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OIL SUPPLY IS ABOUT TO COLLAPSE

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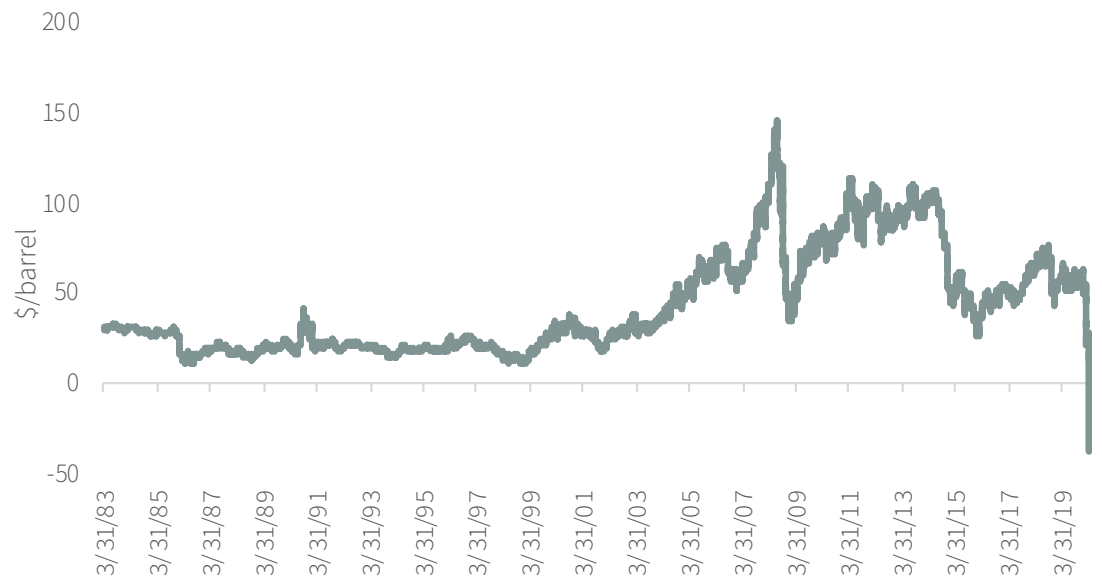
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In the history of crude oil, nothing can compare to the events of the last three months. As recently as February 25, WTI was trading above \$50 per barrel. In the weeks since, the global oil market has been subjected to an endless barrage of shocks to both supply and demand. The OPEC+ framework, in place since 2016, dissolved in March after Russia balked at further production cuts. In retaliation, Saudi Arabia announced it would let its previous production cuts lapse, triggering a de facto OPEC price war. Meanwhile, data began confirming that global demand had collapsed in response to the global quarantine measures put in place to slow the spread of COVID-19. Once OPEC+ realized that global demand was set to fall at the fastest rate ever, effectively wiping out 20 years of global growth, they agreed to implement the largest oil production cut in history on April 9th. A short time later, as global storage approached full capacity for the first time ever, severe bottlenecks began to emerge in the system. These bottlenecks, along with a massively imbalanced futures position going into the expiry of the May 2020 WTI futures contract, forced crude oil prices to go negative for the first time, ultimately reaching -\$45 per barrel.

"THE REAL ISSUE THAT WILL DRIVE OIL MARKETS GOING FORWARD ACTUALLY INVOLVES SUPPLY."

FIGURE 1 WTI First Month's Oil Spot

All



Source: Bloomberg

the attention is currently focused on demand and its impact on storage; however, the real issue that will drive oil markets going forward actually involves supply. The demand shock from the COVID-19 response has been extreme, however it is fundamentally short-term in nature. As the number of new COVID-19 cases recedes and lockdowns are eventually lifted, demand will recover to long-term trendlines. There is even some early data suggesting we may be past the worst in terms of global demand. The massive supply cuts (happening as we speak), on the other hand, will dominate the oil markets for the next decade, if not longer. For patient investors who can withstand near-term volatility, the opportunity is clear.

Extreme volatility will continue to grip global oil markets in the coming weeks. With global oil demand collapsing by as much as 30%, the demand for physical storage has exploded and we are now quickly approaching maximum capacity in almost all storage facilities. Physical traders were faced with this reality on April 20th, 2020 as the May WTI contract expired. Traders still holding long positions into expiry found themselves unable to secure storage for delivery at any price, and prices collapsed into negative territory as a result.

The storage situation will likely be even more dire in May. According to our models, global storage will reach maximum effective capacity sometime in the middle of May for the first time in history. As a result, investors should be prepared for an extremely volatile few weeks ahead.

While the next few weeks will prove challenging, we are most interested in what will happen once inventories reach maximum capacity. While it may sound counterintuitive, once global oil inventories are full, the market will immediately become balanced. Without anywhere to store surplus crude, the entire global petroleum supply chain will be forced into a “just-in-time” dynamic with supply equaling demand overnight. Producers will have to undertake widespread shut-ins of existing wells, and these actions today will have material impacts for years to come.

Once demand starts to recover, it will be impossible to restart production fast enough to keep

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inventories from drawing down sharply. In our past letters, we have discussed many of the problems embedded in the global oil supply base from the shales to aging non-OPEC fields outside of the US. Each of these issues will immediately come to the fore once demand recovers and supply is unable to arrest its embedded decline. There is a strong likelihood that oil prices experience an extremely violent move higher sometime in the next eighteen months if not even sooner.

To understand why, consider the following. Global quarantining likely reduced total oil demand by 25% in April or 25 mm b/d. While this likely marked the low point in oil demand, May should still see impairments of approximately 20 mm b/d compared to normal, equating to global oil consumption of 80 mm b/d. We estimate April production averaged 101 mm b/d, implying the market will be oversupplied by 21 mm b/d in May.

Once storage is full at some point in mid-May, a good portion of this 21 mm b/d will have to be shut in.

The recent production cuts announced by OPEC+ on April 9th are not nearly enough. While the “headline number” calls for cuts of 9.7 mm b/d, we believe the true magnitude is closer to 8 mm b/d from April’s levels. Approximately 1.5 mm b/d will be shut in from so-called “stripper wells” in the United States. These wells are extremely old and nearing the end of their productive lives. In most cases they produce less than 5 b/d each yet make up nearly 20% of total US production in aggregate. Since their production rates are so low and their water production is high, the stripper wells incur operating costs in excess of the oil price and have started being shut in already. While it is more challenging to get data on international stripper wells, we estimate another 1.5 mm b/d will be shut in from this group as well. Canadian oil sands production is both expensive to produce and yields a heavier grade crude that often trades at a discount to WTI. We estimate that at least 1 mm of oil sands and related production will come offline imminently. On April 22, 2020, The Wall Street Journal reported that offshore Gulf of Mexico production is being abandoned as we speak. In total, we would not be surprised if at least 500,000 b/d came offline from offshore sources.

Even accounting for all these sources, there is still nearly 5 mm b/d of production that will need to be shut in once storage is full. To put the enormity of this figure in perspective, at their fastest rate of growth ever, the shales grew by 2 mm b/d over the course of a year, compared with 5 mm b/d of global production that must be curtailed in a matter of weeks. This is already starting to happen according to the most real-time data available. According to the EIA weekly inventory figures, US production has fallen by nearly 1 mm b/d or 7% in only five weeks – the second sharpest decline in US production ever outside of hurricane-related activity.

Most of these “involuntary” cuts will never come back online. In some cases, shutting in a well for a prolonged period will irreparably damage the wellbore or reservoir. The stripper wells meanwhile were only marginally economic to begin with on an operating basis and would never justify the capital cost to drill through the cement plugs used to cap them. While offshore production is accustomed to shutting in production for short periods during hurricanes, longer-term curtailment requires the well to be permanently sealed making re-entry nearly impossible. As Tim Duncan, CEO of offshore producer Talos Energy, told The Wall Street Journal on April 22nd, 2020: “In offshore, we don’t shut in fields, we shutter

them.” The only source of curtailed oil that can likely come back online is the OPEC+ cuts of 8 mm b/d. While these cuts represent a large volume, they will not be nearly enough once global demand begins to normalize.

Source	Rate	Able to Come Back?
Impacted Demand	20	NA
Supply		
OPEC+ Cut	8	Yes
US Stripper Wells	1.5	No
Int'l Stripper Wells	1.5	No
Can Oil Sands	1	Unlikely
US Offshore	0.5	No
Other Sources	7.5	Unknown
Impacted Supply	20	

Source: G&R Estimates

Furthermore, future supply will be impacted by the huge retrenchment in drilling activity taking place today. The US oil rig count has fallen 45% in the last six weeks alone and our models suggest these declines will continue. Of the publicly traded companies we follow, capital spending has been cut by 40% on average so far with many companies now announcing a second round of cuts. In total, we estimate that the US oil rig count will fall by nearly 75% from 2019 levels. Our proprietary neural network tells us that US production will decline sharply by 2.1 mm b/d as we progress throughout 2020 based on these drilling assumptions (before considering any shut-ins). In other words, based upon capital spending guidance, new production would not nearly be enough to offset natural field declines from aging wells. This phenomenon would then continue into 2021 unless drilling activity were sharply increased later this year (something we think is unlikely).

In the rest of the non-OPEC world, several final investment decisions (FIDs) have already been postponed or rejected on long lead-time projects making it a near certainty that production from this group will decline well into the 2020s. Summer maintenance programs in the North Sea will likely be deferred as well, saving near-term cash at the expense of production.

Together with the shut-ins discussed above, attrition from lower drilling expenditures and deferred maintenance could cause production to fall to 80.5 mm b/d by the end of 2020.

As demand normalizes, today's large inventory overhang will be worked off much faster than anyone realizes. For example, "full" crude storage is approximately 3.5 bn bbl while the 15-year low level is 2.5 bn bbl. In the oil section of this letter we will discuss demand drivers in depth, but for now assume that demand normalizes slowly over the year eventually reaching 95 mm b/d by year end. While this sounds optimistic, we should point out this projection assumes demand would still be lower year-on-year by 5 mm b/d by year end (a conservative estimate). Were production to average 80.5 mm b/d, then global inventories would go from "full" to 15-year low levels in only two months. Even if OPEC+ fully reversed their production cuts, inventories would go from full to dangerously low in just under five months.

