Notes at the Margin

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BLOWBACK

The International Energy Agency's *Net Zero by 2050* report has provoked widespread protests from oil-producing nations and multinational oil company executives. The dismay suggests that those who immediately wrote off the IEA's assertion that no new oil and gas development is needed, including this author, may have been mistaken. As suggested in this *Notes at the Margin*, the world might even be able to operate with little oil or other fossil fuels by 2050. The panicked dismissals of the IEA's conclusions by key spokespeople for oil-exporting countries add credence to this conclusion.

Such a surprising outcome may occur for several reasons. First, consumer behavior has changed in a way that hurts oil producers. Second, major oil-importing nations can, if they choose, stop using fossil fuels for most purposes except perhaps aviation. Third, these countries can use their economic leverage to force other nations to follow suit, restricting trade with anyone that does not get on board the carbon-reduction express. Fourth, the major consuming countries also control most levers of international finance, and the central banks in these nations are moving to limit the credit available to the fossil fuel industry. Finally, policymakers worldwide have learned how to address major economic disruptions, making it possible to lessen the impacts of such events.

Our conclusion, then, is that oil no longer poses the economic threat it once did. Indeed, the oil weapon has been at least partially and possibly totally defused. Its removal or moderation will speed the energy transition.

"La La Land"

Platts reported that the Saudi oil minister, Prince Abdulaziz, has scoffed at the IEA's net-zero scenario:

> "I would have to express my view that I believe it is a sequel of [the] La La Land movie," Prince Abdulaziz told reporters June 1 after OPEC+ ministers met to affirm production levels through July. "Why should I take it seriously?"
>
> The IEA's roadmap concluded that if the world were to slash carbon emissions to net-zero over the next three decades, global oil supplies would need to shrink more than 8% annually, down to 24 million b/d in 2050, from pre-pandemic levels of just

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> above 100 million b/d. That would mean no new oil and gas upstream projects should be developed.[1]

The Platts report added that international oil companies are cutting significant portions of their oil portfolios in response to environmental pressures from shareholders and governments.

The authors, Herman Wang and Robert Perkins, observed that OPEC officials were worried that the oil market would be destabilized and investments in oil production jeopardized, threatening the economies of its members:

> "The claim that no new oil and gas investments are needed post-2021 stands in stark contrast with conclusions often expressed in other IEA reports and could be the source of potential instability in oil markets if followed by some investors," OPEC said in a report to members seen by S&P Global Platts.

Bloomberg noted that, on June 5, Rosneft's CEO and a close confidant of Vladimir Putin offered this warning at a St. Petersburg economic summit for what might happen should the IEA roadmap to net-zero be adopted:

> "The world risks a severe deficit of oil and gas," Rosneft Chief Executive Officer Igor Sechin said Saturday at the St. Petersburg International Economic Forum. "The world consumes oil but isn't ready to invest in it."[2]

Sechin also stated that we should only reject oil from environmentally unfriendly projects. He continued,

> "Some ecologists and politicians urge for a hasty energy transition, yet it requires an unrealistically fast launch of renewable energy sources and faces issues with storage, ensuring reliability and stability of power generation," he said at the forum.

According to Sechin, we need to invest around $17 trillion in oil and gas development to maintain outputs at current levels, representing one-third of all global investment.

Reuters covered Sechin's talk, too. According to its report, he warned, "Long-term stability of oil supply is at risk due to underinvestment." The article pointed out that Sechin blamed underinvestment today on the majors' efforts to raise shareholder income through dividend increases and share buybacks.[3]

One thing becomes clear after reading the bits and pieces emanating from the St. Petersburg conference: Igor Sechin, unlike ExxonMobil CEO Darren Woods, does not need to be concerned with shareholders or compete with companies such as Tesla in the battle to attract investors.

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[1] Herman Wang and Robert Perkins, "Saudi oil minister calls IEA's net-zero road map 'La La Land Sequel,'" S&P Global Platts, June 1, 2021 [https://tinyurl.com/393szh6n].

[2] Olga Tanas and Dina Khrennikova, "Rosneft Warns of 'Severe' Oil Shortage Amid Hasty Energy Shift," Bloomberg, June 5, 2021 [https://tinyurl.com/yrvhb676].

[3] Vladimir Soldatkin and Olesya Astakhova, "Russia's Sechin warns of 'acute' shortage amid drive for green energy," Reuters, June 5, 2021 [https://tinyurl.com/2c9cmaz5].

Sechin, OPEC officials, and nations that rely on oil sales do, however, need to worry that key consuming countries could move rapidly to constrain or end fossil fuel use. Furthermore, the shortages and price increases that would accompany such actions would likely accelerate the transition from oil and gas.

Oil producers also should be concerned by consumers being ahead of their governments in shunning fossil fuels. While the explanation for the shift is unclear, recent data point to this movement, at least in the United States. Price shocks could boost the trend.

One way to summarize the situation is to quote the phrase Clint Eastwood made famous in *Dirty Harry*: “Go ahead, make my day.”

Last week, the Saudi oil minister apparently used these words in reference to the IEA net-zero report. Presumably, the prince thought that a quick shift away from fossil fuels would be great for his country’s economy as oil prices spiked.

