

Bloomberg Market Concepts - Module 6

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Commodities: Introduction to Commodities

Introduction to Commodities Markets

Unlike many other financial markets, the commodity market is a tangible market. Commodities permeate our everyday lives—the fuel we use to drive our cars, the clothes we dress in, the houses we live in. In addition to material objects that we use as tools, commodities are also used in food and medicines that we ingest. For example, the raw material aluminum is a key component in antacid tablets such as Maalox and Equate, as aluminum and magnesium work together to reduce stomach acid. Margarine would be a liquid at room temperature if it were not for a metal ingredient called nickel. Platinum has been used in drugs such as satraplatin, which is used to treat certain forms of cancer. Crude oil is used to create food preservatives. With commodities being such an integral part of our lives, any major price disruptions in the raw materials filter down to the everyday products we use. A rise in oil price will cause an increase in the amount you pay to fuel your car or the amount the airline charges you to travel. When we talk about commodities in the traded market, it's important to clarify what we are referring to. A commodity is classified as a raw material used to make goods. Let's compare wheat and bread for further clarification. Wheat is the commodity and bread is the manufactured end product. Today, tradable commodities fall into the following categories: energy, agricultural products, and metals. In the Bloomberg Terminal, you can look at global commodity prices by typing the function `GLCO` or *Global Commodity Prices* in the command line. The three commodity categories are further broken down into subcategories. Energy is further broken down into different types of carbon materials used to create either light or heat, such as oil, gas, and coal. Let's return to the menu to look at metals. Metals is further broken down into base classifications such as copper, ferrous classifications such as steel, and precious classifications such as gold. Lastly, we'll look at agriculture. Agriculture is further broken down into grains and oil seeds such as wheat and soybeans, softs such as cocoa and sugar, and livestock such as cattle. In this course, we're going to dive deeper into the commodity markets through the lens of the oil industry because oil, historically referred to as 'black gold' due to its value, is the most actively traded commodity. You'll learn about the history of commodities trading, how supply and demand drives prices, commodity market players, and how commodity traders use the Bloomberg Terminal to quickly access comprehensive market data and news.

History — Historical Trading Problems

Commodity trading pre-dates the first trades of stocks and bonds by a few millennia. The first civilizations began trading with each other approximately 5,000 years ago. Some of the earliest examples can be found in Mesopotamia and Japan several thousand years ago where farmers needed to protect themselves from things like unexpected weather events that could spoil a crop. Farmers decided to fix a future price for their crops which in turn, gave them the confidence to start sowing the next year's crop before they received any money from the current year's crop. This forward negotiation between two individuals in exchange of a set amount of a commodity on a set date is known as an Over the Counter contract (OTC). Disagreements over what constituted a satisfactory delivery was a common occurrence. This eventually led to the need for standardization and as such, futures trading was born.

History — Emergence of the First Exchange

One of the earliest recognized futures trading exchanges was the Dojima Rice Exchange, established in 1710 in Japan for the purpose of trading rice futures. In Europe, the first exchange was the London Metals Exchange (LME), established in 1877. The origin of the LME can be traced back to coffee shops where groups of traders would assemble. Merchants with metal to sell would draw a circle in the sawdust on the floor and call out ‘Change’, at which point all those wishing to trade would assemble around the circle and make their bids and offers. The modern-day LME still follows this tradition.

History — The Chicago Board of Trade

The first exchange in the US was the Chicago Board of Trade (CBOT) established in the early 19th century. Trading would take place in what was referred to as the ‘pit’. Brokers would match customers’ orders by either shouting or using hand signals. Orders were displayed via the open outcry system to all traders in the pit in order to allow anybody the chance to participate and compete for the best price. Traditional pits have largely closed down and most trading has now gone electronic. The LME remains one of the last exchanges still using an open outcry system. It wasn’t until much later that financial futures were introduced in the 1970s. To access the commodity futures contract database in the Bloomberg Terminal type **Exchange Contracts** in the command line. Here you can find contracts listed by category, exchange, and region. For example, to find a commodity contract on the Chicago Board of Trade click exchange and select the commodity type from the dropdown menu in the category column.

Commodities: Commodities Fundamentals

Introduction to Supply and Demand

Basic economic principles of supply and demand typically drive the commodities markets. If there is a high demand for a commodity but it’s in short supply, then this will drive the price up. If the demand for a commodity is low but it is in high supply, the price will drop. To establish whether a glut or deficit exists, it is important to understand the total amount of production of a commodity and compare it to consumption. So the question arises—how do we determine if markets are in balance?

Storage, Transportation, and Quality Variations

Fundamentals provide insight into the supply and demand structure of each commodity market. In this section, we’ll begin to unpack factors that impact the supply/demand balance. When gauging total supply, we must account for commodities in storage. Commodity storage plays a vital economic role because it helps to dampen volatility and bring markets back into balance. Market participants can offset the effect of market shocks by adjusting inventory levels. When demand exceeds supply, they reduce storage levels. In oversupplied markets, they can bolster underlying demand by increasing inventories. Rarely is a commodity produced where it is consumed. According to the International Maritime Organization, over 90% of the world’s trade is transported via sea. To get an idea of the quantity this equates to, let’s examine oil. Almost 59 million barrels per day of crude oil and petroleum products were transported on maritime routes in 2015, according to the US Energy Information Administration. Other forms of commodity transport are pipeline, trucks, rail, and planes. Let’s take a closer look at the transportation path of oil from initial extraction from either an offshore or an onshore well. The oil needs to be transferred to a facility for processing and then stored before being distributed to the end consumer. Crude can often be shipped halfway across the world before it’s processed. The end products are then transported again to be distributed to end consumers. Transportation costs can be significant and will impact where commodities go. Data needed is vast and not always readily available. Each country reports at varying degrees of frequency, breadth, and accuracy. As such, much goes into estimating these values.

