

McCULLOUGH RESEARCH

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PRINCIPAL

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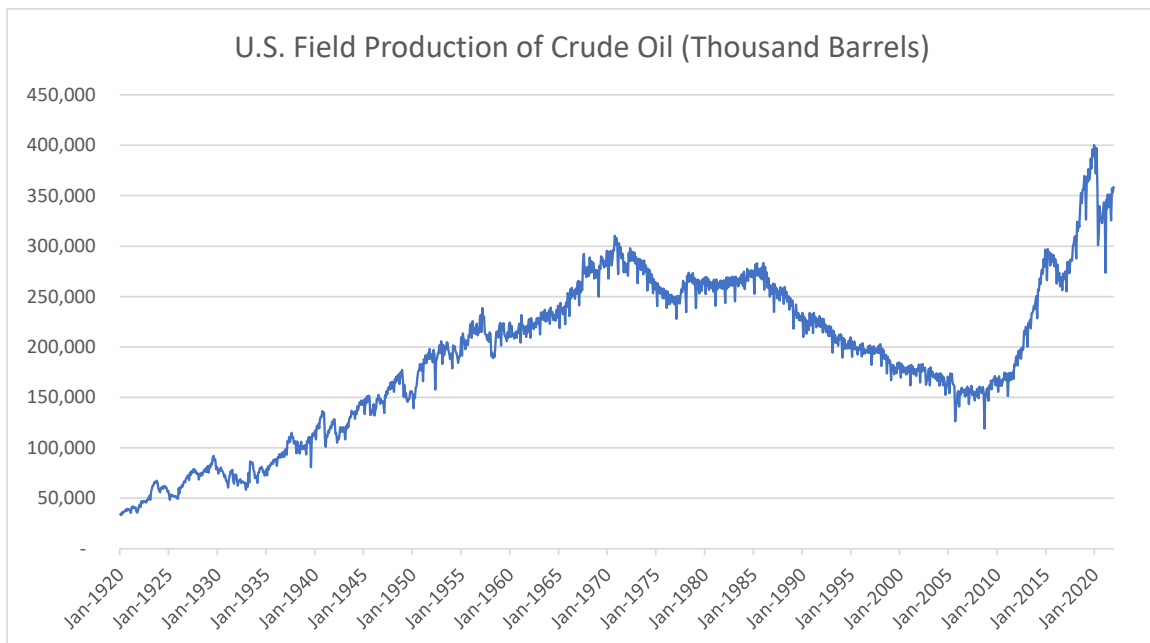
To: McCullough Research Clients

From: Robert McCullough

Subject: Accelerating the Rate of New U.S. Oil Production

Successful oil sanctions against Russia will cause less harm to the world economy if U.S. oil production ramps up. Unfortunately, the U.S. response to high oil prices has been slow and cautious. To meet needs in Europe, the U.S. may need to consider financing support for independent wildcatters in mid-continental oil fields to accelerate U.S. oil production.

The still unexplained spike in oil prices on July 3, 2008 had momentous impacts on U.S. oil production. The high prices spurred innovation in three areas – discovery, access, and extraction. Put more colloquially, supercomputers have allowed a high degree of precision in finding the oil, horizontal drilling allows a broader access per well, and fracturing (aka fracking) accelerates oil recovery. The results for the U.S. are striking:

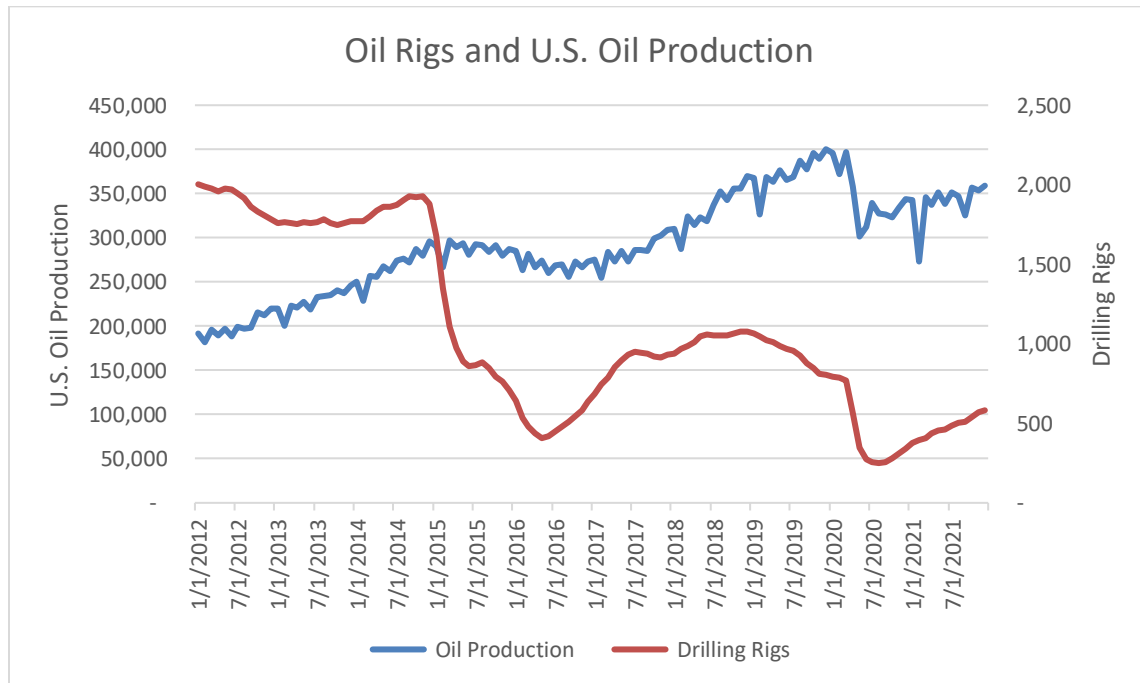


Accelerating the Rate of New U.S. Oil Production

March 7, 2022

Page 2

The dynamics of U.S. oil production is roughly based on the number of drilling rigs in operation – particularly over the past decade:



The shift in technology also changed the business considerably. Using older technologies, a virtual forest of wells could occupy an oil field. Today, a single well exploits a large area. This is reflected in the continuing downward slope of the number of drilling rigs even as U.S. oil production has increased.

Mathematicians describe the point on a curve when it changes direction as an inflection point. For drilling rigs, the inflection point is approximately \$60/barrel. Below \$60/barrel, the number of acting drilling rigs falls. When the prices are above \$60/barrel the number of active rigs increases.

We are currently in a period of increase. Since the price of oil passed \$60/barrel one year ago, the number of active rigs has increase by 17 per month. As can be seen from the chart above, if the previous period when drilling increased the rate of change was 31 active rigs per month.

A more scientific approach is to construct a simple mathematical model as a function of the real oil price and a date. The oil price represents the incentive to increase or decrease

