Global Energy Weekly

Money breaks oil's back

08 May 2023

Commodities
Global

Global Commodity Research
BofA Europe (Madrid)

Francisco Blanch
Commodity & Deriv Strategist
BofA Europe (Madrid)
+34 91 514 3070

Warren Russell, CFA
Commodity Strategist
BofAS
+1 646 855 5211

Andy Pham
FICC Quant Strategist
BofAS
apham3@bofa.com

Michael Widmer
Commodity Strategist
MLI (UK)
+44 20 7996 0694

See Team Page for List of Analysts

Monetary forces are dragging down Brent crude prices...

Since we last updated our forecasts in February (see Medium-term oil outlook report), Brent crude prices have fallen with regional US bank shares in March (see Oil, money, and banks report) only to recover in April as OPEC+ announced a big production cut. Yet macro weakness has kept dragging Brent crude prices lower as concerns mounted over the health of the financial sector. While central banks continue to overcorrect for their last policy mistake (high inflation), oil is rushing to anticipate disinflation and a US recession driven by bank failures and tighter lending conditions. On top of that, US debt ceiling tensions risk further exacerbating these negative macro headwinds, with credit default swaps (CDS) on US Treasuries now trading at the highest levels since 2009. As dollar money supply (M2) contracts 4% YoY and inflation surprises turn negative, oil is among the most attractive tools to hedge deflation risks.

...in anticipation of much weaker OECD oil demand ahead

Having said that, OPEC+ seems committed to cut oil output further if the need arises (see OPEC+ whatever it takes moment report). And oil is cheap measured in gold terms. Why pull incremental barrels of black gold out of the ground when gold itself and CDS on US debt are both soaring? Importantly, lower oil prices should incentivize demand at a time China's economy is showing signs of a recovery, although the battle between industry and services is not over yet (see Oil takes a vacation report). At any rate, tighter money tends to precede falling inflation by a year or two. Continued bank failures risk triggering a credit contraction that drags demand down and commodity prices lower. Should small US businesses stop hiring in 2H23 as credit shrinks, gasoline demand could suffer and oil would lose some of its core strength. Fundamentally, following a robust period of backwardation in 2022, oil timespreads have weakened in 2023 on rising oil inventories.

We adjust our 2023 Brent crude oil forecast to $80/bbl

So, what does this macro environment mean for oil balances and oil prices? The first order effect of reduced credit and further interest rate hikes is weaker demand, so we revise down our global oil consumption growth expectations to 1.2mn and 1mn b/d in 2023 and 2024. This cut is driven by an expected OECD demand contraction of 0.4mn and 0.2mn b/d this year and next. But even with a weaker demand outlook, we project oil market deficits of around 1mn b/d for 2H23 and 0.4mn b/d for 2024, lending support to Brent crude oil prices. Admittedly, these deficits could grow wider if OPEC+ chooses to deepen its production cuts by another 0.5 or 1mn b/d (see $80 is the new $60 report). With negative macro trends poised to amplify demand weakness ahead, we cut our average Brent crude oil price forecast to $80/bbl in 2023. Even then, we leave our 2024 Brent crude oil forecast at $90/bbl because we believe OECD demand will eventually improve while OPEC+ will likely keep proactively and preemptively managing supply.

WTI: West Texas Intermediate
NGL: Natural Gas Liquids
OPEC: Organization of Petroleum Exporting Countries
ULSD: Ultra-Low Sulfur Diesel
TTF: Title Transfer Facility
LNG: Liquified Natural Gas
OECD: Organization for Economic Cooperation and Development
NWE: Northwest Europe

Refer to important disclosures on page 17 to 18.
12555396
Timestamp: 08 May 2023 05:00PM EDT

Exhibit 1: BofA Commodity Research Themes and Outlook
Key takeaways

	View	Recent reports
Macro outlook	■ Our economists see world GDP rising 2.7% in 2023 and expanding by an additional 2.6% in 2024.	
WTI and Brent crude oil	■ We project Brent and WTI to average \$80/bbl and \$75/bbl, respectively, in 2023. ■ The global oil balance should stay tight in 2023, supported by additional OPEC+ cuts starting in May, slower non-OPEC growth, and rebounding Asia demand, ■ We forecast global demand growth to slow to 1.2mn b/d YoY in 2023 and 1mn b/d in 2024. ■ Non-OPEC supply should grow roughly 1.8mn b/d YoY in 2023 and 720k b/d in 2024. ■ We project total US crude and NGL supply to rise 1.1mn b/d in 2023 and 600k b/d in 2024. ■ OPEC crude oil supplies are set to fall 650k b/d in 2023 and 230k b/d in 2024 as OPEC+ actively manages balances.	• OPEC+'s whatever it takes moment 05 April 2023 • Global Energy Paper: Medium-term oil outlook 26 February 2023 • \$80 is the new \$60 for oil 16 September 2022 • Oil demand has a supply problem 27 May 2022
Atlantic Basin oil products	■ Refined product markets face risks from OPEC+ cuts, a looming recession, and rising global refining capacity. ■ We forecast RBOB-Brent to average \$20/bbl in 2023, and we see ULSD-Brent cracks averaging \$26/bbl over the same period. ■ OPEC+ cuts, rising complex refining capacity, lower gasoline and diesel cracks create upside for 3.5% fuel oil cracks, which we see averaging -\$15/bbl this year.	• Oil takes a vacation 21 April 2023 • Gasoline still has fuel in the tank 06 March 2023 • Heat poised to cool down 10 January 2023
US natural gas	■ US gas supply and demand growth should hit 2.4Bcf/d and 0.2Bcf/d YoY in 2023, pushing stocks above +3.9Tcf by October. ■ We forecast \$2.70/mmbtu US gas on average in 2023 and see a recovery to \$4/mmbtu in 2024.	• US nat gas rollercoaster nears the bottom 17 February 2023
LNG	■ European TTF gas prices fell 80% from 2022 record highs on warm temps, demand destruction, and record LNG imports. ■ We see €70 TTF in 2023 as a base case and €40 TTF in a bear case. Prices may collapse into summer if NWE inventories stay high, LNG struggles to clear.	• EU gas takes a warm weather bath 16 January 2023
Thermal coal	■ Thermal coal prices surged to record highs as Russia, the world's 3rd largest coal exporter, invaded Ukraine. ■ We expect Newcastle coal to average \$199/t in 2023 and \$160/t in 2024.	• King coal loses its crown 31 March 2023