However, the reality in 2021 may be even more dramatic. Demand will likely continue to normalize, adding the remaining lost 5 mm b/d to regain the 100 mm b/d level. At the same time, the shales will continue to decline well into 2021, opening the gap between supply and demand to well over 10 mm b/d sometime next year.

As the world begins to demand substantially higher production volumes, all the supply issues we have discussed over the past several quarters will immediately come to the fore. For example, had it not been for the COVID-19 pandemic and OPEC+ price war, the story everyone would be talking about would be lackluster performance of the US shales in 2019. After having grown by an incredible 1.7 mm b/d throughout 2018, the shales peaked and started declining sequentially beginning in November 2019. The last time the US shales declined was in 2015 in response to lower oil prices after the Saudi-led price war initiated November 2014. During that downturn, the rig count had to fall by 60% for production to peak and begin to decline. Last year, shale production started declining after the rig count had only fallen 25%. The reason shale production fell so much faster this cycle is simple: the shale plays are much more mature today than in 2014. Furthermore, in past cycles, companies would often boost productivity as they laid down rigs by focusing only on their best areas, a process known as high grading. In past letters we argued this would no longer be possible given the huge amount of high grading that had already taken place. In retrospect we were correct. Despite the 25% reduction in drilling last year, well productivity in the shales declined for the first time ever. Across the major three shale basins (Permian, Eagle Ford, and Bakken), our neural network estimates that well productivity declined by between 7-14% last year, despite having drilled wells that were 4% longer and used 3% more proppant. Instead, the neural network estimates that geological considerations (i.e., drilling less productive areas) explained nearly all the lower productivity. Shale producers are running out of top-quality inventory, which is already negatively impacting production.

Energy analysts and the market were beginning to slowly recognize these developments as production has started to disappoint; however, due to the severe impacts of the global pandemic, these issues have now become of critical importance much sooner. We estimate that last year, 80% of shale operators were unable to replace production with new proved developed reserves on a debt-adjusted per share basis, even with oil prices that averaged a healthy \$57 per barrel. Not even Exxon was able to replace production last year as they ramped up full-scale development of their Permian asset (a surprise to most investors who were expecting strong results). Additionally, this year many E&P companies are facing financial distress while widespread restructurings may be imminent. Can such a group of operators realistically be expected to quickly ramp up production by over 10 mm b/d to help plug the deficit that will open sometime in 2021?

Clearly global oil markets do not function at \$20 per barrel. We have long said we look to get involved in markets where the price is unsustainably low. Back in the late 1990s we mused that there would not be a gold industry in five years' time if prices stayed at \$300 per ounce. Similarly, there will not be an oil industry if prices stay depressed. Instead, prices will need to rise dramatically once we get through the volatility of the next few weeks.

We have received many calls asking how to benefit from rising oil prices given the challenges we outlined above. To gain exposure to crude fundamentals, we have always preferred oil-related equities. Investing directly in oil has always been challenging because of the contango in the oil market. Since futures prices tend to be higher than spot prices (a/k/a contango), investors are forced to constantly "roll" their holdings thereby lowering their total return. After last week's turmoil in the WTI futures markets investors are beginning to realize the potential challenges of investing directly in the commodity itself (or via an ETF or ETN). We continue to seek out investments that control the last remaining high-quality acreage

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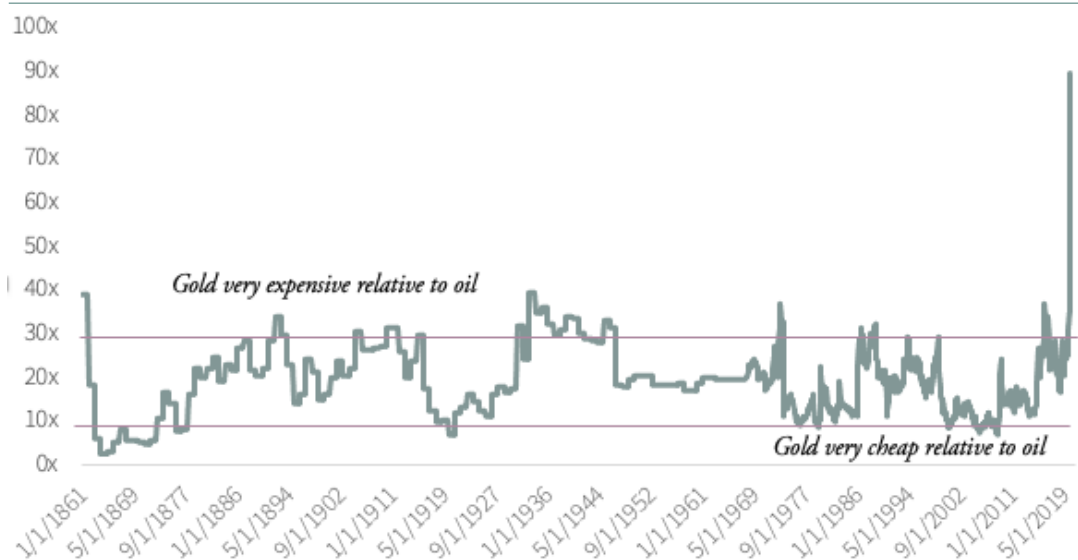
positions in the US shales. While this may sound odd given the issues facing the shale players as a group, there remains a small subset of companies that have attractive assets. Unlike the industry at large, these companies were able to grow their proved developed reserves per debt-adjusted share last year. The other key criteria is a strong balance sheet able to weather lower prices for as long as possible. While we do not expect prices to remain low for long, we want to make sure our investments have as long a “runway” for our fundamental views to be expressed as possible. Finding investments that meet these criteria may not always be easy, but we believe the exercise is critical in maximizing the chance of long-term success.

The coming weeks could be difficult for global oil markets, however the actions that are necessary today will lay the groundwork for the next major move higher in oil prices. Navigating the facts in a volatile market has never been more important and we are here for any questions that come up along the way. For those investors looking for an entry point and are able to handle volatility, the returns could be considerable.

The Gold-Oil Ratio Revisited

Please note: This essay was written before the oil price collapsed below zero resulting in an infinite gold-oil ratio.

FIGURE 2 Gold-Oil Ratio 1860-2020



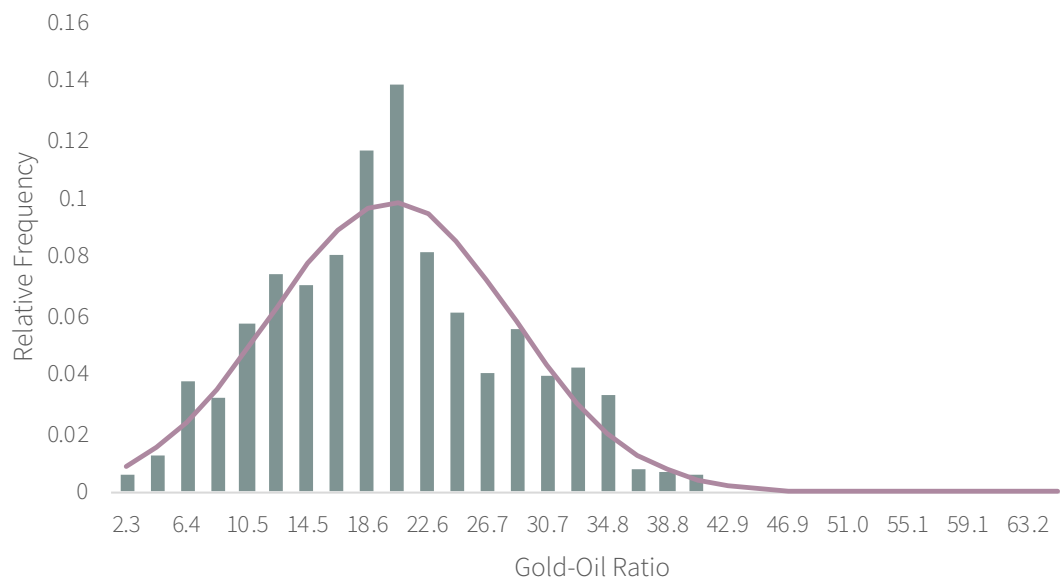
Source: Bloomberg, BP Statistical Review, G&R Estimates.

As proof we live in interesting times, just consider the gold-oil ratio over the last two months. Because of the impact of COVID-19 on the global economy, the gold-oil ratio has reached the highest levels in history. As of noon on April 20th 2020, an ounce of gold purchases over 400 barrels of oil – ten times the previous records reached in the depths of the Great Depression in 1933 and nine times the level reached during the panic lows of early 2016.

Gold and oil have each experienced booms and busts, wars, financial panics, deflationary depressions, gold standards, gold exchange standards, fiat dollar standards, fixed exchange rates, floating exchange rates, oil market share wars, oil shortages, geopolitical tensions, periods of calm, and even prior pandemics. Despite such an incredibly wide variety of

backdrops, the gold-oil ratio has spent 80% of the time between 10:1 and 30:1.

FIGURE 3 Distribution of Gold-Oil Ratio 1860-Present



Source: Bloomberg, BP Statistical Review, G&R Estimates.

Between 1900 and today, one ounce of gold has purchased 20 barrels of crude oil on average, with a standard deviation of 8 (using monthly data). As we mentioned, 80% of all observations are between 10:1 (gold is cheap relative to oil) and 30:1 (oil is cheap relative to gold). According to the historical distribution, a gold-oil ratio of 150 is an eight standard deviation occurrence that is only expected once every 10,000 years – clearly a “black swan” event.

"A GOLD-OIL RATIO OF 150 IS AN EIGHT STANDARD DEVIATION OCCURRENCE THAT IS ONLY EXPECTED ONCE EVERY 10,000 YEARS – CLEARLY A “BLACK SWAN” EVENT."

The gold-oil ratio has been a reliable indicator of when to invest in oil and when to invest in gold over the past 120 years. Since 1900, crude has averaged a 12-month gross return of 7% while gold has averaged a 12-month gross return of 5%. Oil has generated a negative 12-month return 39% of the time while gold has generated a negative return 32% of time.

