

The Impact of Covid-19 on Energy Markets

BY SAM A. VAN VACTOR

Introduction

The World Health Organization (WHO) was informed on December 31, 2019 that a cluster of a coronavirus had broken out in Wuhan China.¹ Further details were provided on January 11th and 12th and WHO began publishing daily reports on January 21st. In three short months since then, the virus has broken out in 185 countries or territories and has plunged the world into a global recession, the first major setback since the Great Recession of 2008.

Energy markets have played an important role by providing early warnings about the economic impact. Once China implemented strict lockdown measures to keep the virus from spreading oil demand turned down. In multiple cases, Chinese companies exercised their "Act of God" contractual clauses to cancel contracts or reduce purchase volumes. The oil market weakened as a consequence, with U.S. oil futures prices falling from over \$60 per barrel the first week in January to around \$50 the first week in February.

The Stealth Bug

The virus, now known as SARS-CoV-2, has a number of features that explains why it has a substantial impact on economic activity. It has a high infection rate and unlike earlier cases of coronavirus, such as SARS and MERS, this one has a long incubation time – up to 14 days. Writing in the New England Journal of Medicine Bill Gates noted: "Covid-19 is transmitted quite efficiently. The average infected person spreads the disease to two or three others — an exponential rate of increase."² These features make containment difficult.

Not only is containment difficult, the virus has a high death rate, especially for those over 60 years of age or with underlying health problems. Bill Gates summed up the problem: "First, it can kill healthy adults in addition to elderly people with existing health problems..."³ In short, SARS-CoV-2 spreads fear as quickly as it jumps from one host to another.

There is another often overlooked problem. Many infected patients do not exhibit easily identified symptoms or may simply carry the virus without any ill effect, meaning that there is no reliable guide as to who should be quarantined. Moreover, without knowing the percentage of the population that are effectively immune, measuring the rate of spread and likely peak has proven to be a serious challenge. Many of the early forecasts produced alarming results. Most famously, the Imperial College produced a report on March 16, 2020 that estimated that without intervention there would be 510 thousand deaths in Great Britain and 2.2 million deaths in the U.S.⁴ These estimates led directly to the adoption of strict

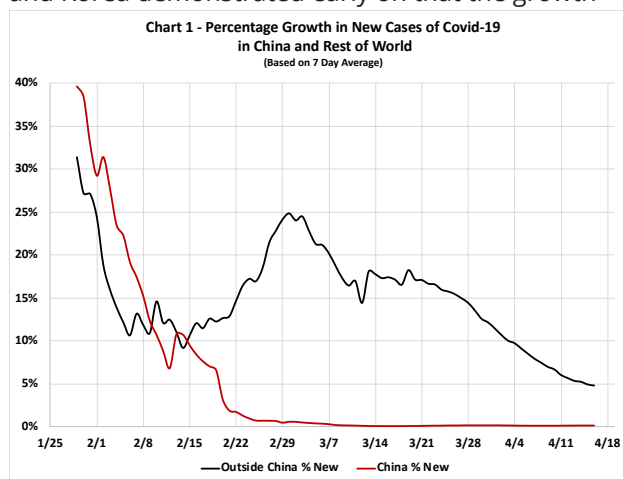
"lockdown" measures in Europe, the U.S. and Canada.

Since the release of the Imperial College report forecasts of cases and deaths have dropped sharply – in large measure due to social distancing and other lockdown measures put in place. Most health authorities now rely on the Institute for Health Metrics and Evaluation (IHME) at the University of Washington.⁵ The methodologies of the two approaches are quite different. Imperial College based its forecast on data collected on the epidemical characteristics of the disease, infection rates, fatality rates, etc. IHME, however used trend analysis based on the experience in China, Korea, and recently Italy and Spain.⁶

Given that the virus is new, the proportion of the population with immunity or near immunity is unknown. Adding vulnerability and uncertainty to a highly interconnected global economy means that the virus spreads rapidly and causes panic. China and Korea demonstrated early on that the growth

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of Covid-19 could be arrested, but at a large cost to economic activity.

