

An Analysis of the Global Oil Market in 2020

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Abstract

Twenty-twenty represented one of the most volatile periods of history for the oil market. This volatility was reflected in market prices, with oil futures going negative in April 2020 and ending the year closer to pre-pandemic levels. As the year progressed, geopolitical tensions, a global pandemic, price wars, hurricanes, and vaccine innovation all contributed to the fluctuations in global demand and supply for oil. The year opened in January with oil prices rising following U.S. airstrikes targeting an Iranian high-ranking military official. February and March saw the beginning of the Covid-19 pandemic, which ushered in a dramatic demand shock unprecedented in market history. April's negative futures prices were the result of an oversupplied market meeting this historic demand deficit. May and June saw the continuation of the Covid-19 demand trend. However, July and August were met with a significant resurgence in Covid-19 in many parts of the world and hurricanes that battered U.S. oil production. September and October saw both economic and political development, particularly in the United States, dampen projections for future demand. Finally, the last two months of the year saw renewed hope that demand challenges would eventually be solved with the emergency authorization of Covid-19 vaccines.

An Analysis of the Global Oil Market in 2020

Introduction

Analysts and historians will long remember 2020 as one of the most interesting years in oil market history. As a result of the global Covid-19 pandemic, both demand and supply experienced unparalleled swings. In a seemingly complicated market, such as the oil market, analyzing how demand and supply developed over 2020 is an interesting entry point into understanding a fuller view of the factors that lead to supply and demand shifts. This paper will begin by giving an overview of 2019's oil market movements in order to provide context for 2020. It will then proceed to lay out the specific supply and demand drivers that affected the price of oil for each month of 2020 (IEA, 2020n).

Oil Markets in 2019

2019 Overview

The oil market saw a strong start in the first quarter of 2019, as the global economy appeared to be growing at a steady pace and the Organization of the Petroleum of Exporting Countries (OPEC) agreed to maintain production cuts. However, demand weakened in the second quarter as economic growth slowed and trade tensions between the U.S. and China escalated (IEA, 2020n). Additionally, the market was impacted by the increasing production of shale oil in the U.S. and concerns about a potential global economic slowdown, which put downward pressure on prices (IEA, 2020n). Despite these challenges, the market remained relatively stable and saw a slight rebound in the fourth quarter, closing the year on a stronger note.

Demand Shifters

In 2019, daily global demand for crude was at an all-time high of 99.7 million barrels per day. While demand had reached record levels, analysts became concerned about the rate of demand growth. The growth in demand only increased 0.9%, which represented 40% of the growth rate from the previous year (IEA, 2021a). The main culprit of this relative slowdown in growth was economic growth. In 2019 real GDP in the United States increased 2.3% compared to the growth of 2.9% seen in 2018 (Bureau of Economic Analysis, 2020). This data reflects a trend that was seen on a global level. Global GDP tumbled 0.7% from 3.6% growth in 2018 to 2.9% growth in 2019 (IEA, 2020n). At the time, analysts were concerned that this slowdown in economic growth signaled the end of the economic growth that had been enjoyed since the 2010s, which was characterized by low interest rates and rising trade and investment.

Supply Shifters

On the supply side, worldwide oil production in 2019 reached levels that it never had before at a slower rate. 94.92 million barrels of oil were produced per day in 2019, which contrasted with 94.88 million barrels per day in 2018 (B.P., 2022). These outputs represented 1% growth year-over-year compared to an annual growth rate of 2.5% from 2017 to 2018. Although the rate of growth was slowing, oil production levels in 2019 represented a historic peak in output that is yet to be matched.

Complications on the supply side of the equation mainly stemmed from geopolitical tensions. First, the United States trade war with China impacted oil production in more ways than stunting consumer demand. For one, a lot of the equipment pieces, such as steel, the U.S. uses to produce oil is imported from China. Additionally, China had become an important market for U.S. oil producers, which exported 500,000 barrels of oil per day to China in 2018 (Rapier,

2019). Second, in September of 2019, the Houthi movement in Yemen commenced a drone strike on vital Saudi Arabian oil processing facilities, which resulted in a total loss of 5% of the world's oil supply (Said and Jones, 2019). Finally, OPEC in response to increased U.S. production and to prepare for a projected slowdown in economic activity cut production levels by 800,000 barrels per day in the beginning of 2019. By the end of 2019, OPEC produced 29.7 million barrels per day compared to 32.3 million barrels per day of production in 2018 (Kraus, 2019).

Increased American oil production reduced price risk for these situations that in the past had caused serious market volatility. From 2012-2019 the United States was in what many considered to be a new fracking boom. In fact, in 2018, the United States was the largest crude oil producer, producing 15% of the world's crude oil supply (EIA, 2021b). By 2019, production had more than doubled from 5 million barrels per day in 2012 to greater than 12 million barrels per day in 2019 (EIA, 2022a). The reason for the increased production stemmed from both oil-friendly policy and regulation cuts from the Trump administration and the widespread adoption of hydraulic fracturing and horizontal drilling techniques, which unlocked vast reserves of oil trapped in shale rock formations (Kilian, 2016).

In December 2019, OPEC and its allies, including Russia, announced that they would increase their production cuts by 500,000 barrels per day resulting in a total OPEC production cut of 1.7 million barrels per day, which equated to a 5.7% drop in production. This was done in an effort to prop up prices and prevent a surplus of oil on the market. The decision was made after oil prices had dropped by more than 25% since April 2019, due to a combination of rising U.S. production, slowing global economic growth, and uncertainty surrounding the U.S.-China trade dispute. This was seen as a significant move by the OPEC, as it had previously resisted

calls to cut production in an effort to maintain market share. The cuts were set to take effect in January 2020 and were set to last for six months, with the possibility of an extension (Hodari and Toy, 2019).

IEA's 2020 Predictions

Heading into 2020, it was clear that while slowing growth was something to pay attention to, the global energy industry emerged from 2019 from a position of relative strength. In the midst of the demand slow down and supply challenges of 2019, oil and gas prices were relatively stable, providing a sense of security for energy producers. Throughout most of 2019, West Texas Intermediary (W.T.I). crude's price oscillated between an average range of \$52.00 to \$58.00. The NYMEX WTI, also known as West Texas Intermediate, is a type of crude oil that is used as a benchmark in oil pricing. It is sourced from the Permian Basin in West Texas and is used to set the price of crude oil futures contracts traded on the New York Mercantile Exchange (NYMEX). It is one of the most widely used benchmarks for oil prices around the world. Brent crude oscillated between \$60.00 and \$66.00. Extracted from the North Sea, Brent crude is a significant global oil pricing benchmark, serving as a reference for about two-thirds of the world's crude oil supplies that are traded internationally. Additionally, despite a minor slowdown, global population figures and economies, as measured by GDP per capita, were continuing to grow, providing a steady demand for energy (IEA, 2020n). Specifically, steady demand was brought on by growth in the global transportation sector, especially in developing nations, and in the petrochemical industry, which uses oil as a feedstock and benefited from increased demand for plastics and other products (IEA, 2020n).

