Quarterly Energy Comment

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The Market

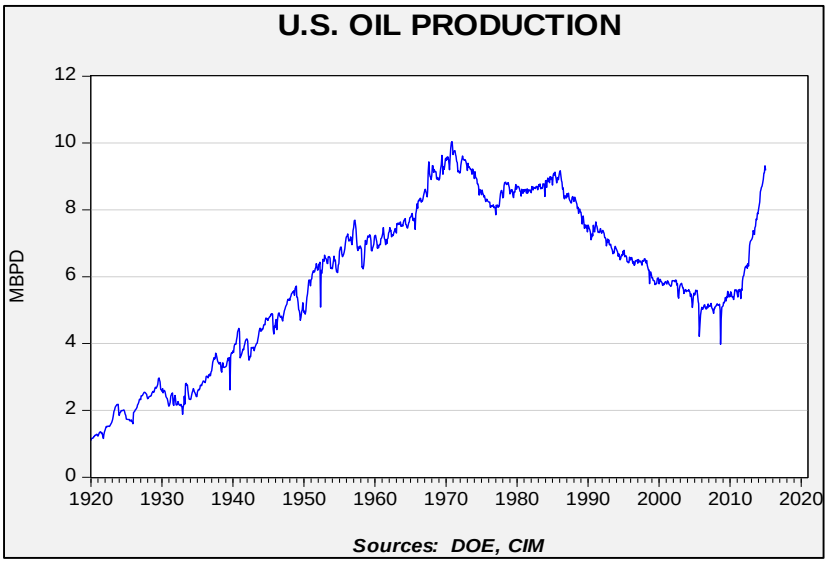
After a precipitous decline from June 2014 to late January, oil prices have been forming a base over the past few months. As the chart below indicates, oil prices have mostly been trading between $45 and $55 per barrel this year. The recent rise above $60 per barrel is raising hopes that the bottom could be in for crude oil.

(Source: Barchart.com)

Are we there yet? In this report, we will discuss some arguments for whether or not the lows are in place for crude oil.

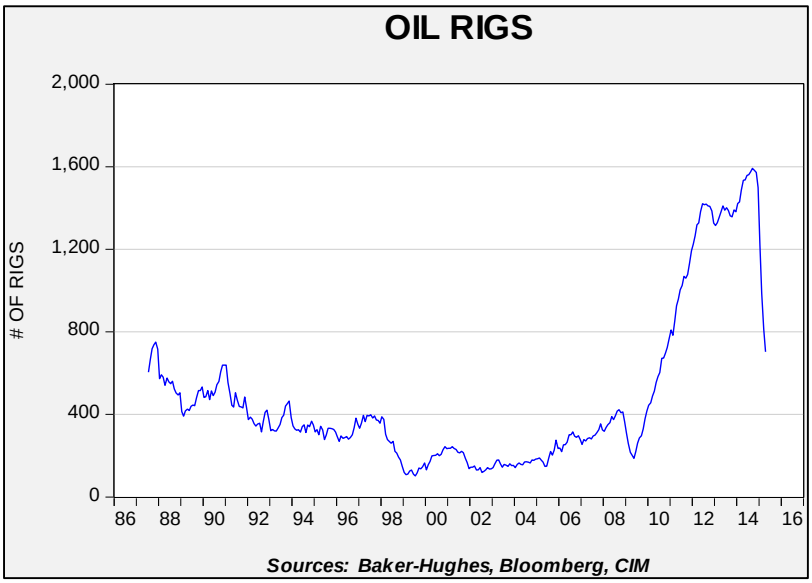
Slowing U.S. Production

The chart below shows U.S. crude oil production on a monthly basis, beginning in 1920. As the chart shows, the advent of fracking on U.S. production has been nothing short of a revolution. American production steadily rose from 1920 into the early 1970s. After peaking, it fell into the early 1980s. Output did lift as high oil prices in the 1970s spurred exploration and production efforts, but after oil prices declined in the mid-1980s, production entered into what appeared to be an unrelenting secular decline.