Oil Demand Drivers and Origins of Supply

Let's look at what drives oil demand and where supply comes from, starting with the history. Although oil has been used for thousands of years—records indicate as early as 6000 BC—the first large-scale demand for petroleum is often tied to Abraham Gesner's groundbreaking invention of kerosene oil in 1852. During the 19th century, whale oil and candles were the primary sources of lighting. Gesner discovered how to make kerosene from crude oil, which burned longer and cleaner and at a fraction of the price. What constituted the first commercial oil well and marked the birth of the modern petroleum industry is often up for debate. Some consider it to be the well dug by Edwin Drake in Pennsylvania because it was the first well powered by a steam engine.

Oil Importance

Before the industrial revolution, agricultural commodities were the largest traded commodity. Today it is crude oil. When people think about oil consumption, it is often thought about first as a source for fuels used in aircraft, road transportation, and for heating homes. About 50% of oil consumption is used for this, but the rest is used to make everyday household items. You may be surprised to know that petroleum is used to create many products that we ingest. Petroleum chemicals are a source of many fertilizers and pesticides that are used to grow food. Food coloring, preservatives, and flavorings are all derived from petroleum and used in many end products that we consume. Take a moment to explore a house and look at some typical everyday products that are created using petroleum.

Oil Demand Growth

Based on what we have learned so far, it's no surprise that the demand for oil continues to grow. We can look at oil demand data in the Bloomberg Terminal by typing **Bloomberg Crude Oil Historical Price** in the command line. Then we'll select the GP function from the list to look at a line chart. We'll change the beginning year to 1970 to look at oil demand over a longer time period. We can see that while there have been fluctuations in demand due to various market events, which we'll dig into later, generally demand for oil has steadily climbed. You can look at the global oil supply/demand balance by typing **International Energy Agency** to load the IEA index. We'll select GP to look at the line chart. The International Energy Agency (IEA) expects demand for oil to grow to 103.5 million barrels of oil per day in 2040, compared to 92.5 mb/d in 2014—an increase of 11%. The world population is increasing along with energy consumption. Developing countries like members of the Organization of Eastern Caribbean States (OECS) have strived to reduce reliance on oil for transport by moving towards electric vehicles. However, the growing automobile fleet is outpacing what so far have been minor reductions.

Supply — Seven Sisters

Oil is a natural resource that takes about 50 million years to form, and we have no control over where natural deposits are located. Not every country has their own supply of oil. This map shows the countries where the largest known reserves reside. From the 1940s to the 1970s, a group of seven American and British companies controlled around 85% of the world's petroleum reserves. They prospected for oil, extracted, transported and priced it, controlled refineries, and sold oil products to end-users. This vertical integration from upstream to downstream meant they dominated the market. They operated as a cartel exerting considerable influence over third world producers and were referred to as the 'Seven Sisters'. By the 1970s, this monopolistic position eroded due to both the emergence of an intergovernmental organization called OPEC and oil-producing nations, especially in the Middle East, asserting national sovereignty over their natural resources. In 2007, the *Financial Times* labeled the power players of today as "the new Seven Sisters." Today the surviving companies from the original seven sisters are BP, Chevron, ExxonMobil, and Royal Dutch Shell—often referred to as the oil majors.

Emergence of OPEC

OPEC, which stands for the *Organization of the Petroleum Exporting Countries*, was founded in the 1960s to monitor the stability and prices of oil markets to secure an efficient and regular supply of petroleum to consumers. It was formed with just five founding members and today has 13 active members. Their main objective was to reclaim developing nations' oil resources from the previous colonizers and the companies then referred to as the 'Seven Sisters' for the benefit of their citizens and "in the interest of their national development." Their mission statement has evolved over the years; however, their primary responsibility has always been to its members. Initially, OPEC members emulated the oil majors and set prices directly, but they soon switched to market-based methods affecting price by varying production. Bloomberg tracks the production for these member countries. In the Terminal, simply type `OPEC` in the command line and select OPEC from the list. In addition to tracking the production levels, the spare capacity, which is capacity minus production, is also monitored. This gives an indication of how much extra oil can be pumped by each country in the event of an oil shortage. It highlights the amount of oil producers are choosing not to produce to comply with current OPEC production quotas.

Oil Price Shocks and OPECs Role

Since the early 1970s, crude oil has had a volatile price history. We can examine this in the Terminal by typing `Bloomberg crude oil historical price` and selecting the index from the list. Then we'll select the line chart. The function for line charts is `GP <Go>`. Let's explore some events that caused major price shocks in the oil markets to see how this has shaped the industry. We'll change the dates so we can look at historical data from 1970 to 2015. OPEC has played a central role in some of the key price moves spanning the last five decades. The first major price shock occurred in 1973 after the oil embargo. On October 6, 1973, Egyptian troops swept across the Suez Canal as Syrian forces launched an offensive to take the Golan Heights from Israel. After the U.S. pledged \$2.2 billion in emergency military aid to Israel, the Arab oil producers imposed an embargo on oil exports to the U.S. and its allies—the Netherlands, South Africa, Rhodesia, and Portugal. In addition to banning the sale of oil to these countries, OPEC cut oil production generally, causing oil prices to quadruple in short order. By February 1974, 20% of U.S. gas stations had no fuel. A 55 mile-per-hour speed limit was introduced to try and limit fuel consumption. This limit remains in place today. The 1973 oil embargo was a vivid demonstration of the oil producers' ability to exert pressure by constraining supply. At the time of the embargo, OPEC controlled half of global crude production and 80% of proven reserves. In a market with very low demand elasticity, this allowed them to exert a high degree of control. There were some long-term impacts from the embargo. Amidst fears of a repeat energy crisis, many nations created strategic petroleum reserves (SPRs) and crude oil inventories (or stockpiles) in order to provide economic and national security. In the wake of this crisis, the International Energy Agency and the U.S. established their own SPRs. Industrial nations funded multi-billion dollar research programs to develop alternatives to high oil prices and improve fuel efficiency in cars. Industries such as electricity generation also switched to alternative, cheaper fuels such as nuclear and gas. This chart shows how oil usage for electricity generation in the UK is almost completely phased out. High prices had seemed like good news for OPEC; however, this discouraged oil consumption. As such, OPEC altered its tactics and instead of high prices aimed for price stability.