Outlooks for 2020 suggested that many of the trends present in the 2019 oil market would continue or even reverse, resulting in a similarly stable market for the year. The International

Energy Agency (IEA), which is an intergovernmental organization designed to further energy security and economic development by promoting international cooperation on energy policy, predicted that non-OPEC production would increase by 2.3 million barrels per day and that global demand would grow by 1.2 million barrels per day in 2020 (IEA, 2019). In reality, both demand and supply fell dramatically over the course of the year. OPEC's production projections for 2020 were in line with the IEA's coming in at a little less than 2.5 million barrels a day of supply growth from non-OPEC producers and its demand projections was more aggressive with a total growth of 2.3 million barrels per day in 2020 (OPEC, 2019). These forecasts were based on the assumption that the United States would reverse its stale growth trend in 2019 and begin to gather momentum heading into 2020. However, what none of the major players in world oil markets could reasonably forecast was a world pandemic that would turn the mechanics of the energy industry on its head.

January 2020

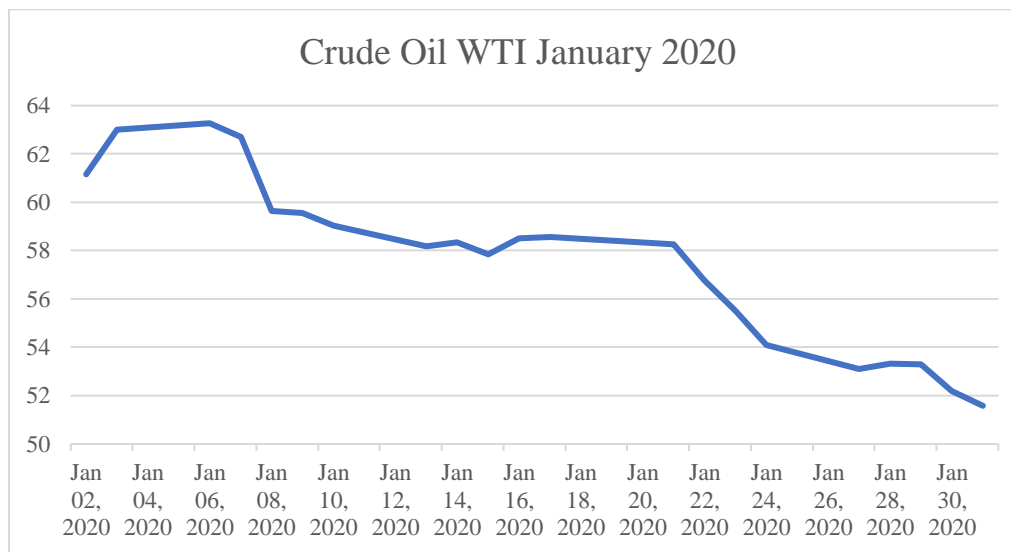
Geopolitical Tensions

As seen in Figure 1, the price of crude was on a downward trend for all of January 2020. It began with excitement as the U.S. conducted airstrikes in Iraq on January 3rd, targeting Iranian-backed militias in response to a missile attack on an American base in the country. This action escalated tensions between the U.S. and Iran, leading to a period of uncertainty and potential for further conflict. At the heart of the tension between the two countries, was the fact that the United States had killed Qasem Soleimani in the air attacks. Qasem Soleimani was a high-ranking Iranian military officer and the commander of the Quds Force, the special operations division of Iran's Islamic Revolutionary Guard Corps (IRGC). The United States government claimed that Soleimani had been behind several devastating terrorist attacks

resulting in the death of hundreds of Americans. The Iranian government issued statements condemning the strikes as a violation of their sovereignty, and the Iranian parliament held an emergency session to discuss the attacks. Iran's Supreme Leader, Ayatollah Ali Khamenei, called for three days of mourning and vowed to take revenge for the killing of Qasem Soleimani. Iran's Islamic Revolutionary Guard Corps also issued a statement, saying that they would take "severe revenge" against the U.S. and its allies. On January 8th, Iran launched a missile attack on two military bases in Iraq where U.S. troops were stationed, in an action that was seen as a retaliation for the killing of Soleimani (Clary and Talmadge, 2022).

Figure 1

Crude Oil WTI Price January 2020 (EIA, 2023)



Demand Shifters

Following the news of his death, oil prices initially surged, with Brent crude oil prices rising by about 4% and W.T.I. crude oil prices climbing by about 3%, which equated to about \$64 per barrel for Brent crude and \$59 per barrel for W.T.I. These prices represented the highest

level seen in 7 months. The concern was that the killing could lead to a wider conflict in the Middle East, which would disrupt oil supplies from the region and push prices higher. Iran is one of the world's largest oil-producing countries and a member of OPEC. According to the U.S. Energy Information Administration (E.I.A.), Iran's oil production was around 6.27 million barrels per day in 2019 (E.I.A., 2022b). Shifts in demand were mainly brought about by concerns that supply would be disrupted. Concerns over oil supply disruption were mainly focused on OPEC's response, as opposed to the loss of Iranian oil exports. The oil industry in Iran had already been heavily sanctioned by the United States since 2017, which had caused severe underinvestment in Iran's energy sector. As a result of the sanctions, Iran's average crude oil and condensate exports fell 84% since 2017 (E.I.A., 2022b). So, while Iran may have not been the most efficient and important global oil producer, the effect that a potential armed conflict may have in that region was enough to move the price of crude oil higher.

Supply Shifters

In the final analysis, January's global oil output, was largely unaffected by these geopolitical tremors. Total supply fell by 0.8 million barrels per day resulting in total output of 100.5 million barrels per day. While this data points to a slowdown in production, output differed very little from January 2019's output of 99.7 million barrels per day. Non-OPEC production picked up the slack from the OPEC production cuts by increasing their production by 2.1 million barrels per day (IEA, 2020l). At the end of January 2020, the outlook for oil markets remained optimistic. The IEA projected demand to increase by 1.2 million barrels per day due to low inflation, higher GDP figures, and a calming of the trade war between China and the United States. Ultimately, analysts were confident that global supply was sufficient enough to withstand predictable geopolitical threats (IEA, 2020m).