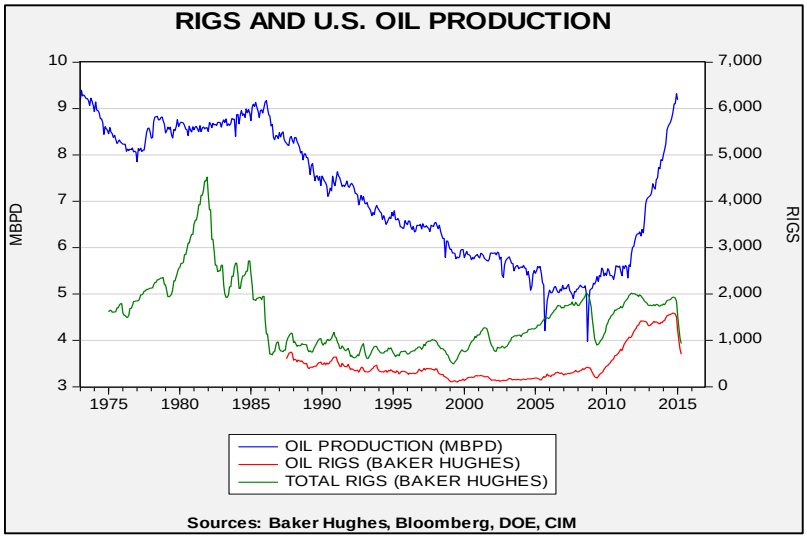
After falling below 3.0 mbpd in September 2008, in the teeth of the financial crisis, production recovered and steadily rose to 9.2 mbpd in January. Natural gas liquids (NGL), not included in this graph, add about another 1.0 mbpd, meaning that U.S. production is at new highs when including both crude oil and NGL.

The advent of fracking has led to a sharp increase in drilling activity as shown by rig counts.



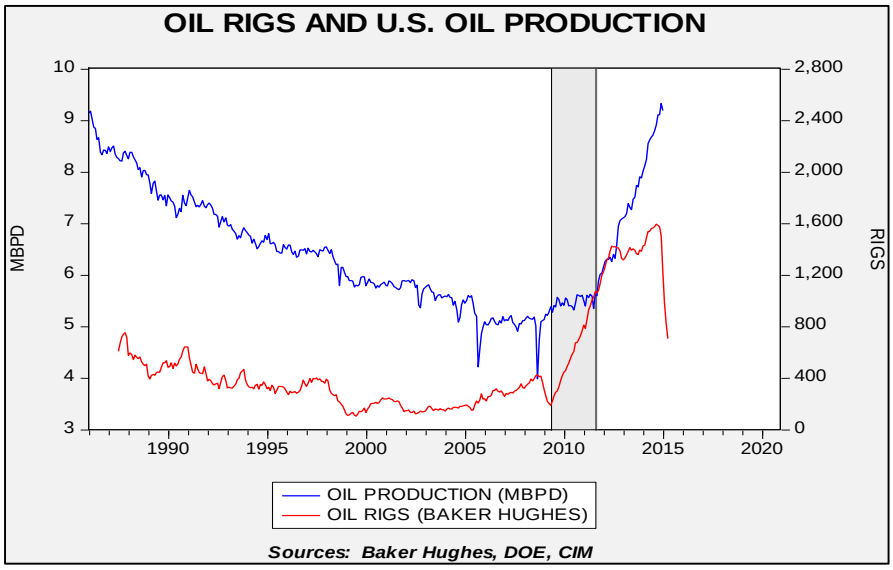
Rigs are usually designated as oil or gas but it is common for associated natural gas to be found with oil. Still, the designation shows the focus of drilling. Oil rigs steadily declined into 1998, rose modestly from 1998 into 2008, then jumped to nearly 1,600 last year. Since last August, rig counts have fallen precipitously. As fewer rigs look for oil,

at some point, U.S. production will decline. The trick is the length of the lag between slowing rig counts and production.



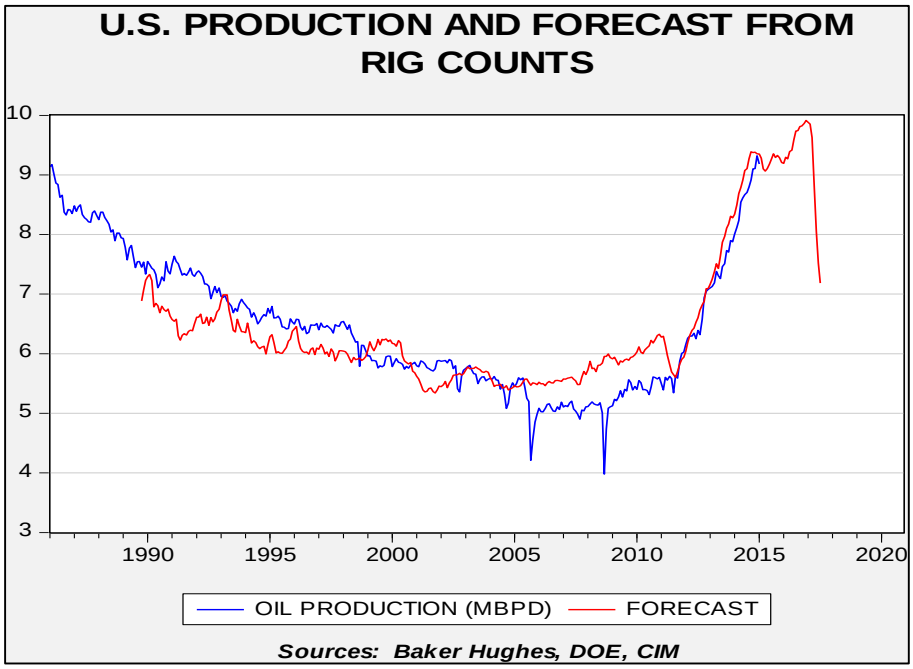
This chart shows rig counts along with U.S. oil production. Baker-Hughes did not separate oil and gas rig counts until 1987 so all we have prior to that year is the total count. It is worth noting that the total rig count rose sharply in the early 1980s, likely reflecting high oil prices. Even after rig counts declined, it took about three years before oil production began to fall. Part of this lag is because rigs are used for drilling wells and once the well is drilled it takes some time for it to produce. Eventually, decline rates rise and so, when a slowdown in drilling activity occurs, production will decline but with a lag.