Source: BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 2: BofA Commodity Price Forecasts
(period averages)

	units	1Q23F	2Q23F	3Q23F	4Q23F	2023F	2024F
WTI Crude Oil	(\$/bbl)	76.00	72.00	75.00	77.00	**75.00**	**85.00**
Brent Crude Oil	(\$/bbl)	82.00	76.00	80.00	82.00	**80.00**	**90.00**
US NY Harbor ULSD (HO) Cracks to Brent Crude Oil	(\$/bbl)	40.62	24.00	20.00	18.00	**25.66**	**18.00**
US RBOB Cracks to Brent Crude Oil	(\$/bbl)	23.13	28.00	20.00	10.00	**20.28**	**12.00**
NWE Low Sulphur Gasoil Cracks to Brent Crude Oil	(\$/bbl)	31.30	16.00	12.00	10.00	**17.34**	**10.00**
NWE Eurobob Cracks to Brent Crude Oil	(\$/bbl)	15.00	18.00	12.00	2.00	**11.75**	**2.25**
NWE 1% Residual Cracks to Brent Crude Oil	(\$/bbl)	-13.40	-10.00	-7.00	-6.00	**-9.10**	**-5.00**
NWE 0.5% Residual Cracks to Brent Crude Oil	(\$/bbl)	2.50	0.00	2.00	2.00	**1.62**	**2.00**
NWE 3.5% Residual Cracks to Brent Crude Oil	(\$/bbl)	-23.20	-13.00	-12.00	-11.00	**-14.79**	**-10.00**
US Natural Gas	(\$/MMBtu)	2.65	2.25	2.75	3.25	**2.73**	**4.00**
Thermal coal, Newcastle FOB	(\$/t)	256	177	179	184	**199**	**160**
Aluminium	\$/t	2,445	2,450	2,750	3,000	**2,661**	**3,500**
Copper	\$/t	8,956	9,250	9,500	10,000	**9,427**	**9,875**
Lead	\$/t	2,131	2,200	2,050	2,050	**2,108**	**2,000**
Nickel	\$/t	26,389	24,000	22,500	20,000	**23,222**	**21,250**
Zinc	\$/t	3,122	3,000	2,750	2,750	**2,905**	**2,500**
Gold	\$/oz	1885	1950	2000	2200	**2009**	**2061**
Silver	\$/oz	22	23	25	28	**25**	**26**
Platinum	\$/oz	996	1,000	1,250	1,500	**1,186**	**1,632**
Palladium	\$/oz	1,578	1,500	1,500	1,500	**1,520**	**1,632**

Source: BofA Global Research estimates

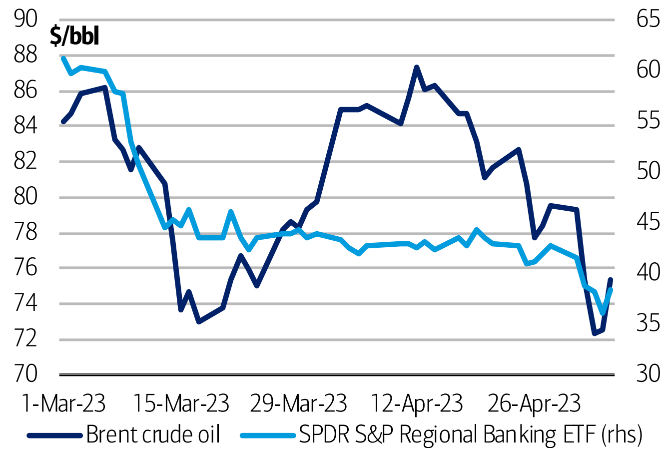
BofA GLOBAL RESEARCH

Money breaks oil's back

Monetary forces are dragging down Brent oil prices…

Since we last updated our forecasts in February (see Medium-term oil outlook report), Brent crude prices fell with regional US bank shares in March (see Oil, money, and banks report) only to recover in April as OPEC+ announced a big production cut. Yet macro weakness and banking turmoil have continued to drag Brent crude oil prices lower this week (). After all, announced OPEC+ output curtailments have often not been enough to fully arrest inventory builds over the course of the quarter during which they were implemented during five episodes the past two decades (Exhibit 4).

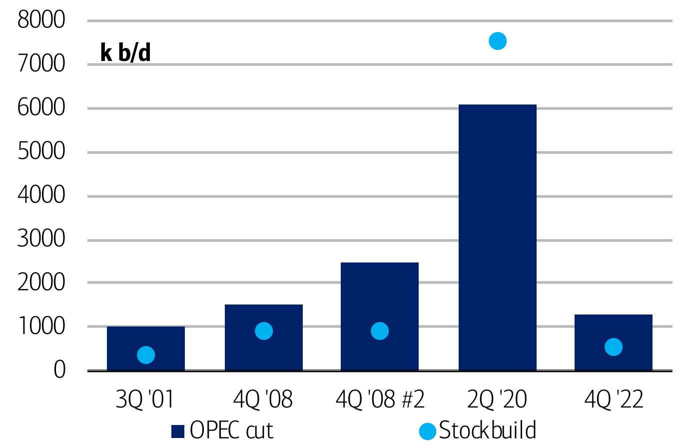
Exhibit 3: Brent crude oil price and SPDR KRE ETF
Oil fell with banks and recovered as OPEC announced its put, but macro weakness and banking turmoil have continued to drag it lower



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 3: OPEC cuts announced at times of demand contraction YoY and inventory builds during quarter of announcement
Announced OPEC+ cuts have often not been enough to arrest inventory builds over the course of a quarter



Note: represents OPEC's portion of OPEC+ cuts during 2020 and 2022. **Source:** IEA, BofA Global Research

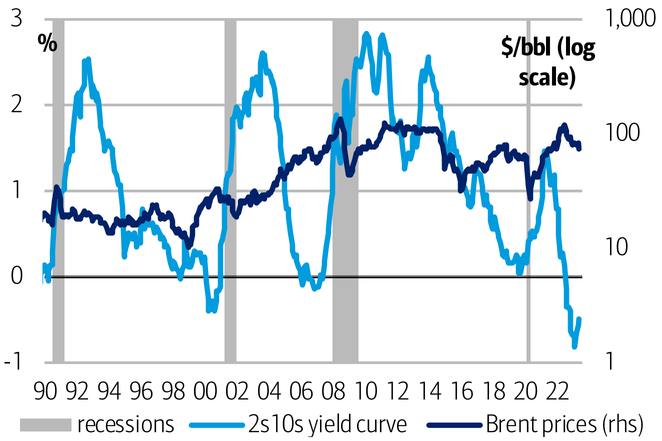
BofA GLOBAL RESEARCH

…in anticipation of a possible US or global recession…

Whether OPEC+ eventually succeeds at reversing rising inventories and a drop in oil prices will heavily depend on the macro outlook going forward, coupled with the true depth of the production cuts. Indeed, the steep inversion of the US yield curve coupled with rising costs to hedge the risk of default on US debt point to a potential recession ahead. The oil market provides a rare macro combination of high liquidity, high volatility, and high cyclicality not easily found in other macro instruments. Brent and WTI prices are taking notice of the macro clouds in the horizon (Exhibit 5). The financial sector faces enough turmoil ahead, with US regional banking sector troubles and an upcoming US debt ceiling tensions likely setting the stage for a further tightening in lending standards. In turn, tighter lending has been strongly associated to recessionary periods in the past (Exhibit 6).