There is another individual who might be quoting Harry Callahan if the IEA scenario takes hold and oil prices spike: Elon Musk.

Below we expand on why crude oil producers need to worry about their future.

Changes in Consumer Behavior

Forecasts made by the oil industry and oil producers rely on the view that consumer oil use will increase as incomes rise. Again and again, one reads projections stating that growth in oil and gas use will come from emerging market nations over the next twenty or thirty years. India and China have consistently been named as the primary sources of consumption expansion, followed by Africa and some South American nations.

These forecasts presume that the historical patterns noted in developed countries will occur in these other nations. The projections also assume that consumers in developed nations will not move off fossil fuels quickly. In his address, Sechin cited the energy catastrophe in Texas in February as an argument for staying with hydrocarbons.

Neither assumption may be correct, especially if prices rise. Start with the second theory. Data from the United States indicate a shift away from oil or at least gasoline. The statistics developed by the US Bureau of Economic Analysis reveal that consumer preferences are changing. We show data for California and Texas to make this point.

The BEA reports statistics on personal consumption expenditures by state. These data also separately identify spending on gasoline and other energy goods. (Expenditures on utilities are not included here. More detailed data at the national level show that gasoline and diesel account for 2.1 percent of the total). Using these data, we calculated the share of consumer spending allocated to gasoline and other energy goods for California and Texas. (We will add states in the coming weeks.) We paired these data with annual gasoline prices for each state.

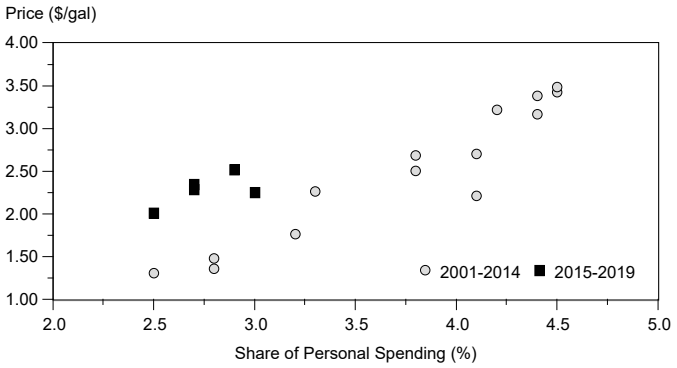
Figure 1 (page 4) compares the share of consumer expenditures on gasoline and other energy goods in California to retail gasoline prices there. The observations for 2015 to 2019 are identified separately.

The most apparent result of this exercise is that the share of the consumer dollar spent on gasoline in California increases as the price rises. However, the relationship is not one to one. Instead, the data reveal that consumers cut use with higher prices. In California, the data show that the amount spent on gasoline rises by one percent when prices double, meaning total spending on gasoline rises forty percent if prices go from $2 to $4 per gallon. In Texas, the share goes up by roughly fifty percent for a price change from $2 to $4 per gallon (see Figure 2).

Figure 1
Share of Personal Spending Allocated to Gasoline in California vs. Gasoline Price, 2001 to 2019

Source: US BEA; US EIA; PKVerleger LLC.

Figure 2
Share of Personal Spending Allocated to Gasoline in Texas vs. Gasoline Price, 2001 to 2019



Source: US BEA; US EIA; PKVerleger LLC.

The more recent data indicate that consumers have become more responsive to gasoline price rises. In California, a doubling of prices now boosts the share spent on gasoline by only twenty-five percent, not forty percent. In Texas, the share increase drops to forty percent.

We offer several explanations for this behavior. One might assert, for example, that consumers are driving more efficiently or purchasing more efficient cars. However, this seems unlikely.

One explanation that does feel right, though, relates to consumer income. Bloomberg *Businessweek* columnist Peter Coy offered insights that may explain the shift. Citing work by Atif Mian of Princeton, Ludwig Straub of Harvard, and Amir Sufi of the University of Chicago, Coy argues that Americans are held in a “debt trap” in which the wealthiest ten percent of our population lends to the remaining ninety percent. He notes that aggregate demand declines as debt burdens rise:

> The lending from rich to poor can be indirect. For example, let's say a rich person buys shares issued by a company. The company stashes the proceeds in a bank. The bank in turn makes a loan to a non-rich person to buy a car or a house. The borrowers have a higher propensity to spend than the lenders, but they have less money to spend because part of their income goes to debt service.[4]

An oil price shock of the type described by Sechin could, given higher consumer debt in the US and other countries, quicken the drop in oil use. A price spike might also speed up the replacement of internal combustion engine vehicles by electric ones. For example, a CarGurus survey on consumer electric vehicle sentiment found that only twenty-six percent of respondents would consider an electric vehicle (EV) if gasoline prices were $4 per gallon. However, ninety-two percent indicated they would be more likely to consider buying an EV if prices were above $10 per gallon.[5]

One can see Elon Musk smirking at Igor Sechin and daring him to "go ahead, make my day."

Government Policies

Consuming-nation governments can also hasten the end of fossil fuels through their policies. Oil-exporting countries have complained about gasoline taxes for decades to no avail. India offers an example.