Of course, it also works in reverse. A rise in rig counts doesn't translate into an immediate rise in production. Using this information, we can offer some insight into how fast production may decline.



The above chart shows U.S. oil production and oil rig counts. We have placed a gray bar on the chart that shows the period from when rig counts bottomed to when production began to rise rapidly. The difference is 27 months, from May 2009 to August 2011. Note that production continued to rise even as the pace of rig counts slowed in 2013. Over time, as oil producers improve productivity they are able to get more oil out of each well, which accentuates the lag effect.

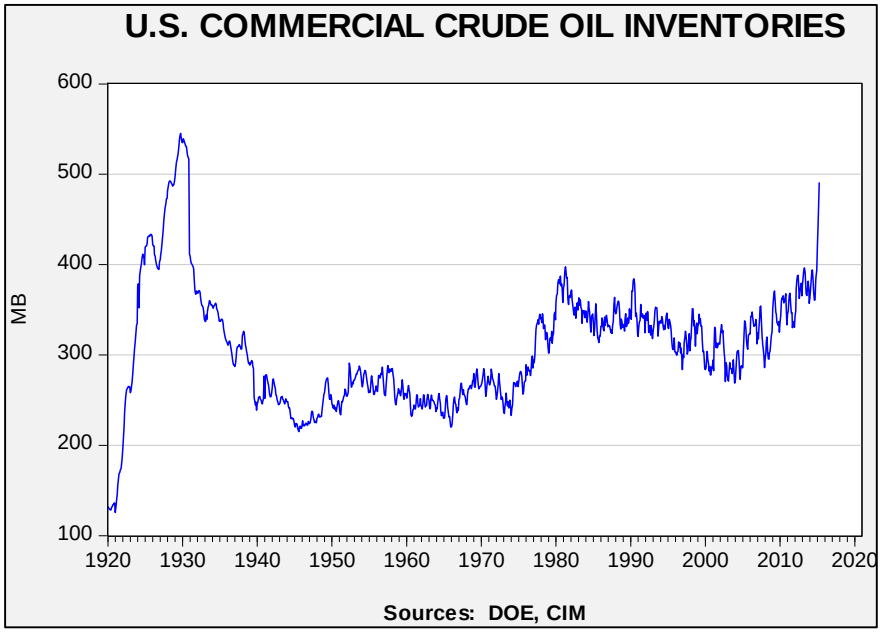
Taking that 27-month lag and deploying it in a production/rig count regression produces the following forecast.



This simple model suggests that production growth will slow very soon but major declines won't occur for a while. Will this model get it perfect? No. All models are prone to error, simply because there are a number of uncountable variables that will affect production. In this case, high decline rates for fracked wells may lead to a shorter lag. Tightening financing could have a similar impact. However, this model does make the case that a major drop in output may simply take time.