Iran's revolution caused the second major price shock. On January 16, 1979, the Shah fled Iran. His departure was caused primarily by Iran's Islamic Revolution. Iranian oil production fell from over 6 million barrels per day to just over half a million, causing oil prices to almost double. Production in Iran recovered quickly after the Shah's overthrow, but in September 1980 it was hit again when Iraqi forces invaded. The war ran for eight years and hit oil production from both countries. Combined output fell from 9.3 million barrels per day in September 1978 to just 600,000 in October 1980. In November 1979, Iranian revolutionaries seized the U.S. embassy in Tehran, holding 52 Americans hostage for 444 days. President Carter imposed an embargo on oil imports from Iran, which remains in place to this day.

Many industrial centers of the world dealt with stagnant economic growth which dampened oil demand. This, coupled with an influx of oil onto the market from non-OPEC supplies such as Alaska, the North Sea, and the Soviet Union, led to a prolonged price slump throughout the 1980s. In this period, OPEC failed to

curb the oversupply, contending instead with internal disputes amongst members “cheating” on agreed-upon production quota cuts.

The value of both the strategic oil stockpiles in consuming countries and the maintenance of spare production capacity in several OPEC countries was demonstrated in 1990 when Iraq troops invaded neighboring Kuwait. The United Nations immediately imposed sanctions on the oil exports of both countries—removing about 5 million barrels a day of supplies from global markets. As a result, oil prices spiked, but it was short-lived as Saudi Arabia was able to ramp up their oil production to cover the majority of the deficit. Oil was also released from IEA and U.S. SPRs.

An economic crisis in Asia was beginning to undermine prospects for oil demand growth, but ministers still agreed to raise OPEC’s output target by 9.5% with Venezuela producing above their target. The global benchmark Brent prices subsequently dropped to their lowest level since the 1970s. In response, OPEC and a group of non-OPEC countries—which included Russia, Mexico, Oman, Norway, and China—reduced oil output. These output deals marked the first time that OPEC successfully reached out to a group of non-OPEC countries for help in balancing oil supply and demand.

China’s economic boom during the first decade of the 2000s set oil prices on their longest and biggest boom in history, taking Brent above \$100 a barrel by March 2008. China is now considered a super importer with any demand shocks having a global impact. High prices fueled a boom in exploration and development in remote and difficult areas, including the Arctic waters of Russia and America, the deep waters of the Gulf of Mexico, and off the Atlantic coasts of Brazil and Angola, and remote basins of East Africa.

The mortgage crisis of 2008 caused global economies to ground to a halt, reducing their oil demand. This marks the biggest oil crash in history until 2020, with prices collapsing from a high of \$147 to a low of \$32 by the end of the year. OPEC countries cut production by 7 million barrels per day in order to bring stability to global prices and reverse the plunge. Fears that unrest in North Africa, Syria, and the southern part of the Arabian Peninsula would spread to oil-rich countries of the Middle East kept an upward pressure on oil prices.

Oil Price Shocks: Shale Revolution

The oil price surge leading up to 2008 spurred many countries to invest in exploring alternative technologies for extraction. Two of those countries were the U.S. and Canada. Canada focused on a method to extract oil from oil sands, while the U.S. focused on extracting oil from unconventional wells called shale wells. Traditional, conventional wells are drilled vertically and can be located either onshore or offshore. By contrast, shale wells are horizontal. Instead of stopping at the oil deposit, they take a 90-degree turn and use high-pressure bursts of sand and water to fracture shale rocks and release the oil. Although the fracking technology used to extract shale oil had been around since the 1950s, it only became commercially viable in the early 21st century. Go to **RIG <Go>** in the Bloomberg Terminal to track the oil wells (referred to as rigs). This data is supplied by Baker Hughes and tracks both the vertical rigs, which are the traditional rigs, and the horizontal rigs, which are the shale rigs. Right-click on the U.S. horizontal number and select **GP** for line chart to plot the number of shale rigs. In January 2000, the horizontal rigs in the U.S. totaled just 51; however, by 2014 this figure had exploded and totaled over 1300. The previous price boom leading up to 2008 was largely fueled by growing economies, such as China and India. By 2010, the growth in these economies began to slow down. This, coupled with the flood of new oil from both Canada and the U.S., led to a supply glut. Let’s look at the Bloomberg Crude Oil Historical Price chart from earlier. Initially, the surge of additional oil onto the market offset declines in output as a result of the Arab Spring tensions and sanctions imposed on Iran in 2012, aimed at curbing its perceived nuclear ambitions. But by mid-2014, the pressure on oil markets became too great and prices plunged. OPEC producers struggled to respond to the shale surge. An initial pump-at-will policy (aimed at killing off shale through low prices) was abandoned in favor of a return to output restrictions amid hopes that the U.S. boom would run out of steam. An initial 6-month output cut that came into effect at the start of 2017 ended up running for four years. Following OPEC output controls, shale oil production continued to increase. U.S. imports shrank dramatically, and

the U.S. is now a prominent global oil exporter. In 2018, the U.S. became a net oil exporter for the first time in 75 years.

