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Goehring & Rozencwajg
Natural Resource Market Commentary

Managing Partners:
LEIGH R. GOEHRING
ADAM A. ROZENCWAJG

BEWARE THE COLLAPSE IN NON-OPEC OIL SUPPLY

Table of Contents

Conventional Oil: The Problem No One is Talking About

"In the second half of this decade total capital expenditures by the large oil and gas groups is projected to fall almost fifty percent to $443.5 bn from $875.1 bn between 2010-15 according to Rystad Energy..."

"...the industry has largely abandoned new investment in the type of mega-projects, from Arctic exploration to Canadian oil sands, which were once its forte."

"Oil producers face their 'life or death' question," Financial Times 6/20/18

"'Big Oil is sowing the seeds for a 'super-spike' in crude prices above $150,' Bernstein warns." CNBC 7/6/2018

The collapse in global discoveries of conventional oil is not new to us. It has been impressive and has received only passing comment by the financial press. In 2017 alone, the global oil industry discovered only four billion barrels while global consumption exceeded 35 billion barrels, leaving an impressive 30 bn barrel gap between discoveries and demand. Over the last five years, the numbers have been equally imbalanced. Since 2012, we estimate global oil consumption exceeded new conventional oil discoveries by a total of 210 bn barrels.

To show how deeply embedded these trends are, the last time conventional oil discoveries exceeded global consumption was 18 years ago when discoveries (37 billion barrels) exceeded consumption (28 billion barrels) by 9 bn barrels.

Anemic upstream capital spending trends almost guarantee that this dismal stretch of conventional oil discoveries will be repeated in the next five years. For example, according to Rystad Energy, the Norwegian oil and gas consulting firm, the global oil and gas industry will spend only $440 bn in the 2015-2020 period, nearly 50% below the $875 billion the industry spent between 2010 and 2015. Although energy investors pay little attention to these large drops in capital spending, significant long-lasting effects have already appeared and are now firmly embedded in global oil markets. Not only have the discovery of new conventional oil reserves collapsed, but conventional non-OPEC oil production has already begun to quietly decline. After peaking at 44.9 mm b/d in 2010, we believe conventional non-OPEC oil production will fall to 43.5 mm b/d this year—a decline of 1.4 mm barrels, or 160,000 b/d per year since 2010.

"SUGGESTS INVESTORS ARE COMPLETELY UNDER-ESTIMATING THE FUTURE IMPACT OF DECLINING CONVENTIONAL NON-OPEC PRODUCTION"

Investors consider the drop in conventional non-OPEC production to be immaterial given the surge in US shale oil production. However, our analysis suggests investors are completely underestimating the future impact of declining conventional non-OPEC production -- production that still represents 45% of world supply.

Between 2010 and 2018 we calculate total non-OPEC liquids production has grown by almost 10 mm b/d, or approximately 1.25 mm b/d per year:

Source	2010	2018 Est	Change
Conventional oil production	44.8 mm b/d	43.5 mm b/d	-1.4 mm b/d
US shale oil	0.9 mm b/d	5.8 mm b/d	+4.9 mm b/d
US shale NGL	0.3 mm b/d	2.7 mm b/d	+2.4 mm b/d
Canadian oil sands	1.5 mm b/d	3.0 mm b/d	+1.5 mm b/d
Bio Fuels	1.8 mm b/d	2.6 mm b/d	+0.8 mm b/d
Refining Gains	2.1 mm b/d	2.3 mm b/d	+0.2 mm b/d
OPEC NGL	5.4 mm b/d	6.9 mm b/d	+1.5 mm b/d
Total Non-OPEC Liquids Production	56.8 mm b/d	66.8 mm b/d	+10.0 mm b/d
Global Demand	87.8 mm b/d	99.8 mm b/d	+12.0 mm b/d
OPEC Crude Production	30.2 mm b/d	32.2 mm b/d	+2.0 mm b/d

Nearly 75% of this production increase came from the US shales. But it's important to put these numbers in context. From 2010 until 2018, even in the face of extremely strong non-OPEC supply growth, global oil demand actually exceeded total non-OPEC liquids growth, a fundamental fact that few energy analysts reference. Even with the ramp-up of four massive shale basins (Bakken, Eagle Ford, Marcellus [important for natural gas liquids or NGLs] and the Permian), the "call on OPEC crude" has actually increased by 2mm b/d.

As recently as last year, most market commentators believed the world was "awash" in oil. And for a brief time between 2014 and 2016 it was. Non-OPEC supply grew by 2.5 mm b/d in 2014 and the

Saudis responded by boosting their production at the November 2014 OPEC meeting, leading to an OPEC market share war. Since then, incredibly strong demand growth, combined with OPEC's decision to curtail production at the end of 2016, has once again thrown global oil markets back into severe deficit, a subject we have discussed at length in these letters. With world oil markets now firmly in deficit even after the most recent OPEC increase, the problems firmly embedded in conventional non-OPEC production (largely ignored by industry analysts), will now become an issue that grabs center stage.

We believe the surge in US shale liquids production will be nearly impossible to repeat in the next five years. Although few agree with us, we believe that two of the three great oil shale basins (the Bakken and Eagle Ford) have largely peaked and that the preponderance of future shale growth will come from just one field—the Permian.

Slowing US shale oil growth, combined with demand that continues to surprise to the upside, means that the world will increase its reliance on a segment of the global oil market that has been neglected and capital starved and is already in decline: conventional non-OPEC oil. Few people have researched or commented upon production trends in conventional non-OPEC oil supply over the last five years and even fewer seem to understand its importance.

"THE BIGGEST COMPETITOR TO OPEC OIL IS NON-OPEC OIL, AND WHEN NON-OPEC OIL GROWTH SLOWS, OPEC GAINS BOTH MARKET SHARE AND PRICING POWER."

Almost a decade ago (2009), we undertook a huge research project in an attempt to project future growth in non-OPEC oil supply. As many of you know, we were one of the few to correctly predict the rapid, unexpected slowdown in non-OPEC oil supply growth that occurred between 2003 and 2008. As we used to tell investors back then, "The biggest competitor to OPEC oil is non-OPEC oil, and when non-OPEC oil growth slows, OPEC gains both market share and pricing power." The rapid slowdown in non-OPEC oil supply growth (which few analysts predicted) provided the backdrop for the huge bull market in oil prices that took place between 1999 and 2008 when oil eventually spiked to $145 per barrel. In 2009, we dusted off our non-OPEC supply models and undertook another large project to update the research we first did nearly a decade earlier.

In our 2nd Q letter of 2009, we outlined our results and once again predicted a large disappointment in non-OPEC oil supply going forward. Instead, the rise of the US shales led to a robust period of non-OPEC supply growth. Although it would be convenient if all of one's bad research calls quietly disappeared, we thought it would extremely interesting to revisit that essay, update the research from a decade ago, and look at what we got right and where we went wrong. That essay (written just as oil production from both the Bakken and Eagle Ford shales were set to surge and before the southwestern liquids-rich Marcellus was about to flood the US with NGL's), grossly underestimated the contribution of shale to non-OPEC oil supply growth. Although we underestimated the huge surge in US shale oil production, we did correctly foresee the ultimate decline of conventional non-OPEC oil production in that essay.

Over the last eight years, non-OPEC conventional oil supply has fallen by 1.4 mm b /d (or by about 155,000 b/d per year). Although this is less than what we modelled back in 2009, we believe the massive capital investment made between 2010 and 2014, supported by oil prices that averaged over $100 per barrel, slowed historical global underlying depletion rates. However, we believe the slowing of these depletion rates is temporary (a position shared by oil service firms such as Halliburton) and that the massive slowdown in upstream capital spending over the last several years will expose

a depletion structure that can no longer be held back. For example, even given the recent run-up in oil prices, over 100 projects (representing close to 27 bn barrels of reserves) remain suspended after the 2014 oil price collapse. We believe the big declines in non-OPEC conventional production, a problem we foresaw back in 2009, is about to reemerge as a huge, unexpected issue in the next several years, and will significantly impact global oil balances.

Investors have been slow to grasp how four years of massive underinvestment in the global oil industry has impacted conventional non-OPEC oil production. But another supply issue is emerging that garners little investor attention. Not only have huge cut-backs in global upstream capital spending impacted conventional non-OPEC oil production, but our research tells us that cuts to upstream capital spending are now beginning to impact OPEC oil production as well. Algeria, Nigeria, and Angola have seen their production decline by over 1 mm b/d in aggregate over the last four years. We believe these declines are directly related to inadequate capital spending. Combined with politically related production problems in Venezuela and Libya, OPEC spare capacity is rapidly falling to zero. It is no longer clear to us whether OPEC could regain its November 2017 production quota of 32.6 mm b/d. In our next letter, we will discuss the production problems now emerging in the OPEC world, including an in-depth look at the only remaining member country with any significant spare capacity: Saudi Arabia. Saudi Arabia continues to maintain that they can pump between 12-12.5 mm b/d, however we believe this figure could be overstated by nearly 1.5 mm b/d.

Last decade, we did a huge amount of research on Saudi oil production and its related reserves (including a visit to the Ghawar field back in 2004). In our next letter, we will discuss both our research and the broader issue of OPEC (and particularly Saudi Arabia) spare capacity. Problems now embedded in non-OPEC conventional oil production combined with dwindling spare capacity within OPEC, will cause additional and unexpected further tightening in global oil markets in the upcoming years.

We have reached a tipping point in this oil bull market. Since reaching the lows in the first quarter of 2016, oil prices have advanced almost three-fold, yet investors remain stubbornly bearish towards oil. Surging US shale production and an entrenched belief that global oil demand will peak and markedly decline as we progress into the next decade have caused investors to ignore the positive fundamentals in global oil markets over the last 18 months. Although oil-related investments have recently started to perform better, they continue to lag the oil price advance. We believe last month's OPEC meeting might prove to be the catalyst to finally change investors' perception.