Bloomberg reported the following in March:

> India's record pump prices of gasoline and diesel are the newest threat to the economy's nascent recovery, as high local taxes on retail fuel risk fanning inflation and driving a wedge between the objectives of fiscal and monetary policy makers.[6]

Prime Minister Narendra Modi boosted these taxes to fund fiscal spending increases. However, the country's central bank recognizes that the taxes and higher oil prices push inflation higher. Growth in petroleum use will slow if the central bank acts to offset this trend.

The Indian central bank's call to lower gasoline taxes is unlikely to be heeded. However, such fuel taxes, combined with the bans on conventional car and truck use in cities we see in more and more European countries, will gradually shoulder oil aside. This push could quicken if governments view rising oil prices as a threat to economic stability.

Governments' willingness to take on oil signals a change from their behavior after the oil shocks of forty or fifty years ago. In 1973 and again in 1979, governments had few choices. Mass transit facilities could not be quickly expanded. Alternative transport forms such as EVs were not available. Today, the alternatives are viable, and governments will advocate for them, especially if fuel prices rise sharply.

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[4] Peter Coy, "The Bottom 90% of Americans Are Borrowing From the Top 1%," Bloomberg Businessweek, June 4, 2021 [https://tinyurl.com/2kwm25dz].

[5] "Electric Vehicle Sentiment Survey," CarGurus, March 2021 [https://tinyurl.com/2se9pbmv], p. 10.

[6] Anirban Nag, "India's Record High Pump Prices Threaten Road to Recovery," Bloomberg, March 3, 2021 [https://tinyurl.com/5zb2ta7k].

Another reason the situation is much different from the 1973 oil crisis is that most industrialized nations no longer need to protect the oil industry. Forty years ago, there were tensions between the United Kingdom and other countries because North Sea production was beginning to surge. Furthermore, the situation in the United States was muddled because oil had been found in Alaska and efforts to expand Gulf of Mexico output were accelerating. The divided interest of the various countries made it difficult to move aggressively against oil exporters.

Today, the oil industry enjoys little support in most consuming countries. Thus, an oil price rise caused by exporter market aggression or lack of investment would almost certainly evoke a much harsher response. Also, consuming nations have learned how to protect consumers and their economies in the last year, as we explain later in this report.

Trade Policies: Carbon Border Taxes

Border adjustments designed to eliminate the competitive advantages enjoyed by nations that shun the battle against climate change will step up the decline in oil use. The border adjustment idea has been debated for some time, with the European Union taking the lead. In fact, the EU has recently circulated a draft plan.

According to Bloomberg, the EU wants to impose emission costs on imports such as steel, fertilizer, cement, and electricity. The purpose is to erase the market edge enjoyed by their producers in countries such as Russia and China, where energy costs are lower.

Bloomberg describes how the border adjustment would work:

> The mechanism would require importers of dirty products such as aluminum, fertilizers and electricity to buy special certificates to cover embedded emissions at a price linked to the EU carbon market.[7]
>
> The planned measure is part of a broader package to be put forward on July 14, in a bid to align the EU economy with stricter emissions-reduction targets for 2030. The 27-nation bloc is tightening its environmental rules in an overhaul that will affect all areas from transport to energy production and trade. The overarching goal of the Green Deal is for Europe to become the world's first climate-neutral continent by the middle of the century.[8]

Bloomberg also observes that the proposal is causing "diplomatic unease" in countries like China, Ukraine, and India. It adds that previous EU tax concepts have led to threats of retaliation from Brazil, China, Russia, and the United States.

While the emissions tax proposal will almost certainly not go into effect in its current form, one can rest assured that carbon reduction measures will be adopted. Other countries will

[7] *Ewa Krukowska, "EU Carbon Border Levy Will Not Be a Quick Fix, Researchers Say," Bloomberg, June 4, 2021 [https://tinyurl.com/e6ywpxyn].*

[8] *Ewa Krukowska and Alberto Nardelli, "EU Eyes First-of-a-Kind Border Levy in Climate Fight," Bloomberg, June 2, 2021 [https://tinyurl.com/dyahfwhe].*

follow. Such carbon border adjustments will squeeze fossil fuel use through cooperation or coercion.

Central Bank Pressure

Added inducements to reduce carbon emissions will come from central banks. The European Central Bank (ECB) has conducted "climate stress tests" of the institutions it regulates. The results revealed that climate is "a major source of systemic risk." As an ECB vice president explained, "In the absence of further climate policies, the costs to companies arising from extreme weather events rise substantially, and greatly increase their probability of default."[9]

Financial Times noted two types of climate risk for banks. The first is physical damage, such as from flooding or wildfires. The second relates to the energy transition, where policies requiring emissions cuts could boost company costs and lead to lower profits or bankruptcies.

One ECB executive indicated that banks exposed to a high level of climate risks on their balance sheets could be required to hold additional capital, a step that would make them less competitive.