Exhibit 4: Brent prices and 2s10s US Treasury yield curve

The steep inversion of the US yield curve points to a potential recession ahead and oil prices are noticing

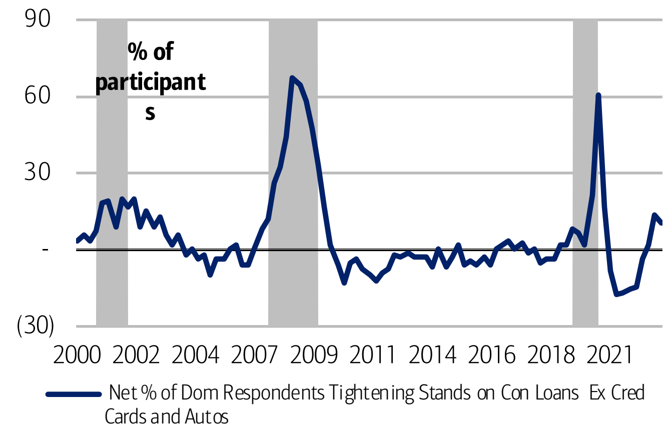


Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 5: Net % of Dom Respondents Tightening Stands on Consumer Loans Ex Cred Cards and Autos and recessions by quarter

Tighter lending standards have tended to be associated to recessionary periods in the past



Source: Bloomberg

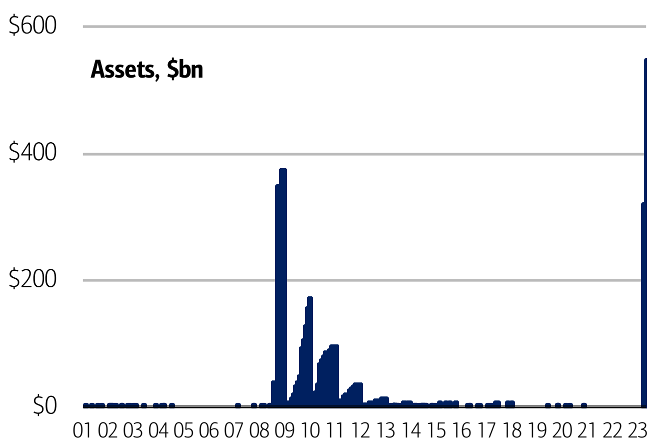
BofA GLOBAL RESEARCH

...driven by bank failures, tighter lending conditions

It is hard to downplay the turmoil in the banking sector. For starters, cumulative US bank failures in 2023 already exceed the levels last seen in 2008 during the financial crisis (Exhibit 7) driven by First Republic, Signature Bank, or SVB, and not accounting for Lehman or Credit Suisse (Exhibit 8). True, Washington Mutual (WaMu) was slightly bigger than First Republic and Silicon Valley Bank, but these last two alone combined exceed WaMu's assets at the time of its demise and are roughly on par with the asset levels held by Lehman when it failed. Crucially, the rest of the banking system will likely still have to face the reality of rising funding costs as $17trn worth of bank deposits consider higher yielding returns in money markets or even US T-bills.

Exhibit 6: Cumulative bank failures by year (total assets)

Cumulative US bank failures in 2023 already exceed the levels last seen in 2008 during the financial crisis...

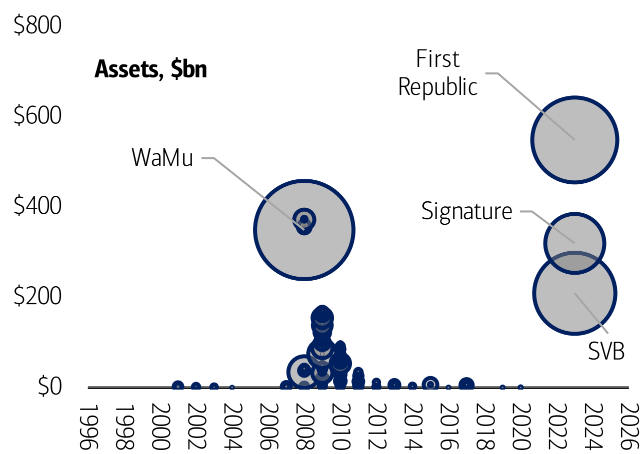


Source: FDIC

BofA GLOBAL RESEARCH

Exhibit 7: Cumulative bank failures by year (total assets)

...driven by First Republic, Signature Bank, or SVB, and not accounting for Lehman or Credit Suisse



Source: FDIC, BofA Global Research

BofA GLOBAL RESEARCH

As inflation expectations roll over, rates should peak

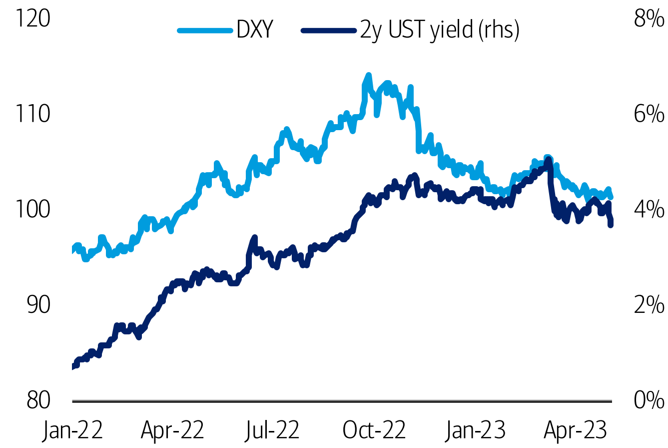
Bank failures are deflationary, other things being equal. But this combination of bank failures with further tightening of monetary conditions in Europe and the US is truly concerning to us. The asset-liability management mismatch in the financial system triggered by the very fast increase in interest rates will take time to fix, and central banks have so far ignored forward looking inflation signals and the lags involved in the transfer of monetary policy decisions into the real economy. For now, global inflation surprises have already dropped below zero, the lowest level since 2020 (Exhibit 9). This drop suggests that inflation is likely to come off hard, with interest rates possibly following suit. In part, the market is already starting to price in this scenario. Meanwhile, the dollar has been wholly driven by the rates complex, a reflection of market expectations of Fed policy (Exhibit 10). And unlike in previous cycles, a weaker US currency has yet to provide any measurable level of support to the commodities complex.