Role of OPEC - A New Paradigm

With additional non-OPEC supply, the role of OPEC has often come into question. One view is that it is still relevant but that its power is diminishing. The fact remains that with the large amount of production flexibility that OPEC holds (predominantly stemming from Saudi Arabia), they are still able to exert a considerable impact on the markets, as was demonstrated on March 9, 2020. On this day, a breakdown in the OPEC+ alliance triggered a price crash of more than 31%, the biggest fall since the Gulf War in 1991. A novel coronavirus causing the infectious disease dubbed COVID-19 swept the world, bringing economies to a standstill and having a catastrophic impact on oil demand. In the Bloomberg Terminal, we can type `map virus` to see conditions around the world in real time. An OPEC meeting was called to discuss how to bring the markets back in balance. Extensions and increases to existing cuts were proposed, which Russia balked at. Talks not only collapsed but a price war ensued in a bid to protect market share. Saudi Arabia, along with many other member and non-member countries, ramped up production, flooding an already saturated oil market. In addition to increasing production, Saudi Arabia also dramatically cut their official selling prices in a bid to win back market share from Russia and U.S. shale. The market, already reeling from the impact from coronavirus, was sent into freefall.

Oil Refining and Complexities

A key concept to understand when talking about oil trading is the difference between crude oil and oil products. Oil that is originally extracted from the ground is referred to as crude oil. The refinery process converts raw crude oil into usable oil products such as diesel oil, jet fuel, and gasoline. As with other commodities, there is a wide spectrum of crude oil types. In its raw, unrefined state, crude oil ranges in density and consistency with a tremendous variation in color from a very thin and lightweight golden yellow fluid to a thick, semi-solid dark fluid. Crude oil types are classified based on the American Petroleum Institute gravity, or API gravity. The two main API classifications are density and sulphur content, measured by percentage. The higher the API number, the lighter the crude. A low sulphur content is referred to as a sweet crude, whereas a high sulphur content is referred to as a sour crude. Generally speaking, the higher quality crude oils (the light, sweet variety) yield a higher percentage of the more valuable products compared to the lower quality crude oils (the sour, heavy varieties) that typically yield a lower proportion of the more valuable products. After extraction, oil then enters the refinery process. Raw crude oil is heated in a large Crude Distillery Unit where liquids and vapors separate into petroleum components according to their weight and boiling point. This is called fractional distillation. Heavy fractions are on the bottom and light fractions are on the top. This process determines the typical oil products extracted at different boiling points. No two refineries are the same and can range in complexity. Simple refineries have one crude distillery tower, while complex refineries encompass many specialized units that further break down oil into even more valuable oil products. As simple refineries generally have no additional conversion units, they have limited ability to handle high levels of sulphur and as such, tend to use light, sweet crudes as a feed stock. By contrast, complex refineries are often designed to use the heavy, sour crudes as they have the ability to convert the low value, heavy residual fuels left over from the main distillery process into lighter, higher value products. The amount of each type of oil product that a refinery will produce, referred to as the crude slate, differs depending on the refinery setup. Generally, the more complex the refinery, the more profit they're able to make because they can sell oil products of higher value. The profit a refinery makes is referred to as the refinery margin. It is the total of the value of the oil products to be sold minus all costs including: cost of crude oil used as an input, transportation, and operating costs. Refinery margins can be viewed on the Bloomberg Terminal using the function `NTBK`, Netbacks and Refining Margins. Here you can see there are various types of refineries ranging in complexity. Topping refineries are the simplest refinery configurations, while hydroskimming, hydrocracking, thermal cracking, and catalytic cracking are more complex. No two refineries are the same. However, these represent typical refineries of that type in a particular location. For example, here you can see that a Topping refinery in the U.S. East Coast will have an estimated profit of \$6.20 per barrel if they use Forcados crude oil grade, whereas if they use the North Dakota Sweet grade,

they would be operating at a loss.

Commodities: Commodities Trading

Determining Price

Many factors are taken into consideration when determining the price of a commodity. Variations of quality, grade, and location must all be taken into consideration. As we've seen with crude oil alone, there is a huge range of crudes varying depending on sulphur content and density level. Transportation and refining costs must also be taken into consideration. Hundreds of types of crude are traded worldwide and so the handful of futures contracts that exist are not always suitable for those wanting to purchase physical oil. To illustrate this, let's take a Nymex WTI futures contract which has a standardized notional delivery point at Cushing, Oklahoma for a specific quality of crude. For those wanting to purchase physical oil, doing so via the WTI futures contract is incredibly limiting. As such, commodity trading remains a largely bilateral business bringing buyers and sellers together in over-the-counter (OTC) deals. With all of this to consider—how does the market determine reference prices in the physical market? This is where price reporting agencies such as Platts and Argus come in. They are private companies that perform a vital public role in providing price assessments for a wide range of spot and derivative oil contracts. These price assessments provide transparency but are also used in trade. Most physical over-the-counter transactions are set at an agreed differential to a Platts or Argus benchmark. In addition to use in the physical market, they are also referenced in futures markets.

Let's further examine benchmarks using the Global Commodity Prices screen in the Bloomberg Terminal. We'll click on energy. There is no singular global market price for crude. Instead, regional markets exist, each with their own benchmarks. The three main benchmarks are: West Texas Intermediate (WTI), Brent Blend, and Dubai Crude. Under normal market conditions, the price differentials between each regional market are limited. If the price differentials become too great, it becomes profitable for traders to blend and transport crudes from cheaper markets and market them in more expensive markets. As these arbitrages are exploited, the supply and demand pressures adjust prices to reduce differentials again. The financial benchmarks provide not only a reference price but are also used for hedging purposes. With the hundreds of crude grades that exist, there is not a financial future for every grade. As such, producers, consumers, and traders of physical oil can use the financial benchmarks to hedge the risks and exposures on OTC contracts.

What Effects Price?

As we have observed, crude oil prices are determined by the demand for refined products and production rates of oil suppliers. But what else affects price? Any major imbalance of supply and demand can have adverse impacts on price.