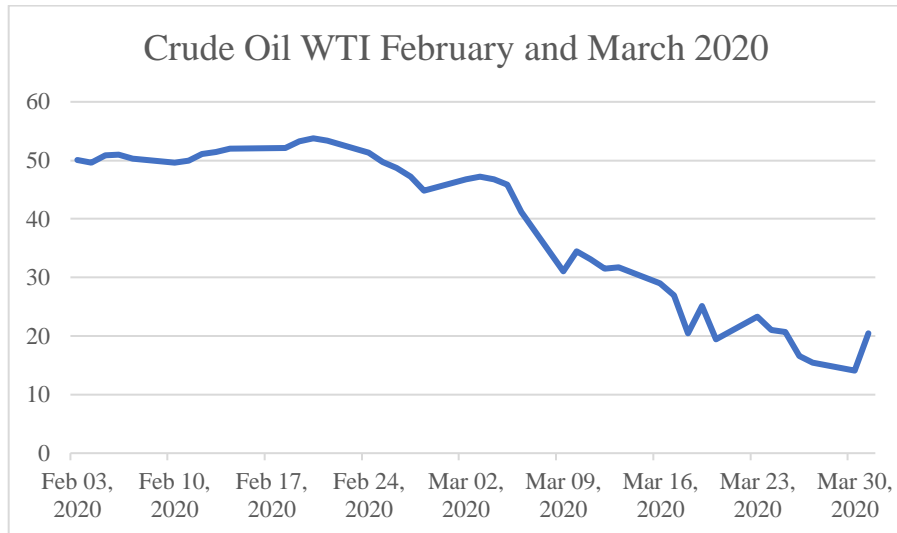
February and March 2020

Covid-19

February 2020 began with price stabilizing but continued the downward trend, as the month progressed, which is shown in Figure 2. It marked the beginning of one of the most turbulent and unprecedented times in market history, the outbreak of Covid-19. Covid-19, also known as the coronavirus disease, is caused by a virus called SARS-CoV-2. It was first identified in Wuhan, China, the capital of Central China's Hubei province, in November 2019 (Ma, 2021). The virus is believed to have originated in bats and then spread to humans through an intermediate host, such as a pangolin. The first cases were linked to a seafood market in Wuhan, which also sold live animals. However, it is also possible that the virus was circulating in the population before it was first detected. In the beginning, the outbreak was exclusive to Wuhan. A retrospective approach found that by December 20th, 60 people were infected and by December 31st at least 266 individuals were infected (Ma, 2021). On January 7, the World Health Organization (WHO) was able to confirm that the virus was a new strain of coronavirus. The WHO activated its incident management system and sent a team of experts to China on January 8 to assist with the investigation and response to the outbreak. The WHO also alerted countries around the world and provided guidance on how to detect, diagnose and manage patients with the virus (WHO, 2020). By the beginning of February, cases had begun to spread in Italy. While in some parts of the world, like the United States, the extent of the COVID-19 outbreak was not yet fully understood, there were beginning to be warning signs that this virus could cause serious harm.

Figure 2

Crude Oil WTI Price February and March 2020 (EIA, 2023)



In February 2020, the COVID-19 outbreak was already having a significant impact on China's economy and industries. The outbreak caused widespread disruption and shutdowns of factories, businesses, and transportation systems, which led to a decrease in demand for oil. However, in March 2020, Covid-19 went from a Chinese issue to a global crisis. The WHO declared the outbreak a pandemic on March 11, 2020. In the United States, the number of confirmed cases began to rise rapidly. In response, the U.S. government and many states started to implement measures such as travel bans and social distancing guidelines to slow the spread of the virus. In Europe, the virus began to spread rapidly, with Italy, Spain, and France being among the countries with the highest number of confirmed cases. Several countries in Europe introduced strict lockdown measures to contain the spread of the virus. In Asia, countries like South Korea, Japan and Singapore reported a significant increase in cases, but China, where the pandemic began, reported a decrease in new cases, thanks to the strict measures they had put in place. Overall, the situation continued to worsen globally, with more and more countries

reporting cases and the number of deaths increasing. Many countries implemented strict lockdown measures to slow the spread of the virus and to protect their citizens.

Demand Shifters

Demand for energy-related products plummeted to levels not seen in decades. With 187 countries instituting some sort of lock down measure and over 4 billion individuals under containment in March 2020, global transportation came to a virtual standstill (IEA, 2020k). Global road transportation was down 50% from its 2019 average, global commercial air travel was down 75% from its 2019 average, and public transportation fell by over 95% in areas, such as London (IEA, 2020k).

As a result of the transportation, slowdown fuel demand sank by 10.8 million barrels per day or over 10% in March (IEA, 2020j). Fuel demand fell the farthest in China with demand slowing down by 2.8 million barrels per day or over 20% (IEA, 2020j). While many questioned the veracity of data coming from China, at the beginning of the pandemic, it was the only data that was readily available. The United States had the second biggest reduction in fuel demand with a reduction of 1.6 million barrels per day or close to 8% (IEA, 2020j). While the majority of this demand reduction was caused from the primary effect of the lockdown measures, the secondary effects of the lockdown measures was the reduction of GDP due to less economic activity.

The IEA projected that April would see demand fall by 29 million barrels per day and May would see that number reign in slightly to 25 million barrels per day (IEA, 2020k). At this point, most analysts were in agreement that demand would improve in June (IEA, 2020k). In June, the fall in demand was projected to resemble the decrease seen in March. In aggregate

global oil demand for 2020 was projected to fall by 9.3 million barrels per day compared to 2019 in March 2020 (IEA, 2020k).

Supply Shifters

On the supply side, there was a global decrease in supply of close to 12% (IEA, 2020k). This would mean that production levels would be as low as they were in 2011. Non-OPEC producers responded quickly to the decreased demand. Oil companies in the United States abandoned drilling plans and reduced budgets at a record pace. In fact, it only took 4 weeks for 25% of all U.S. oil rigs to be shut down (IEA, 2020j).

In early March 2020, Russia refused a proposal by OPEC (of which Saudi Arabia is the de facto leader) to cut oil production in order to prop up falling oil prices caused by the COVID-19 pandemic. In response, Saudi Arabia announced that it would increase its own oil production and offer discounts to customers, effectively starting a price war with Russia. The price war led to a significant decrease in oil prices, causing economic damage to both countries and other oil-producing nations (Egan, 2020). By the end of March, it was clear that OPEC was going to reach an agreement regarding production cuts. On April 12th, OPEC+, which is OPEC plus several non-OPEC countries, such as Russia, Kazakhstan, and Mexico, announced that they had reached a deal that would represent one of the largest production cuts in the history of oil production. They agreed to cut output by 9.7 million barrels per day for May and June, 7.7 million barrels per day in the second half of 2020, and 5.8 million barrels per day in the beginning of 2021 (OPEC, 2020).

