

Commodity Chokepoints and QT

In today's dispatch, we will review some news items that we think are relevant to understand near-term tail risks to commodity prices, economic activity and...
...funding markets.

In *Money, Commodities and Bretton Woods III*, we built on Perry Mehrling's four prices of money framework (par, interest, FX, and price level), adding the four pillars of commodity trading (protection, shipping and foreign cargo as factors that determine the price of commodities that determine the price level in developed economies – Credit Suisse's "theory of the price level" if you will).

Today we'll review some news headlines that are relevant for this framework. Some headlines are from after the start of the war, and some are from before. Some of the headlines from before the war seemed inconsequential in January, but seem far more consequential in the context of geopolitical developments since then. Our aim with this review is to build an "inventory" of triggers that may lead to "G-SIB score-like" chokepoints to the flow of commodities (oil and gas) and hence spikes in spot commodity prices, and to the flow of production through supply chains dependent on commodity inputs like oil, gas, or neon for semiconductors. The chokepoints we are after can uncover hidden leverage: sudden spikes in spot prices can cause liquidity drains for broker-dealers and commodity traders through commodity derivative exposures, and sudden stops in the flow of crucial inputs can cause production shutdowns and furloughs, which can then trigger the drawdown of bank credit lines and fiscal responses.

All three would be funding events, especially if they occurred at the same time.

Banks are swimming in excess reserves for now, and spot price spikes to date haven't wreaked havoc in funding markets to date, but the war in Ukraine is getting more complex for forecast (Sweden and Finland are considering to join NATO, southern Ukraine is now firmly under Russian control, the fog of war is now spreading to include Transnistria, and gas to Poland and Bulgaria has been turned off) and the Fed is about to embark on QT. Over the next six months, liquidity will diminish and the flow of commodities might hit some chokepoints, which can trigger spot price spikes, margin calls and credit line drawdowns.

I continue to believe that STIR traders will benefit from increased literacy about the world of commodities trading and the workings of commodity derivatives, so in today's dispatch, we'll review risks than run through commodity chokepoints, and in an upcoming dispatch, we'll map out the commodity derivatives complex.

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CONTRIBUTOR

Zoltan Pozsar

212 538 3779

zoltan.pozsar@credit-suisse.com

To start, I have learned this week from the indispensable Izabella Kaminska that the besieged Azovstal steel plant in Mariupol is not an average steel plant. It's one of the biggest steel plants in the world, and because of its scale, it can produce neon gas on industrial scale. Another plant in Ukraine, the Zaporizhstal steel plant is another major producer of neon gas, and just like the Azovstal steel plant, its neon-producing capacity is due entirely to its scale. These two Soviet-era steel plants are the largest steel plants in the world, and have no equivalents in developed countries, because *"the capitalist system has never been able to produce equivalents due to the upfront costs"* (see [here](#)).

To which I'd like to add the following: both the Azovstal and Zaporizhstal plants need lots of oxygen to make steel. Oxygen and steelmaking are inseparable, and steelmakers get oxygen through an industrial process called air separation. Air is 78% nitrogen and 21% oxygen plus residuals. When steel plants conduct air separation, they separate oxygen and nitrogen for the basic oxygen process, an oxidation process that converts a charge of liquid blast-furnace iron into steel. Steelmakers aim to forge iron ore into steel with pure oxygen – not air – because nitrogen can cause inconsistent (faulty) mechanical properties in steel.

The point about the basic oxygen steelmaking process, is that an important byproduct of air separation is neon gas. Steel plants perform air separation on industrial scale. The bigger the steel plant, the more air separation they do, and the more air separation they do, the more neon gas they get. Because neon makes up only 0.002% of the air around us, we need lots of air separation to be able to produce neon on an industrial scale. Let's now review some facts...