Mother nature is powerful and unpredictable, causing sudden supply shocks that impact commodity prices. Hurricanes, for example, can cause havoc in the Atlantic, shutting down refineries and grounding ships. Earthquakes and floods can bring mines to a standstill. Droughts can destroy crops. While any environmental event can impact all commodities, some commodities are more susceptible than others. For example, the demand for natural gas is directly interwoven with temperature levels. In February 2018, when Europe experienced a cold wave dubbed the “beast from the east” by the media, mass disruption ensued with train and flight cancellations. Motorists were stranded in their vehicles and schools were closed. The extreme frigid temperatures caused the demand for heating—and consequently, demand for gas—to rise significantly. The UK's infrastructure, which is heavily skewed towards gas-fired central heating, was particularly affected. The system operator, the National Grid, issued a “gas deficit warning,” prompting fears of a shortage. Let's look at a line chart in the Bloomberg Terminal to see the impact this event had on gas prices. Type **UK NBP Natural Gas Forward Within Day** in the command line. Select the index below. Then click **Line Chart** to open the **GP** function. Change the date range using the fields on the top left. We can see here that the price for short-term delivery of gas had a major spike, increasing by over 300% in a matter of days.

As no country is completely self-sufficient, each country relies heavily on both commodity imports and exports. Any disruptions to global trade, especially from key importing and exporting countries, can have a large impact on global commodity prices. A prime example of this can be seen in 2018 when President Donald Trump ignited a trade war with China. Trump began setting tariffs and other trade barriers on China with the goal of forcing them to make changes to what the U.S. says are “unfair trade practices.” China, in turn, retaliated by imposing their own tariffs on U.S.-imported products. The situation continued to escalate, with each country applying additional tariffs in this tit-for-tat trade war. As expected, the trade war affected both economies, but the effects were also felt in the global commodity markets. A wide range of commodities were affected—this chart from Bloomberg News shows the impact on oil, hogs, and copper prices. This particular example shows us how the disruption of supply and demand to any key importing or exporting country can have adverse effects on global commodity pricing.

If there is a big enough cut in the global supply of a commodity, this will have an impact on price. On the 14th of September in 2019, two major oil facilities belonging to state-owned Saudi Aramco in Saudi Arabia were attacked by drones, requiring them to shut down for repairs. The attacks knocked out more than half of the top global exporter’s output at 5.7 million barrels of oil per day, which was approximately 5% of global supply at that time. This marked the biggest one-day disruption to oil output on record, surpassing the loss of Kuwaiti and Iraqi petroleum output in August 1990, when Saddam Hussein invaded his neighbor. It also exceeds the loss of Iranian oil production in 1979 during the Islamic Revolution (according to the International Energy Agency). Oil prices rocketed, and the Brent benchmark experienced the biggest one-day percentage gain since the contract began trading in 1988. Within seconds of the market opening, prices soared by more than 12 (£9.60) a barrel in London. The shock reverberated across global markets, sending stock exchanges across Europe tumbling as investors feared rising geopolitical tensions.

Individual countries may have their own policies that affect their fuel consumption. In Brazil, for example, the government mandates that the road fuel gasoline be blended with a minimum of 25% biofuel ethanol. Let’s look at a news article on the Bloomberg Terminal to learn more about this. On January 1st, 2020, a clean fuels policy was implemented by the International Maritime Organization, which would impact the industry globally. What became known as the *Clean Fuels Policy – IMO 2020* strove to slash marine sector emissions in international waters. It mandated that all vessels were required to burn fuels with 0.5% sulfur or less. Before the rules took effect, some shipowners plowed billions of dollars into exhaust-gas cleaning systems that prevent the sulfur from being released into the air. This pollution-reducing technology was referred to as “scrubbers” and enabled their vessels to keep using the old high-sulfur fuel without breaking the rules. Some deemed it the “most fundamental and dramatic product specification change the oil industry has experienced.” Sulfur emissions are linked to acid rain and medical conditions such as asthma and cardiovascular disease. A Finnish study in 2016 estimated that by introducing the new IMO rule and cutting air pollution from ships, almost 570,000 premature deaths worldwide between 2020 and 2024 would be avoided. Ships have long burned the sulfur-heavy fuel oil (also known as bunker fuel). It’s what is left over from the refining process once more valuable, less sulfurous products such as gasoline, diesel, and jet fuel have been squeezed out of crude oil. As the January 1st deadline approached, prices for the 0.5% sulfur fuel oil spiked, exceeding the prices of the old-grade high-sulfur fuel oil. But the regulation not only affected the shipping industry, it also had an impact on the refinery industry. The complex refineries that were able to create more of the compliant low-sulfur fuel oil reaped the benefits, whereas the simple refineries that lacked the equipment to remove pollutants and turn this into cleaner fuels were disadvantaged. This chart shows the profits from simple Asian refineries vs. complex refineries leading up to January 1st, 2020.

Demand Shock Part 1

Demand tends to be more inelastic, as people consider commodities a necessity in their everyday lives. A slowdown in economic activity will have an impact but is slower to build up over days, weeks, and months. While this is the norm, there have been exceptions. One such case is coronavirus, COVID-19. It swept the globe, wreaking havoc on global economies. Whole countries went into “lockdown” in an attempt to control the deadly spread. The reduced travel via roads and by plane had a sudden and acute impact on fuel consumption. The shutting down of factories also adversely impacted commodities such as metals, coal,