Covid-19 Growth Rates

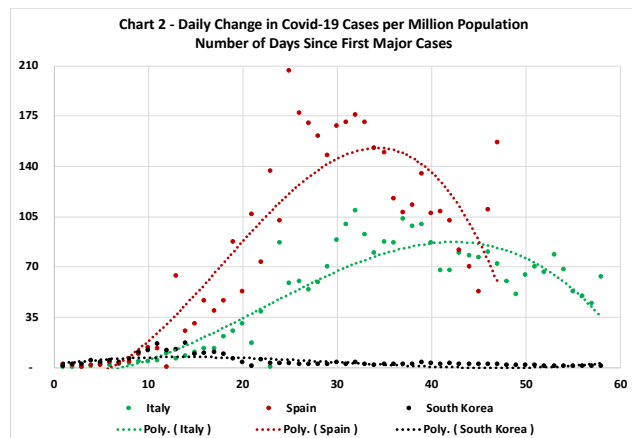
Not since Alexander the Great has an invader made as much progress as the novel coronavirus in conquering foreign lands. Chart 1 illustrates the growth rate of Covid-19 in China and outside China.⁷ As the growth of Covid-19 escalated China took action implementing a "lockdown" of the region on January 23rd. The lockdown had the desired impact and within

one month the growth rate of new cases fell to 1.3%. As new cases dropped in China, they began a rapid ascent in other parts of the world. Since then, growth rates have dropped to around 5%. However, that growth now has a very large base which means that there are around 100,000 new cases each day.

There are of course many advantages to the globalization of world commerce. It has produced long periods of economic growth and lifted billions of humans from crushing poverty. There are, however, disadvantages too. The same channels of trade that foster low cost manufacturing also provide a framework for the rapid transmission of an infectious disease. The first hot spot outside China was South Korea, where the disease broke out in a religious sect that congregated in large groups. A second hot spot was in the holy city of Qom, Iran, in which there were a number of infrastructure projects financed by China and containing laborers and technicians from China.⁸

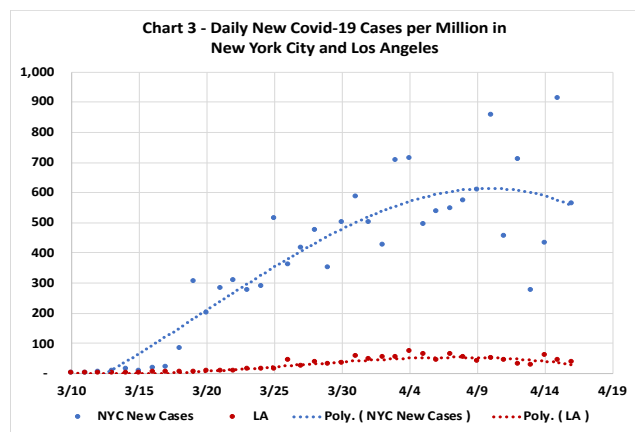
In January and February cases in the United States and Europe were primarily limited to individuals coming from China who had been exposed to the disease there. At that time the limited number of cases allowed public health authorities to identify and track the virus's progress.

Tracking and quarantines held down the spread of Covid-19 until a serious outbreak occurred in Italy. The precise origins of the outbreak are still debated, but



it is well established that Northern Italy has a large number of apparel factories owned and operated by the Chinese.⁹ The Chinese communities are tightknit, and some workers do not have legal residency.¹⁰ This combination of features suggests that early cases of Covid-19 would not have been recognized until they spread to the general population. In any case, when Covid-19 cases began to be detected in Italy they accelerated quickly, outpacing Korea in two weeks.

Chart 2 compares the outbreak in South Korea to Spain and Italy. Note that social distancing, tracking, and wide-scale testing held down cases in South Korea. The country had learned from the SARS epidemic and was prepared. Europe was not prepared and the Covid-19 quickly overwhelmed medical facilities.