However, looking only when the gold-oil ratio has exceeded 30:1 (i.e., oil is cheap relative to gold), crude has returned 32% on average over the next twelve months (over four times its long-term average), while gold has returned 4% on average. Oil was lower only 13% of the time (70% less often). On average, oil outperformed gold by 28% during these periods compared with 2% normally.

At the other extreme, when the gold-oil ratio was less than 10:1 (i.e., oil was expensive relative to gold), crude lost 7% on average over the next twelve months and was negative nearly 60% of the time. Gold returned 18% on average during these periods, outperforming oil by 25%. Since 80% of all observations occur when the ratio is between 10 and 30 you should expect the relative returns of both gold and oil to be like their long-run averages and that is exactly what occurred. When the ratio was between 10 and 30, oil returned 5% on average in the following 12 months, and was lower 41% of the time while gold returned 4% and was lower 33% of the time, roughly in line with long-term averages.

We last used this analysis in early 2016 to justify our investments in oil-related securities. At that point, the gold-oil ratio hit a then-record 47:1. We argued that oil prices were set to surge and invested in oil-weighted E&P securities as a result. Over the next 30-months, oil

rallied by 191% from \$26 per barrel to \$76 per barrel by October 2018. Gold on the other hand fell by 4% over the same period. Oil stocks (as measured by the XLE ETF) advanced by 56%, well in excess of gold stocks (as measured by the GDX) which rose only 3% but lagging the S&P 500 which advanced 69%.

Given today's 400:1 ratio, we believe an unprecedented buying opportunity is presenting itself in oil and oil-related stocks. Nearly every example of an extreme high reading in the gold-oil ratio is followed by a full reversal to an extreme low reading of 10:1. If that is correct, then oil prices are set to increase dramatically.

Thus far, we have simply identified the pattern itself and catalogued the various instances. In the rest of this essay, we would like to explore why, from a fundamental perspective, the pattern seems bound to repeat itself. What are the commonalities between episodes, and can we use them to predict a path forward?

In the chart above (chart 2), you can see there have been four times when the gold-oil ratio surpassed 30: 1973, 1986/1988, 2016 and today, and there have been two periods where gold spent a significant time at 10 or below: the late 1970s and 2003-2008. Remarkably, in every case the move from one extreme valuation level to the other can be explained in terms of the growth in the supply of each commodity.

We will first consider the period between 1965 and 1973 when the gold-oil ratio went from an unremarkable 20:1 to an extreme 36:1. The 1960s were a period of strong growth in global oil supply. New field development in the former Soviet Union, Canada, and Mexico resulted in non-OPEC production surging 150% over the eight years ending in 1973. OPEC grew its production as well, leaving global oil supply up 180% over the same period. The growth was fueled by a three-fold increase in oil prices from \$1.05 to \$3.30 between 1945 and 1973 that helped fund a wave of exploration, discovery, and development.

Meanwhile, gold remained pegged at \$35 through the Bretton Woods Gold Exchange standard. With prices pegged and costs creeping higher due to the increasing inflation of the 1960s, producers' cash margins collapsed. In turn, reinvestment in the industry fell sharply and mine supply growth all but disappeared. Between the late 1950s and the early 1970s gold production barely grew at all. The US dollar gold peg started to erode in 1968 when the so-called "two-tiered" gold pricing system was introduced. Under this system, governments agreed to transact with one another at \$35 per ounce while a "second" free market could develop among the public. President Nixon finally ended the gold peg altogether in 1971 and by 1973 gold had surged three-and-a-half fold to \$120 per ounce. The stock market bottomed in 1970 and by early 1973, the S&P 500 had returned nearly 75%. One of the few assets that did not rally was oil which remained flat at \$3.30 over the period. We believe crude languished because the strong production growth of the previous decade kept markets well supplied.

By 1973, the gold-oil ratio had completely reversed such that one ounce of gold now bought 36 barrels of oil – nearly hitting the previous high of 40 reached during the depths of the Great Depression. Whereas gold had been radically undervalued relative to oil only a few years before, it had become extremely overvalued. Over the next five years from 1973 to 1978, oil radically outperformed gold taking the gold-oil ratio from 36 ultimately to a 55-year low of 8.3. What drove this change from one valuation extreme to the other? Once again, the answer lies in relative supply growth.

While the surge in the gold price from \$35 to \$120 was not enough to stop the decline in mine production, a new source of gold supply entered the market. No longer constrained by the Bretton Woods agreement, global central banks became aggressive sellers of their gold. Between 1976 and 1979 central banks sold an incredible 1,000 tonnes of gold, equivalent to an entire year of gold mine supply. Total gold available for sale (which includes mine supply and central bank sales) grew by 30% between 1973 and 1979.

At the same time, oil production slowed dramatically. After having surged by 180% between 1965 and 1973, global supply growth slowed to only 13% between 1973 and 1979. Although non-OPEC oil supply was able to grow materially, the problem was OPEC production. Two major events in the 1970s (the Arab oil embargo of 1973 and the overthrow of the Shah of Iran) seriously disrupted OPEC production and limited the growth in total global supply.

Between the central bank gold sales and OPEC oil disruptions, global gold supply growth significantly exceeded oil supply growth between 1973 and 1979. While both commodities did well during the period, oil did much better. Reflecting this imbalance, oil prices rallied nearly 1000% while gold prices advanced by “only” 145%. The gold-oil ratio fell from 36 to 8.6 by the summer of 1979 – a level that would not be seen again for another 20 years.

Gold and oil both peaked in 1980 and entered a multi-year bear market. While neither commodity generated positive returns, gold did much better on a relative basis. Between 1980 and 1988, gold fell by 43% from \$850 per ounce to \$480. Oil meanwhile fell by 70% from \$44 per barrel to \$13.37. Yet again, the difference can be explained by trends in relative supply growth.

While the run up in gold prices during the 1970s led to a global exploration boom, any new mine supply was more than offset by central banks’ shift from net sellers to net buyers of gold. On balance, total supply of gold for sale stagnated between 1979 and 1988.

By comparison, global oil markets saw a surge in non-OPEC oil production. This surge was the culmination of widespread global exploration programs funded by the high oil prices of the 1970s. The great fields of Western Siberia, the North Sea, and Alaska all came online between 1979 and 1988, increasing non-OPEC oil production by over 22% in the process. At the same time, the high oil prices of the 1970s resulted in significant global demand destruction from high fuel standards and the shift away from oil used for electricity generation. As a result, OPEC spent the entire 1980s cutting production to maintain the market balance and defend the oil price. After peaking at over 30.5 mm b/d in 1979, OPEC production reached 15 mm b/d by 1985 and was still only 17 mm b/d by 1988. On a combined basis, global oil supply showed limited growth during the period, but given the widespread demand destruction the market was in structural surplus for most of the time.

With the gold-oil ratio at over 32 (up from 8.7), oil was again radically undervalued relative to gold. Once again, oil was radically undervalued relative to gold. By 1988, oil reached \$13.58 per barrel and gold reached \$422 per ounce. While the gold-oil ratio was not quite as extreme as it was in 1973 (32 vs 36), it nevertheless signaled that oil was due to outperform. Over the next 20 years, oil rallied by 930% while gold advanced by 115%. The relative supply trends help to explain the difference.

Total gold available for sale surged during the 1990s and early 2000s. The increase was driven by two sources: a new technology that dramatically increased mine supply (cyanide

heap-leaching) and central banks once again becoming net sellers. Combined, these factors resulted in available gold nearly doubling. Total global oil supply, from both OPEC and non-OPEC increased by only 30% -- far less than the doubling of gold supply. Given the large relative difference in supply trends, it is no surprise that oil materially outperformed gold from 1988 to 2008. With oil at \$140 per barrel and gold at \$914 per ounce, the gold-oil ratio fell to 6.5 by the summer of 2008. Not only did this mark the record price in crude, it also represented the lowest gold-oil ratio since 1872. The only other comparable period in the twentieth century occurred in 1920 following World War I when the ratio hit a low of 6.7.

Since 2008, the difference between gold supply growth and oil supply growth has been dramatic. While gold mine supply was able to grow by 30% from 2008 to 2019, it was completely offset by surging central bank purchases, leaving gold available for sale down 15% over the period. Starting in 2009, European central banks wound down their aggressive sale programs, underway since the early 1990s. Led by China and Russia, central banks turned into large net buyers of physical gold. In aggregate, central banks went from being a source of gold supply of 600 tonnes per year to buying 600 tonnes per year. The impact on the effective gold supply has been huge and resulted in total gold supply falling by 15% despite mine supply growing by 30%. At the same time, oil supply has grown as new drilling and completion techniques have allowed for the economic development of the US oil shales. Since 2008, global oil supply has grown by 20%, driven predominantly by shale production growth. The differential between gold supply growth and oil supply growth since 2008 has been the driving factor behind the surge in the gold-oil ratio both back in 2016 (when it hit a then-record of 47) and today's "one-in-ten-thousand-year" reading.

The collapse in demand related to COVID-19 has now thrown global oil markets into uncharted territory with global storage at risk of hitting capacity. At the same time, the demand for gold has surged given the ramping up of coordinated central bank actions to address the virus' economic fallout. Except for the previous three weeks, the gold-oil ratio has spent 80% of the time since 1860 between 10 and 30. Any period of stress above or below these levels almost always led to a move to the opposite extreme.

Can we ever expect to see the gold-oil ratio reach 10 again in our investment lifetimes? The clues once again lie with the relative supply trends. As we discussed in our introduction, while crude demand will soon rebound, oil supply growth will likely be impaired as we progress through the coming decade. As storage fills, millions of barrels of forced shut-ins will likely be necessary. Most of this production will never come back leaving supply structurally impacted for years to come.

While we remain long-term gold bulls (see our essay in our 2Q2019 letter), the gold supply growth trend will not be nearly as impaired as oil. From a mine supply perspective, we are expecting little to no growth in the coming years. However, we also suspect the role of central banks as gold buyers could very well be coming to an end.

The impact of the COVID-19 virus on government finances is already proving profound. Give the huge strains that will engulf governmental budgets, we would not be surprised if central banks stopped buying gold and became sellers to help fund their obligations. Already, reports are circulating that Venezuela, Russia, and Saudi Arabia have sold gold to offset lost oil revenue.