and gas consumption. Coronavirus crippled up to a third of global demand—an unprecedented amount. In a market already awash with excess supply, a simultaneous supply shock followed with catastrophic consequences. On the 9th of March, an OPEC meeting was called to discuss a course of action to bring the markets back in balance. Additional cuts were suggested, which Russia balked at. This meeting marked not only the breakdown of the current OPEC+ alliance but also marked the start of a price war. The failed meeting was the catalyst to the largest price drop since the Iraq war in 1991, as we can see in the histogram chart. Saudi Arabia strove to protect market share and dramatically slashed its selling prices. In addition to this, they “turned on the taps” and ramped up oil production. Russia and other member and non-member countries followed suit, flooding an already saturated market even further. Let’s look at a chart to see the impact this had on oil price. We’ll type `C01` to load the Brent ticker. Then click the `GP` function. We’ll change the date range to look at data from March of 2019 to March of 2020. We can see that by the end of March 2020 the oil price had plummeted, losing over 60% of its value in just over three months. We can look at a curve chart for further analysis. We’ll load the `COA` ticker to look at Brent active contracts. Then we’ll select the `CCRV` function. `CCRV` helps determine historical forward curve movements and identify pricing trends by showing curve shifts. We’ll click custom to specify a date, in this case September 2019. The market entered a state referred to as a *super contango*, meaning the spot oil was trading dramatically below the futures price. With the extensive oversupply, this caused a downward pressure on the months for earlier delivery compared to delivery months further in the future. The super contango incentivized those with physical oil to delay selling and instead store the oil to be sold at a future date, locking in a higher price. Participants who decided to store the oil would still need to pay for storage costs, but despite these costs, the benefits would still often far outweigh selling in the near term.

Demand Shock Part 2

Owners of physical oil strove to find storage facilities, but as onshore storage sites began to max out, they were forced to look for untraditional methods. Many decided to hire out oil tankers, drop anchor, and use them to store the oil—referred to as “floating storage.” This chart shows that a profit of \$26 million (not including tanker storage costs) could be made by selling a supertanker of oil in May 2021 instead of May 2020. The plunge in oil prices had a significant knock-on impact on many financial markets. With many countries in full lockdown, the economic impact was enormous. China recorded a drop in its GDP of -6.8%, the biggest drop since China began reporting. India faced its worst recession. The drop in the price of oil led to sharp falls in the value of the currencies of key oil and commodity exporting nations. For example, the Norwegian Krone (NOK), Brazilian Real (BRL), and Russian Ruble (RUB) all fell more than 10% following the oil price drop. This is because these countries are heavily reliant on the export of crude oil, and a drop in crude therefore disproportionately hits their economies harder. To illustrate this, the Bloomberg `WCRS <GO>` function shows the currencies that dropped the most against the USD in the month of March 2020. Note that NOK, BRL, and RUB were amongst the worst hit. Both COVID and the sudden plunge in oil inflicted a double whammy to the equity markets, with regard to what they hate the most: more uncertainty. The Bloomberg function `GRR` enables you to analyze the performance of an index. We’ll load `MXWO Index` to see the market cap-weighted stock market index of over 1600 stocks from companies throughout the world. Then type `GRR` and hit `<GO>`. Here the returns have been grouped by sector, analyzing the performance between Jan–March 2020. We see that no single sector worldwide had a positive performance in that timeframe. The uncertainty and fear resulted in investors panic selling risky assets, causing a surge in volatility. The worst-affected sectors were energy and financials, whereas the least impacted were healthcare and consumer staples, due to the defensive nature of those industries—with drug companies working toward a vaccine and consumer staples companies selling food to people in lockdown. Airlines, as we can see from this news article, were largely affected. According to the International Air Transport Association, airlines across the globe faced a \$252 billion loss in revenue in 2020, with the majority seeking governmental support to avoid going out of business. This was reflected in the worsening of their credit default swaps—a measure of the probability of the company defaulting. This is illustrated in Bloomberg’s credit monitor `DRAM <GO>`, where proprietary models track a company’s creditworthiness and whether it has worsened over time. In this example, we looked at a date range of January 2020 to June 2020. Many energy producers suffered heavy losses, closing down oil wells. We can load the Baker Hughes United States Oil and Gas Rotary Rig Count Data Index to examine this. We’ll select the `GP` function to open a line chart. This chart shows the decline in

oil rigs in the U.S. as a result of depressed prices. Banks lent heavily to U.S. energy producers, helping many survive the sector's last major downturn after Saudi Arabia cut prices in 2014 to challenge the shale boom. Fears of defaults led to many of these very companies being downgraded. In the Bloomberg Terminal, you can go to **RATT <GO>** to track credit rating trends. We'll select downgrades from the historical rating actions menu. We can see that there were 63 downgrades in Q1 2020 compared to 25 in Q1 the previous year.

Others Factors

In the previous modules, we looked at how fundamentals can drive commodity prices. Like any traded market, other factors such as market sentiment can also impact price. If unrest is present in a country that is near a key oil-producing region, sometimes simply fear will spread, and this is enough to move the price dramatically. The mere belief that oil demand will increase dramatically at some point in the future can result in soaring oil prices in the present, as speculators and hedgers alike snap up oil futures contracts. Of course, the opposite is also true. Price moves can hinge on little more than market psychology at times. This phenomenon has become more pronounced with oil becoming increasingly financialized over the past few decades, with an ever-increasing number of non-traditional market participants trading oil. Since the turn of the century, the purely financial investors with no interest in handling the physical commodity—such as hedge funds, pension funds, insurance companies, and retail investors—have increased dramatically. In addition to this, there has also been an explosion in the variety of instruments that permit speculation in oil, such as futures, options, index funds, and exchange-traded funds. This massive expansion of the financial layer of oil is often referred to as the *financialisation of the oil markets*. The Commodities Futures Trading Commission (CFTC), the U.S. derivatives regulatory body, began reporting on WTI market positions in 1992. In 2005, the CFTC began categorizing participants as either commercial merchants or managed money. As the latter group trades for purely speculative reasons, trends in this group are closely watched, as they can infer a general market sentiment. In the Bloomberg Terminal, you can go to **COT <GO>** to look at data from the commitment of traders report from the CFTC, so you can analyze trends in specific futures contracts. You can also determine if futures contracts are primarily being bought (or long) or sold (short), then correlate the reasons behind the trends—such as weather detrimentally affecting a specific crop—thus causing more traders to take a short position.