Metinvest, the holding company that owns several plants in southern Ukraine, has not only the Azovstal and Zaporizhstal plants in its portfolio, but also the smaller Ilych Iron and Steelworks (also in Mariupol). All three perform air separation – the Azovstal and Ilych plants for their basic oxygen furnaces (see [here](#) and [here](#)), and the Zaporizhstal plant for a different process (we are not sure what process, but we know that the plant uses oxygen and argon to purge steel produced using open-heart furnaces, and that it is a major provider of medical oxygen, and we deduce that if there is oxygen production there must be air separation).

In English, there is a lot of air separation going on in southern Ukraine...

...and there have been fights about air separation capacity even before the war: Metinvest's portfolio also used to include the Yenakiiv Iron and Steel Works, which according to a statement by the company, it lost control over in 2017 over a tax dispute between the steel plant and the Donetsk People's Republic. The Yenakiiv plant was the site of another major air separation operation for its basic oxygen furnace, which it updated in 2014. Furthermore the map on page 4 of this presentation to the OECD, shows that southern Ukraine has a total of twelve steel plants, and this map by the FT that tracks territories under Russian control in Ukraine shows a near-perfect overlap – Russia's control of southern Ukraine effectively means a Russian control of Ukraine's steel plants...

...and by extension the Russian control of air separation capabilities in Ukraine!

Big steel plants are usually not the companies that purify the non-oxygen, non-nitrogen "parts" of air into component gases. Rather they typically sell the residual gases in bulk to companies that further separate them into components, like neon gas and then sell them to the largest consumers of neon, which are...

...chipmakers.

Chipmakers use neon gas to operate high precision lasers that turn silicon into circuits, through a process called lithography. Lithography involves using lasers to etch tiny delicate patterns onto the glass, which is how silicon wafers are transformed into sheets of chips. Manufacturers need to control the exact wavelength of light emitted by their lasers, which is what neon gas is used for...
...to serve as a "buffer" gas to control the wavelength of laser for lithography.

Chipmakers account for about 75% of global demand for neon, which is a lot, and two of the five largest neon gas manufacturers in the world, Ingas and Cryoin Engineering are both based in Ukraine. Ingas' plant in Mariupol is an eight minute drive from the Azovstal steel plant, and Cryoin's plant is in Odessa, and the two plants supply half the world's semiconductor-grade neon (see here).

Southern Ukraine is thus chokepoint #1: a neon gas chokepoint.

While Odessa (home to Cryoin Engineering) is not under Russian control – as per the FT map above – it is sandwiched right between Transnistria (a breakaway, pro-Russia republic in Moldova) on the left and the regions in southern Ukraine already under Russian control on the right. Half the world's neon supply might thus get under Russian control soon, which is important to realize given that chip companies and industry analysts say that there is only one to six months worth of neon gas in reserve (see here). So there you go:

the Strategic Petroleum Reserve (SPR) is down and is not easy to refill, and the "Strategic Neon Reserve" is down too and is also not easy to refill. That's bad, and so chipmakers in Taiwan, South Korea and Japan are in the midst of all this.

No neon, no chips.

South Korea's breakthrough in January where POSCO managed to produce neon as a byproduct of steelmaking is a good start to "hedge" the neon needs of chipmakers, but POSCO can produce only 22,000 cubic meters of neon per annum currently. Cryoin and Ingas produced that much per month each, and so substituting the supply of neon from southern Ukraine won't be easy.

Chip shortages are looming again...

...which brings us to another news item which we remember from January 25th, in which the U.S. Department of Commerce announced the results of a request of information on the state of semiconductor supply chains (see [here](#)).

More than 150 companies responded to the survey from across the world, and the key findings were as follows: current demand for chips is very strong, running 20% above 2019 demand; most foundries are running at 90% utilization, and the median inventory of chips has fallen from 40 days in 2019 to less than five days today, with these inventories even smaller in some key industries.

To quote from Secretary Raimondo's statement:

"if another COVID outbreak, a natural disaster, or political instability disrupts [our emphasis] a foreign semiconductor facility for even just a few weeks, it can shut down a manufacturing facility in the U.S.," putting the economy, jobs and inflation at risk of shutdowns, furloughs and spikes, respectively.