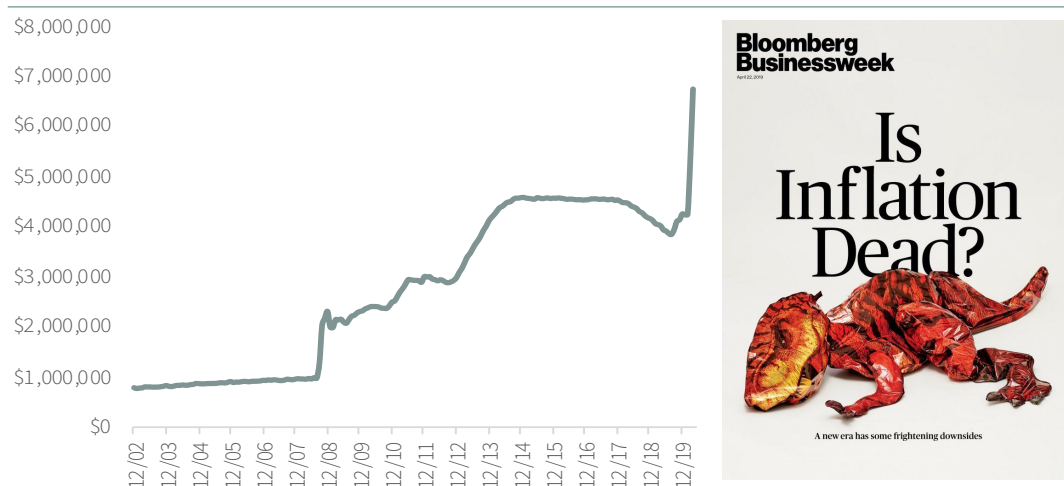
The main force driving the gold-oil ratio from one valuation extreme to the other has been the relative difference in supply growth between the two commodities. When oil supply

grows faster than gold, the ratio tends to move higher and oil becomes cheap relative to gold. Conversely, when gold supply grows faster than oil, the ratio tends to move lower and gold loses its value relative to oil. Although the ratio has reached unprecedented magnitudes, we do not think the fundamental principles underlying the moves have changed radically. The gold-oil ratio tells us that oil has never been cheaper relative to gold. As we look forward into the coming decade, the difference between expected oil supply growth and gold supply growth gives us confidence this ratio will move decidedly lower, and as a result oil prices will move materially higher.

We Are Entering Into A New Era Of Inflation. Are You Prepared?

This article originally appeared on the Goehring & Rozencwajg Blog April 2nd, 2020.

FIGURE 4 Federal Reserve Balance Sheet



Data source: Federal Reserve; Image source: Bloomberg BusinessWeek

Last April, *Bloomberg BusinessWeek* ran a cover story titled “Is Inflation Dead?” We immediately thought back to the infamous 1979 *BusinessWeek* cover “The Death of Equities,” written less than three years before the start of the greatest bull market of all time. We wondered whether this new cover would be equally as prescient in bringing inflation back as the major theme of the coming decade. After the events of last week, the answer appears to be a resounding “yes.”

It is a strange time to talk about inflation given the impacts of the COVID-19 pandemic. Most raw material prices have fallen dramatically while unemployment claims have already broken records – neither of which suggests rising price levels. However, global governments have responded with trillions of dollars in liquidity and stimulus to help mitigate the virus’ impacts. As the impact of the virus eventually passes, the monetary and fiscal measures put in place today will sow the seeds of next decade’s inflation.

As recently as 2008, the Federal Reserve’s balance sheet stood at less than \$900 bn. Following the failure of Lehman Brothers it more than doubled to \$2.2 tr and five years later it had doubled again to \$4.4 tr. The balance sheet then proceeded to slowly fall before bottoming

"THESE ACTIONS COULD TAKE THE FEDERAL RESERVE'S BALANCE SHEET FROM \$5.25 TR TODAY TO OVER \$11 TR IN ONLY A FEW MONTHS."

at \$3.8 tr last fall. In September, the Fed responded to tightness in the repo market and by February the balance was back up over \$4 tr. As of last Friday, this level had already surged to \$5.25 tr – before any material economic relief had even been implemented. [Editor's Note: As of 5/5/2020 this stands at \$6.7 tr]

Then the CARES Act was approved.

The legislation calls for \$2 tr of economic relief in the form of direct payments to individuals, tax cuts and grants to businesses, tax deferral, and the funding of state spending. However, the most impactful measure by far is the \$500 bn in business loans. The federal government will use this funding to capitalize a special purpose vehicle that will in turn lever itself 10:1 via the Federal Reserve. The net result is a \$5 tr injection of liquidity into the economy on top of the \$2 tr of additional fiscal relief. These actions could take the Federal Reserve's balance sheet from \$5.25 tr today to over \$11 tr in only a few months. In 2007, the US was able to run a \$15 tr economy with a Federal Reserve balance sheet of \$850 bn. Thirteen years later, the US will likely run a \$22 tr economy with a balance sheet of \$11 tr.

Moreover, there is already talk of a new relief bill less than one week after the last one was passed. The Fed meanwhile has embarked on an "unlimited" quantitative easing program. Recent actions have dramatically blurred the lines between monetary and fiscal policy: the legislation's fiscal stimulus is being directly augmented by monetary policy with the help of Federal Reserve leverage. The concept of Modern Monetary Theory (MMT) has effectively gone from a theoretical debate to being put into practice. The once sacred separation between fiscal and monetary policy is now largely a relic of the past.

While in some measures we have been in uncharted territory since the GFC, the events of the past week are on another scale entirely. Could these moves finally end the US Treasury bull market, now in its 40th year? What other knock-on effects could result?

The obvious effect would be a shift from the deflationary psychology that has gripped markets over the past decade to a new period of inflation. Very few investors are positioned for such a move. The other effect could be a rerating of real asset prices, generally and particularly commodities. We have shown the chart above several times over the last four years. It shows the price of commodities relative to the price of financial assets. After the recent oil price collapse, commodity prices are now basically as radically undervalued as they were at their lows in 1969 (immediately preceding the best decade for commodity prices ever). The other major periods of commodity price undervaluation were 1929 and 1999 – again both good times to establish investments in resource sectors. In our 1Q2019 and 2Q2017 letters, we explored the conditions leading up to the extreme valuations in 1929, 1969 and 1999 and noted their similarities with today.

We also analyzed the catalyst that started the bull market in resources following all three lows. We concluded that in each case, a bull market in real assets followed a major shift in global monetary policy. For example, in the late 1920s, it was the realization that Britain would have to abandon its attempt to go back on the pre-war gold standard (effectively ending a monetary system that had been in place since 1819). In 1969, it was the first steps in loosening the Bretton Woods exchange standard, ultimately culminating in the "Nixon Shock" two years later. In 1999, it was the move by several Asian economies to intervene in keeping their currencies depressed to spur growth following the Asian currency crisis of 1997. In retrospect, the 2020 rerating of real assets will have been caused by the unprece-

mented actions being taken today by the global central banks.

Investors today are concerned about near-term oil surpluses due to pandemic-related demand destruction as well as OPEC+ price wars. In our recent webinar, we discussed these forces in great detail and we invite you all to listen to the replay. While the near-term market is certainly challenged, longer-term issues will surround the huge shale collapse that is now taking place. It will be impossible to restart this growth once oil prices recover, because the fields are simply too mature this time. At the same time, there are talks that upwards of 10 mm b/d could be shut in permanently from old and uneconomic wells globally. These volumes will never come back and will only make the future price action more severe. To put this in perspective, 10 mm b/d represents nearly a decade of global oil demand growth.

The recent events have certainly been dramatic for every part of the economy. However, while the novel coronavirus will eventually abate, the issues we have laid out here will be with us for the next decade or longer. Many of these trends tend to move in large and long cycles and most often the catalyst for change is an exogenous shock.

We have just had that shock. Are you and your clients prepared?

Q1 2020 Natural Resource Market Commentary

As you might expect, confronted with an economic shock that is being compared in severity to the Great Depression, commodity prices and natural resource equities collapsed in the first quarter. The broad stock market, as measured by the S&P 500 Index, fell 19% in one of the steepest drops in US history. Given the further weakness in physical commodity prices, natural resource related stocks fared even worse. The S&P North American Natural Resource Sector Index (which is heavily weighted toward energy equities) fell 44%. Although the S&P Global Natural Resources Index is less weighted towards energy in favor of metals and agricultural stocks, it still fell by a significant 33%.

By the far the most impacted commodity was oil. Most global transportation ground to a halt following COVID-19 quarantining, collapsing the demand for oil in the first quarter. Both WTI and Brent prices started the year above \$60 per barrel, but by the end of the quarter, both had collapsed by over 65%. Energy stocks also performed terribly for the quarter. For example, the XOP ETF, which mirrors the S&P Oil and Gas E&P index, fell 65% and the OIH, which tracks oil service stocks, fell 70%. However, the real drama only began three weeks later when the WTI price broke through zero and proceeded to move sharply into negative territory.

Open interest in the WTI futures contract has to be physically settled at the Cushing facilities in Oklahoma upon expiry. As storage approached full capacity, panic selling gripped any holders of remaining long contracts. With no storage available, few physical buyers were able to step in and purchase the contracts leaving prices to collapse. On the final trading day for the May contract, WTI prices reached -\$40 per barrel.

Oil joined sovereign debt in doing the once unthinkable: trading at negative prices.

We believe the oil market has been hit with several massively negative events that will unlikely be repeated in our investment lifetimes. The unprecedented collapse of demand due to global quarantining combined with a price war between Russia and Saudi Arabia all helped create

the situation the market faces today.

While the headlines remain bleak, we believe the stage has now been set for a massive rebound in oil prices. Although few energy analysts recognized this, the US oil shales had already rolled over nearly three months before the novel coronavirus hit. The “shale miracle” that has cast a huge negative supply shadow over the global oil market over the last 10 years has now drawn to a close. Given the huge capital spending cutbacks that have been announced over the last two months, we believe the only significant source of supply growth over the last decade has now disappeared.

As demand recovers, the world will face a huge shortage of crude oil. Please read the introduction to this letter, where we frame what is likely to happen to supply in the next two years. This bear market has taken much longer to end than we ever thought possible. We originally believed the oil market bottomed following the last spasm of panic selling in the first quarter of 2016 when oil hit \$26 per barrel. In retrospect we were incorrect. We think the bottom has now finally been hit.