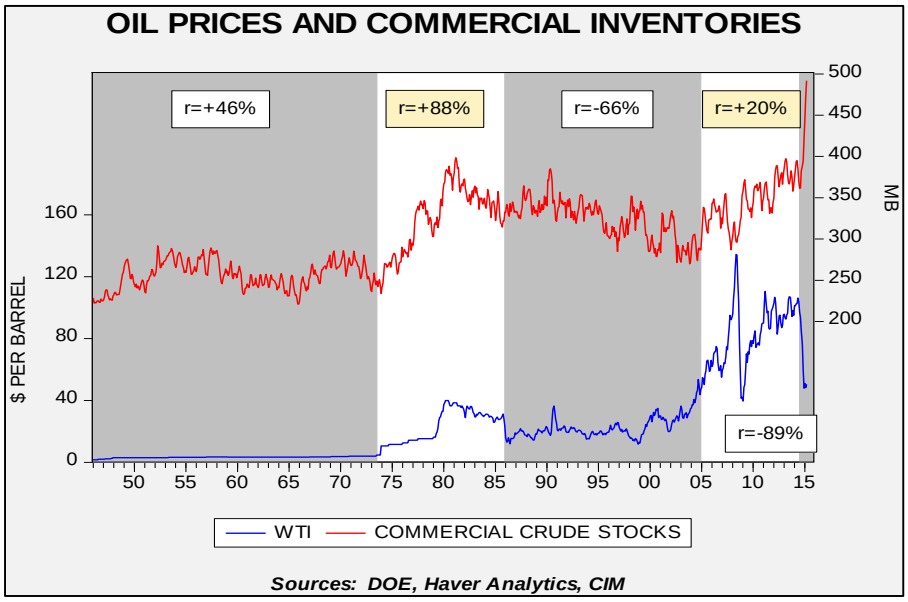
The Inventory Situation

Although the media does discuss this issue, the oil markets seem to ignore oil storage.



This chart shows U.S. commercial crude oil inventories dating back to 1920. The current spike in stockpiles is unusual; the last time we saw anything like this was in the late 1920s. Current inventories are over 490 mb.

In general, inventory is usually thought of as the residual left over after supply and demand are met. Thus, one would assume that higher inventories lead to lower prices. However, that isn't always the case. In periods of supply uncertainty, hoarding occurs and there is a direct relationship between oil prices and inventory.



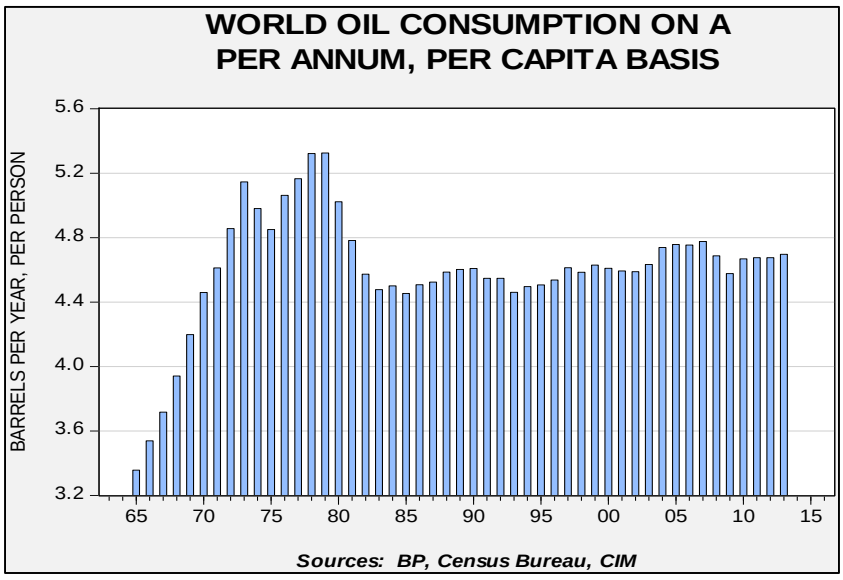
This chart shows various periods of oil prices and stockpiles. We have placed boxes showing the correlation during these periods. In particular, there was a strong, positive correlation from 1973 to 1985; this was the period of OPEC dominance. We had two supply events in this period, the Arab Oil Embargo in 1973 and the Iranian Revolution followed by the Iran-Iraq War from 1979 into the early 1980s. During this period, supply was uncertain and so consuming nations scrambled to build inventories, leading to a strong, direct relationship between oil prices and inventory. After the Saudis decided to end their swing producer role in 1985, the markets entered a long period of inverse correlation. This period ended in 2005 when rising Chinese demand and the financialization of the commodity markets led to a period of modest correlation. Finally, since mid-2014, the correlation between oil prices and stockpiles has reversed to strongly negative.

Seasonally, U.S. commercial inventories peak in mid-May and decline through the summer. This period is the summer driving season, when Americans take to the roads for vacation. The market is beginning to anticipate rising refining activity and stronger demand. However, a normal summer drawdown will still leave inventories well above average. The typical summer drawdown is around 25 mb, which would leave stockpiles at approximately 465 mb, assuming that we are at the peak now. Using the relationship between prices and inventories from 2012 to the present, the current fair value price is $41.88. A $60 price assumes an inventory level of 451 mb. Although such a drop is feasible, it would be much faster than normal. A normal summer decline from these levels would generate a fair value of $53 per barrel.