Economists at the London School of Economics assert that central banks can play a major role in facilitating access to capital for investors pushing "climate worthy projects" while starving the fossil fuel industry of the funds it needs to expand:

> Central banks and supervisors will need to take a systemic perspective, addressing both micro- and macroprudential risks over a much longer time horizon than they do now, and work to ensure that financial flows become aligned with net-zero. Markets respond to signals from central banks, and the seriousness of intent with which they consider net-zero targets is likely to have a profound bearing on financial market decisions that will ultimately determine capital formation and, thus, the carbon trajectory of the economy. As part of this, monetary and financial authorities will need to play a pivotal role in shaping the tools, methodologies, data systems and taxonomies required for net-zero. Crucially, they also need to align their own policies and operations with net-zero.[10]

This view was endorsed last week at a meeting of central bankers in London. At the same time, several attendees, including the Federal Reserve's chairman Jerome Powell, signaled that climate policy was not one of their primary roles. However, the LSE report added there is increasing concern regarding the climate's impact on financial stability and inflation. Speaking at a conference sponsored by the Bank for International Settlements, the ECB's Christine Lagarde was clear on this:

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[9] *Martin Arnold, "ECB stress test reveals economic impact of climate change,"* Financial Times*, March 18, 2021 [https://tinyurl.com/56tbny83].*

[10] *Nick Robins, Simon Dikau, and Ulrich Volz, "Net-zero central banking: a new phase in greening the financial system," Grantham Research Institute on Climate Change and the Environment, Centre for Sustainable Finance, March 2021 [https://tinyurl.com/4h7bbtzj], p. 14.*

> "We central bankers could look down on our mandate and pretend that is for others to act and we should simply be followers. I don't think so."[11]

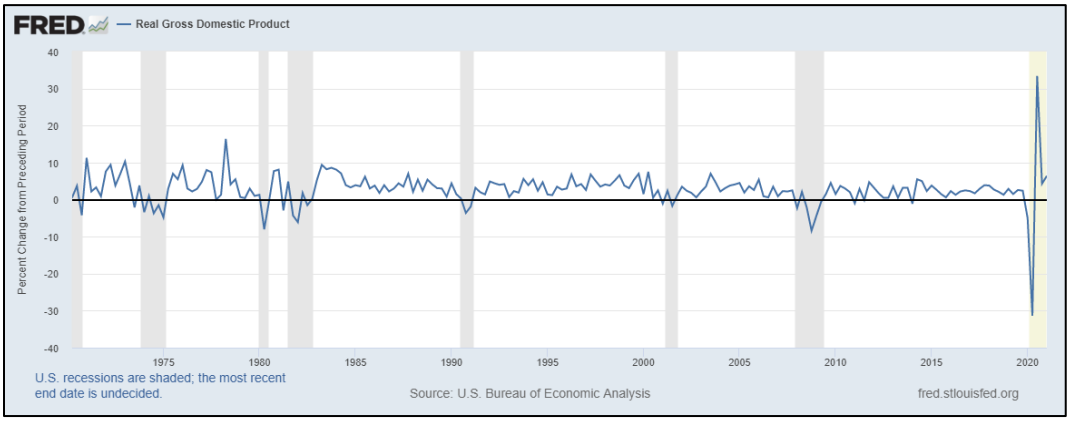
The ECB and the French central bank have published initial findings from their climate stress tests. The Bank of England will run these tests in June. Meanwhile, the Peoples Bank of China's head reported at the BIS conference that it had started testing China's financial system to identify the institutions most at risk.

Rosneft's Sechin stated in his St. Petersburg speech that $17 trillion must be invested in oil and gas by 2040. The statements from central banks suggest the industry will be hard-pressed to obtain the money. To borrow a banking phrase, "the window is closing fast."

Economic Impacts of Net-Zero: Maybe Negligible

Energy executives, the leaders of energy-exporting countries, energy policymakers, and many economists have claimed for almost five decades that energy market disruptions will cause significant economic losses. In reviewing the IEA's net-zero report in *Foreign Policy*, Columbia University's Jason Bordoff mouthed the traditional (and trite) line: "High oil prices hurt consumers at the pump and slow the economies of oil-importing countries."[12]

Recent events have disproved the assertion. The graph below, produced by the St. Louis Federal Reserve Bank, illustrates the point. The figure shows the percentage change at annual rates in real GDP. The shaded areas are recessions as defined by the National Bureau of Economic Research (NBER). The leftmost recession occurred following the 1970s oil price shocks. Higher oil prices also caused the recession around 1980. To the right, one can see the Great Recession, which began in 2008, and then the recent Covid-19 crisis.



The 2020-2021 event is unique because it was so severe and so short. It was harsh because most businesses had to shut down in the spring of 2020. It was brief because the US government and the Federal Reserve stepped in to inject massive amounts of funding to prevent

[11] *Camilla Hodgson and Billy Nauman, "Chinese central bank governor backs push for climate risk disclosure,"* Financial Times, *June 4, 2021 [https://tinyurl.com/fte2wexd].*

[12] *Jason Bordoff, "Why Shaking Up Big Oil Could Be a Pyrrhic Victory,"* Foreign Policy, *June 3, 2021 [https://tinyurl.com/23ww5cx6].*

further deterioration in economic output. US GDP will likely be back to or close to on track by the end of this year. In short, the financial losses from the pandemic were minimized.

The lessons learned from the Covid-19 crisis can also be applied if the world gets hit by the energy market disruption predicted by Igor Sechin and others. Central banks and governments have the tools to cushion the economic blow and prevent massive upsets even as gasoline prices rise. Governments' timely action could even speed up consumers' acceptance of a quick end to fossil fuel use.