Even with the novel coronavirus impact on demand, our analysis suggests that oil markets will slip into severe deficit sooner than anyone believes possible. Energy related equities have never been cheaper and investor sentiment has never been more negative. The risk-reward for those investors able to commit to the energy sector has never been more attractive.

As we outlined in our essay “The Gold-Oil Ratio Revisited,” we are confident that we will see the price of oil again trade “expensive” to gold—that is an ounce of gold will only buy 10 barrels of oil in our investment lifetime.

In comparison to crude oil, natural gas did well during the quarter, falling by “only” 25% compared with 65% for crude. North America experienced a significantly warmer than normal winter, leaving inventories 20% above both five and ten year-averages by the end of the withdrawal season. Despite this inventory overhang, we have turned decidedly bullish on North American natural gas.

As we discuss in the “Natural Gas” section of this letter, we believe both the Marcellus and Haynesville shale plays (together supplying over 35% of US dry gas supply), have stopped growing. Our neural network suggests both fields will begin to experience material declines over the next several years. Furthermore, the coming reduction in oil drilling will lower the production of associated gas from shale oil wells -- another major source of national gas growth over the last decade. We have been natural gas bears for years but have now turned bullish.

Base metals were weak during the quarter, but again much less so than crude oil. Copper (the worst performing base metal) fell by 20% while nickel, zinc, and aluminum fell between 15% and 18%. The base metal-related stocks performed much worse than their respective underlying commodities.

The XMB (the ETF tied to the S&P Global Base Metals Index) fell by 38% while the COPX (the ETF tied to global copper mining stocks) fell by 42%. We continue to believe copper will be the best performing base metal as we progress in the coming decade. While recent demand has been severely impacted and global inventories are growing, 20% of global copper mine supply has now been idled over the last two months. If these curtailments continue for another two months, 2020 global mine supply will be impacted by 5% or 1 mm tonnes.

Uranium was one of the few commodities to actually advance in the first quarter. Uranium

prices started the quarter at \$24.90 per pound before rising by 9% to end at \$27.05. Subsequently, Cameco extended the COVID-19 shut-down of their Cigar Lake property, which produces 18 mm lbs. of uranium annually or 10% of global mine supply. Furthermore, Kazatomprom, the world's largest uranium producer, also announced an additional 10% production curtailment due to COVID-19 responses. In response to these announcements, spot uranium jumped an additional \$5 per pound or nearly 20% and stands today at almost \$35 – their highest level since 2016. We remain extremely bullish on uranium and uranium related investments.

Although gold has shown huge amounts of strength since COVID-19 quarantines started, precious metal markets as a group were mixed in the first quarter. While gold rose 4%, silver fell 21%. Palladium rose a strong 21%, whereas platinum fell 25%. Gold-related equities were weak during the quarter, falling by more than the broad market despite the strength in the commodity. The GDX ETF (tracking the NYSE ARCA Gold Miners Index) fell 21% and the SIL (tracking the Solactive Global Silver Miners Index) fell 28%. Since quarter's end, gold has continued its advance and is now up 14% for the year.

Many of the gold ratios we follow closely have set all-time records so far in 2020. For example, gold is now as expensive as it has ever been relative to oil. Similarly, on March 18 with gold at \$1,470 and silver at \$11.75, the gold-silver ratio set a record reading of 125. Considering there is accurate gold-silver data going back to at least 1300, this is quite a record. Even today with gold at \$1,730 and silver at \$15.30, the ratio stands at 113 – higher than any other previous period.

The previous record was set 29 years ago at 100 with gold at \$370 and silver at \$3.70. In this letter, we explain the history of the gold-silver ratio and invite anyone interested in learning more to please revisit it our fourth quarter 2018 letter. As we describe in that essay, extremes in the gold-silver ratio often coincide with major precious metal bottoms over the last 50 years.

Other significant dislocations occurred in precious metals markets in the first quarter as well. Notably, a huge divergence emerged between the price of gold in the futures market and the price to acquire a physical bar.

At the end of March, over the course of a few chaotic trading days, the premium for New York gold futures soared to over \$70 per ounce versus the physical spot price in London. The last time a comparable divergence occurred between gold spot and futures markets was 40 years ago during the Hunt Brothers' infamous silver short squeeze at the end of 1979.

We have argued that this precious metals bull market will be driven by Western investors and speculators. Although the consensus opinion is that the dislocation was caused by COVID-19, metal refinery shutdowns, and the lack of airline service between London and New York, we believe that surging speculative futures trading in New York is the real cause. If we are correct, then the events of the past month are a harbinger of things to come in global precious metals markets as we progress through this decade.

Compared to other commodities, agricultural markets were relatively quiet in the first quarter. Corn prices fell 12% and soybeans fell 6% while wheat rose 2%. In an interesting development, fertilizer prices were strong during the quarter. Urea (nitrogen) was up a strong 20% during the quarter and DAP prices (phosphate) advanced slightly while potash prices fell 10% in the US. In the most recent USDA report, US farmers are expected to plant an

exceptionally large 97 mm acres this year. This figure is up over 7 mm acres from 2019 levels and significantly above the consensus estimate of 94 mm acres. Farmers are also expected to plant 83.5 mm soybean acres, an increase of 7.5 mm acres over 2019 levels. Most of these additional acres will come at the expense of wheat planting. The USDA estimates that US farmers will only plant 44.7 wheat acres -- the lowest level since records began in 1919. In their latest World Agricultural Supply and Demand Estimates (WASDE) report, the USDA slightly raised its US corn carryout estimates primarily driven by faltering ethanol demand. Soybean carry-outs increased in the US but were offset by decreases elsewhere, leaving global carryout levels unchanged.

Overall, the WASDE report introduced little new information. The Northern Hemisphere planting season is now just beginning. Given this is a relatively calm time of the year for grain markets (and given how volatile other markets have been), we will not write a separate Agricultural section in this quarter's letter. Next quarter, once the 2020 planting season is completed, we will review the latest developments as well as future outlooks regarding weather in greater detail. As readers of these letters know, we believe global weather patterns are about to undergo serious changes over the next several years due to sunspot activity that could result in much more challenging growing conditions with an impact on global grain yields. Grain prices have been in an eight-year bear market, and if we are correct, this bear market could soon be ending. We continue to recommend investors have significant exposure to global agricultural stocks.

Oil Demand's Worst Days are Behind Us

In this letter's introduction, we explained how COVID-19's impact on global oil demand was driving prices sharply lower in the near term, but how the most important factor over the next decade will surely be the virus' impact on supply. Decades-low demand today has created a sharp but temporary surplus of oil in global storage tanks, raising the possibilities they will imminently hit maximum capacity. Oil production will be forced to shut in, most of which will never come back online again. As the virus eventually passes and demand returns, global oil markets will experience their worst deficit in history.

While supply will be the long-term driver for global oil markets, there is no denying the material impact low demand is having today. In this section, we will discuss what is happening to global demand and how we expect this to proceed.

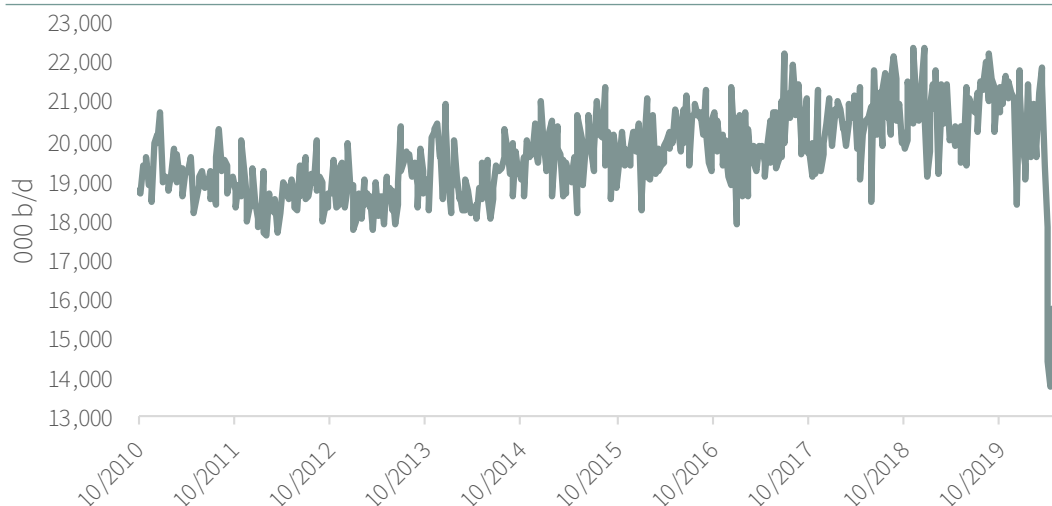
Reliable real-time information on global demand is extremely sparse. While the International Energy Agency (IEA) releases quarterly demand figures as part of its monthly Oil Market Report, there is a two-month lag. Given how fast COVID-19 emerged, the impact of global lockdowns has not yet shown up in this data.

Various global governmental agencies release more real-time data, but there are lingering concerns about its quality and reliability. For example, Customs data suggests that Chinese oil demand increased year-on-year for January and February during the height of the Wuhan lockdown.

At present, the most reliable real-time data comes from the US Energy Information Agency's (EIA) weekly petroleum status report. According to this data, US demand for petroleum products fell by 8 mm b/d between March 13th 2020 and April 10th 2020, a decline of 37%.

For April as a whole, we estimate US demand was down 5.6 mm b/d compared with March or 30% -- the largest monthly drop on record and four times larger than the previous record set after Hurricane Katrina.

FIGURE 5 US Petroleum Product Demanded



Source: Energy Information Agency

The question facing analysts today is how best to extrapolate the US experience to the rest of the world. Global oil demand averaged 100 mm b/d in 2019 and so, applying the same rate of demand decline, would suggest 30 mm b/d of lost demand in April. While we have seen estimates of this magnitude in the press, we believe they are likely too severe.

While most North American and Western European countries have imposed some form of lockdown, many parts of the world have not. According to research from Raymond James, approximately 35% of the world's population is currently under lockdown. Adjusting for oil demand, we estimate that countries representing 55% of global oil demand are currently imposing restrictions on their populations.