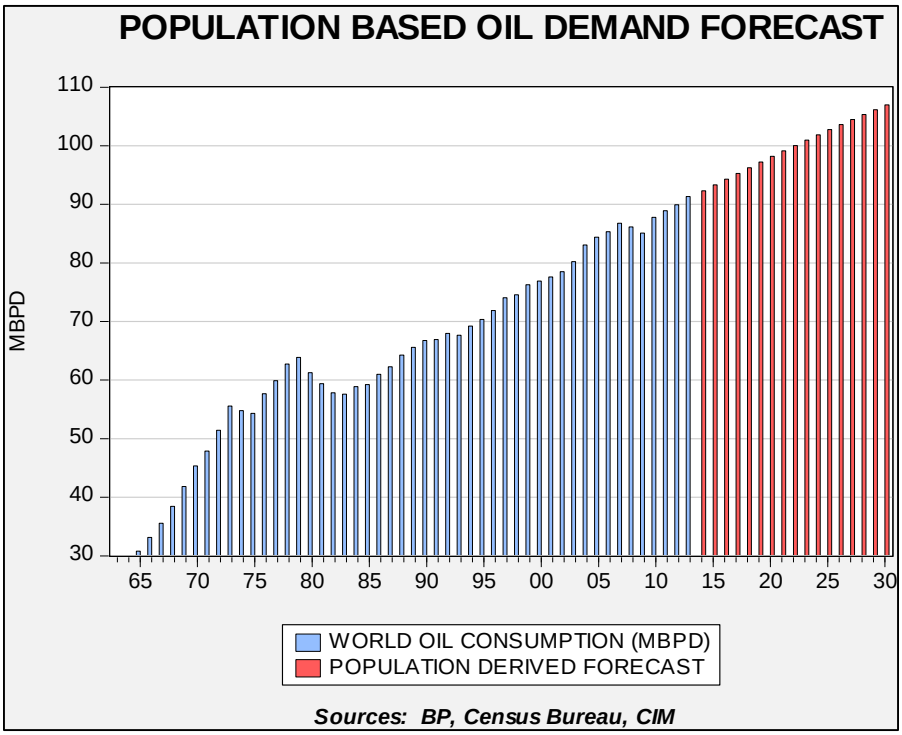
Of course, a larger than normal decline probably requires a rather rapid drop in production. As the earlier section warned, that might not occur. In any case, the market appears to have already discounted a rather rapid decline in inventories.

What about Demand?

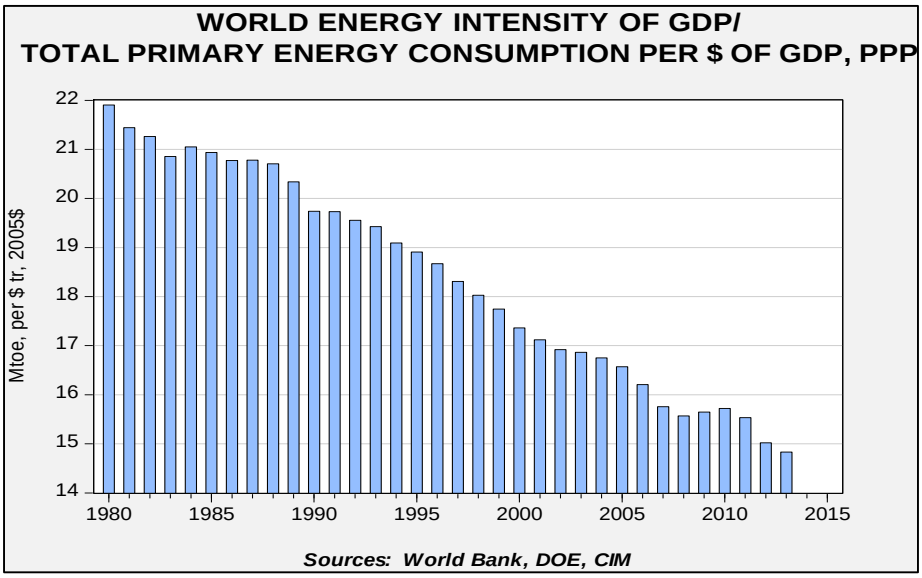
Although oil demand is tied to economic growth, a good way to predict long-term consumption is to look at demand on a per capita, per annum basis. In other words, how many barrels of oil does each person in the world consume in a year?



On average, each person in the world consumes about 4.7 barrels of oil per year. As is often true with averages, it conceals as much as it reveals. For example, the average U.S. resident consumes 21.8 barrels, while the average Chinese resident consumes 2.9 barrels. The long-term bull case for oil consumption is that China reaches average. However, as the above chart shows, the world number has been relatively stable, running between 4.5 to 4.8 barrels. Even with China steadily rising, the developed world has seen falling consumption on this basis, keeping the world number relatively steady.