"Indebted Demand," the Mian, Straub, and Sufi paper mentioned in Peter Coy's *Businessweek* article[13], opens an entirely new way of thinking about oil prices and economic shocks. The authors note the recent emergence of negative interest rates in much of the world. They suggest that such rates result from the excessive savings of the very rich, savings that drive interest rates down. (They acknowledge earlier work on this subject by Lawrence Summers.)

When we examine their findings closely, we come to a tentative conclusion that excess savings and negative interest rates have ***neutered the oil weapon.*** For almost fifty years, government officials in consuming countries have lived in fear of the economic shock of an oil price spike. The analysis of Mian, Straub, and Sufi makes clear that today there is no reason for that anxiety. Governments can simply compensate their consumers with increased spending following the protocols established with Covid-19, while allowing prices to rise. The price increase, of course, will help speed the end of oil.

Jason Bordoff is probably unaware of this research. In his *Foreign Policy* piece, he states that

> high gasoline prices risk causing a backlash against stronger climate policies, as France's "yellow vest" protests against rising green taxes on fuel demonstrated. Indeed, Europe's current plan to extend its carbon pricing regime to more sectors of the economy is already drawing fierce political blowback.

Bordoff misses a critical point: the packaging matters. The backlash in France occurred because the Macron administration imposed higher fuel taxes without considering the impact on middle-class voters, particularly individuals who had no fuel alternative. It was an elitist move that backfired. As those in the advertising business understand, the presentation is all.

Bordoff also warns that higher fuel prices resulting from elevated world crude oil prices brought on by the IEA net-zero plan will create political problems. He asserts that governments of consuming countries have no options "when the price hikes result from market forces themselves and the increased spending by consumers flows to petrostates."

Bordoff's thinking is almost fifty years out of date. Once again, we note that the US government and the Federal Reserve and other central banks have shown in the last year that they can address such problems. Furthermore, the interests of China, the EU members, Japan, South Korea, Australia, New Zealand, and the United States will all be aligned should a disruption occur.

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[13] *See Atif Mian, Ludwig Straub, and Amir Sufi, "Indebted Demand," January 24, 2021 [https://tinyurl.com/vkkru8vy].*

A price spike may temporarily enrich some oil-exporting countries. However, it will also permanently strand a substantial amount of global resources.

Igor Sechin and many in the Middle East might believe they hold the high cards in the battle with consuming nations, but their thinking is based on the events of 1973 to 1980. Much has changed since then. A price spike today will only hasten the transition to a net-zero world and render many oil-exporting nations irrelevant.

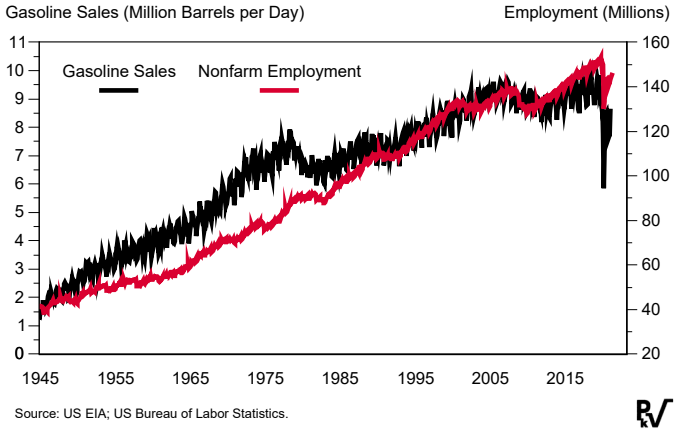
Market Commentary

The BEA published preliminary estimates for employment for May on Friday. Another 559,000 jobs have been added to the US economy. The unemployment rate is down. However, as a chart in *The New York Times* illustrated, employment in the United States is still 7.6 million workers below the February 2020 level.[14] The shortfall is 4.6 percent. The May 2021 employment number was almost four percent below May 2019 employment.

This observation caught our attention because, as OPIS reports, US gasoline consumption remains down about nine percent. Trying to connect the dots, we compared employment data to gasoline sales. The results are important and point to a likely continued shortfall in sales.

Figure 3 presents monthly US gasoline sales reported by the Department of Energy to the monthly nonfarm employment data. Neither dataset is seasonally adjusted. One can note from the graph that the data series move together. One can also note that, in the last few years, total nonfarm employment has increased more rapidly than gasoline sales.

Figure 3
US Gasoline Sales vs. Nonfarm Employment, 1945 to 2021



We examined other data series, including the BEA data on gasoline consumption. Again and again, the results showed that gasoline use rose more slowly than employment. The general conclusion is that the price elasticity with respect to employment is around 0.8, meaning that a ten-percent increase in employment leads to an eight-percent rise in gasoline sales.