Exhibit 8: Global inflation surprises index
Global inflation surprises have now dropped below zero, the lowest level since 2020

Source: Citigroup, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 9: Dollar index (DXY) and 2y US treasury yields
The dollar has been wholly driven by the rates complex, which is a reflection of market expectations of Fed policy



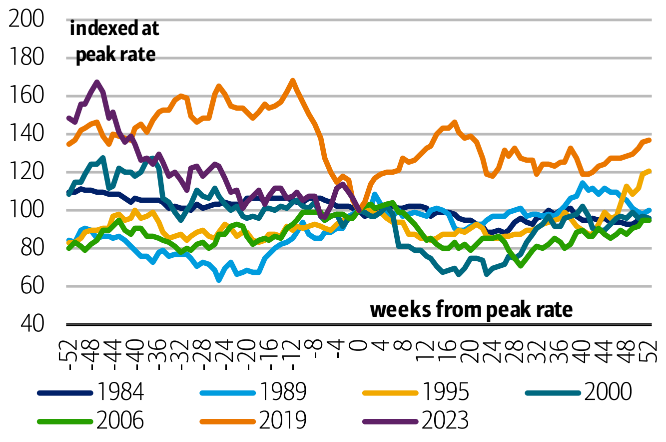
Source: Bloomberg

BofA GLOBAL RESEARCH

Yet prior US rate peaks didn't signal oil price direction…

So, oil prices are down 32% YoY, M2 is now contracting at an annual rate of 4.1% YoY, inflation surprises are now negative, regional US and some global banks are failing, credit default swaps on US government debt are spiking, credit availability is shrinking and central banks can not politically stop hiking rates because the US unemployment rate is 3.4%. So, what will happen to oil if rates do peak? Looking at average weekly oil prices, we note that prior US rate peaks have not been always supportive of oil prices (Exhibit 11). If we look at average monthly prices, we note that the 2019 period was the most supportive, followed by 2000 (Exhibit 12). Both charts suggest that the end of an interest rate hiking cycle does not seem to have a clear-cut positive effect, *prima facie*, on oil price movements over the following 6 months. If anything, there could be a negative short-term bias followed by a modest lift in prices 12 months out.

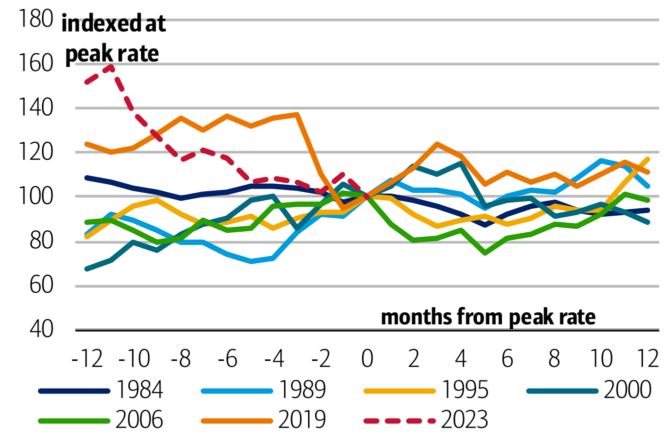
Exhibit 10: WTI prices before and after peak rates, average weekly
Looking at average weekly oil prices, we note that prior US rate peaks have not supported oil prices



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 11: WTI prices before and after peak rates, average monthly
If we look at average monthly prices, we note that the 2019 period was the most supportive, followed by 2000



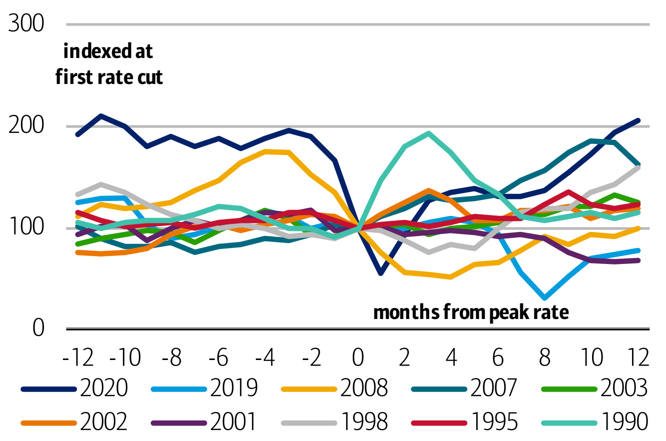
Source: Bloomberg

BofA GLOBAL RESEARCH

...even if rate cuts tended to be more price supportive

In contrast to periods of peak rates, which are not particularly supportive of oil prices, we note that US interest rate cuts have tended to modestly boost oil prices, but only 6-12 months out (Exhibit 13). Said differently, the current environment of rising rates, assuming it is nearly over, does not provide a clear signal either for oil price direction. Thus, any monetary boost to oil would have to wait until rate cuts kick in. In that regard, the rates market is pricing in rapid interest rate cuts starting in September at the moment (Exhibit 14). Assuming the rates market is right, monetary policy support to oil prices could come in 2H23.

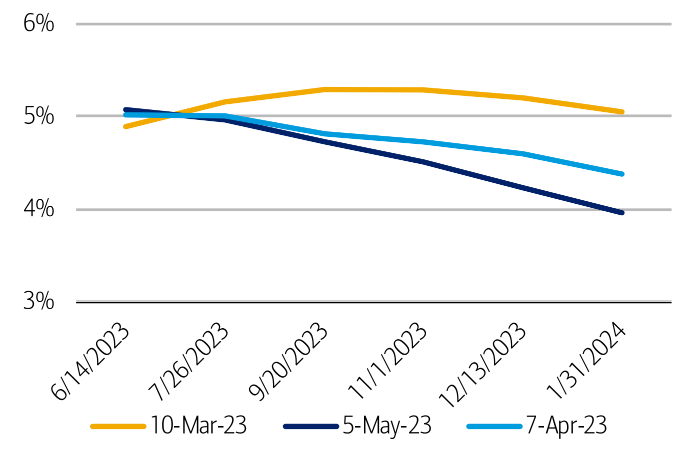
Exhibit 12: WTI prices before and after US rate cuts
US interest rate cuts have tended to be more supportive of oil prices, but only 6-12 months out



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 13: Fed OIS curve
At the moment, the rates market is pricing in rapid interest rate cuts starting in September 23



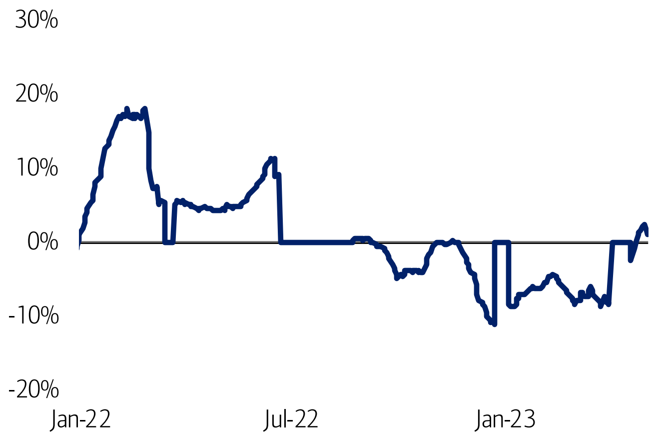
Source: Bloomberg

BofA GLOBAL RESEARCH

CTAs were short this year, but caught long this week...

Another factor that has led to sharp swings in oil prices in the recent period has been positioning. Commodity Trading Advisors or CTAs were short at the beginning of the year but quickly spooked out of their positions by a surprise OPEC+ cut. CTAs were then caught net long WTI this week. Positions have been falling but have not yet hit their stoploss (Exhibit 15). Also, managed money CFTC open interest has steadily been falling since 2020 and rebounded earlier this month but is at the lowest levels since the pandemic, while Brent crude is at average levels relative to history (Exhibit 16).