Assuming that global consumption on a per capita, per annum basis remains near 4.7 barrels per year, and using the Census Bureau's forecast for global population, global consumption will be at 98.2 mbpd by 2020, up from the current 92 mbpd. Of course, there are bumps in the historical record, primarily three. The first occurred in 1973-75, due to the Arab Oil Embargo and the spike in prices. The second came after the Iranian Revolution and the Iran-Iraq War, and the 1981-82 recession. The most recent, in 2008, occurred due to the financial crisis. The first two led to a change in the trend of oil demand, whereas the 2008 event, at least so far, has not. However, there are growing concerns that may change.



This chart shows the trend in the amount of energy required to generate an inflation-adjusted dollar of GDP for the world. Note that this measure has mostly been in a steady downtrend for the past 23 years. However, from 2006 into 2009, this measure did rise modestly. This increase was due to China providing more of global GDP, which has a high degree of energy consumption for each unit of GDP due to its heavy reliance on industry. This situation is changing, however. China is in the midst of restructuring its economy, which will affect the energy demand in two ways. First, GDP will likely slow rather dramatically, falling to 5% growth or less in the coming years. Second, the shift toward consumption and away from exports and investment will further reduce energy consumption.

Finally, for oil, the shift to alternative energy sources and greater concerns about climate change will likely undermine oil demand. It is very difficult to predict exactly how great of an impact policy changes will have and how quickly they will occur, but the situation in coal could be a harbinger of oil's future. In other words, we may be heading toward a future where the per capita, per annum oil consumption declines, putting a damper on demand. Some analysts are calling this "peak demand" as opposed to "peak oil," which refers to production. This issue leads us to the next section, OPEC (read: Saudi) output policy.

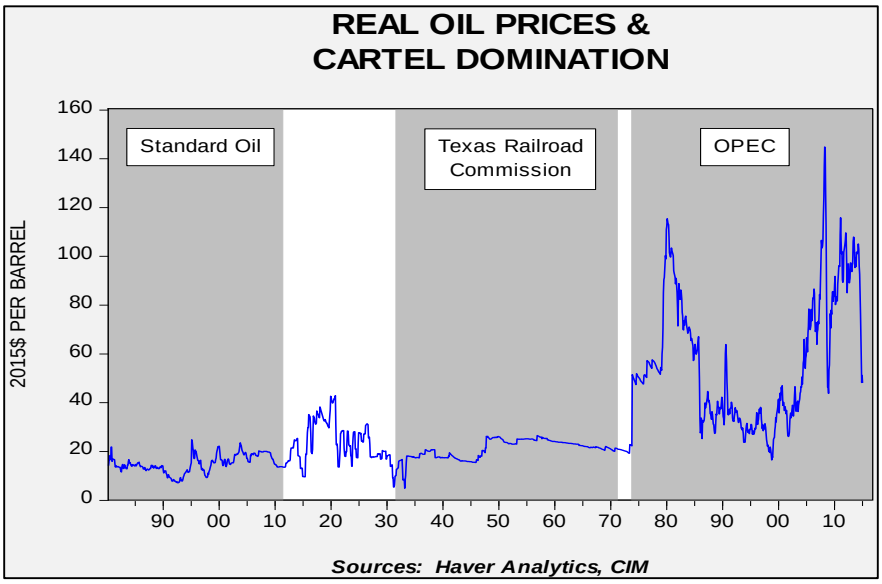
OPEC (Saudi) Production Policy

Last year, Saudi Arabia forced OPEC to abandon its price support role in order to maintain market share. Oil Minister Ali al-Naimi seems to have three reasons for the decision to go for market share and allow oil prices to fall. First, his nation's geopolitical rivals, Iran and Russia (due to the latter's long-time support of Syria), are less able to cope with lower oil prices. Allowing prices to decline undermines their economies and gives the kingdom an edge in managing its geopolitical risks in the region. Second, the sharp growth in U.S. production, led by fracking, was a threat to OPEC market share. Al-Naimi knows Saudi oil production carries a lower marginal cost than U.S. production.

However, as we discussed in point #1, he realizes lower production in the U.S. may take longer than expected. Third, and perhaps most critical, the Saudi oil minister is reportedly very concerned about the potential for peak oil demand. He sees a concerted effort to address climate change. He is worried that China's demand growth is poised to slow and that terrible pollution problems may encourage the country to leap-frog to alternative energies without ever completely fulfilling its promise to consume energy like a developed nation. Lowering oil prices and ***keeping them lower*** is the best response to all these issues. In other words, low oil prices harm the kingdom's enemies, undermine unconventional oil production and extend the life of oil demand by undermining conservation and making it more difficult for alternative energy sources to compete.