Another conclusion is that the Covid-19 shutdown caused a much larger decrease in gasoline sales and vehicle miles traveled than in employment. This has implications for gasoline

[14] *Patricia Cohen, "US Added 559,000 Jobs in May, But Road to Recovery is Bumpy,"* The New York Times, *June 4, 2021 [https://tinyurl.com/34maccwu].*

sales this summer. While most businesses are reopening, many are not doing so full-time, at least not until the fall. As a result, projections of a strong recovery in gasoline sales in the US this summer should be questioned. While Americans are taking to the roads again for vacations, vacation demand will likely not offset the loss in gasoline use associated with working.

Excess returns to storage and refining margins depict a tight distillate market and floundering gasoline market. It appears that the run cuts made to accommodate depressed gasoline consumption have tightened the distillate market. Distillate cracks are especially strong, although we have not corrected them for the renewable volume obligation. We will make the adjustment once we are sure of the precise formula.

Crude markets present a mixed bag. Tightness in the European market seems to have eased, although the cash price of Brent remains uncertain. The Cushing market, the only reliable liquid crude market, continues to tighten (see Table 2, page 12).

Recent events have revived investor interest. The share price of the BP Prudhoe Bay Royalty Trust (BPT) has moved back above $4. Based on that price, our model indicates that investors see $70-per-barrel WTI by the first quarter of 2022 (see Table 1). All other indicators point in the same direction.

Even the natural gas market is tight. Excess returns are near the bottom of the normal range. The current nationwide hot spell could take prices to $5 per million Btu.

Table 1. Projections for WTI and Brent Prices Derived from BPT Share Price on June 4, 2021 (Dollars per Barrel)

	WTI	Brent
2021Q1	58.12	60.12
2021Q2	65.50	67.50
2021Q3	67.02	69.02
2021Q4	68.57	70.57
2022Q1	70.17	72.17
2022Q2	71.79	73.79
2022Q3	73.46	75.46
2022Q4	75.16	77.16
2023Q1	76.91	78.91
2023Q2	78.69	80.69
2023Q3	80.52	82.52
2023Q4	82.38	84.38

Source: PKVerleger LLC.

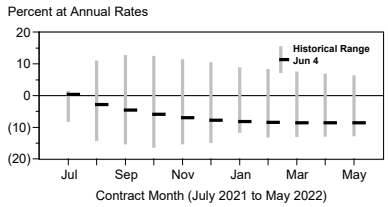
Table 2. Excess Returns to Storage on May 28 and June 4, 2021, for Two Crudes and Two Distillates (Percent at Annual Rates)

	WTI Cushing – No Storage Costs on June 4	Brent at Sullom Voe – No Storage Costs on June 4	WTI Cushing – No Storage Costs on May 28	Brent at Sullom Voe – No Storage Costs on May 28
Aug	-2.8	10.5	-2.5	-5.9
Sep	-4.6	4.5	-4.4	-6.1
Oct	-5.9	0.9	-5.5	-6.7
Nov	-6.9	-1.1	-6.4	-6.9
Dec	-7.8	-2.4	-7.1	-7.2
Jan	-8.1	-3.2	-7.4	-7.2
Feb	-8.4	-3.8	-7.7	-7.2
Mar	-8.6	-4.1	-7.9	-7.1
Apr	-8.6	-4.4	-7.9	-6.9
May	-8.6	-4.6	-7.8	-6.8
Jun	-8.5	-4.7	-7.8	-6.7

Distillate Markets	New York June 4	ARA June 4	New York May 28	ARA May 28	New York Historical Average	ARA Historical Average
Jul	-0.3	6.3	-1.4	7.1	7.4	11.7
Aug	0.3	2.8	-0.7	3.3	7.8	9.3
Sep	0.6	5.4	-0.3	6.0	8.3	8.8
Oct	0.6	4.1	-0.1	4.6	8.9	8.9
Nov	0.5	2.1	-0.1	2.8	9.1	8.1
Dec	0.3	0.4	-0.2	1.0	8.9	6.8
Jan	0.1	-0.1	-0.4	0.5	8.6	6.1

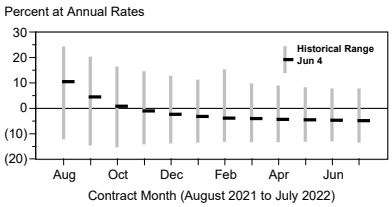
Source: PKVerleger LLC.

Excess Returns to Storage for WTI — June 4 Returns vs. Historical Range



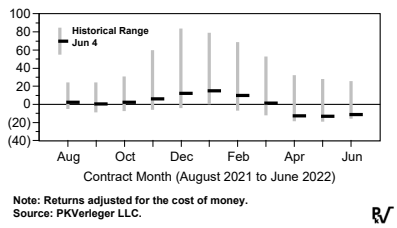
Note: Returns adjusted for the cost of money.
Source: PKVerleger LLC.

Excess Returns to Storage for Brent — June 4 Returns vs. Historical Range



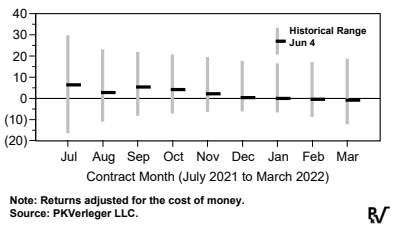
Note: Returns adjusted for the cost of money.
Source: PKVerleger LLC.