Consensus opinion held that any OPEC deal to increase production would cause a near-collapse in prices as a new market-share war (with Russia now thrown in) would break out. Reflecting generally accepted consensus opinion, a Bloomberg headline shouted: "Coming Soon: 'OPEC's Worst Meeting Ever, Part 2.' The Saudi about-face on production lays the ground for discord in Vienna." But a funny thing happened after the June OPEC meeting concluded: even though a pact increasing oil production was agreed to, prices rallied with West Texas Intermediate (WTI) making a new high.

We believe the bull market in oil, (ignored thus far every step of the way by the investment community) is set to dramatically accelerate to the upside. Stay long oil and oil related investments.

Q2 2018 Natural Resource Market Commentary

Natural resource markets showed significant strength in the second quarter, even in the face of an extremely strong dollar and continued trade war escalations by the Trump administration. The Goldman Sachs Commodity Index, with its large oil weighting, rose a strong 8%. The Rogers International Commodity Index, which has much larger agriculture and base metal weighting, rose a smaller 3.6%. Regarding natural resource related equities, the S&P North American Natural Resource Sector Index, with its very high weighting in energy stocks, rose a strong 12%. The S&P Global Natural Resource Index, which has much higher base metal and agricultural exposure, rose only 4.6%

By far the second quarter's strongest commodity was oil. Even as the US dollar advanced a strong 5%, WTI oil prices rose 14% and Brent prices surged 17%. The price action of E&P stocks was also strong. After lagging significantly in the first quarter, E&P stocks rose a strong 22% during the quarter. Oil has now advanced by 180% since the lows reached back in February 2016, and investor interest in energy stocks seems to have finally returned.

We believe global oil demand is significantly exceeding supply and inventories on a global basis should continue to draw throughout 2018. Based upon the supply and demand analysis we presented last year, global oil inventories should draw by 650,000 b/d on average. US core petroleum inventory draws moderated slightly during the second quarter, but our models suggest they will accelerated again in the second half of the year. During the second quarter, US core petroleum inventories drew by 23 mm barrels. The second quarter historically experiences a draw of 9.5 mm barrel on average over the last 10 years, so according to this data US inventories drew by 150,000 b/d relative to seasonal averages. On a global basis, we only have data through May, but again these numbers display similar draws. For the three-month period ending May 30th, global inventories, according to the International Energy Agency (IEA) have drawn by 24 mm barrels. Average ten-year global inventories typically build by 42 mm barrels over the same three-month period suggesting inventories drew by 640,000 b/d versus seasonal levels —very much in line with the modeling we put forth at the end of last year.

Oil prices have significantly exceeded consensus forecast over the last 12 months and, based upon our modelling for 2019, we believe the analytic community is again significantly underestimating oil prices. As we outlined in this letter's introductory essay, investors do not understand the problems currently developing in conventional non-OPEC oil production which has already rolled over and is now declining. In the next several years, our research tells us that declines in conventional non-OPEC oil production will accelerate significantly. Please read the "Oil Section" of the letter, where we go into current oil market fundamentals and how, based upon our modelling, 2019 global oil market supply and demand numbers should play out. It continues to be a very bullish story.

Natural gas prices were trendless in the second quarter. Although gas prices were able to rise above $3.00 per MMBtu in mid-June, they have since traded back to $2.80. Although natural gas demand remains extremely strong, supply continues to surge. For example, the Energy Information Agency (EIA) indicates natural gas supply is now growing at rates surpassing 1 bcf/d per month – the fastest growth rates ever registered.

In next quarter's letter, we will write extensively about global natural gas demand, and the liquified natural gas markets (LNG). We have followed and modelled global LNG markets extensively in the past and we will present our updated research and investment outlook. The US is scheduled to complete 5 bcf/d of new LNG export capacity in 2019. We will attempt to analyze whether this new slug of demand has any hope of tightening the North American natural gas market. In the interim, we remain neutral toward natural gas prices as supply continues to surge.

Base metal markets were mixed during the second quarter. Copper and zinc prices were weak (down 3% and 13%, respectively), while nickel and aluminum prices advanced by 12% and 6%, respectively. After the close of the second quarter, the Trump administration announced plans to place tariffs on an additional $200 billion of Chinese exports to the United States, thereby ratcheting up the possibility for a full-blown trade war. Since the announcement of additional China export tariffs, base metal prices have pulled back sharply. Copper prices have been particularly hard hit, falling an additional 7% since the end of the quarter.

Although it's hard to know how the Trump administration's trade war will play out and what effect it will have on global growth (particularly as it regards China), our hunch is that the pull back in base metal prices (particularly copper) represents a buying opportunity. As we outline in the copper section of this letter, global demand continues to remain very robust (driven by both China and now India) while future projections of global copper supply continued to be reduced. Although trade war fears and impacts are real, our modelling continues to tell us that structural deficits have already firmly embedded themselves in global copper markets and that higher prices will be the only realistic way to close this structural gap.

In response to the strong 5% move in the dollar, precious metal prices were weak during quarter. Gold and silver fell 5% and 1%, respectively, but gold stocks actually managed to eke out a small 1.5% gain. Although we are long-term precious metal bulls, we continue to believe that the next leg in the gold market has yet to arrive. In our previous two letters, we wrote that the gold market today is repeating what happened between 1999 and 2001. We like to follow the pricing relationship between gold and oil. Back in 1999, when oil hit $11 per barrel, gold became very expensive relative to oil. Historically, such extreme readings often take years to work off and what happened back in 1999 to 2000 was no exception. After peaking at nearly 30 (an ounce of gold bought 30 barrels of oil), oil proceeded to appreciate 230% in the next 18 months. During the same time gold prices declined by almost 10%. By the end of 2000, gold had become radically undervalued. In fact, gold had become about as cheap as it ever gets relative to oil: one ounce of gold only bought 7 barrels of oil. At that point gold (and particularly gold stocks) began to radically outperform both oil related investments and the stock market in general. For example, over the next six years gold prices tripled and gold stocks surged more than eight-fold. In the current cycle, the gold-oil ratio hit an all-time high of 44 (the highest level in over 160 years of data that we keep), and, just like the 1999-2000 experience, oil has radically outperformed gold ever since. Since the February 2016 low, oil prices have advance over 180% compared to a gold price that has only advanced a little less than 20%. The gold-oil ratio has steadily contracted and today stands a little over 17. Although open to wide varieties of interpretation, we believe that we are still on track to have the gold ratio trade back into the low teens in this cycle. If oil were to surpass $100 per barrel in the move (and gold continued to drift lower - very similar to the 1999-2000 experience) we believe the Dow-gold ratio could easily approach 10. At that point gold would become a tremendous buy, just like it was in the fourth quarter of 2000. In the interim, we continue to prefer oil related

investments. The underlying fundamentals in both gold and silver markets continue to support our neutral investment approach. Investor interest in precious metal markets remains lackluster. We have seen little accumulation in either physical gold or silver ETF's. Also, contracting premiums on physical gold in both India and China indicate a period of lackluster demand. We carefully monitor all of these indicators, but as of today, we see little evidence of the strong physical demand that would be needed to push gold prices higher. We sit, we carefully watch, and we wait. We believe a huge bull market is gold is coming, but it isn't here yet.

"BELIEVE A HUGE BULL MARKET IS GOLD IS COMING, BUT IT ISN'T HERE YET."

We know a large number of our readers have an intense interest in precious metal markets and we promised that we would give our long-term view of where gold stands in relation to the larger investment cycle. We are long-time students of precious metal markets, and we firmly believe a huge bull market in gold lies in front of us. In the "Precious Metal" section of this letter, we outline why gold remains extremely undervalued and why a huge precious metals bull market will take place in the not-too-distant future. We will also outline our viewpoint on how high gold prices might go. As mentioned in the last letter, I was profiled in the June 24, 2000 issue of Forbes Magazine with the headline "Gold at $2,500?" With gold trading at $290 at the time, such a price target seemed beyond reason. Although gold did not reach my price target, it did hit $1,900 in September of 2011, a number that I should point out, with gold trading below $300, seemed utterly implausible at the time. And how did I come up with that $2,500 price target? Please read on.

While uranium markets were largely quiet during the second quarter, prices did see some firming, rising form $21 per lb. to $23 per lb. Two very interesting and important data points emerged during the quarter. First, as we have mentioned in previous letters, we believe this uranium bull market will be greatly assisted by the completely unexpected emergence of a new source of demand—the financial investor. During the second quarter, two significant uranium purchases were made by financial investors which we believe shows the huge potential demand from this new source. We have received many inquiries after we published our bullish price outlook in our last two letters and we believe this is an indication that many investors are searching for ways to play the upcoming uranium bull market, including investments in the actual metal. It's unusual for investors to show such interest in a commodity before a bull market starts, and we believe it represents the large potential investor demand for physical metal that could develop. In the last uranium bull market, we did see some hedge-fund accumulation of physical uranium, but those investments were made after uranium prices had already risen ten-fold.

"THIS URANIUM BULL MARKET WILL BE GREATLY ASSISTED BY THE COMPLETELY UNEXPECTED EMERGENCE OF A NEW SOURCE OF DEMAND—THE FINANCIAL INVESTOR"

Second, on their first quarter conference call, Cameco told investors that as a result of suspending operations at Cigar Lake, Cameco would be 24 mm lbs. short in its ability to fulfill contractual supply agreements. The company said approximately 15 mm lbs. of uranium would come from their own inventory, but that at some point in the second half of 2018, they would have to enter the physical spot market to purchase an additional 10 mm lbs. to satisfy remaining commitments. The physical spot uranium market is extremely small (estimated by analysts to be only 10 to 20 mm lbs.) and we will get a good test of exactly how much physical inventory is actually available to the market during the second half. We remain extremely bullish on uranium.

Grain markets were hammered during the second quarter by escalating trade war rhetoric. In retaliation to tariffs put in place on Chinese exports, the Chinese government has placed significant tariffs on a large number of US agriculture exports including soybeans, by far the US's largest export crop. Soybeans, the grain most affected by the Chinese tariffs, fell almost 20% during quarter, but corn also

fell almost 10%, despite the fact that Chinese imports of US corn have already fallen to insignificant levels. Although it's hard to predict how this brewing trade war will play out, (and today it looks like agricultural markets are expecting the worst -- for example, speculators in soybean futures markets have now gone net short), we see a number of positive forces that continue to exert themselves on global agricultural markets.