The two OPEC-inspired price declines, in 1986 and 1998-99 events, ended because the Saudis declared victory and reduced production to support the market. Neither ended due to market forces. Although this episode may end without overt Saudi action to stabilize prices, we doubt that will be the case. Ideally, the kingdom would probably like to create a new trading range at prices well below the range seen into the summer of 2014.

This chart shows inflation adjusted oil prices under three cartel regimes—Standard Oil, Texas Railroad Commission and OPEC. The economics of cartels suggest that cartel pricing is higher than the market-clearing price with less volatility. This is because the cartel holds production off the market to generate higher than market-clearing prices. This excess productive capacity can be added to the market during periods of rising demand or supply shocks (weather events, wars, etc.). OPEC, due to its large membership, has been less effective in stabilizing prices than the previous cartels but we believe that OPEC does want to achieve that goal. After all, OPEC kept prices relatively stable from 1986 into the late 1990s. We believe it wants to create similar conditions around the $50 per barrel range.



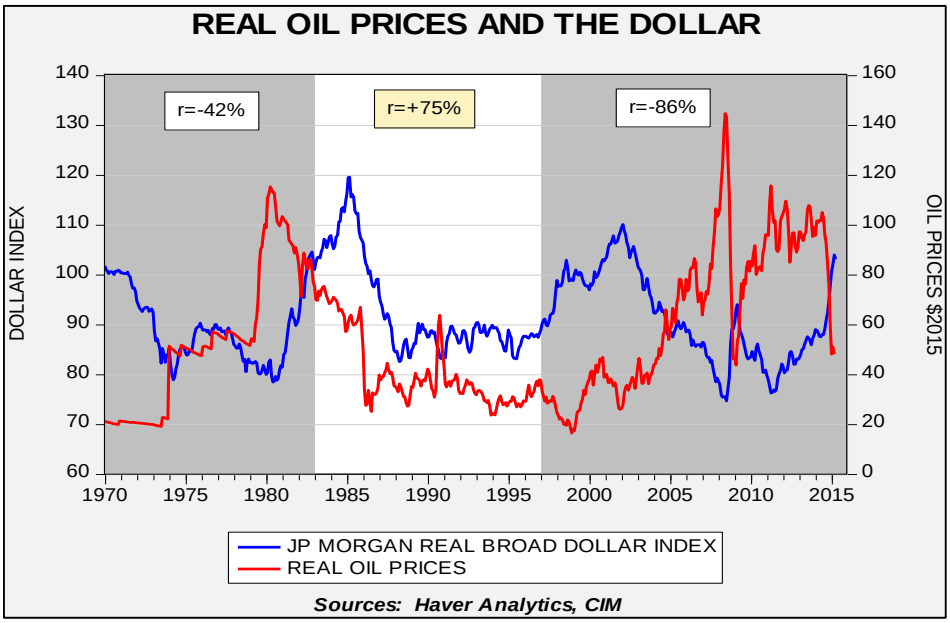
Will the Saudis change their minds? There are two factors that might change the kingdom's current policy. First, if Iran is able to expand its influence and threaten the kingdom and the U.S. fails to respond, then Iran would likely take control of OPEC policy. Iran needs higher prices and would probably try to force the Arab Gulf producers to cut output and bolster prices. Second, if Saudi Arabia found it was unable to afford the current low price environment due to falling financial reserves, it would be forced to cut output and lift prices. So far, the kingdom's reserves have declined by $47 bn since October. A combination of falling revenues and higher spending for defense and social support (especially with the recent change in power) has reduced reserve levels. It should be noted that Saudi foreign reserves were $708 bn at the end of March, so the kingdom has the financial firepower to maintain low prices for a while.

The Financial Factors

Oil is a critical commodity and there have been periods when there were strong relationships between oil prices and financial instruments. For example, from 1979 to 1998, the correlation between10-year T-note yields and oil prices was 80%. Any long-term interest rate model during that period was improved by adding oil prices. The dollar's exchange rate has always had an impact on commodity prices; most commodities are priced in dollars, so a generally stronger exchange rate tends to raise prices for non-U.S. buyers.

However, the relationship between financial instruments and commodity prices is not consistent across time periods. Even more problematic is that the relationships tend to be reflexive. Reflexive relationships, a term coined by George Soros, mean that the direction of causality is either unable to be determined or that the causal relationship "reflects" on itself. For example, a strong dollar may weaken the price of oil, and the more oil prices weaken the more confident currency traders become in buying the dollar.

This chart shows the relationship between the dollar and real oil prices.