Excess Returns to Storage for Natural Gas — June 4 Returns vs. Historical Range



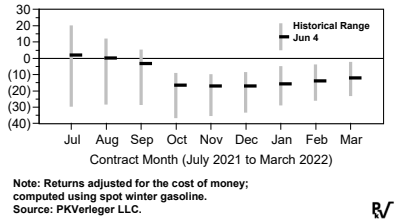
Note: Returns adjusted for the cost of money.
Source: PKVerleger LLC.

Excess Returns to Storage for Gasoil — June 4 Returns vs. Historical Range



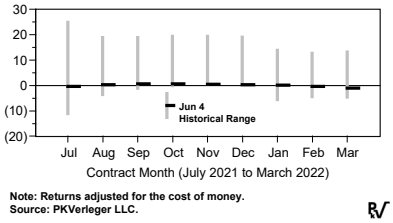
Note: Returns adjusted for the cost of money.
Source: PKVerleger LLC.

Excess Returns to Storage for Gasoline — June 4 Returns vs. Historical Range



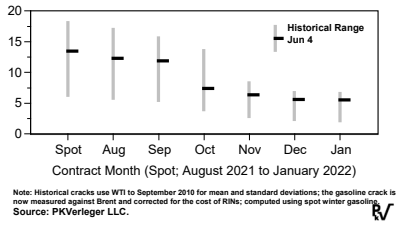
Note: Returns adjusted for the cost of money; computed using spot winter gasoline.
Source: PKVerleger LLC.

Excess Returns to Storage for Heating Oil — June 4 Returns vs. Historical Range



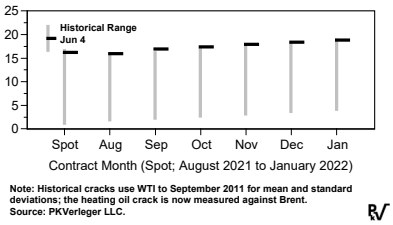
Note: Returns adjusted for the cost of money.
Source: PKVerleger LLC.

Refining Margins for Gasoline — June 4 Margins vs. Historical Range



Note: Historical cracks use WTI to September 2010 for mean and standard deviations; the gasoline crack is now measured against Brent and corrected for the cost of RINs; computed using spot winter gasoline.
Source: PKVerleger LLC.

Refining Margins for Heating Oil — June 4 Margins vs. Historical Range



Note: Historical cracks use WTI to September 2011 for mean and standard deviations; the heating oil crack is now measured against Brent.
Source: PKVerleger LLC.

Excess Returns to Storage for Crude, Products, and Natural Gas — First Week of June vs. Prior Week and First Week of June in Prior Years (Percent at Annual Rates)

	Current	Last Week	2020	2019	2018	2017	2016
Gasoline							
August	0.1	-1.0	20.1	-13.0	-9.7	-6.4	18.5
September	-3.1	-4.2	11.9	-15.3	-10.1	-7.9	10.7
October	-16.4	-17.1	-10.7	-31.8	-22.5	-24.4	-12.3
November	-17.0	-17.8	-11.8	-31.8	-21.6	-22.9	-14.4
December	-17.0	-17.8	-11.4	-29.5	-20.4	-21.2	-14.8
Distillate							
July	-0.3	-1.4	27.5	3.7	3.2	4.6	3.7
August	0.3	-0.7	30.1	2.9	1.4	4.7	4.4
September	0.6	-0.3	29.6	3.1	1.0	5.6	5.6
October	0.6	-0.1	28.5	3.3	0.8	8.3	6.5
November	0.5	-0.1	27.3	3.7	0.7	8.7	7.1
Gasoil							
July	6.3	7.1	65.7	5.1	-9.8	-0.1	6.9
August	2.8	3.3	46.5	4.0	-5.5	1.2	6.2
September	5.4	6.0	39.9	3.8	-4.3	2.6	6.5
October	4.1	4.6	35.7	3.6	-3.7	5.0	7.2
November	2.1	2.8	31.1	2.0	-4.1	4.5	6.9
WTI							
July	0.4	0.2	0.2	-2.3	-2.2	-1.1	-2.1
August	-2.8	-2.5	4.8	-0.9	-2.8	1.4	2.9
September	-4.6	-4.4	5.5	-0.7	-4.0	2.5	4.9
October	-5.9	-5.5	4.9	-1.2	-5.0	2.9	5.5
November	-6.9	-6.4	4.9	-1.6	-5.0	3.3	5.8
Brent							
August	10.5	-5.9	20.4	-13.6	5.6	0.8	12.7
September	4.5	-6.1	14.3	-16.3	2.3	9.3	11.8
October	0.9	-6.7	12.1	-16.0	0.2	8.8	10.7
November	-1.1	-6.9	10.9	-14.8	-0.7	8.3	10.4
December	-2.4	-7.2	10.3	-13.6	-1.8	7.9	9.5
Natural Gas							
September	0.7	1.6	42.2	-6.4	-4.0	0.6	15.1
October	2.2	2.5	48.9	3.7	-2.3	2.4	20.2
November	6.0	6.5	100.1	16.0	1.3	6.8	32.6
December	12.3	12.7	153.0	34.9	8.0	15.7	48.1
January	15.0	15.3	131.3	42.4	11.5	21.3	49.8

Note: “Current” = June 4, 2021. All returns to storage are adjusted for the cost of money.