Global grain markets continue to be on a knife's edge. Because of extremely strong grain demand any drop-in record global grain yields will have huge impacts on global grain inventories, which are already drawing relative to historical seasonal levels. While today's headlines are dominated by trade war rhetoric, these issues will ultimately have little lasting impact on the bullish longer-term emerging-market protein demand trends.

Finally, regarding soybeans, we would like to point out what a grain market participant with over 30-years of agriculture market experience told us. He said the Chinese (with their incredibly strong demand) have to buy their soybeans from somewhere, and Brazil, now the largest exporter of soybeans to China, can't export enough to meet China's demand alone. As Brazil ships more soybeans to China, Brazil's export to other parts of the world will decline, opening up demand for displaced US exports. Although there are short term dislocations with negative price pressure because of the tariffs, in the long run, Chinese tariffs on soybeans will not affect total export demand.

Bullish developing trends in global agriculture markets have been temporarily interrupted by trade war fears, but we do not believe the long-term bullish story has been derailed whatsoever. We increased our exposure to the agriculture space significantly in the first quarter through our purchase of various fertilizer equities, and we should point out they have shown little price weakness in the second quarter. Given any price weakness, we would increase our exposure to agricultural related equities.

Conventional non-OPEC Oil in Depth: Declines are Set to Rapidly Accelerate

The success of shale oil in the United States has been one of the most dramatic advancements in energy production since the discovery of the Saudi mega-fields after World War II. Since 2010, US shale oil production has grown by over five million barrels per day – by far the largest single source of growth in the world. Having been an early investor in the US shale plays, we have written for over a decade about the incredible potential unlocked by the combination of horizontal drilling and hydrological fracture stimulation (first in the natural gas shales and later in the oil shales). However, while the world has been focused entirely on shale oil production, something very important has taken place in the rest of the non-OPEC world that few people have noticed.

"WHILE THE ANALYTIC COMMUNITY HAS BEEN FIXATED SOLELY ON THE SHALE PLAYS, 65% OF NON-OPEC PRODUCTION HAS BEEN QUIETLY DEVELOPING A SEVERE DEPLETION PROBLEM THAT WE ANTICIPATE WILL ONLY GET WORSE."

As we mentioned in our introduction, since 2010 conventional non-OPEC crude oil production has declined substantially. This is critically important because, even after the meteoric rise of shale production over the last eight years, two out of every three non-OPEC barrels still come from conventional sources. While the analytic community has been fixated solely on the shale plays, 65% of non-OPEC production has been quietly developing a severe depletion problem that we anticipate will only get worse.

Starting ten years ago, the industry faced a dearth of new mega-projects. Several years of high oil prices were not able to overcome this challenge and, as a result, new discoveries have plummeted. Making matters worse, low oil prices since late 2014 have led many oil companies to abandon what new mega-projects they did have and defer maintenance capital on their existing fields. We believe that all of these forces have combined and will result in material conventional non-OPEC disappointments going forward.

We first conducted this analysis and presented our results nearly a decade ago. While much of what we predicted was correct, our work had one major flaw: while our analysis was correct regarding conventional non-OPEC production, we did not properly anticipate the rise of US shale production. When we wrote, Eagle Ford production was less than 60,000 b/d while the Bakken produced barely 200,000 b/d. Combined, the Eagle Ford and Bakken represented less than 0.5% of total non-OPEC production at the time and we did not anticipate the strong growth that lay ahead. We understand that making predictions about the future is risky and we do not mind admitting when our analysis misses certain factors, however important. Despite missing the coming rise of the shales, there is still a lot we can learn from our previous work and its impacts on conventional non-OPEC production going forward.

Back then, we explained how non-OPEC production growth was on the verge of turning sharply negative. We wrote how from 2006 to 2009 new large non-OPEC projects (greater than 25,000 b/d) added a very robust 1.9 mm b/d every year. We estimated that these projects represented 80% of all projects and concluded that total non-OPEC production from new projects added 2.4 mm b/d annually. Over that same period, total non-OPEC production growth averaged only 200,000 b/d, implying base depletion averaged 2.2 mm b/d annually or 4.2% per year.

Looking forward, we observed that the number and size of new non-OPEC projects was about to slow materially. Instead of adding 1.9 mm b/d every year, we anticipated that new large non-OPEC projects would only add 1.0 mm b/d each year between 2010 and 2015. Assuming again that large projects represented 80% of all new non-OPEC projects, we predicted total new production would average 1.2 mm b/d, a full million barrels per day less than base declines assuming a similar depletion rate of 4.2%. As a result, we wrote that non-OPEC supply would decline materially, leading to larger than anticipated OPEC market-share gains and upward pricing pressure.

While our analysis completely missed the impending rise in shale production, it was fairly accurate when focusing only on conventional non-OPEC crude oil production. For example, we predicted large-scale new projects would add 1.0 mm b/d per year between 2010 and 2015 when in fact they added 1.2 mm b/d. Assuming large projects represented 80% of total new conventional non-OPEC additions, then total new production averaged 1.4 mm b/d. Actual conventional non-OPEC production declined by 200,000 b/d on average between 2010 and 2015, implying base declines averaged ~1.7 mm b/d or 4.0% per year. While not perfect, most of these figures were quite close to our original predictions.

We should point out that new large-project startups did increase somewhat in 2016 and 2017 as the last batch of projects sanctioned and developed when oil prices exceeded $100 per barrel (particularly in Canada and Brazil) came online. Over the two-year period, large conventional non-OPEC projects added 1.7 mm b/d each year. However, looking forward, our models indicate that both the number and scale of new conventional non-OPEC projects are set to slow dramatically yet again.

For example, according to the IEA, major new non-OPEC projects will only add 1.0 mm b/d per year between now and 2022 – a 40% slowdown compared with the last two years and 30% below the last ten year's average. Once again assuming major projects account for 80% of all new field development, we expect total new conventional non-OPEC production to add 1.2 mm b/d per year. Assuming a 4% decline rate implies that conventional non-OPEC crude production will decline by nearly 500,000 b/d each year between now and 2022.

Once you add back OPEC NGLs, biofuels, refining gains and (meager) oil sands production growth, we believe that total non-OPEC production outside the US will decline by 100,000 to 200,000 b/d per year between now and 2022. As you will see in the oil section of this letter, the US shales simply cannot meet the combination of anticipated global demand growth and a decline in non-OPEC production outside the US. The implications to the global oil markets are huge and yet very few people are commenting on these trends.

Making matters worse, several years of reduced maintenance capital spending is taking its toll on existing conventional non-OPEC fields. North Sea production has been down 150,000 b/d on average year-on-year for the last three quarters (a problem we first anticipated in our fourth quarter 2017 letter). We expect these problems will persist and the IEA has now revised North Sea production lower for the remainder of 2018. Similarly, the IEA has revised Mexican oil production lower by a very large 200,000 b/d for all of 2018 after third quarter 2017 production declined over 300,000 b/d year-on-year (also something we flagged in our fourth quarter 2017 letter).

The world is fixated on the US shale plays and this myopia has caused analysts to miss the troubling trends (brewing now for nearly a decade), gripping the rest of the non-OPEC world. For example, the IEA originally called for non-OPEC production outside the US to grow by ~600,000 b/d in 2018. We have long disagreed with this projection and the IEA has already walked back their estimate to 200,000 b/d (which we believe will still be revised further). Despite this year's (predictable) disappointment, the IEA is once again hoping that 2019 will see robust conventional non-OPEC crude growth outside the US in excess of 500,000 b/d – something our models suggest will again be impossible to achieve.

How will these disappointments affect global oil balances? Please read on.

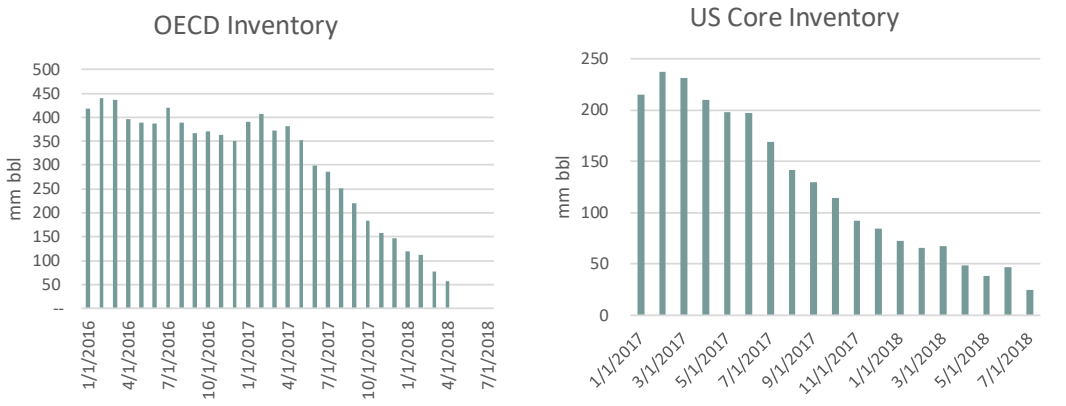
Oil Market Overview: 2019 Balances are Set to Tighten Even Further

Oil prices were strong during the second quarter with WTI and Brent both reaching their highest levels in three and a half years. WTI reached $75 per barrel while Brent broke through $80 during the quarter. Oil related equities fared well during the quarter as well with many stocks advancing between 10 and 25%. Since the end of the second quarter, oil prices have been weaker as concerns surrounding trade wars have dominated headlines. However, the equities have not pulled back, suggesting investor sentiment may be in the process of becoming more bullish.