Policy Tradeoffs Between the Economy and Lives Lost

Epidemiologists describe coronavirus outbreaks as clusters. Ordinary flu is sensitive to the season, but generally breaks out across a wide segment of the population at lower infection rates. Covid-19 follows the coronavirus rule in that certain regions seem to have had a more intense outbreak than others. In Europe the most intense clusters so far have been in Italy and Spain. In the United States it has been in New York State and particularly New York City.

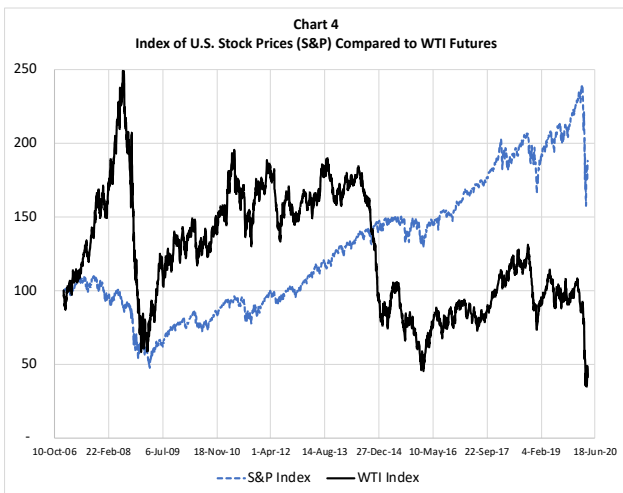
Chart 3 compares the number of Covid-19 cases per capita in Los Angeles to New York City. Both cities pursued social distancing, shut down bars and restaurants, etc. and yet they had vastly different results. Many factors go into determining the intensity of the outbreak: timing of the lockdown, population density, social interactions, variation in cultural habits, etc. Nonetheless, the difference between the two cities is striking.

New York City may hope to be back to normal life fairly soon, but Los Angeles (which adopted lockdown rules earlier in the outbreak) may have to wait to prevent a similar spike. If most residents remain vulnerable, however, some authorities have suggested that lockdown measures may have to be re-introduced. There is precedent for this; there were three different waves to the Spanish Flu between 1918 and 1919.¹¹ All of this makes predicting the length of lockdowns and subsequent impact on the economy highly problematic.

How Covid-19 Impacts the Economy

Dislocations caused by supply chain disruptions, shifting consumer preferences, and the outright banning of many economic interactions will cause unpredictable shifts in the economy. These shifts, in turn, will impact cash flow and the ability of some companies to service their debt. Put another way, the dislocations caused by Covid-19 could morph into another financial crisis. Large banks are already setting aside reserves in order to cover expected loan losses.

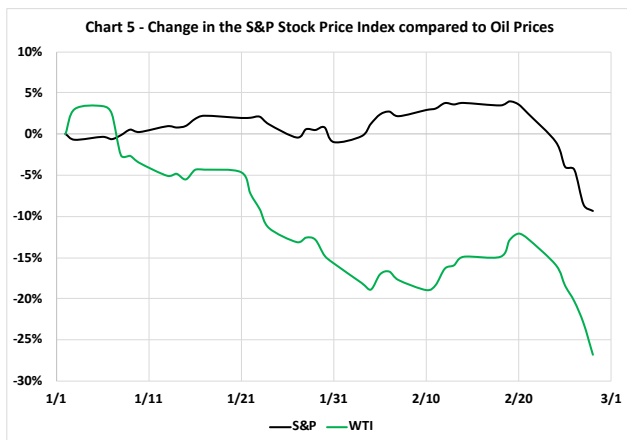
To offset the economic impact most governments



have announced a massive infusion of economic support – outright cash payments, grants, loans, increased unemployment compensation, job guarantees, etc. The problem with these programs is that the broad sprinkling of cash may not reach regions and sectors that have been most damaged.

Energy as a Leading Indicator

To provide some perspective it is worth reviewing how financial and commodity markets changed leading



up to and following the 2008 Great Recession. Chart 4 illustrates the longer-term relationship between oil and stock prices.¹² Oil prices are often a leading indicator of stock market prices. Following the recession oil and stock prices moved together until the summer of 2014. However, the rapid development of U.S. shale oil and other new oil supplies severed the relationship.