Assuming the countries under lockdown are seeing similar demand trends as the United States, global demand was likely directly impacted by 17 mm b/d. Other countries are likely being impacted as well through decreased travel and widespread economic slowdowns. If we assume the indirect impact on countries not under direct lockdown themselves is 10% (a very rough estimate), then this group represents an additional 5 mm b/d of demand impact. Together, these estimates total 23-25 mm b/d of impacted demand in April. While we admit our estimates are preliminary and subject to revision, until we can get more widespread reliable data they are the best we (or any other investors) have.

These estimates attempt to address the magnitude of the virus' impact on global oil demand. Next, we would like to address the duration of the impact. We believe there is reason to be optimistic. First, according to EIA weekly demand data, it appears the worst of the demand declines may be behind us. After having fallen sharply for five consecutive weeks, US petroleum demand has rebounded for the past two readings. We will continue to monitor this data very closely to see if it persists going forward. As we go to print, several states are in the process of reopening their economies and, we want to point out, that the increased demand over the last two weeks has all occurred before any such reopening.

"ACCORDING TO EIA WEEKLY DEMAND DATA, IT APPEARS THE WORST OF THE DEMAND DECLINES MAY BE BEHIND US."

We are also interested in the progression of the disease itself. Early in the pandemic, we became interested in the work of Dr. William Farr. In the early 19th century, Dr. Farr outlined what would later become known as “Farr’s Law,” an early attempt to empirically model the progression of how viruses and diseases spread. He noted that during a recent smallpox epidemic, deaths per period followed a roughly bell-shaped curve. We have been modeling both COVID-19 deaths and cases according to Farr’s Law ever since and the results have been fascinating. Thus far, both COVID-19 new confirmed cases and deaths have followed a Farr’s Law curve perfectly, each with an R2 of 0.995.

FIGURE 6 Global New COVID-19 Cases Ex. China

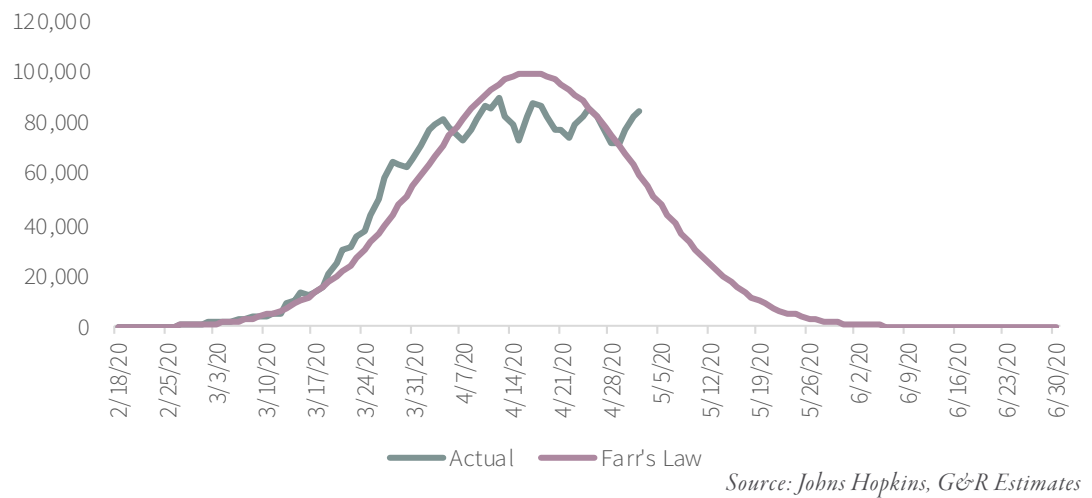
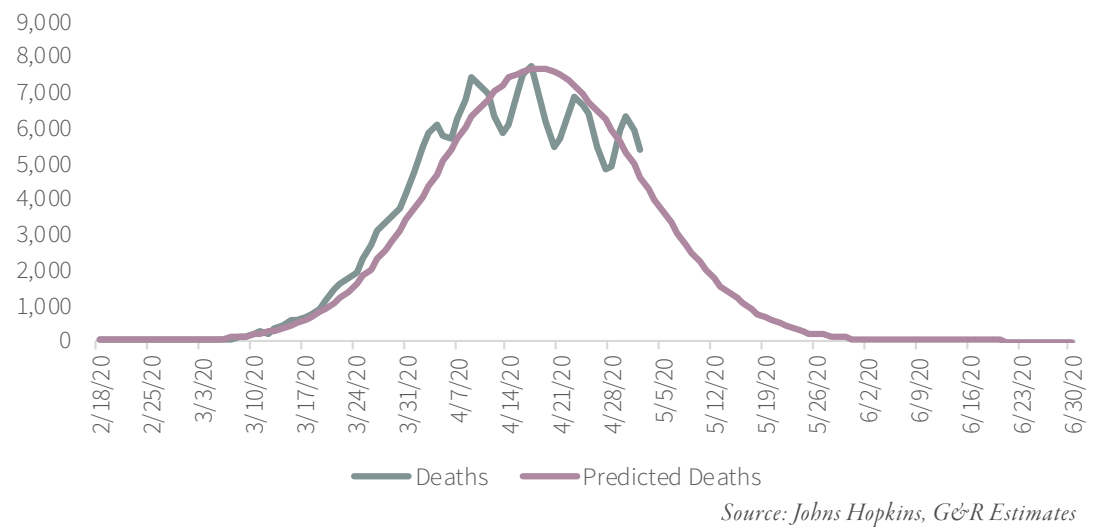


FIGURE 7 Global COVID-19 Deaths Ex. China

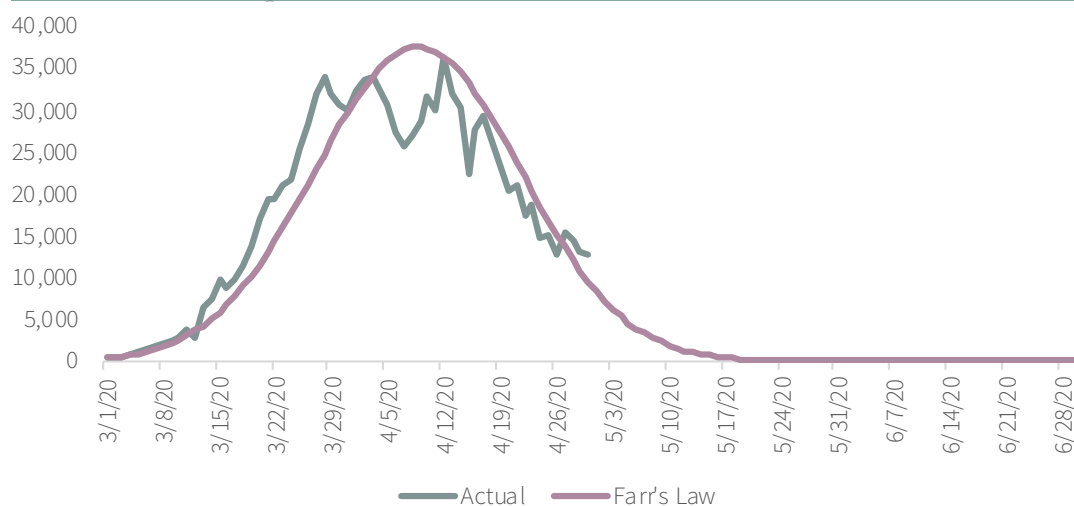


"AS EARLY AS THE FIRST WEEK OF MARCH, FARR'S LAW SUGGESTED THAT MAXIMUM DAILY NEW CASES WOULD OCCUR SOMETIME IN THE MIDDLE OF APRIL."

As early as the first week of March, Farr’s Law suggested that maximum daily new cases would occur sometime in the middle of April. While the total expected case count varied as the early data jumped around, Farr’s Law never predicted the tens or hundreds of millions of cases put forward by the most draconian estimates. While social distancing likely reduced these numbers materially, we still believe the original figures were far too pessimistic given the pattern of early disease spread.

The other key takeaway is that if Farr’s Law holds, the virus will likely retreat as quickly as it came on originally. This is the most profound economic conclusion looking forward. While the media continues to suggest we may never get back to normal again, Farr’s Law suggests new daily cases could be 90% lower in a matter of several weeks. While this may sound impossible, consider that daily new European cases have fallen by 65% in 18 days – exactly in line with Farr’s Law.

FIGURE 8 European New COVID-19 Cases



Source: Johns Hopkins, G&R Estimates

Many people are extremely concerned about the potential of a “second wave” of cases as social distancing rules are relaxed. Such a concern makes tremendous intuitive sense, however many diseases have followed Farr’s Law in the 180 years since it was first put forward. The most notable deviation was the Spanish Flu in 1918 that did experience a strong second wave of cases. However, upon closer inspection there were a myriad of mitigating circumstances (including the transporting of the sickest soldiers from the battlefield to the cities) that complicates the analysis.

Either way, the next several weeks will be instrumental in projecting the path forward: more complete demand data will be released by the IEA for March and April, while Farr’s Law will either continue to be validated or be disproved. In the meantime, we are monitoring both daily.

Last, we would like to touch on the OPEC+ developments of the first quarter. In response to sharply declining demand, OPEC+ called a meeting to discuss emergency production cuts on March 6th 2020. In a surprise move, Russia rejected the demand for a 1.5 mm b/d production cut, to be shared among OPEC+ members contingent on Russian involvement. Saudi Arabia retaliated and on March 7th 2020 announced they would allow their existing production agreement to lapse on March 31st 2020, effectively signaling they would materially increase production.

Oil prices collapsed on the news, declining by 25% on Monday March 9th 2020 – the largest daily percent loss ever to that point (since eclipsed by crude’s move negative on Monday April 20th).

We have received many calls asking why Russia would provoke Saudi Arabia and why Saudi

Arabia would then retaliate given the uncertain market outlook. While conspiracy theories of Russia and Saudi collusion abound, we believe the truth is much more pedestrian. Cartel behavior is inherently unstable. Each member faces a prisoner's dilemma of sorts, whereby they are better off with the cartel existing but not being subjected to its rules.