Price Movement

The price of oil fell drastically in March. On March 8, W.T.I. fell to \$31.13, which represented a one day decrease of 24.6% and Brent fell to \$34.36, which represented a one day

decrease of 24.1%. This was the lowest level that either of these grades traded at since 2016, and the price action represented the largest one-day price decline since 1991 during the Gulf War (Stevens, 2020). W.T.I. and Brent had the biggest ever price declines in March 2020. Both grades fell by around 40% during the month, which represented 18-year lows. As the dust settled, W.T.I. finished March at around \$22.74 per barrel and Brent finished the month at \$20.09. However, as the month progressed, Brent did reach below \$20 in intraday trading. As demand continued to slow, the futures forward curve entered into an extreme contango. A contango is a market condition where the future price of a commodity is higher than the spot price, resulting in a positive cost of carry for holding the commodity (IEA, 2020j). At the end of March, Brent's 3-month spread came in at \$7.02 per barrel. This was a spread not seen since 2004. The market picked up that was economically beneficial to store oil, as it could be sold for more in 3 or 4 months (IEA, 2020j).

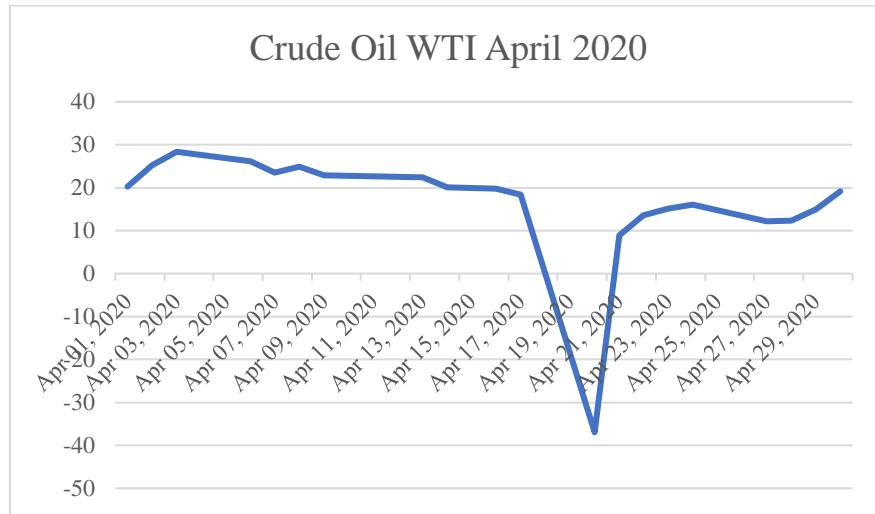
April 2020

Futures Volatility

April 2020 brought with it an unprecedented event in global oil markets, negative oil futures prices. In Figure 3 it is shown that on April 20, the NYMEX West Texas Intermediate (W.T.I.) contracts for May 2020 delivery settled at a price of -\$37.63 (Le, T., Le, A. T., & Le, H, 2021). W.T.I.'s negative price represented a break from W.T.I.'s historic relationship with Brent and broader energy market prices. Additionally, CL May contract's price going negative, caused the NYMEX E-mini W.T.I. contract (Q.M.) to halt trading. The "law of one price" suggests that the prices of these two contracts should be closely connected due to potential for arbitrage. A review of data from 2011 to 2020 shows that the average price difference per barrel between these contracts is usually insignificant, except for April 20, 2020 (Burns and Kane, 2022).

Figure 3

Crude Oil WTI Price April 2020 (EIA, 2023)



There are three factors that in confluence produced this historic price movement. Two are demand-oriented, and one is supply driven. They are the sustained drop off in demand from the Covid-19 pandemic, the stretched storage capacity for crude, specifically in Cushing, Oklahoma, and the oversupply of oil from the Middle East.

Demand Shifters

By April, it was clear that oil demand in 2020 would represent the largest fall in oil demand in history. There was still over 4 billion people in some sort of mandated confinement. Although the IEA's mobility index saw a slight increase in November from 70 to 85, it was still at historically low levels. This led to global demand for gasoline products to continue spiraling downward, with gasoline demand in the United States falling by as much as 40%. The global unemployment rate rose significantly. In the U.S., the unemployment rate surged from 4.4% in March to 14.7% in April, resulting in over 20 million job losses (IEA, 2020i). These were

unemployment levels that have not been seen since the 1930s. Additionally, most nations reported extremely low GDP growth for Q1 2020; China's GDP dropped by 6.8% year-over-year, the Eurozone's GDP decreased by 3.3% (France -5.4%, Spain -4.1%, Italy -4.8%), and the U.S. saw a meager increase of 0.3%. All of this economic devastation resulted in April oil demand falling by 25.2 million barrels per day (IEA, 2020i).

Historic lack of demand for energy products lead to storage limitations have left many producers without a place to put their product. Cushing, Oklahoma is a major hub for oil storage and transportation in the United States. The city is home to a large network of pipelines, storage tanks, and terminals that connect oil producers in the region to refineries and other destinations across the country. The Cushing oil storage facility is one of the largest in the world, with a storage capacity of over 80 million barrels of crude oil (Reed and Krauss, 2020). This capacity makes it an important hub for the distribution and trading of oil. The facility is closely monitored by the U.S. government and industry groups, as changes in the amount of oil stored in Cushing can indicate shifts in global supply and demand. In April of 2020, Cushing's available storage dwindled down to 21 million barrels, which represented a little less than two days of American oil output (Reed and Krauss, 2020). In February, Cushing's storage levels had not even approached 50% of total storage capacity (Reed and Krauss, 2020). In total, Cushing's storage build up rose by 23 million barrels in April, causing total Cushing storage to reach 65 million barrels, which equaled 83% of total capacity (Brusstar and Hui, 2020). Total U.S. crude stocks rose by 48 million barrels in April 2020. Cushing and the LOOP, Louisiana Offshore Oil Port, terminal were the two main contributors to this build up. Limited capacity caused the majority of storage hubs to drastically raise storage costs. LOOP's crude oil storage futures contract rose to \$0.55 per barrel in April, which was up from \$0.07 per barrel in March (Brusstar and Hui, 2020).

Nobody wanted the excess oil being produced because they could not find a place to store the product, or they could not afford the high prices of storage.

The total decrease in oil deliveries for the month was 12.5 million barrels per day, or 26%, the biggest drop ever recorded (IEA, 2020f). Specifically, the United States saw a decrease of 5.5 million barrels per day, the United Kingdom decreased by 860 thousand barrels per day, France decreased by 720 thousand barrels per day and Canada decreased by 680 thousand barrels per day (IEA, 2020f). Global oil consumption decreased by 21.7 million barrels per day compared to the same month the previous year (IEA, 2020f). In the Organization for Economic Co-operation and Development countries, the largest decline was in gasoline consumption, which dropped by 5.6 million barrels per day, followed by jet fuel/kerosene at 2.9 million barrels per day, and gasoil/diesel at 2.6 million barrels per day (IEA, 2020f). Because of the demand devastation, April 2020 has since been dubbed “Black April”.