In times past, coal miners used to take caged canaries into the mine while they were working. The canaries gave advanced warning about explosive gases or carbon monoxide that would endanger the miners. Analysts have sometimes viewed oil and commodity markets as barometers for the global economy. Although much of the trading is in the futures market, there is enough activity tied to physical

flow of commodities to provide some insight into forthcoming economic activity. Buyers have to fix orders well in advance of actual consumption. If orders are canceled or cutback it puts downward pressure on commodity prices. All of this happens in real time. In contrast, stock prices are based mainly on estimated earnings lagged several months. It can be argued that commodity markets are the canary in the coalmine, presupposing changes in the real economy.

Chart 5 illustrates the change in the S&P stock price index compared to the change in the WTI index during the critical period of the Covid-19 breakout. U.S. crude oil prices dropped over 15% through February 10th due to concern about China's oil demand. At the same time stock prices were unmoved by what appeared to be a localized virus. However, over the weekend of

Date	Crude Oil and Product Stocks	Total Product Supplied	Gasoline Supplied	Kerosene Supplied	Diesel Supplied
Jan-20	1.2%	-3.3%	-3.6%	-0.5%	-5.8%
Feb-20	1.2%	-1.9%	1.0%	-7.5%	-6.8%
Mar-20	1.8%	-2.1%	-5.6%	-15.2%	-4.9%
Apr-20	4.2%	-30.0%	-46.4%	-64.5%	-13.3%

Source: EIA

February 22, South Korea had a major outbreak with the number of cases rising from 204 on Friday to 833 the following Monday. At that point the S&P index also began to decline as markets recognized that Covid-19 could spread beyond China.

The Dramatic Drop in Oil Demand

After mid-March oil prices and stock prices parted ways. This was due in part to the failure of Russia to agree to a production cut set by the OPEC cartel on March 6th. Two days later Saudi Arabia launched a price war by ramping up production and announcing additional discounts to indexed prices. The resulting supply shock threatened to flood the market with even more oil.

Ultimately, the price of crude oil is determined by what consumers are willing to pay for petroleum products, particularly motor fuels. The market reached a low point on March 23rd, when the price of wholesale gasoline actually fell to 49 cents per gallon, over \$2 per barrel below the price of West Texas Intermediate (WTI) crude oil. The Saudi supply shock would have an impact on the order of 2 or 3% of total supply, well short of the Covid-19 panic, which has reduced global oil demand by up to 35%, in the short run.

Table 1 summarizes weekly petroleum supply data published by EIA. Overall stocks have increased as crude oil backed up in pipelines and storage filled up. Compared to April last year, crude oil and petroleum product stocks have increased 4.2%. In the first two weeks of April overall products supplied declined 30.0%, gasoline was down 46.4% and jet fuel was down 64.5%.

Impact on U.S. Shale (tight) Oil Production

The dispute between Saudi Arabia and Russia

centered partly around shale oil development in the U.S. Russia wanted prices to drop in order to stifle U.S. shale oil production. Saudi Arabia's interests were more complex and for the short term they focused on increasing market share, at the expense of Russian sales to Western Europe.

Unlike conventional crude oil fields shale oil has a relatively high short-term price elasticity. Conventional fields decline gradually over many years. Shale oil, however, has a steep decline rate. Over one-half of the oil produced from a shale oil well will be produced in the first year. In order to keep production rates up, companies have to constantly drill and complete wells

Following the dispute between Saudi Arabia and Russia, U.S. crude oil prices fell to under \$20 per barrel on the futures exchange. Field prices for oil fell much further, given the infrastructure problems of transport and storage. On April 15th Plains All American Pipeline posted prices for crude oils in the field that ranged from \$3.50 for high sulfur oil in Texas to \$16.50 for domestic sweet at Cushing Oklahoma.¹³ Eagle Ford Light in Texas (a major shale oil play) was posted at \$16.25 per barrel.