Source: PKVerleger LLC.

Open Interest for Crude, Products, and Natural Gas — First Week of June vs. Prior Week and First Week of June in Prior Years (Number of Contracts)

	Current	Last Week	2020	2019	2018	2017	2016
Gasoline							
Total	423,950	397,905	361,730	375,344	468,444	394,233	397,712
July	156,089	165,187	100,346	116,280	130,790	117,035	132,476
August	83,262	65,636	52,624	70,729	91,767	67,843	54,317
September	59,437	49,020	50,346	55,060	62,877	58,620	58,013
October	32,225	28,663	35,237	42,086	49,932	42,556	34,430
Distillate							
Total	436,904	423,976	383,249	422,282	410,716	380,648	415,532
July	137,760	142,182	81,085	108,456	108,679	95,998	128,534
August	47,729	41,548	36,053	68,853	74,439	67,125	57,084
September	49,676	44,217	37,145	43,441	50,200	44,143	42,895
October	26,724	23,478	25,823	38,317	33,228	22,700	27,437
Gasoil							
Total	1,059,879	1,061,877	874,654	977,453	1,039,452	806,306	746,785
July	222,088	202,697	148,282	172,259	173,827	136,963	152,059
August	90,933	94,320	76,705	124,302	156,860	98,138	97,291
September	90,841	84,427	73,703	89,807	93,262	68,883	51,427
October	110,744	103,439	55,672	83,583	84,202	61,682	45,121
WTI							
Total	2,525,956	2,475,001	2,458,288	2,126,520	2,109,204	2,551,692	2,198,705
July	453,902	490,223	237,893	343,970	368,036	399,576	505,632
August	299,885	321,838	238,866	192,105	288,182	331,305	187,640
September	293,655	224,085	330,241	202,053	221,331	226,728	136,367
October	174,385	167,300	110,390	143,573	194,828	107,558	80,098
Brent							
Total	2,406,385	2,466,884	2,609,287	2,391,139	2,537,839	2,461,792	2,161,218
August	524,449	560,641	395,826	449,055	480,755	505,498	441,621
September	345,780	317,614	286,519	342,499	424,567	402,618	313,275
October	171,933	160,265	148,135	192,825	173,971	197,395	141,570
November	122,743	113,012	126,289	150,582	155,215	118,257	142,256
Natural Gas							
Total	1,237,141	1,217,590	1,332,921	1,326,026	1,557,377	1,471,440	1,050,329
July	293,689	310,761	364,219	379,566	257,125	258,407	319,456
August	102,702	90,044	97,434	127,907	126,947	164,826	87,478
September	149,163	145,090	150,979	163,727	167,843	156,864	124,987
October	139,076	133,696	119,504	137,272	158,221	183,933	111,236

Note: “Current” = June 4, 2021.

Source: PKVerleger LLC.

Gasoline Cracks – First Week of June vs. Prior Week, Prior Month, and First Week of June in Prior Years ($/bbl)

	Current	Last Week	Last Month	2020	2019	2018	2017	2016	30-Year Average
Spot	13.51	11.80	12.27	6.68	8.17	13.45	12.99	13.02	12.81
August	12.34	11.84	13.03	7.19	7.94	10.83	11.28	14.44	11.97
September	11.90	12.41	12.60	6.87	7.88	10.42	10.38	13.51	11.04
October	7.38	11.84	11.82	3.11	2.86	5.96	5.84	7.61	9.09
November	6.35	7.20	6.76	2.18	1.93	5.06	4.78	5.99	5.60
December	5.59	6.08	5.57	1.55	1.17	4.53	3.98	4.79	4.49
January	5.58	5.26	4.79	1.48	1.04	4.65	3.85	4.49	4.24
Average	8.95	9.49	9.55	4.15	4.43	7.84	7.58	9.12	8.46

Note: “Current” = June 4, 2021. Gasoline cracks measured against Brent from 2010 with RIN cost removed.

Source: PKVerleger LLC.

Heating Oil Cracks – First Week of June vs. Prior Week, Prior Month, and First Week of June in Prior Years ($/bbl)

	Current	Last Week	Last Month	2020	2019	2018	2017	2016	30-Year Average
Spot	16.26	16.60	13.64	6.86	11.51	16.56	13.02	13.64	9.76
August	15.98	17.06	13.49	8.21	12.81	14.79	12.79	13.74	9.66
September	16.93	17.13	14.06	7.08	15.50	15.28	12.94	13.44	10.02
October	17.38	17.51	14.63	7.99	16.67	15.73	13.19	13.58	10.60
November	17.91	17.99	15.28	8.70	17.50	16.17	13.49	13.83	11.19
December	18.38	18.43	15.90	9.22	18.05	16.53	13.74	14.13	11.78
January	18.80	18.86	16.47	9.48	18.42	16.99	14.02	14.25	12.33
Average	17.38	17.65	14.78	8.22	15.78	16.00	13.31	13.80	10.76

Note: “Current” = June 4, 2021. Heating oil cracks measured against Brent from 2011.

Source: PKVerleger LLC.