To quote from an FT article from that very day covering Secretary Raimondo's press conference (which I think is more important than Chair Powell's presser):

"Right now we make zero leading-edge semiconductor chips in the U.S.; we buy almost all of them from Taiwan. [...] Those are the chips needed in

sophisticated military equipment [our emphasis]". Those are some comments during wartime and the U.S. military's chip shortage and sourcing problem puts

Russia-China relations and Russia's intense focus on southern Ukraine into a different context: set aside Taiwan as a link in the daisy chain of things, Taiwan needs neon from Ukraine to produce chips, and chips are needed to replenish sophisticated military equipment that are getting shipped to Ukraine.

This reminds us of the importance of the Alsace-Lorraine region in past wars...

Like southern Ukraine today, the Alsace-Lorraine region was rich in iron ore and was home to many steel making plants that the German Empire incorporated into its territory after France's defeat in the Franco-German War in 1870-71, and was then retroceded to France in 1919 after World War I, and was then occupied by Germany in 1940 during World War II. Steel was important then, and it is important today too, but basic oxygen steelmaking did not take off until after 1949, i.e., well after the end of World War II. Back to the present...

...where we fight with precision missiles which need lots of chips and neon.

Donbass (a large slice of southern Ukraine) has the largest coal field in Ukraine (coal is an essential input to steel production) and the Krivoy Rog mountains nearby have the largest iron ore deposits in Ukraine (another essential input) – hence the many steel plants in southern Ukraine with air separation and neon production capabilities. What southern Ukraine is to Russia and to Ukraine today is a bit like what the Alsace-Lorraine region was to Germany and France during the Franco-German War and WWI and WWII. But Alsace was about steel, and...

...Donbass is about neon.

According to one astute market participant, who is also a keen observer of the chip market, Japan, South Korea and Taiwan form a sort of "Chip NATO", or NeATO (Northeast Asian Technology Organization), and so there you have a thematic overlap between the role of NATO and the needs of "NeATO" today.

Chip shortages are important to track.

We know that massive stimulus checks driving demand for consumer electronics can "crowd out" industries like autos (see our concept of commodity leverage, and Japan's experience with a 40% decline in auto production in 2020, when shutdowns due to the first wave of the Covid pandemic caused chip shortages).

We might soon learn that military demand (it's wartime and there is legitimate reasons to re-stock in case the proxy war escalates into something far bigger) can also crowd out civilian demand for chips – a phones versus missiles thing...

If that happens, appreciate that missiles are not in the CPI, but phones are...

...and this is another thing that the Fed can't do much of anything about, and also keep in mind that as Secretary Raimondo reminded us back in January, industries can shut down not only because people have to quarantine at home, but also because neon gas is "quarantined" in Ukraine. Shutdowns are painful, and like in March 2020 then can trigger a massive drawdown of credit lines, and massive fiscal stimulus to ease the burden on furloughed workers, And that's just the "neon-chips-manufacturing" supply chain, and not the chain in Germany and the EU that is highly reliant on Russian natural gas as an input.

Banks' stock buybacks are lowering SLRs as we speak, and the Fed is about to embark on QT, and these nominal balance sheet and liquidity trends, will at some point clash with the realities of a garden variety of supply chain issues.

So beware...

Now onto other news items. Let's stick with southern Ukraine and focus on the sea to the south of southern Ukraine – the Black Sea. Earlier this week, the FT reported that NATO rejected a plea for naval escorts in the Black Sea.

Remember that what par is to money, protection is to commodity traders – protection of sea lanes and vessels. According to the FT, “*the head of the world's largest ship manager has urged NATO to provide naval escorts for commercial vessels passing through the Black Sea [...] as dozens remain stuck in the conflict zone*”. According to the article René Kofod-Olsen, CEO of V. Group, the world's largest ship manager, demanded that “*our seafaring and marine traffic is being protected in international waters,*” adding that “*I'm sure NATO [...] has a role to play in the protection of commercial fleets*”.