Supply Shifters

In the beginning of April, Russia and Saudi Arabia, two of the world's largest oil producers, had increased their production, further flooded the market, and caused a steep drop in oil prices. As a result, many oil-producing countries were forced to cut production or even shut down wells due to the low prices and lack of demand. In early April, OPEC+ signed a deal that would further cut production by 9.7 million barrels per day in May and June (IEA, 2020i). However, the severe drop in demand for crude drastically outpaced these cuts and made it difficult for the global supply chain to absorb the additional product (IEA, 2020i).

Saudi Arabia and the United Arab Emirates sought maximum oil production in March and the beginning of April. Saudi Arabia was producing 12 million barrels per day, which allowed it to tie with the United States, as the number one global crude producer in late January

(IEA, 2020j). In April, OPEC's crude oil production was 30.73 million barrels a day an increase of 2.38 million barrels from the previous month and 1 million higher than April 2019.

Meanwhile, non-OPEC oil supply decreased by 1.1 million barrels a day compared to the previous year. The countries that increased production in April primarily exported to China, which had lifted its Covid-19 restrictions and imported more than 11 million barrels a day of crude, a record high, as per the vessel loadings. Iraq, Saudi Arabia, Russia and Brazil all exported at or near their highest levels. The increase in oil supply from Gulf producers more than made up for the decrease from North America, Ecuador and other regions, resulting in a global oil supply of 100.05 million barrels a day in April, an increase of 260 thousand barrels a day from the previous month (IEA, 2020i). This amount of output coupled with decreased demand forced producers to have to pay buyers to take the oil off their hands. The extreme output was not expected to last, however. By May, the OPEC+ production cuts were set to come into effect and Saudi Arabia pledged to cut its production by a voluntary amount of 1 million barrels a day in June (IEA, 2020j).

May-June 2020

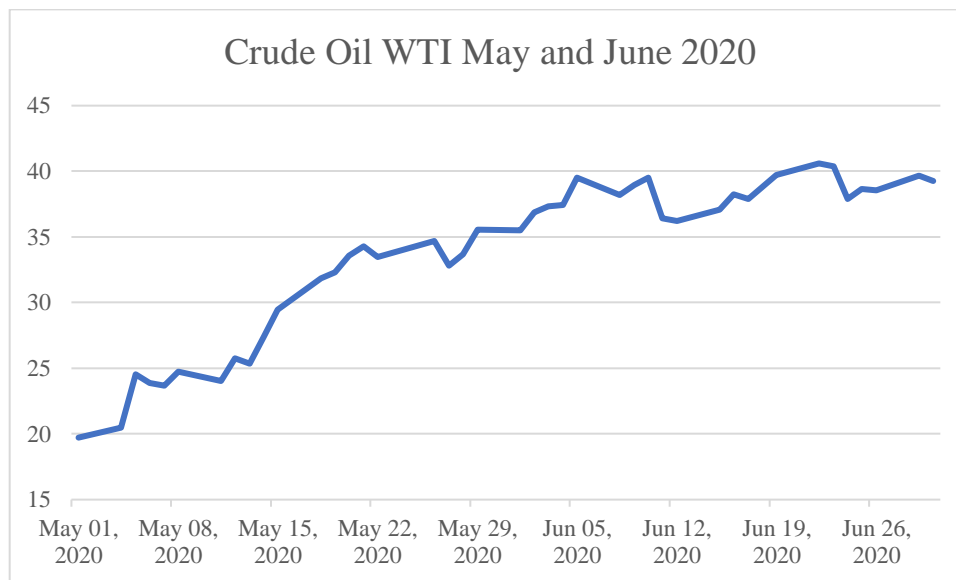
Market Movement

May and June saw a general increase in prices, which is seen in Figure 4. On May 6th, the price of W.T.I. decreased after experiencing a period of five consecutive increases, settling at \$23.88 per barrel. This followed a 20% increase to its highest close since April 17th, due to expectations of increased demand as restrictions were being lifted around the globe. Similarly, Brent crude oil finished at \$29.72 per barrel, following a 14% increase (Nasdaq, 2023). On May 21st, W.T.I. and Brent both reached their highest levels since March 10th, with W.T.I. settling at \$34.30 (E.I.A., 2023) and Brent at \$36.06 (Nasdaq, 2023). The decrease in U.S. crude supplies

and OPEC production, along with positive economic news from Europe and the United States, contributed to these gains. However, potential tensions with China limited the extent of the increase (IEA, 2020g).

Figure 4

Crude Oil WTI Price May and June 2020 (EIA, 2023)



On June 11th, the price of W.T.I. experienced a significant decline, dropping by more than 8%, the largest decrease since April 27th. This resulted in the first negative weekly performance in seven weeks, closing at \$36.43 (E.I.A., 2023). Similarly, Brent crude oil also ended the week with a decline of over 8% (NASDAQ, 2023). Despite OPEC's efforts to reduce production, the ongoing COVID-19 pandemic continued to weigh on the oil market (IEA, 2020g). For the week ending June 19th, W.T.I. saw a slight increase of nearly 10% to \$39.75 (Nasdaq, 2023). However, on June 24th, W.T.I. experienced a decline of nearly 6%, before slightly recovering the following day to close at \$38.72 (E.I.A., 2023), while Brent also saw a decrease of more than 5%, before a slight recovery. The decrease was due to some U.S. states

delaying the process of reopening and others returning to lockdown measures in response to COVID-19 (IEA, 2020g).

Demand Shifters

By May, the annual decrease in oil demand was 18.6 million barrels per day, which is about a 15% improvement from April. While this figure still points to an unprecedented reduction in demand, the narrowing of the annual contraction was a positive sign that conditions were improving. There were certainly signs of demand improvement from areas, such as China and India. During March and April, China had increased so drastically that analysts predicted Chinese oil demand would grow to a level greater than 2019's third quarter levels. China saw such impressive growth during this period (1.1 million barrels a day in April and 0.7 million barrels a day in May) because of a rebound in demand for gasoline and diesel, as manufacturing and driving activity began to increase. Total Chinese demand approached 14.2 million barrels per day (IEA, 2020f). In India, similar reduction of lockdown measures caused demand to increase by 1.1 million barrels per day (IEA, 2020g).

As June came to a close, 2nd quarter demand destruction for crude came in at a decrease of 16.4 million barrels a day compared to the same period a year ago (IEA, 2020f). In June, there was a year-over-year increase of 730 kb/d, significantly lower compared to the average of 2.6 mb/d for the first five months of 2020 (IEA, 2020d). Chinese oil consumption exceeded expectations with a year-over-year increase of 750 thousand barrels per day, the greatest growth since before the Covid-19 outbreak. The greatest rises were observed in transport fuels like gasoil/diesel and gasoline, increasing by 185 and 210 thousand barrels a day respectively (IEA, 2020d).