The fact that OPEC has managed to maintain cohesion for nearly six decades is a testament to the geopolitical importance it wields, particularly in the Middle East. From the outset, OPEC was formed to help its member countries apply political pressure on the West by using the so-called "oil sword." While these more hawkish policies have receded into the background in recent years, they nevertheless form the basis for the group and are an important part of its history. In this regard, Russia's involvement in OPEC+ was always dubious. Russia decided to agree to production cuts in 2016 along with OPEC-member countries, creating what has been referred to since as OPEC+. We have always had reservations about this arrangement. Why would Russia, a sovereign nation, chose to allow its single largest industry to be held to the dictates of a working group fourteen hundred kilometers away in Vienna? The answer is that the near-term benefits of a production cut in 2016, along with the improved stature it afforded them in the region, incentivized Russia to go along with the plan. By the first quarter of 2020 on the other hand, Russia felt it in their best interest to pump and so broke ranks without second thought.

Saudi Arabia's reaction, on the other hand, was likely driven by raw emotion. Our understanding is that Crown Prince Mohammad Bin Salman (MBS) was so incensed by Russia's actions that he decided to retaliate by not renewing the existing production cuts. This decision was extremely unpopular within the country, where the impacts of MBS's last price war from 2014-2016 are still being felt. During that episode, Saudi Arabia lost 30% of its foreign exchange reserves as they were spent to fill the massive deficit in the country's budget brought about by plummeting oil revenues. On March 6th, hours before the new Saudi policies were being announced, three senior members of the Royal family were arrested and charged with treason. One of these members was Prince Ahmed bin Abdulaziz, the current King's younger brother, while the other was Prince Mohammed bin Nayef (MBN). MBN was previously first in line to inherit the throne before he was ousted by MBS in a 2017 coup. The fact that they were arrested and charged with planning an alleged coup against MBS, hours before the announcement of a major policy initiative, is likely not a coincidence. Instead, it suggests that the price war had notable detractors within the country and was likely driven more by emotion than long-term strategy.

Regardless of the original Russian and Saudi motivations, the demand impact of the novel coronavirus eventually became too large to ignore. OPEC+ agreed to meet again on April 9th 2020 where they announced their record-setting headline production cut of 9.7 mm b/d. For now, OPEC+ is once again cooperating, however if there is a lesson to be learned it is that Russia's involvement will likely come to the fore at some point in the future again. At that point, we will have to assess the ramifications on global oil balances.

Saudi Arabia's threat to ramp production to 12.5 mm b/d led to many questions by our investors and colleagues as to whether they would be able to do so. In the past, we have been skeptical that Saudi Arabia has the spare capacity they claim (please see our 3Q2018 letter for more information). Our view was that Saudi Arabia would likely be able to hit their target for a short period, by pumping at full capacity combined with sales from inventories.

Source: St. Louis Fed, Bloomberg

After a short period, it was our opinion that Saudi Arabia would have to rest their fields or risk permanent damage caused by water incursion and gas caps. Given the subsequent OPEC+ production cut on April 9th 2020, we will not get to test our hypothesis this time around.

However, if we are correct global oil markets will fall into extreme deficit in 2021 as demand normalizes while supply languishes. It will be extremely interesting to see if Saudi Arabia is able to increase oil production to help balance the market.

The Bull Market in Natural Gas is Here

The twelve-year bear market in natural gas has ended. Two major developments in natural gas production have finally shifted the market into deficit for the first time in over a decade. Although we have mostly stayed away from natural gas stocks over the last several years, we continue to follow the market extremely closely. In many respects, natural gas is exactly the type of industry we seek out: the commodity has fallen in price by over 88%, the stocks are incredibly undervalued (often trading near liquidation value), and most analysts and investors have no interest whatsoever. Demand for natural gas is extremely robust, having grown by 30% over the last decade (three times the rate of the previous decade). This growth has been driven by widespread conversion of coal-fire power plants to natural gas in the United States along with increased LNG exports.

The biggest factor keeping us on the sidelines has been supply. In particular, surging production from the Marcellus shale in Pennsylvania along with associated-gas production from oil wells in the Permian Basin have kept the market in a perpetual surplus for most of the past decade despite strong demand. In many regards, North American natural gas has been moving along a knife's edge – demand has been strong, but supply has been even stronger keeping the market in surplus. If production were ever to falter, a massive bull market in North American gas prices would result.

That moment has now arrived, and the implications could be profound.

Production from both the Marcellus and the Permian are now set to fall dramatically. In our third quarter 2019 letter, we explained how our neural network warned us that the Marcellus was far more mature than investors appreciated. Using the neural network, we predicted that half the field's recoverable reserves will have been produced within 12 months at which point the field would likely peak. The Marcellus has gone from nothing to representing 25% of total US dry gas supply in only 10 years; if the field were to unexpectedly stop growing and decline it would have massive repercussions. When we wrote that essay back October, the Marcellus was still growing robustly, but since then the field has peaked. Production has now declined steadily for the last four months by 1 bcf/d in total or 15% on an annualized basis.

The sudden decline was driven by an abrupt slowdown in drilling activity in the basin. After peaking at 81 rigs in April 2019, the Appalachian rig count (which includes the Marcellus and Utica) is now down 40% to 48 rigs. Our models tell us that this sharp drilling slowdown has brought forward the geological depletion problems that were set to take hold sometime in the next twelve to eighteen months. For example, the last time 50 rigs turned in the Appalachian basins (in mid-2016), basin production was still able to grow by 200 mmcf/d

each month. Today, that same rig count can no longer offset base depletion, resulting in monthly production declines of 300 mmcf/d.

As energy prices have plummeted in response to the current pandemic, natural gas companies have slashed their drilling budgets as well. The natural gas-directed rig count today stands at 85 – the lowest reading on record and 95% below the 2008 peak. Marcellus production will not be able to arrest its decline in such an environment and will continue to fall materially as we progress through the year.

At the same time, associated gas production from the Permian is set to collapse. We explained in our introduction how US shale oil production would fall dramatically in response to record-low oil prices. Many shale oil wells, notably in the Permian basin, produce a large volume of natural gas as well. The gas generated as an oil-well by-product is known as “associated” gas and has represented a huge source of supply. As the oil shales have ramped up production, “associated” gas from the Permian basin alone has gone from zero to 11 bcf/d over the last decade, and Permian basin “associated” gas now represents the second largest gas shale source in the country, despite the field being thought of as an oil shale. Last year, Permian gas production grew by 2.3 bcf/d (nearly the same amount as the Marcellus), highlighting its importance to total US production. Based on announced and expected drilling budgets, our neural network now expects Permian gas production will also contract materially through 2020.

In total, we expect US gas supply will contract by approximately 10 bcf/d over the next 12 months, leaving the market in a dangerous deficit. While natural gas demand has also been impacted by the economic slowdown related to COVID-19, it has not fallen nearly to the same extent as oil demand. Adjusting for weather, we estimate that US natural gas demand has been impacted by COVID -19 ~6 bcf/d or 7%, compared to US oil demand that has fallen 30% over the same period.

Following the recent mild winter, natural gas inventories in the United States currently stand at 2.1 tcf or 20% above the five-year seasonal average. If our models are correct, this will change dramatically as supply falls. We estimate that inventories may only reach 3.2 tcf of gas by the end of October, the lowest reading since 2003 and some 16% less than both last year and the five-year average. At these levels, the market would be very susceptible to a weather-related price spike as we enter the 2020-2021 winter withdrawal season. Even without colder-than-normal weather, our models suggest inventories will hit dangerous levels sometime in late January, leading to higher prices.

Natural gas-weighted E&P equities have outperformed their “oilier” counterparts over the last two months, reflecting the positive fundamentals we just discussed; however, we believe huge profit potential still exists in these stocks. North American natural gas has been in a bear market for over a decade during which time the related equities declined in value by over 90%. That bear market is now likely over, and the investment implications and profit potential could be tremendous.

Copper: Both Supply & Demand Impacted by COVID

COVID-19 has impacted both copper demand and mine supply in a material way, but at this time the net effect of the virus remains unclear. Over the last month, approximately

20% of global mine supply has been idled and it is unclear when it will restart. Most analysts expect most of the idled capacity will be brought back online within the next 60 days, resulting in a total loss of approximately 1 mm tonnes or 5% of mine supply in 2020.

The demand impacts of COVID-19 are more challenging to quantify. Anecdotal information from China suggests copper demand has rebounded sharply from February's low levels. Chinese copper stockpiles appear to have drawn down steadily over the last six weeks and now stand 30% below their February peak. Global copper exchange warehouse inventories have grown over the last two months but are still at manageable absolute levels. After having bottomed at 300,000 tonnes at the end of 2019, exchange inventories have increased to 560,000 tonnes by the end of April. While this may sound ominous, inventories remain significantly lower than in the first quarter of 2019 when they reached 900,000 tonnes.

Copper demand, at this point, appears to be holding in better than global oil demand. Meanwhile, scrap copper prices are rising dramatically. Mine supply disruptions look to be offsetting any drop in demand resulting in extreme tightness in the secondary copper market. So far, global copper appears to be handling the global economic contraction relatively well. Although rising exchange inventories suggest the market is in surplus today, the absolute level of inventories remains manageable while firmness in the scrap markets suggests localized deficits may be emerging.

Copper continues to have one of the best long-term supply/demand fundamentals of any commodity. Copper mine supply will hardly grow at all over the next five years while demand growth will remain strong driven by continued emerging market development and the push for copper-laden renewable electricity. We are maintaining all of our copper related investments.

COVID Mine Closures Last Straw for Uranium Bears

Uranium was a rare bright spot during the first quarter. Spot prices advanced over 30% to finish above \$30 per pound for the first time since 2016 and uranium producers are among the few stocks posting gains for the year, advancing by 10-15% on average since the beginning of 2020.

The catalyst for the rally was Cameco's decision, announced on March 23rd, to suspend production at its remaining flagship mine, Cigar Lake, in response to the novel coronavirus. Initially, Cameco announced the shutdown would last four weeks, but on April 23rd they extended the curtailment "indefinitely," pending a resolution of the pandemic. Cigar Lake was expected to produce 18 mm lbs. of U₃O₈ this year or almost 10% of annual global mine supply.