The 2008 price crash created a surge of academic research which strove to measure and quantify this phenomenon and to investigate the implications for markets and investors. A popular view is that the oil price increase between 2003–2008 cannot be explained by the economic fundamentals and was instead facilitated by the financialization of oil futures markets. One potential impact of this financialization is the breakdown of the inventory/price relationship. In theory, if there is a high amount of oil stocks in inventories, then this is bearish for price. The attached graph shows how this relationship was evident in 1994; however, in the preceding years, this relationship broke down. There remain many contradictory views; however, what cannot be disputed is the sheer increase of financial participants in the oil market. This chart shows the net long positions of the non-commercial traders in oil futures as compiled by the Commodity and Futures Trading Commission (CFTC). There has been a dramatic increase since 2004, which is a similar picture to the WTI benchmark front month contract. This chart just measures participants in the futures markets and does not capture the increase of money flow into oil-related funds. In 2011, the Institute of International Finance reported that the increase in assets under management rose from less than \$10 billion around the end of the last century to a record high of \$450 billion in April 2011. Consequently, the volumes of exchange-traded derivatives on commodity markets are now 20 to 30 times greater than physical production. The influence of financial markets has systematically transformed these real markets into financial markets.

Speculation is the act of purchasing something today with the anticipation of selling it at a higher price at a later date. Financial investors speculate on oil prices by purchasing a contract of oil to be delivered at a later date (a futures contract) and then sell the contract before the expiry of the contract when oil is due for delivery. They then use the proceeds to purchase another futures contract for delivery at a more distant date. Futures, as financial instruments, themselves follow basic supply and demand dynamics. If the general expectation is that the price of oil will be higher in the future, this in turn motivates investment funds to take positions in these contracts. As demand for futures contracts increases, so does their price, which also

moves the current oil price.

On April 20th 2020, on the day before contract expiry, the May WTI contract, which was the front month contract at the time, dropped to minus \$40 — a move that marked a historic event in the financial markets. What cannot be disputed is the integral role that the financial players played this event. In a 20-minute span that ranks among the most extraordinary in the history of financial markets, the price cratered to a level that few, if any, thought conceivable. The price of WTI had never before dropped below 0, let alone cratered to the staggering -40. With a Corona-induced demand shortage and a supply glut following the Saudi / Russia price war, the market was drowning in crude with storage facilities either already full or nearing capacity. In the week leading up to the historic price event, everyday retail investors piled into investment vehicles such as oil ETFs trying to call the bottom for oil prices. At the time, after oil lost nearly two-thirds of its value since the start of 2020, many felt that it couldn't go any lower and would eventually recover once economies reopened and so betted on a price rebound.

With this sudden inflow of investors, the largest American ETF, the U.S. Oil Fund, or USO, saw its number of shares balloon from 145 million at the end of February to more than 1.4 billion by mid-April. At various points, the fund held about a quarter of all May and June contracts for WTI. Unlike shares that can be held indefinitely, oil futures have fixed expiration dates and are contracts to buy or sell a physical commodity. Investors who do not intend to take physical delivery must unwind their positions before expiry. Exchange-traded funds use these contracts to speculate on future oil prices. Rather than taking delivery, they “roll” their positions—selling near-term contracts and buying longer-dated ones. The USO fund's massive position disrupted market dynamics: when it rolled from May to June, May prices plunged, while June prices spiked. Many believe USO's actions exacerbated the volatility and contributed to crude dropping below zero. By April 20th, only a few traders remained in the May contract. With storage capacity unavailable, they had no choice but to liquidate at any price. As the contract settled at -\$40, sellers were effectively paying \$40 per barrel for someone to take delivery and store the oil. Selling at a negative price was preferable to accepting physical delivery with nowhere to put it. One notable fund that failed to roll its position was the Crude Oil Treasure fund based in China. It held some 3,700 retail investors, who collectively lost \$85 million. The plunge in crude prices underscored the rising role of ETFs in the oil market. Tools like the FFLO function allow tracking of exchange-traded fund flows. As of August 2020, the USO fund had received over \$4.5 billion in inflows since the start of the year.

Conclusion

As we've observed in this course, many commodity markets have become more and more financialised over the years. However, we cannot forget that it is a physical market underpinning it all, making it a fascinating market to trade. Subject to much uncertainty, commodity markets are exposed to significant levels of volatility with the range of influences being complex and wide-ranging. As we've seen, factors ranging from very macro to very micro can result in very large price movements. With such extreme levels of volatility, commodity markets can be an appealing asset class to trade. However, such levels of volatility can be both a blessing or a curse if you end up on the wrong side of the trade. We have explored using commodity instruments as both tools to hedge and as tools to speculate. This module explored two of the most prevalent instruments available—futures and ETFs—though there exists a wide variety of instruments. To trade a futures contract, you only need between 3% and 15% of the total value, thus making them highly leveraged instruments. This leverage, coupled with extreme volatility levels, has the ability to make you rich in one moment but also has the ability to wipe out all of your capital in one fell swoop. For every long position, there is a short bet on the other side of the trade. One person's profit is another person's loss—referred to as the 'zero sum' game. As such, to be successful, you must outperform other traders who may or may not be more experienced than yourself. Trading oil is not for the faint-hearted, proving either very lucrative or very costly. However, with a good grasp of Bloomberg commodity screens and an understanding of what the fundamental and financial drivers are, you are set to take on commodity trading markets.