Supply Shifters

During April to June, oil production was reduced by an average of nearly 14 million barrels a day globally, with Saudi Arabia leading the way, due to an unparalleled decrease in demand and falling oil prices (IEA, 2020f). This swing in supply represented a market that was attempting to reach equilibrium. In May, the global oil production dropped by nearly 12 million barrels a day compared to April, because of an historic cut by OPEC+ and a large number of closures by U.S. producers (IEA, 2020g). In June, world oil production dropped to its lowest point in 9 years due to cuts by Saudi Arabia exceeding 1 million barrels per day below its OPEC+ quota and decreases in both Iraq and the U.S. of around 500,000 barrels per day. With a total output of 86.9 million barrels per day, June's production declined by 2.4 million barrels compared to the previous month and 13.4 million barrels compared to the same time the previous year (IEA, 2020f).

The historic reduction in supply had many analysts and producers concerned that it would be challenging to revamp production to meet the forecasted rebound in demand for 2021. When a well or production facility is closed, it may take some time to bring it back to full operation. This is particularly true if the production facilities have been shut down for an extended period. Also, if the closed wells are unconventional, such as shale, the production rate may fall quickly after reopening, making it more challenging and costly to restore it to its previous level of production before the shutdown. Because of the challenging market environment, oil producers took sizeable hits to their margins. Additionally, the move towards renewable production of diesel products and preceding plans to reduce petroleum refineries led to production closures in 2020. At the beginning of 2020, the number of refineries that were either active or inactive in the United States, not including U.S. territories, was 135. In 2021, it was 129. As a result, 2021

opened with the lowest U.S. annual capacity figure at the start of a year since 2015 with 18.1 million barrels a day (E.I.A., 2021b).

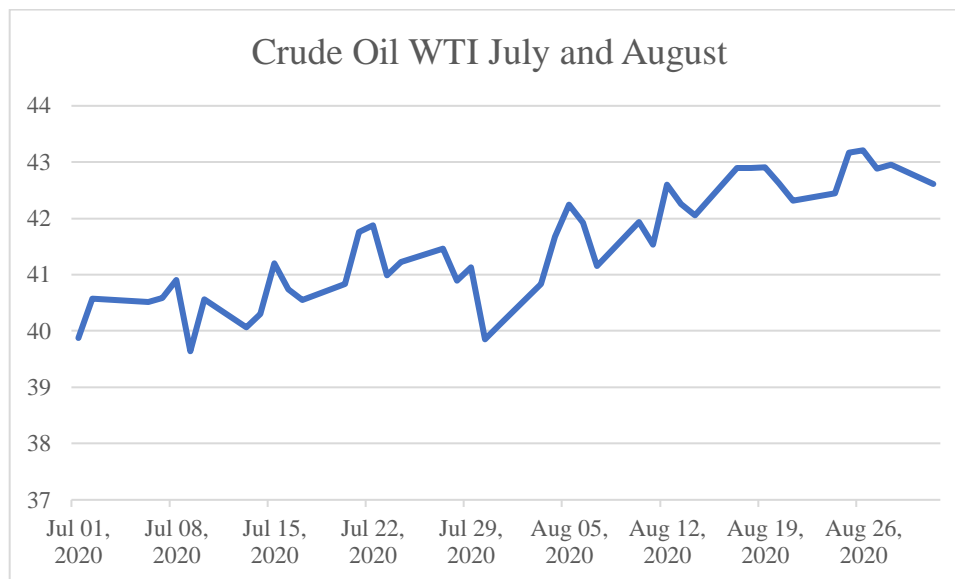
July-August 2020

Covid and Hurricanes

Figure 5 proves that July and August continued the positive price trend from the two previous months. At the end of May, many U.S. states and countries around the world had planned to ease up on lockdown restrictions. However, on July 2nd 50,000 new Covid-19 cases were recorded in the United States, which represented the biggest one-day increase in cases since the Covid-19 pandemic began. As a result, many states, such as Indiana and California, extended lockdown measures (AJMC Staff, 2020c). By July, the number of new confirmed Covid-19 cases had been consistently increasing, reaching a plateau at around 280,000 per day, which is the highest rate since the beginning of the pandemic. The lifting of the initial confinement measures was expected to result in a resurgence of cases as normal activities resumed. In response, several countries reinstated social distancing measures and implemented localized lockdowns (IEA, 2020a). On July 17th, a new daily record of 75,600 reported cases, the 11th time the record was broken since June, in the U.S. signaled that Covid-19 disruptions were far from over (AJMC Staff, 2020b). While through August new daily cases declined slightly, Covid-19 still remained a present threat, as it became the third leading cause of death in the U.S. behind cancer and heart disease (AJMC Staff, 2020a).

Figure 5

Crude Oil WTI Price July and August 2020 (EIA, 2023)



Near the end of August and into the beginning of September, Hurricane Laura, a category 4 hurricane, wreaked havoc through the Gulf coast of the United States. Damage to oil facilities in the U.S. Gulf of Mexico caused a substantial portion of offshore supply to remain offline weeks after landfall. The restart of production has been hindered by onshore power disruptions, logistical issues, and Covid-related staff shortages. At first, it appeared that the reduction in refinery demand would match the reduction in production. However, refiners recovered at an extremely fast rate, so that demand eventually passed supply, which forced the United States to tap into its Strategic Petroleum Reserve. The Strategic Petroleum Reserve (S.P.R.) is a government-held stock of crude oil stored in underground salt caverns, used as a contingency against oil supply disruptions. At the end of August, Hurricane Laura caused a shutdown of 1.7 million barrels per day of crude oil production in the Gulf Coast (IEA, 2020d). By September 12th, three refineries with a combined capacity of 700 thousand barrels a day were still closed,

compared to nine refineries with a total capacity of 2.3 million barrels a day offline after the initial destruction (IEA, 2020d).

Demand Shifters

In July, demand rose by 3.4 million barrels a day on a month over month basis. This increase in demand represented a spike compared with seasonal averages. The rise in demand was largely contributed to by the increase in summer travel by consumers in the Northern Hemisphere and some of the increased movement brought about by looser Covid restrictions (IEA, 2020c). Global demand in August 2020 was not as encouraging. Oil consumption was up only 90,000 barrels a day from July's consumption numbers. This number was considerably lower than the average of 4.9 million barrels a day of oil consumption growth per month. Non-OECD deliveries increased by 380 thousand barrels a day, which is a decrease from the 2.5 million barrels a day seen from May to July, due to floods in India and widespread rising Covid-19 cases. OECD demand dropped by 300,000 barrels a day, because of reduced mobility and closed factories (IEA, 2020b).