Do remember the nexus between global trade and the global military alliances: to remind, as we discussed in Money, Commodities and Bretton Woods III, there are precedents of NATO providing cover for commercial private ends (see for example the first page of the book *The World for Sale*, by Javier Blas and Jack Farchy, recounting the turbulent descent of Vitol's private jet with the oil trader Ian Taylor aboard under the protection of a NATO drone chaperoning its plane into war-torn Libya to negotiate a deal with rebels to trade crude oil from fields controlled by the rebels for gasoline to fight the forces of Gaddafi).

But that was a civil war, and the war in Ukraine is a proxy war...

Much like NATO is unwilling to create a no-fly zone in Ukraine, it is unwilling to guarantee safe passage to seafarers in the Black Sea, which is another twist in our neon story. As this page on Ingas' webpage shows and describes, neon is transported in containers (see images) either by road, sea or air transport, which brings up the following issue: if sea and air routes are not safe for neon (and they are not safe because NATO is hesitant to guarantee safe passage), then the only way out for neon is via road. From Mariupol, which is home to Azovstal and Ingas and is under Russian control, neon gas can only go east, but for neon to get to chipmakers in South Korea, Japan and Taiwan by road, it has to pass through China first and then onto a ship to reach the final stop...

...which is chokepoint #2: the neon transportation chokepoint.

The west can still secure neon from Odessa (not under Russian control), but the west's ability transport neon from Odessa to the Far East by air or sea is a function of who controls Odessa in the “Alsace-Lorraine region” for neon. And that assumes that steel plants in southern Ukraine have not been damaged and that there are enough workers left to operate them. So either way is bleak:

plants can either produce neon but we can't get neon to the Far East, or the plants are destroyed or unmanned and can't produce neon period. Oil shocks aren't as consequential these days as they were in 1973, because cars and everything else is more energy efficient, but neon and chip shocks we are not ready for because we have never been forced to think about chip efficiency, and the findings of the U.S. Commerce Department's survey underscore that.

Let's now leave neon gas and move on to natural gas.

Natural gas pipelines are commodity chokepoint #3: Poland and Bulgaria not getting gas any longer for failure to comply with Russia's payment terms (gas for rubles) is an important precedent. Everyone understands Germany's and Italy's reliance on Russian gas, and the EU's reluctance to pay in rubles heightens the risk of disruptions to gas supplies, which would cause massive spot price spikes, margin calls, non-payments due to force majeure clauses and industrial shutdowns and furloughs as described above and here and here.

Let's next move from gases to liquids – crude oil.

The U.S. has already boycotted Russian oil and Europe is getting ready to do it, and the pressure is on for the rest of the world to not buy any Russian crude.

Unlike natural gas, surprisingly little Russian oil is flowing directly to consumers via pipelines. The only exception is the ESPO pipeline which runs from Siberia to China, Japan and Korea. The vast majority of Russian oil travels from fields to ports via pipelines, where they get loaded on to oil tankers for shipment.

There are two extreme scenarios for Russian oil.

First, the entire world boycotts Russian crude, bar the oil flowing via ESPO. Once tank tops are reached, Russia is forced to turn off oil production and the 7 million barrels per day that Russia produces for export disappears. Once you turn oil off, it's hard to get supply back online quickly. The spot oil price does not price this scenario, despite consumers' eagerness to boycott Russian oil. The release of oil from the SPR and from the reserves of other IEA members certainly helps at the moment, and China's oil demand is weak at the moment due to lockdowns, but the SPR is not infinite, neither are lockdowns in China.

Second, the world splits and while the West boycotts Russian oil, Russia will find willing buyers in the East. India for example is buying more Russian oil (see here), and the volume of Russian oil on the water has reportedly increased since March (Russian oil loaded on tankers on a given day, less oil discharged on the same day) which also indicates that Russian oil is being re-routed from the Baltics to the Far East. That's all well, but as we noted in this dispatch, you can't really do that with all Russian crude, because if you do so you end up with a shortage of about 80 very large crude carriers (VLCCs). And likely more, because since we published that dispatch, Euronav, the single largest owner of VLCCs (with a fleet of 45 VLCCs, see here) announced that it suspended the shipment on Russian oil (see here). India only has 5 VLCCs (see here), and so it needs others' fleets to stock up on cheap Russian oil from the Baltics. Since China still receives Russian oil through the ESPO pipeline, it may boost purchases of Russian seaborne oil too, but we would still end up short VLCCs.