In our 4th Q 2016 letter, we wrote that "oil prices are headed much, much higher." At the time this seemed like an outlandish prediction: OECD oil inventories stood at record high levels of ~400

million barrels above seasonal averages while Brent prices were ~$55 per barrel. We explained how global oil markets were much tighter than market participants realized and that global inventories would normalize faster than anyone expected. While few agreed with us at the time, our thesis has played out nearly perfectly since. In our 3Q 2017 letter, we refined our outlook and predicted that global and US core oil inventories should be within 20 mm bbl of seasonal averages sometime in the second quarter of 2018.

CHART 1 Inventory vs. 10 Year Seasonal Averages



Source: Energy Information Agency (EIA), International Energy Agency (IEA), Goehring & Rozencwajg models.

As you can see, US core petroleum inventories did indeed reach our target levels during the second quarter, while OECD inventories (a proxy for global stockpiles) will likely be only one month late. These milestones were thought to be impossible only a few months ago. Over the last 16 months, OECD inventories have drawn by 635,000 b/d relative to seasonal averages – the fastest recorded drawdown since inventory data began. This occurred despite repeated warnings that oil inventories would remain bloated for an extended period of time. As recently as last summer (at which point inventories had already been drawing sharply for six months), investor bearishness remained at extreme levels. As you likely recall, WTI prices collapsed by 20% between April and June 2017 as continued concerns surrounding OPEC cheating and "peak oil demand" (brought about by the EV) gripped investor psychology. Last summer, we wrote that our models continued to suggest global oil markets were in severe deficit and inventories would continue to draw down further – which is exactly what happened.

"US CORE PETROLEUM INVENTORIES DID INDEED REACH OUR TARGET LEVELS DURING THE SECOND QUARTER, WHILE OECD INVENTORIES (A PROXY FOR GLOBAL STOCKPILES) WILL LIKELY BE ONLY ONE MONTH LATE."

The same models that accurately predicted OECD inventory behavior over the last 16 months continue to point to tightness in global crude markets going forward. For the remainder of 2018, the IEA projects global demand will average 99.6 mm b/d while total non-OPEC production (including biofuels, processing gains and OPEC NGLs) will reach 67.7 mm b/d. These figures imply a call-on-OPEC crude of 31.9 mm b/d during the second half of the year. However, we believe this figure will be revised significantly higher. First, we continue to believe non-OECD demand is being understated. Based on our emerging market oil demand work (the so-called "S-Curve"), we have long argued the IEA would be forced to revise demand higher. The most notable country going through its "S-Curve tipping point" (the period when oil demand begins to rise much faster relative to real GDP growth) is China, but in our last several letters we explained how India had passed its tipping point as well. Since

the IEA first released estimates for 2018 demand, they have revised both Chinese and Indian demand higher by 130,000 and a staggering 240,000 b/d, respectively. However, we continue to believe more revisions are forthcoming. The reason continues to be the "missing barrels" which have persisted through the first half of 2018. Over the last eight months, the IEA's "miscellaneous to balance" line item has averaged nearly 500,000 b/d and our models continue to tell us these "missing barrels" will ultimately be accounted for through upward revisions to non-OECD demand.

Furthermore, we believe non-OPEC production outside of the US will continue to disappoint. Between upward revisions to global demand and downward revisions to non-OPEC production outside of the US, we would be surprised if inventories did not continue to draw by at least 500,000 b/d compared to seasonal averages throughout 2018. Such a deficit would take OECD inventories down to dangerously low levels not seen since 2008, which should maintain continued upward pressure on pricing throughout the remainder of the year.

Looking forward to 2019, we expect global oil inventories will continue to draw down sharply. In their preliminary projections for 2019 (first released in June), the IEA expects global oil demand to grow by 1.4 m b/d and ultimately reach 100.6 mm b/d, breaking the psychologically important 100 mm b/d mark for the first time in history. If our analysis surrounding the "missing barrels" is correct, then this figure will ultimately prove to be too conservative. Assuming the recent "missing barrels" wind up being underestimated demand (which we believe is the case), 2019 demand could approach 101.1 mm b/d, 500,000 b/d above IEA estimates. US production (driven entirely by the shales) is expected to grow by 1.2 mm b/d while non-OPEC production outside the US (including OPEC NGLs) is expected to grow by nearly 650,000 b/d. As we discussed in our analysis on conventional non-OPEC production earlier, we do not believe this is possible. Instead, we expect non-OPEC production outside the US may actually decline by as much as 250,000 b/d. As a result, total non-OPEC production (including the US) may grow by less than 1.0 mm b/d next year to reach 68.2 mm b/d. This would leave the call on OPEC at 32.4 mm b/d – or over 700,000 b/d above current OPEC production levels.

Whether OPEC will ultimately increase production is a hotly debated subject. On June 22nd 2018, OPEC member countries met in Vienna for their 174th Meeting where they agreed to increase the nominal OPEC quota by as much 700,000 b/d (with an additional 300,000 b/d from select non-OPEC countries, namely Russia). However, central to this agreement was the understanding that no member country can make up for another's production shortfalls. In other words, Saudi Arabia will not make up for Venezuela's lost production. We believe that of the 700,000 b/d nominal quota increase, at least half is allocated to countries that are not in a position to increase production at all. Furthermore, Libya, Venezuela, and Angola are all suffering from severe outright production declines (to say nothing of being able to grow production). Production from the three countries alone has declined by over 600,000 b/d over the last six months and shows no signs of improving, casting serious doubts about the feasibility of a sustained OPEC production increase. The prospect of lower Iranian oil exports due to US sanctions as well as curtailed Iraqi exports due to civil unrest make it even less likely that the group will be able to significantly increase production.

For the third consecutive year, the only source of non-OPEC supply growth has come from the US shales – a trend we believe will continue going forward. In past letters we have explained how we believe the ultimate size of the shale basins in the United States have been overstated. In particular, we believe the Eagle Ford and Bakken shales are exhibiting their first signs of exhaustion. While

the Permian Basin still has substantial development potential ahead, it cannot meet global demand growth alone. In our last letter, we explained how many energy companies were running out of top-tier drilling locations in the Eagle Ford and Bakken and were being forced to drill locations that were up to 50% less productive. At the same time, these companies were massively increasing their completion intensity (by injecting more proppant), which was offsetting the impact of moving to Tier 2 locations. As increased completion intensity began to hit its practical and economic limits, we felt that productivity (and later, production) would begin to slow in the Bakken and Eagle Ford. Our models continue to suggest production will slow in these plays going forward, however it has not shown up yet in the production data.

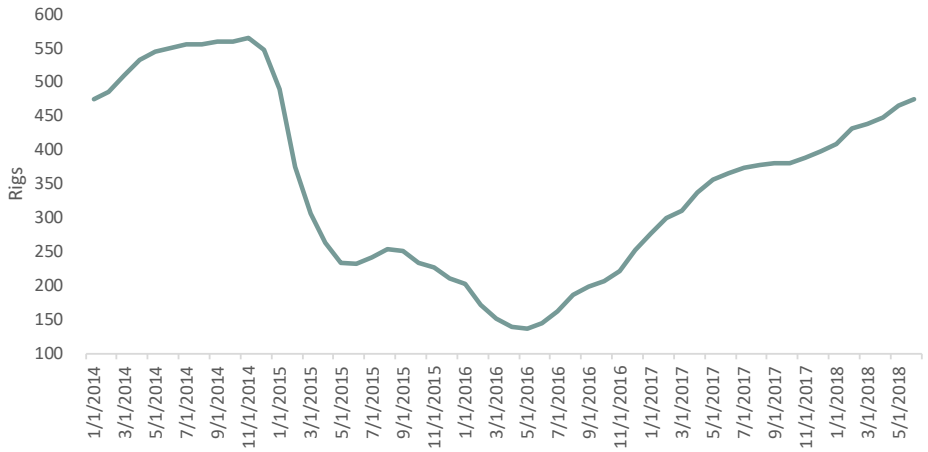
As you have heard us say many times, we are often early with our research and we always lay out a set of mile-markers we need to pass to make sure we are headed in the right direction. While we have not yet seen production roll over in the Bakken and Eagle Ford, we have passed one important mile-marker confirming these fields are indeed facing exhaustion: drilling activity has been very weak even as oil prices have recovered. For example, back in the fall of 2014 with oil prices at $70 per barrel, there were 270 rigs turning in the Eagle Ford and 190 rigs turning in the Bakken. Oil prices proceeded to fall by 65% before bottoming in February 2016 at $26 per barrel. Drilling activity bottomed a few months later in May with only 32 rigs turning in the Eagle Ford and 24 rigs turning in the Bakken (down 88% in both cases). Since then, oil prices have once again broken through $70 per barrel, however the rig count in each of these fields remains 65% and 70% below their Fall 2014 levels.

CHART 2 Drilling Activity in Eagle Ford and Bakken

Source: EIA Drilling Productivity Report.

The slow ramp up of new drilling in the Eagle Ford and Bakken is remarkably different than what happened in the Permian. In the fall of 2014, the Permian basin had 560 rigs turning. Like the Bakken and Eagle Ford, drilling activity fell substantially and eventually bottomed in May 2016 nearly 80% below the fall 2014 level. However, as oil prices recovered to their late 2014 levels, drilling in the Permian has rebounded sharply and today stands only 15% below its late 2014 rate.

CHART 3 Drilling Activity in the Permian



Source: EIA Drilling Productivity Report.

"IF ALL THREE SHALE BASINS HAD AMPLE DEVELOPMENT POTENTIAL AHEAD OF THEM, WE SHOULD EXPECT TO SEE DRILLING ACTIVITY IN ALL THREE BEHAVE IN A SIMILAR WAY. INSTEAD, ACTIVITY IN THE BAKKEN AND EAGLE FORD ARE ACTING VERY MUCH LIKE EACH OTHER, BUT VERY DIFFERENTLY FROM THE PERMIAN."

If all three shale basins had ample development potential ahead of them, we should expect to see drilling activity in all three behave in a similar way. Instead, activity in the Bakken and Eagle Ford are acting very much like each other, but very differently from the Permian. Our analysis tells us that the only material difference between the plays is that the Permian has ample Tier 1 drilling inventory remaining whereas the Bakken and Eagle Ford are in the process of running out. If we are correct, we would expect to see production from the Bakken and Eagle Ford begin to disappoint in the quarters to come. Should production increase materially from here, we will have to revisit our thesis, but so far, the slow level of drilling activity in these plays suggests to us that we are on the right track.