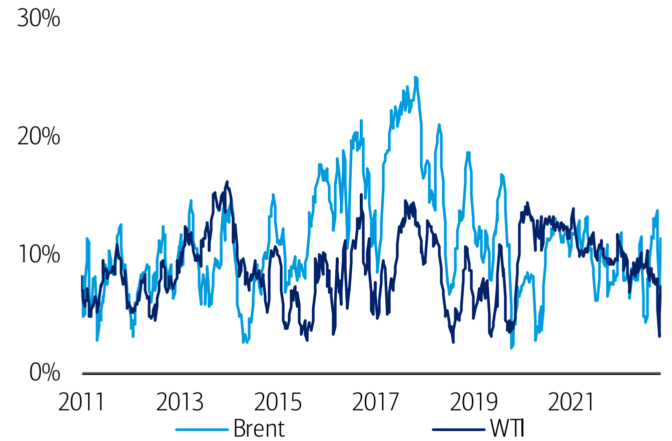
Exhibit 14: CTA oil positioning
CTA's were net long WTI this week and positions are falling but have not yet hit their stoploss



Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 15: CFTC WTI and ICE Brent crude oil positioning as % of open interest
Managed money CFTC open interest has steadily been falling since 2020 anc rebounded earlier this month, but is at the lowest levels since the pandemic, while Brent crude is at average levels relative to history



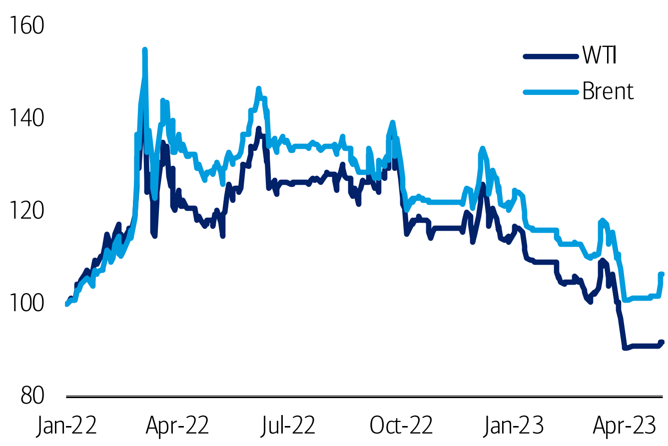
Source: CFTC, ICE

BofA GLOBAL RESEARCH

...while OPEC+ cuts have further hurt momentum in oil

The rapid gyrations in oil prices caught many systematic investors wrong footed in recent months. True, trend following strategies saw gains in 2022, but performance has been abysmal year-to-date (Exhibit 17) and further exacerbated by the bank crisis and the OPEC+ cuts. Why have funds failed to capture these moves? In part, trend signals have switched from short to neutral at inopportune times with oil trading sideways (Exhibit 18), ultimately trouncing strategies that were looking for momentum to deliver investor returns.

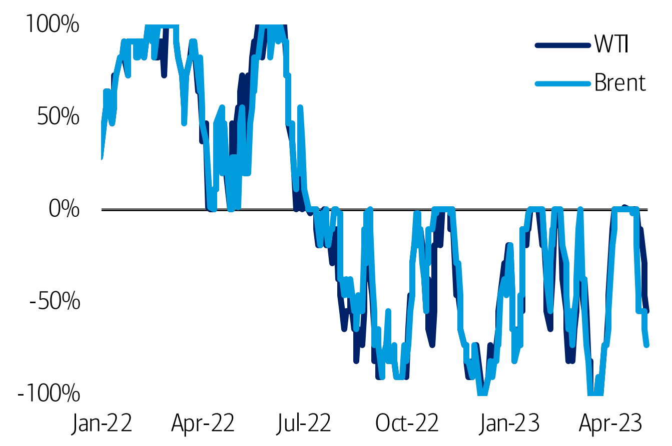
Exhibit 16: Weekly trend following for WTI and Brent crude oil based on moving average aggregator signal (MAA)
Trend following saw gains in 2022, but has been abysmal year-to-date...



Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 17: Moving average aggregator for WTI crude oil
...as trend signals have switched from short to neutral at inopportune times with oil trading sideways



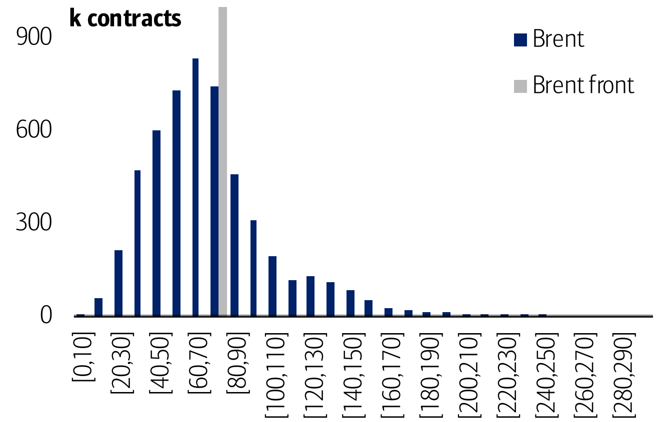
Source: BofA Global Research

BofA GLOBAL RESEARCH

In options, Brent shows greater downside bias than WTI

Another important source of information with regards to oil price direction and positioning is the options market. Looking at Brent crude oil options, we note that long positioning is more on the bearish side (Exhibit 19), perhaps a surprise to many given that OPEC+ has committed to cutting oil production 3 times in the last 8 months (September 22, October 22 and April 23). Meanwhile, long WTI options holders seem instead positioned for an upward price move (Exhibit 20), broadly ignoring US government signals that a refill of the Strategic Petroleum Reserve is not going to happen imminently.

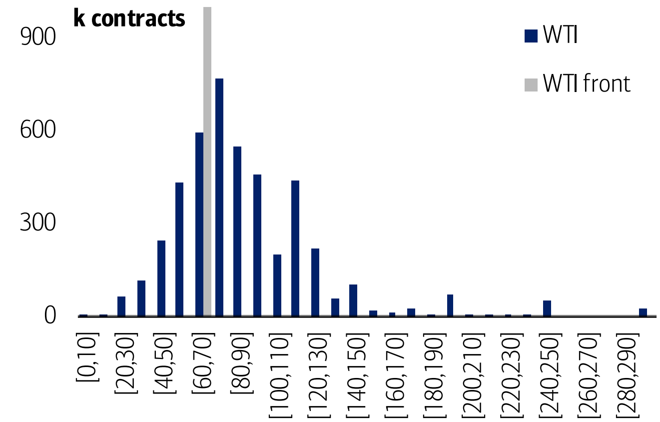
Exhibit 18: Brent crude option open interest by strike as of May 2nd, 2023
Looking at Brent crude oil options, we note that long positioning is more on the bearish side...



Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 19: WTI crude option open interest by strike as of May 2nd, 2023
...while long WTI options holders seem instead positioned for an upward price move



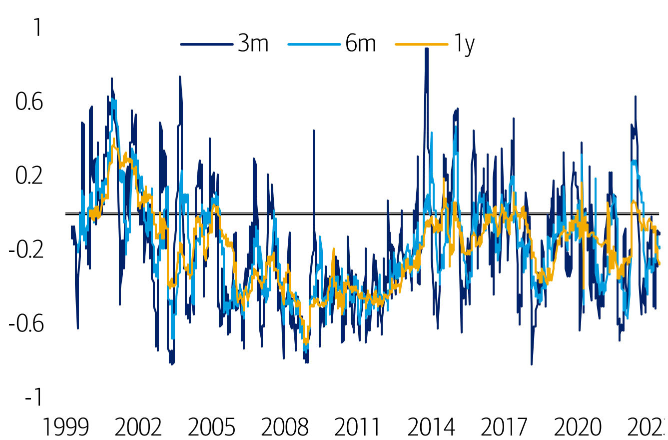
Source: BofA Global Research

BofA GLOBAL RESEARCH

A weaker US dollar is not providing support to oil prices...

Does the foreign exchange market provide any clues with regards to the next oil price move? After being persistently negative for a decade, rolling correlations between oil and the DXY have hovered around zero for the past ten years or so (Exhibit 21). In our view, the break down in oil/dollar correlations is partly linked to the hard economic fact that energy prices have stopped having an impact on US trade balances (Exhibit 22) as America became energy independent on the advent of US shale.

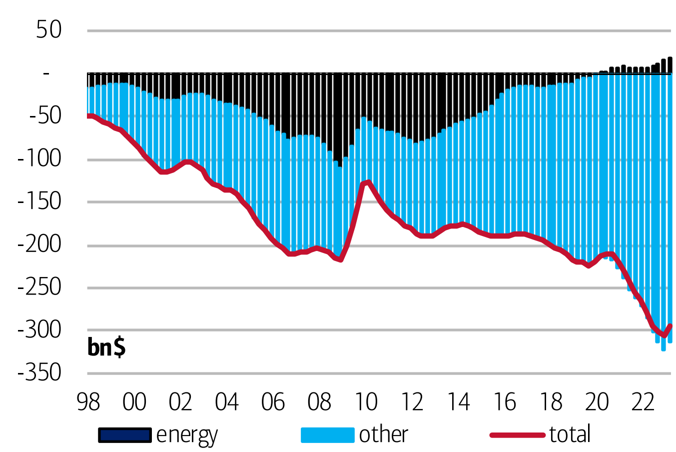
Exhibit 20: Rolling correlations of weekly Brent crude (CO1) and dollar index (DXY) returns
Rolling correlations between oil and the DXY have hovered around zero for years...



Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 21: US trade balance (quarterly, 4Q moving avg.)
...as energy prices stopped having an impact on US trade balances



Source: CEIC, Haver, EIA, Bloomberg

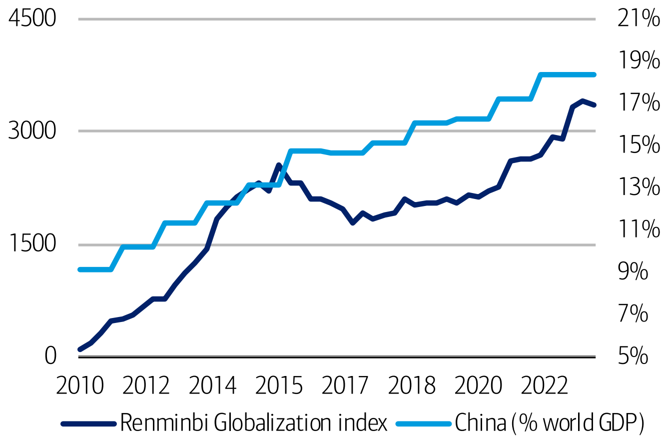
BofA GLOBAL RESEARCH

...and China's move to push away from USD isn't either

So, a weaker dollar in recent weeks is unlikely to provide much support to oil prices going forward, but China's move to push away from the USD isn't either, in our view. True, global yuan usage has steadily been increasing outside of 2015-2017, in line with China's growing share of GDP growth (Exhibit 23). And CNY transactions have overtaken USD payments with 48% share of China's cross border payments occurring in local currency (Exhibit 24). Yet, an increasing push to price commodities in CNY is a slow grind and unlikely to support oil in USD/bbl any time soon.

Exhibit 22: Standard and Charter's Renminbi Globalization Index and China as % global GDP

Global yuan usage has steadily been increasing outside of 2015-2017, in line with China's growing share of GDP growth

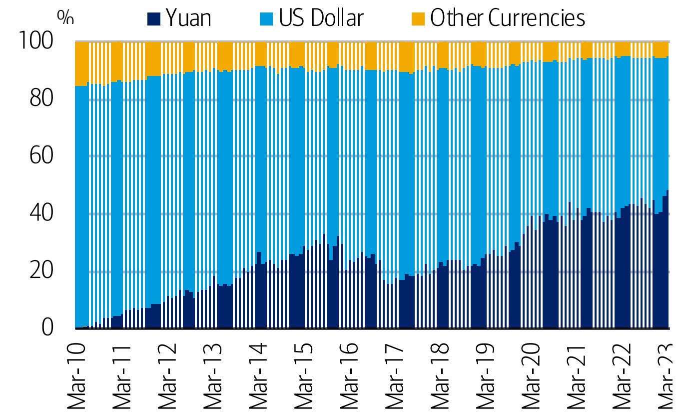


Source: Bloomberg, World Bank

BofA GLOBAL RESEARCH

Exhibit 23: Currency share (%) China cross border payments& receipts

CNY transactions have overtaken USD payments with 48% share of China's cross border payments occurring in local currency



Source: BofA Global Research, CEC, PBoC

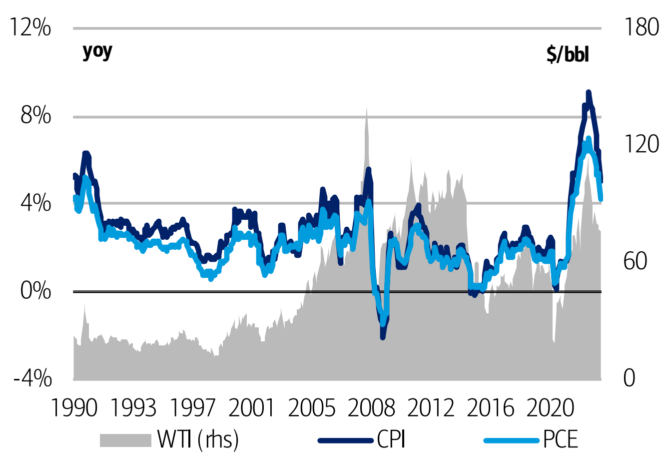
BofA GLOBAL RESEARCH

Also, oil is a natural hedge if deflation forces take hold

The crucial factor to understand on the macro side is that lower oil prices are likely linked to weaker demand and also feed quickly into lower inflation expectations and lower inflation surprises. With oil prices falling, headline inflation has compressed significantly as the inflation episode shifts from energy and aggregate supply-driven to core demand (Exhibit 25), which is weakening due to higher interest rates. Moreover, oil prices tend to move in tandem with economic activity, and GDP growth forecasts could take an additional hit on the back of the banking crisis (Exhibit 26).