Supply Shifters

The beginning of July marked the end of Saudi Arabia's voluntary supply cuts, in response to the flooded market of March and April. On a month over month basis, global production increased by 2.5 million barrels a day. OPEC+ was the major contributor to this increase in demand. The United Arab Emirates supplied 550,000 barrels a day more than its stated output target and Saudi Arabia's voluntary 1 million barrel a day reduction was reversed. For the month of July, OPEC's total output grew by 1.2 million barrels a day. As for non-OPEC countries, supply cuts as a result of Covid-19 grew from a low of 5 million barrels a day in May to only 3 million barrels a day worth of cuts in July (IEA, 2020e). The United States production

levels for July were close to 11 million barrels a day, which represents a 10% increase from its May production levels of 10 million barrels a day (IEA, 2020c). This increase in U.S. production was largely a result of increased fracking in the Permian Basin, with fracking levels more than doubling between June and July (IEA, 2020e).

Global output reached 91.7 million barrels a day in August. Increased production was thanks to Russia and Saudi Arabia, as OPEC+ cut agreements eased. On a month over month basis August global production increased by 1.1 million barrels a day (IEA, 2020e). These gains were in spite of non-OPEC production slowing (IEA, 2020e). The United States saw production drop, as a result of hurricane Laura battering the Gulf coast at the end of August. OPEC+ agreed to a 2 million barrels a day growth in their supply target for August (IEA, 2020e). As a result of this planned increase, Saudi Arabia and Russia increased their production by 900,000 barrels a day in August (IEA, 2020e).

September-October 2020

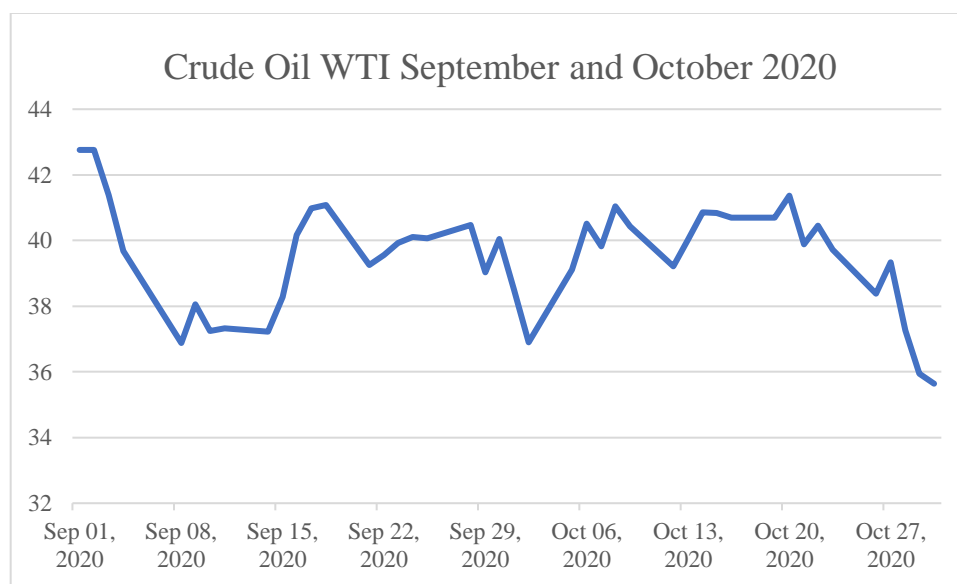
Economic Factors

In the months of September and October, the price of crude declined and experienced a period of stagnation, as seen in Figure 6. On September 4th, W.T.I. was \$39.77 and ended October at \$35.29 (Crude Oil, W.T.I.). Likewise, Brent began September at \$39.83 and ended October at \$37.94 (Nasdaq, 2020). These price fluctuations largely came from adverse economic shifts and continued concern over Covid-19. In the United States, a strong dollar and increased unemployment signaled poor future demand for crude and contributed to the price fluctuations. Additionally, a heated upcoming Presidential election in the United States caused uncertainty around the future trajectory of U.S. oil production. On the global stage, the unpredictability brought on by the Covid-19 pandemic continued to persist. In Europe and India, there was an

increase in the number of new cases as summer came to an end. President Trump tested positive for COVID-19 on October 2, which led to widespread concern over the trajectory of the pandemic. As winter in the northern hemisphere was approaching, many analysts and economists were concerned that cases would see a significant increase.

Figure 6

Crude Oil WTI Price September and October 2020 (EIA, 2023)



Demand Shifters

Global oil demand rose to nearly 94 million barrels per day in September. While this number represented demand growth, there was still a slowdown in that growth. Mobility indices showed that there was a significant decrease in transportation demand in the U.S., Canada, and most of Europe from September through December due to an increase of both Covid-19 cases and lockdown provisions meant to slow the spread of Covid-19. In OECD countries, total demand rose by 720,000 barrels a day. Most of this demand increase came from diesel demand with gasoline demand hardly posting a gain of 40,000 barrels a day, which reflected the overall

decrease in transportation demand (IEA, 2020a). Non-OECD demand increased to 51.3 million barrels a day in September, which was only 3% below 2019 levels. Non-OECD countries experienced steady demand increases lead by gasoline, as they were less affected by rising Covid cases and measures in September (IEA, 2020b).

Global oil demand approached 95 million barrels a day in October. OECD oil demand increased by 240 thousand barrels a day in October. An increase in air travel, European OECD demand decreased by 190 thousand barrels a day, as the summer came to a close and Covid-19 restrictions increased (IEA, 2021d). Non-OECD countries increased demand by 440 thousand barrels a day in October. This increase was driven mainly by continued mobility growth in emerging markets (IEA, 2020a).

Supply Shifters

There was a total decline of 600,000 barrels a day in global supply for the month of September. Total output for the month reached 91.1 million barrels a day. The decline in output compensated for the surge in supply from United States producers recovering from Hurricane Laura. This decline was due in a large part to the United Arab Emirates cutting production by 440 thousand barrels a day. They did this to improve compliance with the agreed to OPEC+ production targets. OPEC's total output for the month reached 24.08 million barrels a day in September. For non-OPEC producers, there were several disruptions in September that resulted in a decrease in production. Despite increasing output in the U.S., heavy maintenance in Brazil and Norway, as well as seasonal reduced biofuel production, caused the decrease. During September the U.S. was producing close to 11.1 million barrels a day (IEA, 2020c).

October saw some production growth with global output reaching 91.2 million barrels a day. This was largely due to increased production in Libya and the North Sea, both of which

compensated for the losses experienced by the U.S. due to Hurricane Delta and production cuts by the United Arab Emirates. Libya's crude output rose to 1 million barrels a day from just 100 thousand in August, as it was exempt from OPEC production cuts. This Libyan increase was the result of a cease fire in September that put an end to an eight-month long blockade of production. OPEC's total output for the month rose by 200 thousand barrels a day and reached 24.25 million barrels a day of production. Non-OPEC suppliers reached output of 47 million barrels a day, which was a month over month contraction of 170 thousand barrels a day. Gulf of Mexico production decreased by 600 thousand barrels a day because of hurricanes that battered the region (IEA, 2020b).