One area of concern for us is the large increase in US NGL production over the last several months. This increase has been driven by the huge ramp up in natural gas production from the Marcellus, Permian and SCOOP/Stack (please see the gas section for more details). The combination of strong natural gas production, relatively high oil prices, and very low gas prices has led gas producers to strip out NGLs wherever possible (and sell them at oil-linked prices). As of April, US NGL production is up 300,000 b/d over the last six months and 625,000 b/d on a year-over-year basis. While not a direct substitute for crude oil, NGLs can be used in several industrial processes (particularly in petrochemical production) to effectively back out crude oil demand. Offsetting this area of concern has been infrastructure and equipment bottlenecks in the Permian basin. In particular, pipeline constraints have led to increased differentials for Permian crude and natural gas. Permian producers without firm take-away today face a difficult choice. In some situations, companies are restricting their drilling plans for the second half, which ought to lower production volumes coming from the largest single source of growth (and really only material source of growth) in the non-OPEC world. In our next letter, we will discuss updates to both of these trends.

"WE HAD CONCERNS OVER THE LEVEL OF DISCLOSURE RELATED TO ARAMCO'S OIL RESERVES THAT WOULD BE NECESSARY FOR A LISTING ON ANY MAJOR GLOBAL EXCHANGE"

Last, we would like to discuss recent developments in the Saudi Aramco IPO proceedings. In January 2016, Saudi Arabia announced its plan to pursue an IPO of Saudi Aramco (the state oil company and by far the largest single producer in the world). At the time, market watchers expected Aramco to carry a valuation in the trillions of dollars. While we never discussed the IPO in these pages, we were featured on a Grant's Interest Rate Observer podcast in the fall of 2017 where we expressed doubts over the viability of an Aramco IPO. In particular, we had concerns over the level of disclosure related to Aramco's oil reserves that would be necessary for a listing on any major global exchange. Aram-

co's oil reserve figure is a tightly guarded state secret and many oil analysts (including us) believe it is far below the 280 bn bbl level last reported in 1982. The debate surrounding Aramco's oil reserves is of critical importance to world oil markets because it is directly related to their ability to sustainably increase oil production. Simply put, if their reserves are less than widely reported, then Saudi Arabia's spare capacity, on a sustained basis, may be much lower than stated. In early July, Aramco's chairman and Saudi Arabia's oil minister announced that the IPO has been postponed to sometime in 2019. However, many people believe the IPO has been cancelled altogether. Given the fact that energy related securities have advanced between 50 and 75% since January 2016, we do not believe that market conditions have caused Aramco to postpone (and potentially even cancel) their proposed IPO. We will continue to monitor the situation closely and, as mentioned in our introduction, we will write extensively on Saudi Arabia pumping capability in our next letter.

Natural Gas: Supply Continues to Surge. Stay on the Sidelines

North American natural gas prices were weak during the second quarter with Henry Hub averaging $2.83 per MMBtu – the lowest quarterly average since 2016. Prices were very weak despite inventories which actually drew to 2.1 tcf by the end of the quarter (driven entirely by weather), 726 bcf less than a year ago and 500 bcf below seasonal averages (the largest deficit since 2014).

Low inventory levels were not enough to overcome the bearish psychology that has gripped the natural gas markets for the better part of the last decade and we do not see this trend changing anytime soon. The reason for the disconnect is the continued huge surge in US production from the shale basins. In our past letters, we have discussed how the incredible geological properties of the Marcellus, Utica and Permian basins have severely changed the supply and demand dynamics in the North American gas market. To put this into perspective, the best Permian oil well today is approximately twice as productive as the average first generation Bakken oil well from a decade ago. On the other hand, the latest top-quality Marcellus gas well is up to fifty times as productive as the original Barnett wells and (unlike the oil shales) the inventory of top-tier gas drilling locations seems to be getting larger by the day.

"THIS RATE OF GROWTH IS NOW NEARLY 25% HIGHER THAN THE PREVIOUS ALL-TIME RECORD SET IN THE FOURTH QUARTER OF 2014, DESPITE THE FACT THAT THE INDUSTRY IS TURNING NEARLY 45% FEWER RIGS TODAY THAN THREE YEARS AGO."

As a result, US dry gas production grew by an unfathomable 7.3 bcf/d during the first quarter year-on-year (the last quarter for which we have complete data). This rate of growth is now nearly 25% higher than the previous all-time record set in the fourth quarter of 2014, despite the fact that the industry is turning nearly 45% fewer rigs today than three years ago. To emphasize how different this is from the oil shales, consider US crude oil production is growing nearly 5% less than the last peak in the fourth quarter of 2014 despite a rig count that is within 10% of where it was back then.

We have long described the challenges faced by the North American natural gas industry. However, there are demand developments taking place in the rest of the world that are incredibly promising. We first started writing about global natural gas demand in our quarterly letter nearly a decade ago. At that time, we explained how as a country gets richer, it develops a preference for burning a cleaner fuel. Civic unrest in China regarding air quality over the past decade is a perfect example of this force at work. Natural gas is a much cleaner alternative to coal for generating electricity, however the infrastructure required to store and transport natural gas is much greater since it is in a gaseous state under normal conditions. Because of this, coal can be as high as 65% of an emerging-market economy's energy mix. In our 2009 letter, we estimated that China would begin to move towards a higher mix of natural gas in its fuel burn and that gas demand would surge between 2010 and 2020.

In our next quarterly letter, we will discuss the dynamics of the global natural gas market and the implications going forward for the next ten years. We believe global LNG may be setting up to be one of the most important areas of the global natural resources market in the coming decade.

Gold and Precious Metals: The Next Leg of the Gold Bull Market Approaches. Gold is Going Much Higher Than you Think

"An investor sees the Dow Jones Industrial Average trade at book value twice in an investment career."
-An old Wall Street saying

I began my Wall Street career in the Trust Department of the old Bank of New York in 1981, near the end of a bear market that had dragged on for almost ten years. The "old timers" in my office would regale me with stories about the vicious bear market of '73-75: the massive layoffs and the huge consolidation it forced upon the industry. Wall Street had yet to recover when inflation and collapsing bond prices scared investors away from equity markets anew. By the summer of 1982, the Dow Jones Industrial Average traded at a 20% discount to book value, which stood at approximately 920 at the time. I experienced my first exposure to the Dow at book value.

The market literally exploded off the bottom that August and entered into what we in retrospect now know to be one of the greatest bull markets of all time. After trading at a 20% discount to book value in August 1982, the Dow has never come close to trading near book value again. Today, with the book value of the Dow approaching 6,000, the ratio stands at its second-highest historical level ever -- 4.2 times. Only during the dot-come bubble back in 1999-2000 did the Dow Jones ratio to book value exceed this level.

I reference all this information regarding book value to provide us with an additional target price for the upcoming bull market in gold. As we wrote extensively first in the late 1990s and again today, we believe that gold has become radically undervalued. Although many investors believe that gold can't be valued, we take a different view. We believe gold is like any other asset class. Asset classes (bonds, stocks, emerging markets, commodities or gold) become popular, sustain large price advances and become overvalued. At that point, they represent poor investments. Conversely, these same asset classes will often undergo long periods of investor disinterest, experience sustained and drawn-out price declines, and consequently will become undervalued. At that point, they often represent excellent investment opportunities. We agree with consensus opinion regarding gold on a long-term basis: gold represents a poor investment. As its critics correctly point out, it pays no dividends or interest, and it is expensive to store. However, if investors can properly identify those periods when gold is severely undervalued, then gold (as an asset class), can produce superior (and indeed often spectacular) uncorrelated returns, just like it did back in 1929, 1970 and 1999. As many of you know, we believe gold today is undervalued and that a huge gold bull market lies in front of us.

We took a look back over the last 100 years and tried to identify times when gold was radically undervalued (presenting investors with an excellent investment opportunity), and times when gold became radically overvalued (a poor investment). We use three valuation metrics that clearly show gold's periods of undervaluation and how those valuation parameters compare to where gold is priced

today. Also, as promised in last quarter's letter, we attempt to estimate potential targets for gold in the upcoming bull market. To many investors, these price targets may seem "far-fetched," but please remember the ratios we use to compute these price targets are the same ones we have been using for 27 years with predictive results. Please read on.

Over the last 100 years, gold has experienced three distinct periods of undervaluation, each followed by three large advancements in price. Each gold bull market occurred under completely different macroeconomic circumstances: the gold bull market of the 1930s took place in the middle of a massive deflationary economic collapse, the second gold bull market beginning in 1970 took place amidst a massive surge in inflationary expectations, and the latest great gold bull market took place at a time when inflationary and deflationary forces strongly exerted themselves in different areas of the world economy simultaneously.

Although each of these gold bull markets happened alongside extremely different financial conditions, there were valuation similarities that appeared before each started. For example, preceding each of these gold bull markets were periods of intense money printing by central governments. In each period, the growth in money supply significantly exceeded the growth in gold supply before the gold bull market started. Also, in all three bull markets, intense periods of financial speculation preceded or accompanied the first leg of the run-up. In addition, all three periods were characterized by excessive financial strain (most likely the result of excess money printing).