Commodities: Commodity Players

Players — Producers and Consumers

Now that we have a deeper understanding about factors that impact commodity prices, let's take a closer look at who trades them. Commodity companies are generally classified into one of two categories: producers or consumers. Producers procure the raw materials, whether that be mining for metals, drilling for oil, or growing crops. Consumers use the raw materials. Car companies, for example, need to acquire many types of metal in preparation for their manufacturing process. Some of the main metals include aluminum for the car frame, copper for the wiring, and cobalt for the batteries. The aviation industry needs fuel to power engines. Airlines require jet fuel, ship companies require fuel oil, and trucking companies require diesel or gasoline. Food producers will need to purchase raw ingredients to produce the food and drinks we find on our supermarket shelves. In this section, we'll examine consumers and producers to understand how they predict market price fluctuations and develop strategies to hedge risk.

Commodity Exposure

Producers will have exposure to price decreases and can hedge this risk by purchasing instruments that enable them to lock in the highest selling price possible. Consumers, on the other hand, are exposed to price increases, so their goal is to lock in the lowest purchasing prices possible. The airline sector is one example of a large industry that must secure massive amounts of fuel at stable prices to hedge exposure to price increases. They use financial instruments as part of their budgeting process to normalize expenses and avoid monetary losses from fluctuations in price. This helps them to reduce the volatility of their financial statements and risk for investors. Jet fuel can account for between 20–50% of an airline's operating costs. Swings in oil prices and jet fuel can result in a huge boost or hit to profits.

Trading Houses

Very rarely is a commodity produced where it is consumed. In most cases, commodities are produced in other countries and therefore need to be imported. The logistics surrounding sourcing, storing, and transporting commodities globally can be very complex. Global trading houses serve as an intermediary by facilitating commodity trade transactions. They manage the entire transaction between the consumer and producer to meet the customers' timing, delivery, and quality requirements. The consumer does pay a higher price when using a trading house; however, they avoid the hassle of importing if they were to go to the producer directly. In essence, commodity trading houses move the raw materials necessary for daily life from their place of production or extraction to their place of consumption.

How Trading Houses Profit

Trading houses make their profit from arbitrage—essentially, buying a commodity at a certain price and selling it at a higher price, taking into account all costs. There are three main methods they use to achieve this. The first is leveraging geographical arbitrage. For example, sourcing a product in one place, shipping it, and then selling it at a higher price in another location. The second is time arbitrage: buying a commodity at a certain time, holding it, and then selling it at a higher price in the future. The third method is production arbitrage—buying raw (untransformed) commodities and processing them to produce higher-value products (transformed commodities). Glencore, Vitol, Trafigura, Cargill, Noble, Koch, and ADM are some of the largest trading houses in the world. Often, large trading houses are no longer just the “middle men” and have acquired commodity assets themselves. Glencore is one example of this. Founded in the 1970s, it was purely a trading company and today boasts around 150 mining and metallurgical sites, oil production assets, agricultural facilities, warehouses, ships, storage, port facilities, and commodity processing plants. They have grown into one of the largest global diversified natural resource companies in the world, operating in over 90 countries. They now sell commodities that they mine and produce themselves in addition to their traditional marketing business, sourcing commodities and products from a global supplier base to sell to customers around the world. Owning upstream and transportation assets enables trading houses to secure supply.

Investment Banks

Investment banks help midstream and downstream companies with inventory financing. They provide credit via trade finance to trading houses so they can buy and sell large volumes of commodities. They help corporate consumers hedge their exposure by providing liquidity via commodity-linked financial instruments. In the past, investment banks were even further entrenched in the industry and participated in the physical markets. Many of the large investment banks used to own assets across the value chain and, like trading houses, moved commodities around the world. After the 2008 financial crisis and the bank bailout, banks were forced to sell those assets and exit physical trading. Now most investment banks stick to financing activities or providing liquidity for corporations to hedge their risk using derivatives. However, some Japanese and Australian banks are still active in the physical markets, such as Macquarie Bank and Sumitomo.

Speculators

As commodities markets have become more liquid, they have attracted an increasing number of financial market participants who seek to profit from speculating on future price movements. The act of speculation, however, is not confined to purely financial investors such as hedge funds, but is also carried out by market participants involved in the physical commodity markets. For the purposes of this module, however, we will refer to speculators and investors as the financial players that take directional views on the asset prices of commodities without being involved in the value chain or providing any service. There are a variety of reasons why financial participants want to get involved in the commodity markets. Commodities such as gold are often used as hedges during periods of global economic uncertainty because they tend to retain their value even during market turbulence. Commodities have intrinsic value independent from currency and so can be used in a hedge when the value of a currency falls in an inflationary environment. Commodities often find their way into investment portfolios as a means of diversification, as there is generally little correlation between commodities and traditional portfolio constituents such as equities and fixed income assets. Wild swings in commodity prices are not uncommon, and many financial participants seek to profit from this notoriously volatile market. Financial participants generally fall into one of two categories: the pure speculators and the investors. The main difference tends to be the risk appetite, time horizon, and frequency of trading employed. An investor will typically have a longer time horizon, trade less, and have a lower risk appetite—seeking to profit through long-term ownership of instruments such as exchange-traded funds (ETFs) and mutual funds that track commodities. On the flip side, a speculator is generally thought to have a higher risk appetite, profiting from short-term fluctuations in price movements, more commonly using instruments such as futures, options, and structured products.

Trading Techniques

Technical traders invest after analysing chart patterns. They often employ partially automated systems, such as computer software programs, to follow price trends, perform technical analysis, and execute trades. Quantitative trading employs mathematical computations to analyse historical data in order to identify market price patterns. Using this research, computer models are then created which aim to predict future trading opportunities and are used in real-time markets with real capital. Quantitative trading techniques include high-frequency trading and algorithmic trading. Algorithmic trading, also referred to as automated, algo, or black box trading, is a process for executing orders utilizing automated and pre-programmed trading instructions to account for variables such as price, timing, and volume. High-frequency trading, also known as HFT, is characterized by high speeds and turnover rates using powerful computer programs to transact a large number of orders in fractions of a second.