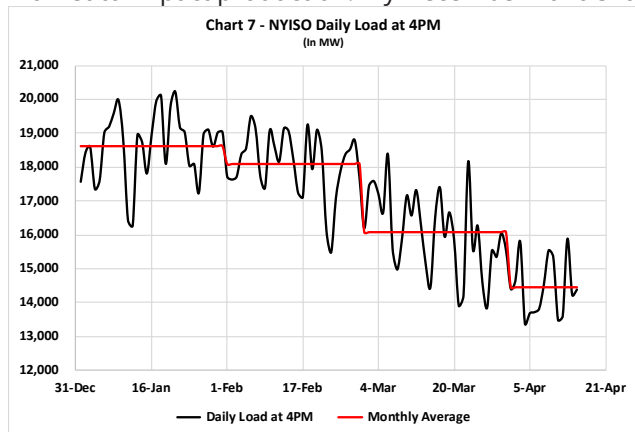
A similar price collapse happened after the summer of 2014, but it took several years for the market to

Table 2 - Impact of Covid-19 on U.S. Retail Sales 2020

Activity	Change February		
	to March	March	February
Clothing & clothing accessories stores	-50.48%	\$11,088	\$22,389
Furniture & home furn. stores	-26.81%	\$7,337	\$10,025
Food services & drinking places	-26.50%	\$48,559	\$66,066
Motor vehicle & parts dealers	-25.59%	\$79,302	\$106,571
Sporting goods, hobby, musical instrument, & book stores	-23.31%	\$4,982	\$6,496
Gasoline stations	-17.15%	\$35,326	\$42,641
Electronics & appliance stores	-15.13%	\$6,870	\$8,095
Miscellaneous store retailers	-14.30%	\$10,299	\$12,018
Retail & food services	-8.73%	\$483,066	\$529,262
Building material & garden eq. & supplies dealers	1.35%	\$33,829	\$33,380
Nonstore retailers	3.11%	\$68,787	\$66,712
Health & personal care stores	4.27%	\$30,807	\$29,546
General merchandise stores	6.40%	\$63,781	\$59,946
Food & beverage stores	25.58%	\$82,099	\$65,377

Source: US Census Bureau

bottom out. In February 2016, futures prices reached \$26.21 per barrel, with corresponding deductions for field prices. The bottom did not last long, however, and shale oil production continued to increase. There is of course a lag between price changes and shale oil production. It took nearly a whole year for the weaker market to impact production. By December 2016 shale



oil production had stabilized and then doubled output in four years, reaching 8.2 million barrels per day (mbpd,) producing heartburn from Riyadh to Moscow.

Various estimates suggest that tight oil production will drop quickly, by up to 2 mbpd at the end of this year. Many independent oil producers were in a weak financial condition before the price war and it had become increasingly difficult to finance new production. In the four-year period when production doubled, productivity increased by around 15% per year.¹⁴ Similar productivity increases are likely to continue. The industry has been plagued in recent years by difficult infrastructure shortages. Modest production cuts will reduce the pressure on infrastructure and improve field prices relative to New York and London benchmarks. In short, the shale oil industry is here to stay and there is no price level acceptable to Russia or Saudi Arabia that will eliminate it.

Electricity Load as an Indicator of Economic Growth

The key economic indicators that influence markets and policy makers are calculated after-the-fact. For example, the Bureau of Economic Analysis did not release calculations of 4th quarter GDP for the U.S. until March 26th.¹⁵ By the time data for the first and second quarters of 2020 are available, lockdowns may be over. Other data, however, can provide some insight into economic activity. Table 2 from the U.S. Census Bureau provides a snapshot of the impact of the virus and associated lockdowns on a variety of retail sales. It should come as no surprise that food and beverage stores had a whopping large increase and that clothing got pummeled. Overall, retail sales were down 8.7%, despite the fact that most states did not implement stay-at-home orders until mid-March or later.