The first gold bull market took place over a very short period of time when President Roosevelt suspended the gold standard in 1933. While the US dollar had previously been fixed at $20.67 per ounce, Roosevelt took the US off the gold standard in June of 1933 and began raising the gold price until it reached $35 per ounce by the very beginning of 1934. Although precipitated by the 1932-1933 banking crisis, we believe the underlying forces for the gold bull market were set back in 1927 when Benjamin Strong, then president of the New York Fed, administered his famous stock market "coup de whiskey." By simultaneously lowering rates and printing money, Strong attempted to save a global monetary system still dependent on an overvalued British Pound. In retrospect, we now know most of this excess money creation encouraged another spasm of intense financial speculation, culminating with the 1929 US stock market blow-off. After Strong's death in 1928, the Fed reversed his monetary expansions, draining credit from the banking system. These actions resulted in a huge stock market crash, a massive banking crisis, and finally the biggest deflationary economic implosion in US history. From its peak in 1929, US wholesale prices collapsed 30%, nominal GDP collapsed 50%, and the stock market collapsed 90% from peak-to- trough. Gold, however, proved to be one of the best investments during this time period -- for everyone except US investors who after 1932 were precluded from owning gold. From 1929 to 1934, gold advanced almost 70%. But it wasn't only gold that performed well during the Depression. Gold stocks were also spectacular performers. For example, Homestake Mining and Dome Mines, the largest gold producer in the US and Canada respectively, both advanced over 500% between 1929 and 1935. In comparison, the stock market, even though it had rallied over 100% from its 1932 bottom, was still priced 60% below its 1929 peak.

The second bull market in gold occurred during the inflationary period of the 1970s. The Bretton Woods monetary agreement had pegged gold at Roosevelt's $35 pre-World War II price. Spurred on by the double impetus of the Vietnam War and President Johnson's "Great Society Program," the 1960s was a decade of excess money and credit expansion which resulted in a sharp increase in inflationary expectations. Excess US dollar creation during the 1960s caused a huge drain on gold from the

US Treasury (foreigners recognized dollars had become overvalued) and President Nixon was forced in September 1971 to cease exchanging US dollars at $35 per ounce. After Nixon closed the "Gold Window," gold and commodity prices surged as global investors, now denied gold convertibility at $35 per ounce, aggressively sought to exchange their depreciating dollars for hard assets. Accelerating inflationary expectations combined with two energy crises eventually caused gold to peak in a spectacular parabolic blow-off in January of 1980. From its $35 per ounce starting point in 1970, gold proceeded to appreciate 25-fold in the next 10 years, again making it (with the exception of silver) the best performing asset class of the decade.

The latest and third gold bull market started quietly enough back in the middle of 1999 when gold, in a spasm of European Central Bank selling, bottomed at $253 in September. Gold had been in a 20-year-long grinding bear market and everyone was convinced that gold had lost most, if not all, of its investment appeal. Oddly, it wasn't only the European Central Banks who were racing to sell their gold, but the gold industry itself. Seduced by the bullion banking industry into using what were considered low-risk derivative strategies, gold producers had begun in the mid-1990s to sell forward huge amounts of their future gold production. As an example, by the late 1990s it was not uncommon to find Australian gold producers who had sold forward 10 years of their gold production even though they processed only eight years of reserves. And if selling pressure from central banks and producers wasn't bearish enough, bullion bankers, taking advantage of gold that could be easily borrowed from European banks, sold gold and front-ran the producers and central banks who were their clients.

By 2000, all this selling pressure had produced one of the most undervalued gold markets in history. Over the next 12 years, gold advanced by 650%, making it by far the best performing asset class. For comparison sake, over the same 12-year time period, the stock market experienced two large bear markets (the 2000 break of the dot -com bubble and the 2007-2008 global financial panic) and returned little.

If deflation was the economic backdrop to the 1930s gold bull market and inflation the backdrop to the 1970s bull market, in a bizarre twist the 2000s gold bull market incorporated inflation and deflation simultaneously. Excess money creation throughout the latter half of the 1990s (due to the crises surrounding emerging market currencies and the Long-Term Capital Management hedge fund collapse) set the backdrop for inflation in the stock market -- at the 2000 peak the stock market was the most expensive in US history. Excess credit also created a huge housing bubble in the US which led to the 2007-2008 mortgage and related banking crisis. As the cost of housing, college tuition, and health care advanced at 8% annual rates, surging competition from Chinese manufacturers exerted a deflationary force on manufactured goods and on the wages of the very same American manufacturing workers paying those surging prices.

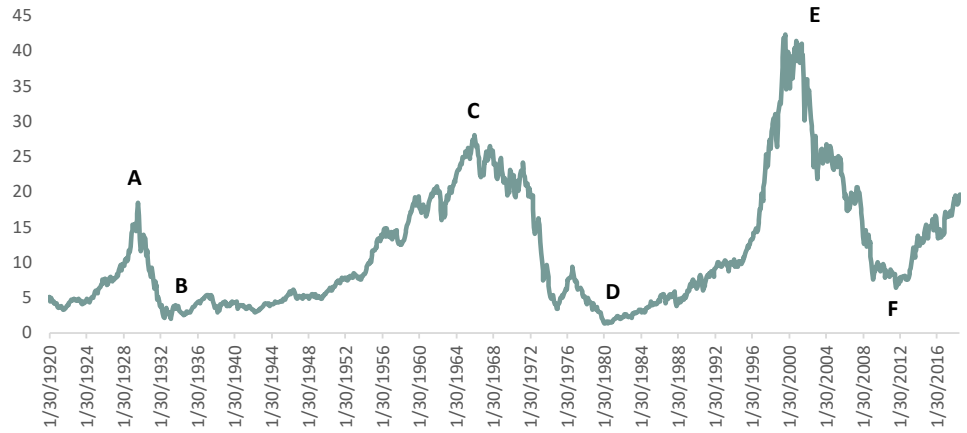
Back in the late 1990s, Barton Biggs, Morgan Stanley's chief global strategist, and Steve Roach, the firm's chief economist, engaged in a debate on how this extremely large economic expansion and related bull market, now going on for almost 50 years, would end. Would it end in a deflationary implosion similar to the 1930's or would this economic era end in an inflationary blaze? "Fire or Ice," the debate was called. For those interested in the future potential pricing of gold, we luckily have had gold bull markets that took place under both scenarios.

Let's look at how gold has been priced relative to financial assets historically, as well as the historical

relationship between the amount of money created by the US Federal Reserve and the gold held by the US Treasury. Both of these valuations metrics have strengths and weaknesses and are open to debate on their relevance to how gold is valued today. Still, we set out on this exercise with two goals: first, no matter what valuation metric you use, we want to demonstrate that gold today is historically cheap and second, using these various ratios, we will demonstrate approximate price targets that gold could reach in the upcoming bull market no matter what unfolds regarding the macroeconomic situation in the coming decade; inflation, deflation, and /or stagflation.

We will start with the historical relationship between the popularity of financial assets versus the popularity (and related price) of gold. The popularity of financial assets (especially the stock market) and gold tend to be inversely correlated and by measuring the divergence between stock prices and gold we can see where we stand in the investment cycle. One of our favorite ratios is the price level of the Dow Jones Industrial Average to gold's price. As you can see from the chart below, there have been three distinct periods of extreme overvaluation of financial assets versus gold in the last 100 years. In 1929, with the Dow Jones Industrial Average hitting 380 in September and gold being set at $20.67 by the US Government, the Dow reached a ratio extreme of 18 times the gold price. After the severe banking crisis and resulting financial panic, the Dow proceeded to trade as low as 42 in July of 1932 (down 89% from its 1929 peak). At that point, the Dow / Gold ratio had fallen to 2 (Dow 42 / gold $20.67)—a valuation extreme that investors would not see again for almost 50 years. In January 1934, Roosevelt raised the gold price to $35 per ounce, so although the Dow and gold did not cross in price in 1932, they just missed each other by one and a half years and $7.

CHART 4 Dow Jones Industrial Average/Gold Price



Period	Date		Stock Market (Dow Jones Indu Avg)			Gold Price			DJIA/Gold Ratio		DJIA Book Value per Share/Gold	
	Start	End	Start	End	Return	Start	End	Return	Start	End	Start	End
A – B	9/1929	6/1934	380	95	-75%	$20.65	$35	+70%	18	2.7	4.2	2.3
B – C	6/1934	12/1966	95	1000	+950%	$35	$35	--	2.7	28	2.3	13
C – D	12/1966	1/1980	1000	860	-14%	$35	$850	+2300%	28	1	13	1
D – E	1/1980	1/2000	860	11700	+1260%	$850	$290	-65%	1	40	1	7.8
E – F	1/2000	9/2011	11,700	11,000	-6%	$290	$1,900	+550%	40	5.7	7.8	2.4

Source: Bloomberg.

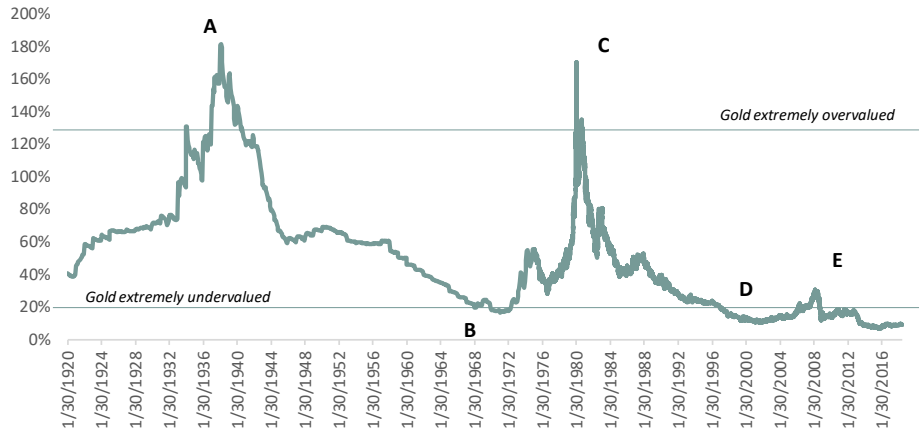
The next period of radical overvaluation of financial assets relative to gold took place in the late 1960s and early 1970s. With the Dow hitting 1,000 back in 1966, 1969, and again in 1973, the Dow / Gold ratio hit a new all- time high of 28 (Down 1000, gold $35 per ounce). The 1960s experienced a long period of excess money and credit creation and, when Nixon closed the gold window in 1971, gold entered a huge bull market that eventually saw the gold price rise 25-fold in 10 years. In January 1980, in a parabolic blow-off, the Dow and gold almost crossed in price. On January 21, 1980 the gold price hit its peak of $850 per ounce and the Dow that same day began trading at 867.