In past letters, we have detailed the dynamics in global uranium markets over the last three years. Beginning in 2018, after years of low prices, both Cameco and Kazatomprom announced widespread supply curtailments at their flagship properties. These actions served to push the market into a slight deficit that we expected would become more severe as new reactor demand from the non-OECD world ramped up throughout the 2020s.

Cameco's recent decision to suspend operations at its remaining operational mine puts new strains on an already tight uranium supply chain. When Cameco first suspended operations at McArthur River in late 2017, their strategy was to purchase volumes in the spot market to meet contractual obligations that would have come from the mine's production. At the same time, they disclosed commercial uranium inventories of 28 mm pounds. While they

could sell down these inventories, Cameco announced at the time they would prefer to maintain ample stockpiles in case of unforeseen supply disruptions. By the end of 2019, these inventories had nevertheless shrunk by 71% to only 6 mm lbs. suggesting they were either unable or unwilling to source as many spot volumes as they expected.

Over the last two years, Cameco had ~55-60 mm lbs. of uranium committed under long term contract. We estimate this was met through 20 mm lbs. of production from Cigar Lake, 15 mm lbs. of inventory drawdowns, 10 mm lbs. from their Inkai joint-venture and 4 mm lbs. from other contractual obligations, leaving 10 mm lbs. to be purchased in the spot market or 5 mm lbs. per year.

Looking forward through 2020, the two largest sources of Cameco's supply – Cigar Lake production and commercial inventories – are now highly uncertain. While a lot will depend on how quickly Cigar Lake comes back online, the recent shutdown extension only fuels concerns in an already strained supply chain. If Cameco decides it does not want to lower its inventories any further and Cigar Lake stays closed for four months, spot purchases could total 17 mm lbs., or three times the average rate of the last two years. In the last six months, Cameco has often stated the difficulty of sourcing uranium in spot markets, and we believe this will only become more difficult as Cameco has to aggressively seek additional supply.

Cameco is not the only uranium producer facing challenges due to COVID-19. On April 7th 2020, Kazatomprom announced they too would be lowering production across their assets by as much as 10 mm lbs. in response to the lockdown. The market will learn more when they provide an operational update on May 4th 2020.

Many electric utilities have long-term contracts that must be renewed in 2020. Weak prices, along with uncertainty around "Section 232" legislation resulted in many buyers waiting on the sidelines throughout 2019. Given the recent developments, we would not be surprised if many of these buyers decide to finally act in the coming weeks and months to avoid any potential supply disruptions.

The other development this quarter involved the US Department of Energy's Nuclear Fuel Working Group report released on April 23rd. The report explains the importance of "restoring America's nuclear energy advantage" and advocates for domestic sources of uranium mine production and processing. The most notable recommendation is for the establishment of a strategic uranium stockpile sourced from domestic mine supply. Other recommendations include easing the permitting for uranium and nuclear related projects. While it remains to be seen how these policies will be implemented, we believe the release of the report itself will help remove major uncertainty for fuel buyers.

We have long argued that a new bull market in uranium was on the horizon. The market had quietly slipped into deficit sometime in 2018, but this deficit was being "bridged" by drawdowns of commercial inventory. Our modelling strongly suggests this inventory is now largely depleted at the same time that COVID-19 has created new large-scale supply disruption. At the same time, utilities find themselves the most under-contracted in decades. All the pieces have now fallen into place for a huge bull move in uranium prices.

The Return of the Western Gold Investors

Back in the fourth quarter of 2015, gold touched \$1,050 per ounce, reaching an important

bear market bottom in the process. In almost every letter since, we have written why we believed a massive precious metal bull market was approaching. We explained how the upcoming bull market would be dominated by Western investors, a vast difference from the last bull market from 1999-2011—a bull market that was dominated by Eastern buyers primarily from China and India. We also explained how the upcoming bull market would have a huge speculative element to it – again quite different from the first leg of the bull market that was mostly orderly and driven by value-conscious Eastern investors.

During the first quarter of 2020, evidence again clearly shows that speculators and Western investors are indeed developing a huge interest in precious metals. The economic impact of COVID-19 has led central banks around the world to accelerate their aggressive balance sheet expansions. Recognizing these trends, investors directed an ever-increasing amount of capital to precious metals through the physical ETFs. While the 17 physical ETFs we track accumulated 325 tonnes of gold during all of 2019, this level accelerated to 237 tonnes for the first quarter of 2020 alone and another 143 tonnes in the three weeks subsequent. Over the last 15 weeks, these ETFs accumulated 380 tonnes of metal – more than during all of 2019. Precious metal ETF buying tends to be dominated by Western capital and we continue to believe these flows represent the return of Western investors. Investor interest for physical silver continues as well. For all of 2019, the nine physical silver ETFs we follow accumulated 2,580 tonnes and, for the first 15 weeks of 2020, these ETFs have already accumulated an additional 2000 tonnes of metal.

Western investors have been completely absent from the precious metals market for almost 40 years, except for the brief period between 2009 and 2012, and the recent surge in interest in precious metal, we believe, is only the beginning. If we are correct, we should continue to see extremely large accumulations in both gold and silver physical ETFs as Western buyers come to dominate global precious metal markets.

Furthermore, the first quarter brought the first signs that speculative “animal spirits” were awakening in the gold market after nearly 40 years of hiatus. At the end of March, the price of gold as quoted by the New York COMEX futures completely decoupled from the price of physical spot gold in London.

For several days, New York future prices traded at a \$70 per ounce premium to London physical spot gold – something that should rarely if ever occur, given how easily a trader can send metal from London to New York to arbitrage away the difference. While many gold market commentators attribute the divergence to the disruption of air traffic patterns due to COVID-19, we think it represents a much more important shift in the the market dynamics.

For nearly 40 years, gold has flowed predominantly eastward from London. Western investors have been near constant sellers that entire period. The huge divergence between Western prices (represented by the New York futures prices) versus the London spot prices (representing gold being shipped East) points to the return of increased Western demand. As this gold bull market progresses, Western speculators will have to aggressively bid gold away from Eastern buyers. New York gold future prices trading at huge premiums over London spot prices is a strong sign of surging Western demand and we believe this will occur repeatedly as the gold bull market unfolds.

Along with the gold-oil ratio discussed earlier in this letter, another record was set in the gold market in the first quarter.

On March 18, one ounce of gold purchased 127 ounces of silver – a level not seen since at least 1300 (we have good records of both gold and silver price going back that far). The previous record was set on February 27, 1991 at 100. In our 4Q2018 letter, we wrote extensively about the history of the gold-silver ratio.

In a pattern that has repeated itself multiple times since the US government ended the Bretton Woods agreement in 1971, the gold-silver ratio contracts during precious metal bull markets (as the price of silver rises faster than the price of gold) and expands during severe bear markets (as the price of silver falls faster than the price of gold).

Since 1971, the gold-silver ratio has surpassed 80 five times and in four of these instances it paid to accumulate significant positions in both metals.

FIGURE 9 Gold-Silver Ratio



Source: Bloomberg

The only false positive came in 1990 at which point the ratio hit 100, but did not result in strong forward performance. For a detailed discussion of each period, please refer to our [4Q2018 letter](#). With the gold-silver ratio having recently hit an all-time high of 127, (today the ratio still sits at 115), is this another great buying opportunity for precious metals or are we getting another false positive, as we did in 1991? Although we will only know in retrospect, we believe the simultaneous record set in both the gold-oil and the gold-silver ratio is likely signaling something profound. In both cases the denominators (oil and silver) are likely being depressed by the severe deflationary forces being experienced across the commodity complex at large due to the COVID-19 economic dislocation. At the same time, the numerator (gold) has rallied, reflecting the increased likelihood of further currency debasement and resulting inflation as we progress through the decade due to the massive expansion of the central banks' balance sheets.

In other words, gold suggests that inflation is on the horizon while commodity prices in general (and oil and silver in particular) suggest forced selling pressures continue. Viewed in this way, the simultaneous records set in the gold-oil and gold-silver ratios are bullish not only for gold, silver and oil but for commodities in general. In fact, commodities (and oil in particular) could be giving the buy signal of a lifetime.

Lastly, we would like to update a valuation methodology we have laid out in several past letters.

In our 2Q2018 letter, we laid out several long-term price targets using various valuation methodologies. In one valuation exercise, we compared the value of the US Treasury's gold holdings to the size of the US Federal Reserve balance sheet, a valuation methodology we believe is particularly relevant today given the announcement of another massive round of balance sheet expansion. Twice over the last 100 years, the dollar value of the Treasury's gold holdings has exceeded the Fed's balance sheet by 1.7 times. The first time was the late 1930s after the Treasury raised the gold price to \$35 per ounce while concerns over war in Europe caused gold to flow to the US Treasury seeking a safe haven. The second time occurred in January 1980 as surging inflationary fears created a speculative craze in both the gold and silver markets. With gold spiking to over \$800, the size of the Treasury's gold holding once again reached 1.7 times the size of the Fed's balance sheet.

There is a strong probability that sometime in this bull market, gold prices will reach levels where the dollar value of the Treasury's gold holdings again exceeds the Fed's balance by 1.7 times (comparable to 1937 and 1980). Before the impacts of COVID-19 (but after three rounds of quantitative easing), the Fed's balance sheet was \$4 tr while the Treasury's gold holdings remained unchanged at 262 mm oz. For the ratio to merely reach 1:1 would imply a gold price of \$15,000 per ounce. In the past we have used this framework to conclude a minimum \$10-12,000 price target was achievable in the upcoming bull market, even if the Fed were to shrink its balance sheet materially.

However, starting last October the US Federal Reserve stopped shrinking its balance sheet and began another material round of expansion in response to stress in the repo market. To address the economic strain introduced by COVID-19, the Federal Reserve has exploded its balance sheet by 50% to nearly \$7 tr in a matter of weeks. Were the Treasury's gold holdings ever to reach 1:1 now implies a price target of \$20,000 per ounce.

We strongly believe inflation's return will be a hugely significant investment story this decade. Western investors and speculators are set to become heavily involved in the precious metals markets just like they last were in the 1970s, and we believe huge speculative forces are set to be unleashed as this decade unfolds. Our initial \$10,000 price target for gold, which in the past seemed outlandish, might end up being far too conservative.