November-December 2020

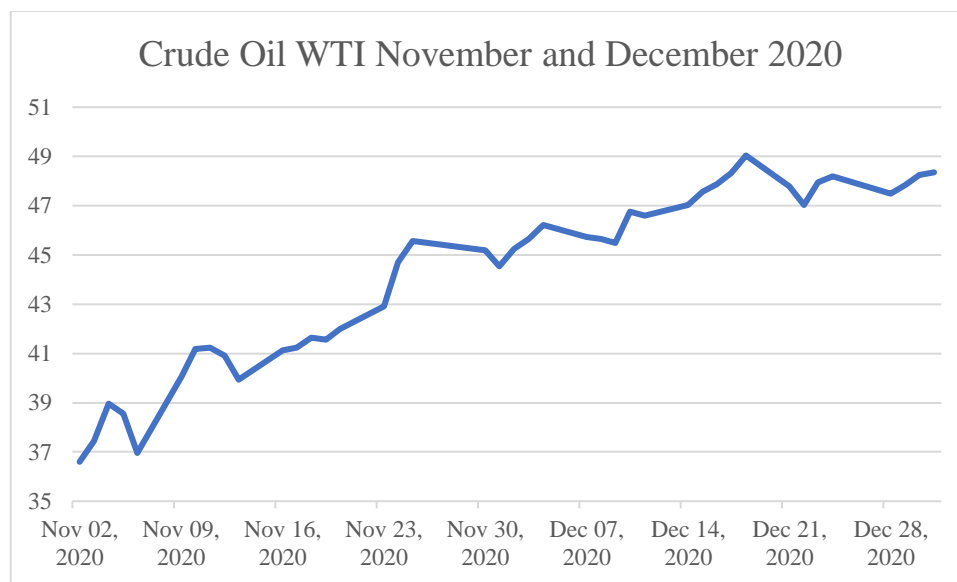
Vaccine Rollout

In Figure 7, November and December saw oil prices generally increase. As November approached, there began to be hope that a Covid-19 vaccine may burst onto the scene. This was extremely important to all areas of the economy, but especially to the oil and gas industry. Demand for transportation, which drives oil and gas demand, was largely seen to be held at artificially low levels until some sort of vaccine could be produced that would negate the need for Covid-19 lockdowns. On December 10, 2020, the Pfizer-BioNTech vaccine was granted emergency use authorization (Thomas, Weiland, and Lafraniere, 2020). Vaccinations in the United States began four days after authorization was granted. Subsequently, the Moderna vaccine was authorized for emergency use on December 17th, 2020 (Loftus and Burton, 2020). While it would take some time for vaccines to reach critical mass, that did not stop the market from responding in an overwhelmingly positive way. By the end of 2020, Brent futures prices climbed to \$50 a barrel, which is the first time it had reached that level since the onset of the

Covid-19 pandemic. This contango was a sigh of relief for a market that had been in slight backwardation (IEA, 2020a). As 2020 came to a close, it was clear that there was still a lot of work to be done on the vaccine front for oil demand to return to pre-pandemic levels. However, the arrival of vaccines signaled that demand would be trending in the right direction for 2021.

Figure 7

Crude Oil WTI Price November and December 2020 (EIA, 2023)



Demand Shifters

There was a slowing in global oil demand in November 2020 caused by a resurgence of Covid cases in Europe (IEA, 2021c). OECD countries reported a growth in demand of 120 thousand barrels a day (IEA, 2021c). Increased use of jet fuel during the holiday season in the U.S. and L.P.G. as the weather turned colder led American growth. U.S. oil demand grew by 150 thousand barrels a day in November (IEA, 2021c). Transport fuel was the main culprit of a fall in OECD European demand of 625 thousand barrels a day, which represented the most significant decline in demand the region had seen since April (IEA, 2021c). This was a direct result of

European lockdowns becoming stricter in the wake of increasing Covid cases. Asian OECD demand picked up the slack in November with demand growing by 600 thousand barrels a day (IEA, 2021c). Over half of this growth was kerosene demand, as temperatures started to cool (IEA, 2021c). Non-OECD continued its demand growth with an increase of 540 thousand barrels a day in demand in November (IEA, 2021c).

December demand slowed slightly due to falling Chinese demand and a Covid resurgence. OECD countries saw total demand growth of 180 thousand barrels a day in December. This growth was despite demand contraction in both the U.S. and Europe of 430 thousand barrels a day. OECD demand growth was salvaged by Asia, which saw demand growth of 610 thousand barrels a day, as temperatures remained low and kerosene demand was still strong. China led the way for the non-OECD demand contraction of 450 thousand barrels a day with a 320 thousand barrels a day demand slowdown. This was a result of Chinese transport demand falling, as Covid continued to surge (IEA, 2021c).

Supply Shifters

92.7 million barrels a day was the total global oil supply in November. Global supply grew by 1.5 million barrels a day from October to November. Libyan output and American production recovery drove this growth. OPEC's supply reached 25 million barrels a day and grew by 730 thousand barrels a day thanks to the increased production from Libya, which was exempt from OPEC+ production cuts. U.S. production increased by about 500 thousand barrels a day in November as more drilling and fracking operations continued to come back online and prices increased (IEA, 2020a). December supply levels showed slight growth of 100 thousand barrels a day to reach a level of 98.2 million barrels a day in total output, with U.S. declines

being largely offset by Libyan production. As a result of this increased Libyan production, OPEC+ agreed to lift production levels at the beginning of 2021 (IEA, 2021d).

Conclusion

2020 presented historic challenges to the oil market and provided a unique glimpse into how external factors shape both the demand and supply of the oil industry. The tensions between the United States and Iran at the beginning of the year illustrated how geopolitical expectations can have an impact on demand for crude. The beginning of February and March marked the beginning of a steep drop in demand that would affect oil markets for the rest of the year. This drop in demand led to the price of oil going negative for the first time in history, which offered a firsthand look at what happens when supply factors, like a price war, meet a drastic cut in demand. As the year continued, hurricanes, Covid resurgences, economic uncertainty, and vaccine rollouts all had direct impacts on supply and demand in the oil market. The events of 2020 showed the vulnerability of the oil market to global shocks, such as pandemics, and emphasized the need for a more resilient and diversified global energy system. Further research could delve into what innovative processes oil producers can use to combat another sizeable demand shock or how producer price wars have affected supply in the past and how they can be effectively resolved.

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