Given its radical overvaluation, gold spent the next 20 years in a grinding bear market while financial assets entered into a huge new bull market. It took only 20 years this time versus 50 before for gold to become radically undervalued versus the stock market. By 1999 with the Dow surpassing 11,000 and gold falling to a low of $253 per ounce, the Dow / gold ratio hit the highest level ever seen: 43. Given the radical overvaluation of the stock market (by the early 2000s, the Dow's price-to-book ratio hit 5, making the stock market the most expensive to both gold and book value ever. Investors should have expected gold to enter a large bull market, and that's exactly what happened. From the bear market low in the summer of 1999 to the peak in August of 2011, gold appreciated over five-fold whereas the stock market returned nothing over the same 12-year period.

The gold bull market peaked in August of 2011. With the Dow trading at 11,000, the Dow / gold ratio fell to a little below six. Although gold did not become as overvalued relative to the stock market as it did back in 1935 and 1980, in retrospect we know that gold was ready for a significant pullback (gold prices fell 45% peak to trough between 2011 and 2016) and that the stock market was ready for a significant advance. For students of the gold market, we believe the 45% pullback in price was very similar to the 45% price pullback experienced between 1975 and 1976 during the previous gold bull market. In the 1930s gold bull market, the Dow and gold almost crossed; they did cross in 1980. Although open to all sorts of interpretations, one can make the case that the post-2011 pullback in gold prices is nothing more than a correction in a huge bull market, as it was in 1975 and 1976. Supporting this viewpoint is the valuation of the stock market. Previous lows in the Dow/gold ratio have occurred when the Dow traded below book value. Back in 1932, the Dow Jones Industrial Average bottomed at a 40% discount to book value and in 1980, the stock market traded at book value. Major peaks in gold prices in the last 100 years have occurred when investors have adopted extremely pessimistic outlooks for financial assets, as they did in 1932 and 1980. However, the stock market in 2011, even though it had pulled back that year, still traded at 2.7 times book value—still in the expensive category. Our hunch is that the bottoming of the Dow to gold ratio in 2011 signaled a large correction in the gold price, though not the end of the bull market, a viewpoint supported by the huge amount of money printed by global central banks in the last eight years.

With the stock market having more than doubled since 2011 and gold prices today 35% below their 2011 peak, the Dow to gold ratio stands at 20. Although we have not reached the valuation extremes of 1970 or 1999, we are trading above the ratio of 18 achieved back in 1929. To give us comfort that the gold price pullback since 2011 is not the first leg in a new gold bear market that will end with the Dow being priced at 40 times the price of gold, we turn to another historical relationship that we like to monitor. What's so interesting about this relationship is that it brings up a fascinating observation: Maybe the question isn't whether the gold bull market that started in 2000 is over, but has it really even begun? Take a look at the chart below to see what we mean.

CHART 5 US Treasury Gold Holdings/Federal Reserve Monetary Base



Period	Date		Treasury Gold Holdings / Fed's Monetary Base		Stock Market (Dow Jones Ind Avg)			Gold Price		
	Start	End	Start	End	Start	End	Return	Start	End	Return
A – B	12/1936	12/1968	160%	18%	185	980	+430%	$35	$35	--
B – C	12/1968	1/1980	18%	170%	980	850	-13%	$35	$850	+2330%
C – D	1/1980	1/2000	170%	16%	850	11,700	+1275%	$850	$290	-65%
D – E	1/2000	9/2011	16%	15%	11,700	11,000	-6%	$290	$1,900	550%

Source: St. Louis Fed, Bloomberg.

In previous letters, we have discussed the historical relationship between the size of the US Federal Reserve's balance sheet and the dollar value of the Treasury's gold holdings. The chart above clearly shows two periods when gold was massively over-valued: the second half of the 1930s and the late 1970s. In both periods, the dollar value of the Treasury's gold holdings exceeded the size of the Fed's monetary base by 1.3 times. In retrospect, we know gold represented an extremely poor investment and that stocks were the place to be. There have also been two periods when gold has been radically undervalued—the late 1960s and the late 1990s. In those periods, the size of the Fed's monetary base exceeded the value of the Treasury's gold holdings by more than six times. Today we know that gold produced extremely good returns in both periods, especially compared to the returns of financial assets. Gold and stock market returns for various periods are listed at the bottom of the chart.

What has happened to these ratios since the 2008 financial panic intrigues us. In response to three periods of Federal Reserve "quantitative easing" (now emulated by the ECB and the Bank of Japan), the ratio of the Fed's monetary base to the Treasury's gold holdings significantly exceeds the extreme levels seen back in the late 1960s and late 1990s, even though gold today is up almost five-fold from its bear market lows in 2000. Back in 1969, the Fed's monetary base exceeded the Treasury's holdings of gold by six times. In 1999, the Fed's monetary base exceeded the value of the Treasury's gold holdings by eight times. Today, with the Fed's monetary base at $3.6 trillion and the value of the Treasury's gold holdings at $320 billion, this ratio stands at over 11 times (nearly 40% higher than before the last bull market started in 2000). According to this measure, gold remains radically undervalued and, if history is a guide, another massive advance in gold prices is in the future.

Given the amount of money printed over the last seven years and that gold equities reached record low valuation levels back in 2016 that rivaled the same level of "cheapness" last seen in the gold market

"WE BELIEVE THAT TODAY'S DOW TO /GOLD RATIO OF 20 REPRESENTS A SIGNIFICANT BUYING OPPORTUNITY AHEAD OF THE NEXT BIG MOVE UP. NOW THE QUESTION IS TRYING TO PREDICT HOW HIGH THE GOLD PRICE COULD GO IN THE UPCOMING BULL MARKET."

bottom of 1999, we believe that today's Dow to /gold ratio of 20 represents a significant buying opportunity ahead of the next big move up. Now the question is trying to predict how high the gold price could go in the upcoming bull market.

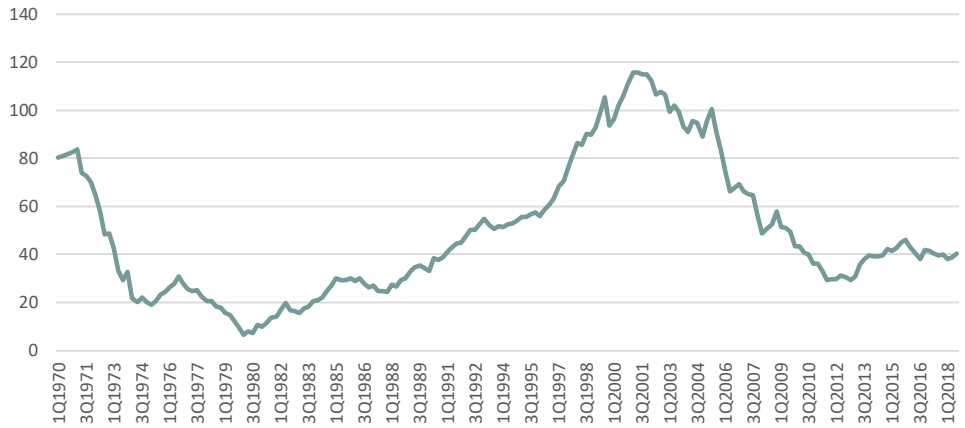
We start first using the Dow to gold ratio as a framework. As mentioned earlier, there have been two instances in the last 100 years where the Dow and gold almost crossed and then did: 1932-34 and 1980. We believe the Dow and gold will cross again, but the question is, when and what level. This question brings us back to my old Wall Street saying about investors seeing the Dow at book value twice in their lifetime. Today, the Dow's book value is almost 6,000 and the stock market trades a little over four times book value, a level only surpassed in the 1999-2000 "Dot-Com" bubble. On the price-to-book basis, stocks are extremely popular today. But if stocks become unpopular and the stock market were to trade back to book value, could we predict where gold would be priced?

We believe we can formulate price targets under two different macroeconomic scenarios. In the massive deflationary period of the 1930s, after Roosevelt had raised the gold price to $35 per ounce, gold was priced at a 56% discount to the Dow's book value of 80. In the massive inflationary period of the 1970s, when gold peaked at $850 per ounce, the Dow's book value was a little over 850, so gold reached parity with the book value of the Dow.

If we experience massive deflation like the 1930s (unlikely, but still possible given that the Fed has announced its intention to shrink its balance sheet), then a probable gold price target would be 45% of the book value of the Dow, or $2,700 per ounce. If the 1930s are a guide, even in a deflationary implosion, gold would more than double from today's price. However, if all the money printed in the last eight years winds up causing severe inflation and the 1970s provides the right framework, then we could expect to see the gold price reach the book value of the Dow, which today stands at approximately 6,000. We would expect gold to appreciate nearly five times.

These price targets are supported by our other methodologies. For example, instead of looking at just the Dow Jones Industrial Average and the gold price, let's look at the chart below which shows the total dollar value of global financial assets versus the dollar value of the world's total gold stock. In 1970, we estimate that the total value of global financial assets (~$8.5 tr) was almost 85 times the total value of the world's gold stock (~$105 bn). By 1980, with gold peaking at $850 per ounce, we estimate that the global financial stock (over $13 trillion) traded at less than five times the value of the world's gold stock, valued at almost $2.9 trillion. With the ensuing bull market in financial assets and given the 20-year gold bear market, by 2000, the ratio of global financial assets to the gold stock exploded to almost 100 times. By the end of 2011, with gold at $1,900, the ratio of global financial assets to the gold stock had fallen to 30, but just like the Dow indicator discussed above, this ratio has fallen nowhere near its 1980 low. With the pullback in gold and the continued surge in global stock markets and government debt, we estimate that global financial assets have surpassed $300 trillion. With today's gold stock now valued at approximately $7.3 tr, this ratio stands at over 40. Although not as undervalued as at the bottoms of the gold bear market in 1970 and 2000, it's still not anywhere the bull-market levels we saw in 1980. If today's stock of global financial assets traded at five times the value of the global gold stock, this gives us a $6,000 potential price target for gold. Unfortunately, we don't have data on the global stock of financial assets going back pre-1970, so we have no historical data on how this ratio behaved in the deflationary period of the 1930s.