Accelerating the Rate of New U.S. Oil Production

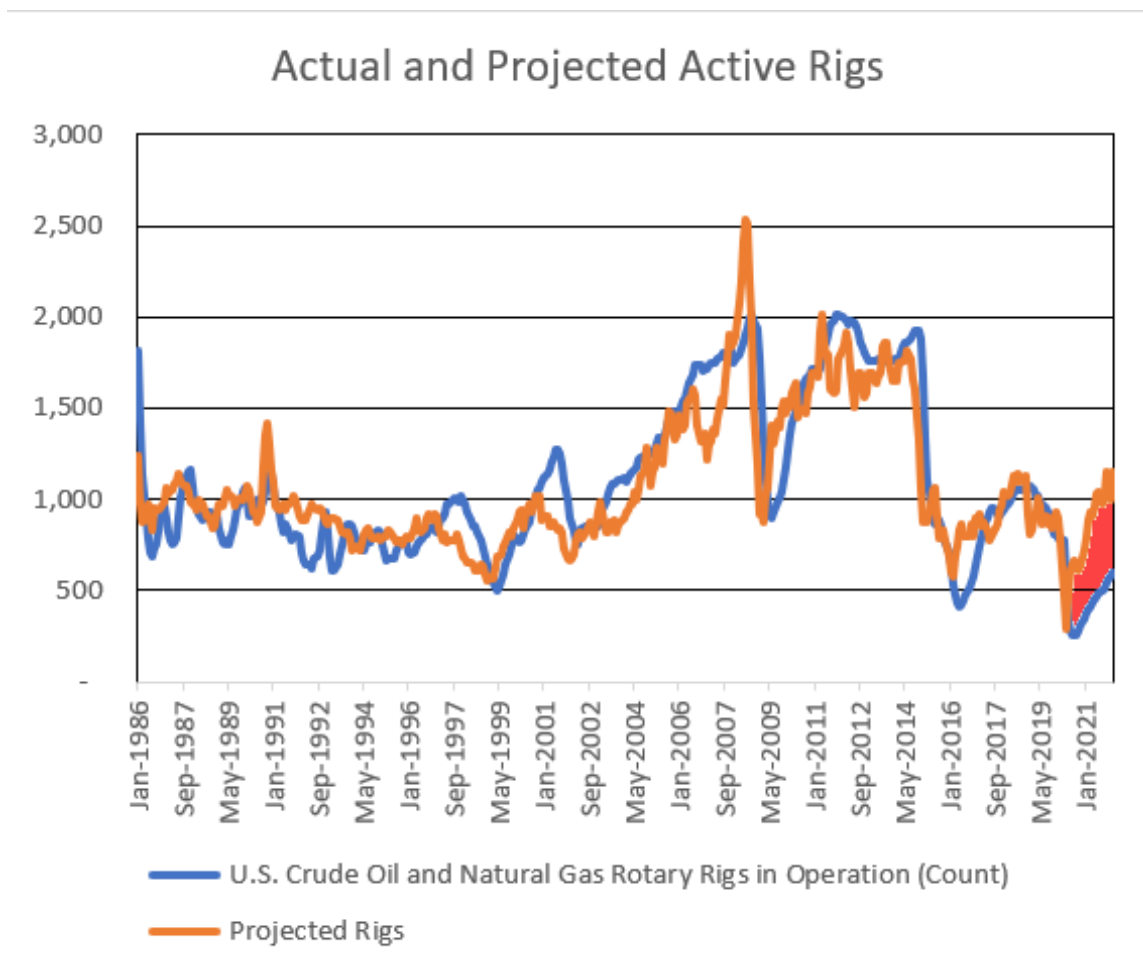
March 7, 2022

Page 3

drilling. The date is a rough representation of the greater efficiency of modern drillings – finding more oil with fewer wells:

$$\text{Active Drilling Rigs} = \text{Constant} + 13.7 \text{ Rigs}/\$1 \text{ increase in the WTI price} - .03 \text{ Rigs per day}$$

This simple model is statistically significant at the 99.9% level and explains 71.4% of the explanatory variable.



The area highlighted in red reflects a much slower pace of added drilling rigs than in previous high oil price periods.

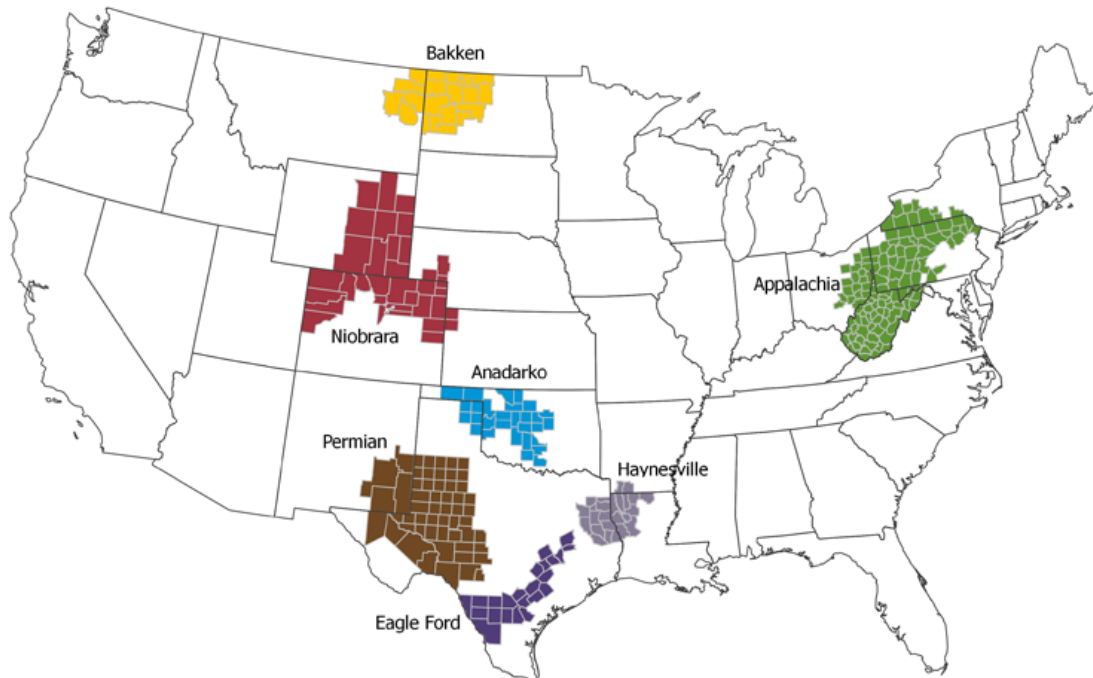
Accelerating the Rate of New U.S. Oil Production

March 7, 2022

Page 4

Given current incentives, we would expect twice as many rigs to be active as we see today. Based on the relationship between active oil rigs and oil production, this would increase U.S. production by 10% -- a sizable increment to world oil production,

While market structure in some areas – such as California – have raised market power concerns over the years, oil drilling in U.S. mid-continental basins are highly competitive. The map below illustrates a variety of basins where the constraint may well be financing for smaller companies:



Short term financing guarantees may well provide needed relief for oil price increases while displacing Russian oil exports.

It should be noted that nothing in this proposal will increase global emissions. Increased oil production will simply reduce Russian oil sales – and Russian oil revenues – as U.S. production provides supplies to European allies.