Exhibit 24: WTI crude oil (front month futures) and US year-on-year inflation

With oil prices falling, headline inflation has compressed significantly as the inflation episode shifts from energy and supply driven to core demand

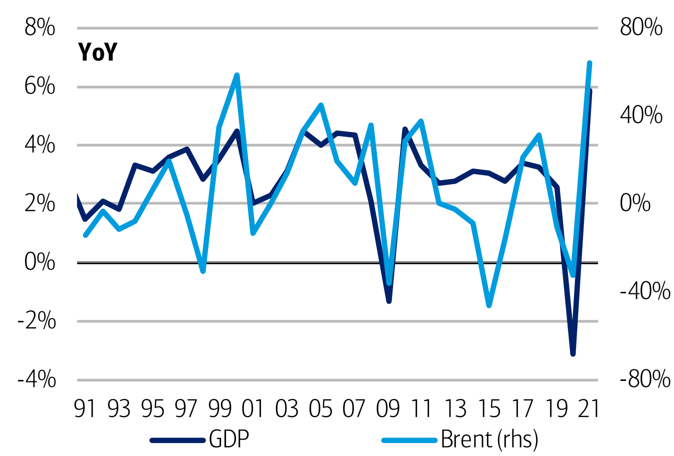


Source: Bloomberg, BLS, BEA

BofA GLOBAL RESEARCH

Exhibit 25: World GDP and Brent price growth

Oil prices tend to move in tandem with economic activity, and GDP growth forecasts could take a hit on the back of the banking crisis



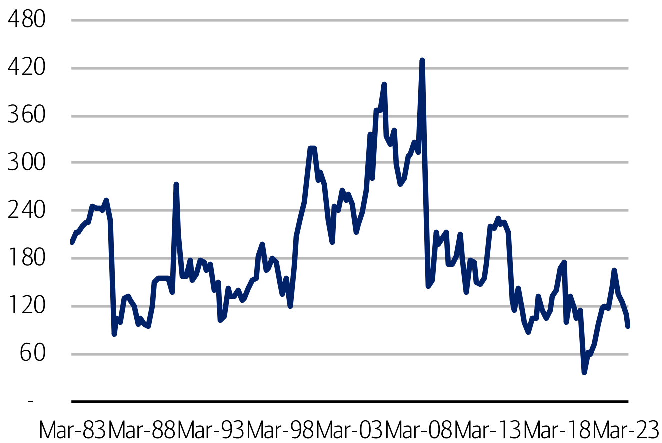
Source: Bloomberg

BofA GLOBAL RESEARCH

Having said that, oil is really cheap measured in gold...

The bottom line is that oil prices are likely to remain under downward pressure if growth falters and inflation continues to surprise to the downside. This is not to say that oil is expensive and that it has a lot of downside from the current levels. Rather, oil measured in centigrams of gold shows that prices are at the lowest levels since 2020 and one of the lowest levels in decades (Exhibit 27). After all, with central banks increasingly leaning towards accumulating gold rather than USD or EUR reserves, OPEC+ may choose to leave black gold barrels in the ground (Exhibit 28) at these oil-to-gold conversion rates.

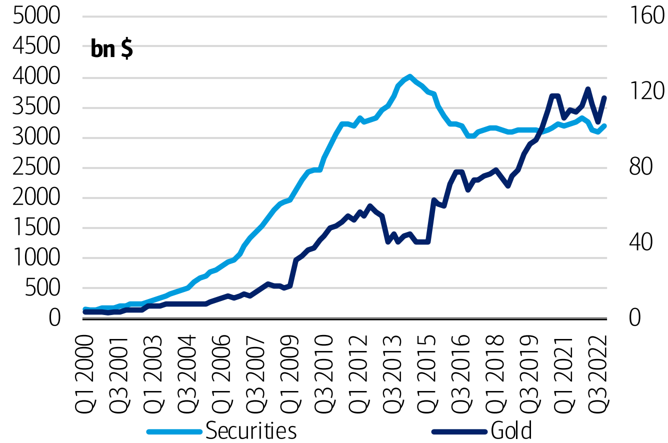
Exhibit 26: Oil prices in centigrams of gold per barrel
Oil, when measured in centigrams of gold, shows that prices are at the lowest levels since 2020



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 27: China FX reserves
With central banks leaning to accumulate gold rather than USD or EUR reserves, OPEC+ could choose to leave the barrels in the ground



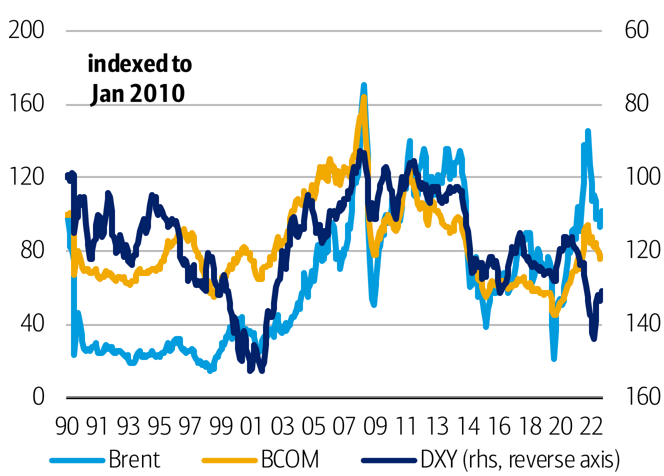
Source: CEIC

BofA GLOBAL RESEARCH

...whether you believe or not in global de-dollarization...

There is little doubt that FX is playing a key role in commodity price formation, although its impact on short term price movements is a lot more questionable as correlation analyses suggest. In fact, oil, commodities, and the DXY have moved in opposite directions in the recent past (Exhibit 29) and the two-decade long link between DXY and BCOM levels seems now completely broken. An alternative currency to the USD is unlikely to show up any time soon, as dollar and euro still dominate cross-border payments as RMB remains around 2% (Exhibit 30), but this provides little comfort for the oil market.