CHART 6 Value of Global Financial Assets/Value of Global Gold Stock



Source: Goehring & Rozencwajg Models.

So far the effects of global quantitative easing have been relatively benign with the biggest impact felt in financial asset inflation. If this were to change and quantitative easing began to produce unanticipated results—either deflationary or inflationary -- we believe we can also use past extremes in the Fed Monetary Base to gold ratio as a framework to compute potential price targets for gold. Today the Fed's monetary base stands at $3.6 trillion or over 11 times the $320 bn size of the Treasury's 262 mm ounce gold holdings. In the second half of the 1930s and in the late 1970s, these numbers were reversed. The Treasury's gold holdings traded at greater than 1.3 times the Fed's monetary base and reflected gold's popularity (and safety) versus financial assets. If the Treasury's gold holdings were to exceed the value of the Fed's monetary base by 1.3 times today, gold would trade at over $18,000 per ounce. As we discussed back in our 1st Q 2016 letter, even if we take all $1.9 trillion of "excess reserves" off the Fed's monetary base, the adjusted monetary base ($1.7 trillion) times 1.3 would give us a gold target price of between $8,000 and $9,000 per ounce. Although investors can argue endlessly over this methodology, it does provide more data that points to gold's radical undervaluation. It also offers another argument that bolsters our belief that the 45% pullback in gold prices between 2011 and 2016 was not the end of a gold bull market that started back in 2000, but a correction in a massive gold bull market that still has another huge bull run left to go.

To conclude, we believe gold is radically undervalued today. If we experience a deflationary implosion (which we think is unlikely), our various price targets all tell us gold could reach multiples of where it trades today. If we experience an inflationary period instead, these price targets would be several times higher still.

The price targets we laid out earlier may seem very high to many, but we wish to stress that gold has reached these same valuations not once, but twice in the last 100 years (each time during completely difference macroeconomic conditions). Although, we are neutral on gold for the time being (as discussed in our market commentary), we believe the next leg in the great bull market will begin to take shape in the not too distant future. It has been over 38 years since we last saw speculative fevers grip global precious metal markets. We would not be surprised if the next upward move in gold ushers in a return of extreme speculative activity, something that has been completely absent from the gold bull market that started back in 2000. If speculative fever returns in the next leg of this gold bull market, the price targets we have just put forward could be significantly exceeded.

As the famed market commentator Richard Russell used to repeatedly tell investors: "There is no fever like gold fever."

Copper: Buy the Dip

Of all the base metals, copper has pulled back the most on trade-war fears. Not only have we seen a significant liquidation by financial speculators here in the United States, but persistent rumors keep appearing in the financial press regarding significant forced liquidations by various Chinese financiers speculating in global copper markets. Since peaking at $3.30 per lb., as late as the first week of June, copper prices have pulled back a significant 20%. As mentioned several times in this letter, we don't know how this trade war will play out nor how vicious it will get, but we want to outline copper fundamentals as they exist today.

"THE OTHER POCKET OF COPPER DEMAND CAME FROM INDIA, WHICH ALSO SHOWED A 15% INCREASE IN YEAR-OVER-YEAR DEMAND. WE HAVE WRITTEN THAT OUR MODELS INDICATE INDIA'S COPPER DEMAND SHOULD SEE YEARS OF EXTREMELY STRONG GROWTH AND THIS IS WHAT WE ARE MOST LIKELY BEGINNING TO SEE."

First, global copper demand remains strong, particularly from China. For the first four months of 2018, data from the World Bureau of Metal Statistics (WBMS) shows that after a lackluster 2017, copper demand in China surged 15% year-over-year. The other pocket of copper demand came from India, which also showed a 15% increase in year-over-year demand. We have written that our models indicate India's copper demand should see years of extremely strong growth and this is what we are most likely beginning to see. Driven by China and India, world copper demand grew by 4.5%, even with flat year-over-year consumption in the OECD world.

On the supply side, world mine supply grew by 4.5% year-over-year, but this represented nothing more than the return of the giant Escondida mine which experienced a 45-day strike in the first quarter of 2017. Escondida, which represents 5% of world mine supply, came back into full production at the beginning of April 2017. Since Escondida's return, global mine supply has shown no growth. We continue to forecast little growth in global copper mine supply until the large Cobre Panama project commences production in the second half of next year.

Regarding global inventories, exchange traded inventories (LME, Shanghai, and Comex) have declined significantly since the end of the first quarter. Given our models of mine supply, demand growth, and declining inventories, we believe the copper market today has returned to slight deficit.

Where do we go from here? Today, China represents a little over 50% of total world copper demand. We don't have much data on how the Trump administration trade tariffs will impact Chinese growth either short- or long-term. The need to build out the electrical grid in China has been by far the largest demand source for copper over the last 20 years. Given China's stated goal of growing its consumer economy, this source of copper demand will only grow in the future. A July 19th 2018 Bloomberg article succinctly describes the continued need to build out the Chinese electric grid: "After Winter Heat Crisis, China Braces for Summer Power Crunch.... Parts of China are at risk of shortages as the nation's distribution networks struggle to cope with soaring temperatures and the fastest power consumption growth in seven years."

Much of the non-OECD world, most notably China and India, is now squarely in the midst of a period of rapid acceleration in copper consumption. Also, new demand associated with building out the global renewable grid strongly suggests copper demand growth will continue to surprise well into

the middle of next decade. Combining strong demand with a mine supply situation that becomes more and more constrained implies to us that the copper bull market still has many years to run. The weakness we are seeing today will, in retrospect, represent a tremendous buying opportunity.

Copper equities have pulled back significantly in the last six months and we believe that many offer excellent risk-reward characteristics. Although we haven't added to our copper positions, we are maintaining them all.

Agricultural Markets: Despite Trade Talk, Global Grain Market Remains on a Knife's Edge

US grain markets, like copper, have found themselves front and center in the rapidly escalating trade war with China. Since the Trump administration announced two rounds of tariff increases on Chinese goods, the Chinese government has imposed and raised tariffs on a wide variety of agricultural goods, including soybeans.

Grain prices have taken huge hits. Since early June, when grain prices hit their peak for the quarter, both corn and soybean prices have fallen almost 20%. Although grain markets have been gripped with a massive spasm of bearishness, we believe current weakness in global grain markets should be bought. We began to increase our exposure in agricultural related equities in the first quarter and we are not reducing our exposure.

There are three reasons to be bullish. First, global grain demand, led by soybeans, is surging. As mentioned in our last letter, global soybean demand is growing at over 5% annual rates. As China's demand grows unabated, needs from other emerging market economies in the Asian sphere continue to accelerate. Surging demand increases for soybeans (15 mm tonnes per year) means that 10 mm new soybean acres have to be planted each year. In the US alone, 15 mm acres, traditionally planted in corn and wheat, have been diverted to soybean production over the last several years. Gobal corn demand and US corn exports continue to set records. With reduced corn planting, total US corn carryout stocks are being reduced. From a record corn carryout level of 2.3 billion bushels reached back in the 2016-2017 growing year, corn carryout this year is expected to fall to 1.55 billion bushels according to the latest USDA World Supply and Demand Estimate (WASDE). And global corn demand remains strong. Over the last four years, China corn demand has grown by over 5% per year and is now estimated to have reached 249 mm tonnes, far outstriping estimated supply of 220 mm tonnes. China is already rapidly drawing down its corn stocks which are estimated to be somewhere between 80 and 140 mm tonnes. Adding to future corn demand, all gasoline sold in China must contain 10% ethanol starting in 2020. An "E-10" standard will add an additional 30 mm tonnes of Chinese demand. Given the large drawdowns now taking place in Chinese corn inventories, we believe China will be forced back into becoming a large corn importer in the next several years.

Second, current supply-demand trends for all grains are dependent on extremely high yield assumptions. For example, US corn yields have exceeded historical trend lines four years in a row, something very seldom seen. For the 2018 season, the USDA again expects US corn yields to hit an all-time high of 177 bushels per acre, a full 5 bushels above the long-term historical trend lines of 172 bushels per acre. If yields were to drop to just historical trend lines, we calculate ending corn stocks would swing

from today's levels to dangerously low levels in just six months. The same situation exists in today's soybean markets. Although the most recent WASDE report increased the US soybean carryout to 580 mm bushels (up from the 465 mm bushel carryout last year), the same yield math applies to soybeans as well. Just like corn, soybean yields have significantly exceeded trend line growth over the last four planting seasons—a trend never before observed in the last 60 years. The USDA is assuming a 2018 US soybean yield of 49.1 bushels per acre, a full 2.1 bushels higher than historical trend line. And just like corn, if soybean yields were to fall just back to the 47 bushel trend line yield, we compute the US soybean carryout would swing from record highs to record lows in incredibly short order. Although estimates for both corn and soybean carryouts are at high levels today, our modeling tells us that any drop-in yields could have huge impacts on carryout inventory levels and price.

In last quarter's letter, we outlined our belief that the world's unprecedented streak in global growing conditions is coming to a close. Over the last four years, the world has experienced excellent back-to-back global growing conditions which significantly helped the surge in crop yields just discussed. However, various meteorological cycles (primarily the eleven-year solar cycle) are now ending and, if history is a guide, less than ideal global weather conditions could emerge in one (or several) grain growing regions in the next several years. For example, drought conditions are at present gripping Europe. Recently, Bloomberg News ran the headline: "Europe's Blistering Heatwave is Ruining This Year's Harvest." The Black Sea in the FSU (a huge wheat producing region) is too experiencing severe drought conditions. Also, it will be imperative to monitor growing conditions in Brazil. Widespread drought conditions are expanding there as well with no relief in sight going into the upcoming September/October planting season. A 2018-2019 drought in Brazil, could put significant upward pressure on grain prices in the next several months.