From 1970, roughly when currencies began to float, to 1982, there was a negative, but rather modest, correlation between the dollar and oil prices. The spike in oil prices in 1979-80 did coincide with a weaker dollar, but the primary factors driving prices higher were geopolitical. From 1983 to 1997, the dollar and oil prices were directly correlated at the 75% level. A positive correlation is counterintuitive; for the most part, from 1987 to 1996, both the dollar and oil prices were mostly stable. During this period, OPEC created a stable trading range and the dollar was mostly steady in the post-Plaza Accord and Louvre Accord era. From 1997 to the present, the dollar and oil prices have been inversely and highly correlated. The recent drop in oil prices has coincided with a steadily strengthening dollar.

The dollar has been stronger due to divergent monetary policies. The Federal Reserve ended quantitative easing (QE) last October and is preparing to begin raising policy rates later this year. Most of the other central banks are easing policy. The drop in oil prices is more due to OPEC policy. However, on any given day, a rising dollar will tend to depress oil prices and vice versa. In other words, in the absence of significant energy news, traders will tend to buy oil when the dollar weakens. Although it doesn't show on the above chart plot of the dollar index, which is broad based and inflation adjusted, the dollar has weakened over the past month against the euro. In general, if the dollar recovers from the recent correction, it will tend to act as a bearish factor for oil prices

Conclusion

Over the past few weeks, oil prices have staged an impressive recovery. This recovery has been supported by expectations of slowing U.S. oil production growth and a seasonal reduction in oil inventories. The correction in the dollar's recent appreciation has helped lift prices. However, we believe that Saudi Arabia is not yet ready to create a bottom and until it is, the oil market will be vulnerable to a retest of the high $40s per barrel range.

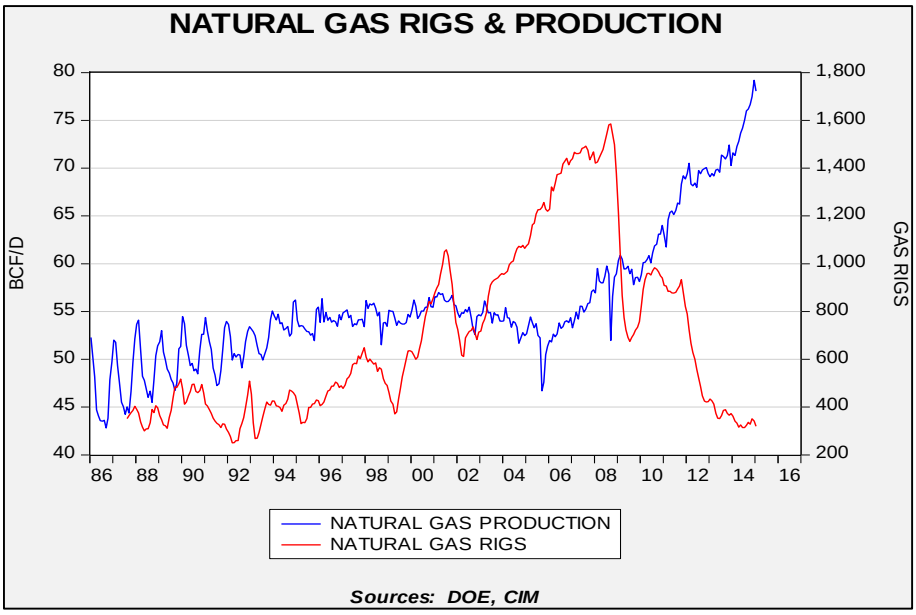
As the year wears on, we expect a trading range to develop, most likely with a midpoint of $50 with a $5 per barrel range.

Natural Gas

Natural gas prices failed to rally despite the cold winter.

(Source: Barchart.com)

After the November cold snap, a mild December was followed by a cold January and February. However, prices remained soft primarily because production is elevated.



This chart shows natural gas production and rig counts. Natural gas rig counts tend to track natural gas prices. When prices began to rise in the late 1990s, rig counts rose as well. As prices declined, rig counts fell too. However, due to improving well

productivity and some associated gas from oil drilling, natural gas production has continued to rise. Industry reports suggest that associated gas is not all that significant, meaning this production increase is coming mostly from productivity. This means that natural gas prices will probably remain under pressure for the foreseeable future even with favorable demand conditions, e.g., hot summers and cold winters. If the weather fails to cooperate, prices could be hit even harder.

In the long run, nothing fixes low prices like low prices. Eventually, the underlying demand will rise. The longer prices stay low, the more confident consumers will be in using gas-fired applications compared to competing fuels. Unfortunately, that may take a rather long while. Thus, for now, we look for mostly range-bound prices, probably between $3.00 per MMBTU to $2.25 per MMBTU through the summer.

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