As described earlier, lower crude oil sales first signaled pending economic problems. Likewise, electricity consumption tends to mirror changes in economic output. In countries lacking reliable data on GDP, electric load growth has been used as a means to approximate economic growth.¹⁶ In response to Covid-19, Governor Cuomo of New York issued a statewide stay-at-home order on March 22nd. Electricity load had already dropped before the order, and it fell further soon afterward. Chart 7 illustrates the impact based on average weekly load at 4PM each day.¹⁷ During the first two weeks in April the load averaged 22.5% less than during the month of January. These figures are comparable to the reduction in petroleum products supplied, confirming that U.S. GDP will decline significantly in the first half of 2020.

Conclusion

It is unlikely that the economy will return to normal before a vaccine or an effective medication for those taken ill is developed. Energy markets have been

particularly stung by the virus because they provide essential services for manufacturing, transportation, and many of the engines of economic growth. Most of the energy demand collapse is temporary, and once lockdowns lift, commuters will return to the roads, rails and air¹⁸ways. However, there has also been a great deal of energy demand destruction. Companies are learning how to pull work together from remote locations, exotic vacations are not a necessity, a great deal of business can be conducted by video conferencing, no one has to eat out every night, and the shift eliminating many jobs by automation and artificial intelligence has been accelerated.

Chart Sources

Charts 1, 2, 3: JHU

Charts 4 and 5: EIA, CNBC

Chart 6: EIA

Footnotes

¹ Vatter, M., Van Vactor, S., and Coburn, T., "Impact of Shale Oil on the Global Market," paper presented at IAEE International Conference, Montreal, June 2019.

² <https://www.bea.gov/news/2020/gross-domestic-product-fourth-quarter-and-year-2019-third-estimate-corporate-profits>, accessed April 17, 2020

³ Cicala, Steve, "Early Economic Impacts of COVID-19 in Europe: A View from the Grid." https://home.uchicago.edu/~scicala/papers/real_time_EU/real_time_EU.pdf, accessed April 17, 2020

⁴ <https://www.nyiso.com/load-data>, accessed April 17, 2020

⁵ COVID-19 Response Team, "Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand," p.7.

⁶ <http://www.healthdata.org>, accessed April 17, 2020

⁷ The Washington Post, "Experts and Trump's advisers doubt the White House 240,000 coronavirus estimate," April 4, 2020.

⁸ Case data are quite erratic, particularly in the early stages of the outbreak. This chart was prepared by calculating a 7-day running average of the number of cases and calculating a growth rate based on the rolling average. ⁹

¹⁰ <https://www.wsj.com/articles/irans-strategic-partnership-with-china-lies-at-root-of-its-coronavirus-outbreak-11583940683>, accessed April 17, 2020

¹¹ <https://www.theguardian.com/global-development/2020/mar/25/as-if-we-were-the-disease-coronavirus-brings-prejudice-for-italys-chinese-workers>, accessed April 17, 2020

¹² <https://www.newyorker.com/magazine/2018/04/16/the-chinese-workers-who-assemble-designer-bags-in-tuscany>, accessed April 17, 2020

¹³ <https://www.cdc.gov/flu/pandemic-resources/1918-commemoration/three-waves.htm>, accessed April 17, 2020

¹⁴ Both oil prices and S&P stock prices have been indexed at 100 based on the January 3, 2007 level.

¹⁵ <https://www.plainsallamerican.com/getattachment/b36c0034-5573-4a89-bb7b-71e2332d0aa8/2020-072-April-15-2020.pdf?lang=en-us&ext=.pdf>, accessed April 17, 2020

¹⁶ Vatter, M., Van Vactor, S., and Coburn, T., "Impact of Shale Oil on the Global Market," paper presented at IAEE International Conference, Montreal, June 2019.

¹⁷ <https://www.bea.gov/news/2020/gross-domestic-product-fourth-quarter-and-year-2019-third-estimate-corporate-profits>, accessed April 17, 2020

¹⁸ Cicala, Steve, "Early Economic Impacts of COVID-19 in Europe: A View from the Grid." https://home.uchicago.edu/~scicala/papers/real_time_EU/real_time_EU.pdf, accessed April 17, 2020

¹⁹ <https://www.nyiso.com/load-data>, accessed April 17, 2020