):

Table 6 Oil tankers fleet evolution, 2016-2017 (Review of Maritime Transport 2017)

	2016	2017	2016-2017 %
Oil tankers	505.736.000	534.855.000	5,76
The world fleet percentage share of dead-weight tonnage	28,0	28,7	4,68

Regarding the age of the oil tankers worldwide at the level of 2017, the situation is as follows (Table 7):

Table 7 Oil tankers age distribution

Age (year)	Age 0-4	Age 5-9	Age 10-14	Age 15-19	Age over 20	Average age 2016	Average age 2017	% 2016-2017
% number ships from total	16,03	22,51	15,46	7,74	38,26	18,76	18,36	0,40
% displacement (tdw)	22,07	34,74	34,44	12,67	6,09	9,90	9,54	0,36
Average displacement (tdw)	73,274	82,242	84,610	89,498	9,777			

The maximum displacement of VLCC oil tankers was in 2011 (65 new ships) - 20.1 million tons. In 2017, 15.9 million tdw were scheduled for VLCC, while Aframax deliveries would reach 9.4 million dwt. Deliveries for Panamax ships are 2.4 million dwt. With regards to small oil tankers, only 18 Handysize are delivered in 2017. Deliveries and cancellations of contract orders have increased considerably after the oil market fell in 2009 (Poten & Partners Report, 2017). VLCC tankers have the highest ratio delivery environment of 80%, ranging from a high level of 100% in 2006/2008 to a low of 53% in 2013. Based on the historical variability of ship deployments and its apparent correlation with the transport market, 25 -40% of orders for oil tanks and up to 50% of oil tankers scheduled for 2017 may not be delivered on time. However, the number of orders is high, but the prospects for maritime tanks in 2017 are better than suggested by a brief analysis of this issue [20].

At the beginning of February 2017, petroleum product tanker orders declined to the lowest level in the past 17 years as it was equivalent to 10.2% of the capacity of the fleet, a low-level since August 2000 (Clarksons Research, 2017).

At the beginning of February, the order of tanks for oil products for ships with a tire delimitation of more than 10,000 dwt was 321 ships, over 16 million tdw displacement. This is the smallest number of product tanks commissioned since 2001, after a sharp decline in 2016, when it dropped to 9.2 million dwt, a decrease of 35%.

Overall, investing in the construction of new tanks over the period 2013-2015 has led to a rapid increase in the petroleum product fleet by around 6% in both 2015 and 2016. In 2017, the new construction order is at its highest low level in recent years has fallen to 7.7 million dwt, with an estimated fleet growth of 4% [21].

Conclusions

Today, in the conditions of interdependence and globalization, the transport of oil and liquefied gas by sea, with regards to efficiency and cost-effectiveness is the engine of economic development and prosperity.

The oil and liquefied gas transport market is driven by global energy needs, the world economy, demographic, industrial and, most importantly, the "geography" of global energy surplus and shortage.

As a perspective, increasing profitability with an ever-increasing motivation to protect the environment inevitably leads to the use of natural gas or liquefied petroleum gas, and the study of cost-effectiveness leads inevitably to long-distance sea transport.

The current trend in the construction of ships specializing in oil and gas transport at sea is increasing tonnage, specialization and safety in service.

For the years 2017 and 2018, in its latest Allied Shipbroking-2018 report, in the first half of 2018, crude oil shipments with VLCC declined to \$ 5,449 a day in the last part of March, a figure reached in 2014, while the average value for the past five months is close to \$ 2,100 a day. This is a much lower level than last year, which was around \$ 10,200 a day. Following the current downward spiral, a record level of ship scrapping has been recorded over the past year, a phenomenon that can be considered to be in line with the low earnings, but has also significantly been fueled by high demand from the ship recycling market. On the other hand, there was a relatively high level of new construction activity despite the imbalance between supply and demand and the difficulties encountered. It would have been expected that the new ship orders would be smaller, leaving room for a certain rebalancing to take place in the years. Against this logic, new ship orders registered by the end of April have already reached levels close to half of the total volume recorded last year.

The return of the oil tanker market concerning gains is long and complicated, given current trends and visible geopolitical changes. For the time being, the latest upward trend in crude oil prices can be seen as a possible hope for the market, given the potential generated by arbitrariness in rising prices and production potential. However, given that this recent price increase was not the result of changes in demand but rather changes and concerns about possible supply disruptions, we could conclude that this development is less favorable for oil transporters. It may be thought that the general approach adopted by most investors is that the long-term global outlook looks better and that it may be good and on this basis, this most recent investment in this field may inevitably find land fertile in the future (Table 8).

Table 8 Price Index WET NB (mil. USB) (Allied Shipbroking Inc., 2018)

	18 May 2018	13 April 2018	%	min	average	max
	Last five years					
VLCC	87.0	87.0	0%	80.0	90.5	101.0
Suezmax	58.5	58.5	0%	53.0	59.4	66.0
Aframax	46.0	46.0	1.1%	43.0	49.1	55.0
LR1 (75.000 tdw)	43.8	43.8	0%	40.5	43.8	47.0
MR (56.000 tdw)	35.3	35.3	0%	32.5	34.8	37.3

While a rebound took place in the last month of 2016 and the early days of 2017, the market has recently experienced a further slowdown. The question is now what will happen next, and the

business environment seems somewhat uncertain. To get a clearer picture of short-term prospects, we need to look at the supply and demand side. Crude oil production slowed down by the end of 2016, OPEC group announced a reduction in gross production of 1.2 million bpd in 2017. According to OPEC and IEA (International Energy Agency) estimates, in January 2017, OPEC reached only 90 % of total production compared to planned production reductions. However, the potential for non-compliance with the projected production plan for the rest of the year, given the group's history, is not small and generates excellent uncertainty. At the same time, Iran is exempt from cuts as it attempts to bring production back to levels similar to those of the pre-sanctioning period, backing positive expectations for an increase in Iranian crude oil exports in 2017. Exports from OPEC countries are approximately 60% of global exports, and therefore these reductions can affect world trade. However, with OPEC members, several non-OPEC countries have agreed to reduce their oil production in 2017. It remains uncertain whether these countries, such as Russia, will meet reductions, although current projections show a 1% drop in exports gross crude oil of the former Soviet Union in 2017. Reducing crude oil production creates similar uncertainty in crude oil imports. If OPEC and other countries insist on cuts in production, oil prices will continue to rise, in which case the US will increase its investment in shale gas oil industry. In the case of shale oil production, imports from the US will drop to about 10%. Also, these higher oil prices will reduce European imports, as their profit margins are lower and, subsequently, import activity may be adversely affected. Therefore, we see that all the uncertainty in the oil industry results from the fact that the production cuts will be applied in full or not. Although there is a high degree of difficulty about crude oil production in 2017, which will permanently affect exports and imports, the current projections of global oil exports only refer to an increase of just 0.2% which represents a significant slowdown compared to the 2016 growth [23].

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