So the question of Russian crude oil leads to chokepoints #4 and #5:

First, a supply chokepoint if the entire world boycotts Russian oil and Russia is forced to shut down its oil fields. we lose 7 million barrels per day in exports.

Second, a shipping chokepoint if India and China buy Russian oil and we don't have enough VLCCs to ship the oil. Furthermore, if India and China cannot take up all Russian oil due to VLCC bottlenecks, then Russia will have to cut output which means turning off oil fields and so we're back to a supply chokepoint...

Either way, Russia will export less, perhaps 3-4 million barrels less per day, and the SPR won't be able to cover that kind of a shortfall. If oil gets to \$200,

margin payments for commodity traders and for broker dealers with large commodity derivative books would skyrocket – another funding event to watch.

In *"The 'G-SIB' of Shipping"* we wrote about the planned merger between Frontline and Euronav, which would create the world's largest fleet of VLCCs

– 67 vessels combined. As a matter of national security for the West, government officials should be cognizant of the non-zero probability risk of a Chinese takeover of the combined Frontline-Euronav entity. The U.S. or the EU

do not have any tanker fleets, much like they do not have any chip foundries, or neon gas supplies for chips. The largest tanker fleet controlled by China...

...could chokepoint #6: our "commodities, your problem" compounded with "our VLCCs, your problem". And the flow of oil can get even more complicated:

Iran, China and Russia held naval drills in the Indian Ocean as part of the "2022 Marine Security Belt" exercise in January (see [here](#)), and have been holding trilateral drills since 2019 in the Indian Ocean and the Sea of Oman to "expand multilateral cooperation between the three countries to jointly support world peace, maritime security and create a community with a common future".

Discount the chances of an oil deal with Iran (to re-fill the SPR) in this context, and also the risk that the naval cooperation between Russia, China and Iran in the present context of world affairs represents to the mother of all chokepoints...

...the Strait of Hormuz, which a lot of Middle Eastern oil passes through not to mention the LNG shipments from Qatar that the EU plans to soon transition to.

The Strait of Hormuz is chokepoint #7.

Alan Greenspan used to worry about the Strait of Hormuz while he was Chair (see Greg Ip's [interview](#) with Greenspan in the Wall Street Journal from 2007), and maybe it's time to dust off some of those worries. Volcker had OPEC. Greenspan had Iraq. Powell has Russia. OPEC and Iraq were about oil only, but the present conflict is about oil, VLCCs, natural gas, neon gas and chips...

...and who knows what else will come.

Oil, VLCCs, distillates, natural gas, neon and chip shortages mean two things: spot prices can spike for each and they can also shut down supply chains. Spot price spikes for commodities with large derivative markets behind them (oil and gas) can cause funding stresses for commodity traders and broker-dealers, and a shutdown of supply chains, either because there is no oil, gas or neon can cause a similar "tsunami" of credit line drawdowns that a shortage of workers caused when governments enforced quarantines globally during March 2020.

There are plenty of chokepoints already...

...and QT and SLR constraints can become chokepoints #8 and #9 on the list. But then remember the overarching context in which we have been writing about current events: according to the four prices of money framework, where the four prices of money are par, interest, foreign exchange and the price level, central banks can only deal with nominal, not real chokepoints. It is easy to call force majeure on QT and to exempt banks from the SLR (temporarily) to address the liquidity issues that might arise from chokepoints #1 - #7, but central banks won't be able to do anything about the chokepoints themselves.

Dealing with those chokepoints is the responsibility of the sovereign...

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...and the sovereign will need a lot of money to deal with them. Thus, while we think QT is certainly happening in the near-term, its days and scale will be numbered straight from the get go. The Fed will do QE again by summer 2023.

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