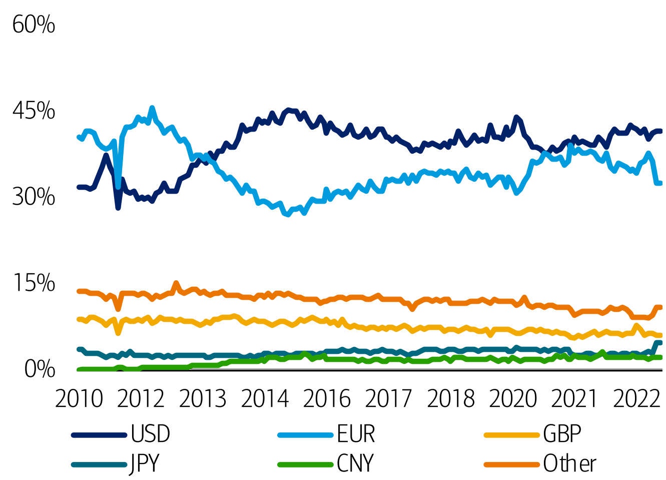
Exhibit 28: BCOM, DXY and Brent crude oil prices
Oil, commodities, and the DXY have moved in opposite directions in the recent past



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 29: FX share of SWIFT payments
Dollar and euro still dominate cross-border payments as RMB remains around 2%



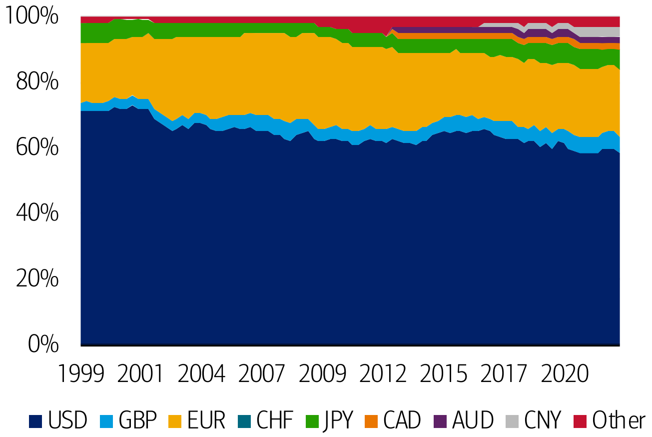
Source: Bloomberg

BofA GLOBAL RESEARCH

...which should incentivize OPEC+ to cut output further

Whether one believes or not in de-dollarization (see Reports of USD replacement greatly exaggerated report), a key idea to consider is that even as the USD share of FX reserves has steadily fallen and the CNY has been rising, it remains small at around 2% (Exhibit 31). Saudi Arabia has a history of moving production levels aggressively to adjust for price and demand conditions (Exhibit 32), and the value of dollars out of the ground (i.e. oil in a ship) vs dollars in the ground (i.e. oil in a reservoir) is a more important consideration for the world's swing oil producer. In that sense, a de-peg of the Saudi currency from the USD may matter a lot more to oil price formation that a rising share of CNY FX reserves.

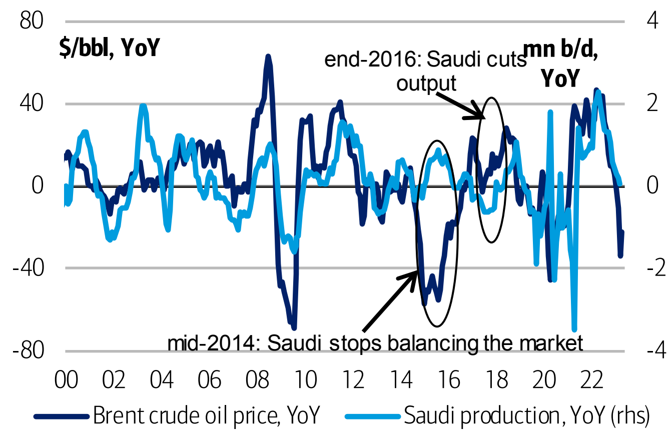
Exhibit 30: IMF foreign exchange reserves by currency
US share of FX reserves has been steadily falling, and while CNY has been rising, it remains small at around 2%



Source: IMF

BofA GLOBAL RESEARCH

Exhibit 31: Brent crude oil price and Saudi production changes
Saudi Arabia has a history of moving production levels aggressively to adjust for price and demand conditions



Source: Bloomberg

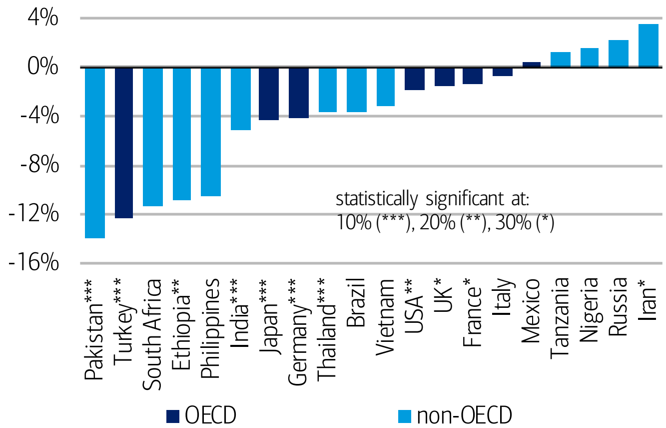
BofA GLOBAL RESEARCH

In any case, lower prices should incentivize oil demand...

At any rate, there are also natural floors to average oil prices that come back to the stimulus they provide to consumers themselves. The price elasticity of oil demand works both ways and lower prices should support consumption (Exhibit 33). Countries such as Pakistan, India, China, Türkiye or even Japan should find the lower oil price levels attractive. Even then, we have to account for the fact that bank failures are not a good omen for oil demand, and in this note we reset growth expectations to 1.16mn b/d YoY for 2023 (Exhibit 34) by factoring in a -410k b/d demand contraction for OECD economies, compared to -30k b/d prior.

Exhibit 32: Price elasticity of oil demand by country

The price elasticity of oil demand works both ways and lower prices should support consumption…

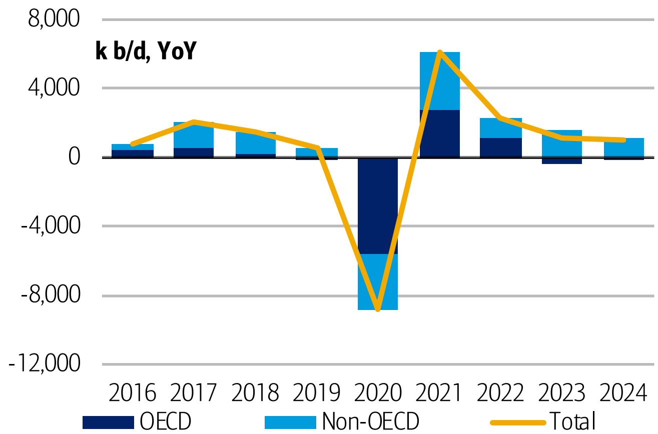


Source: Bloomberg, IEA, JODI, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 33: Global oil demand growth

…although bank failures are not a good omen for oil demand, so we reset growth expectations to 1.2mn b/d for 2023



Source: IEA, BofA Global Research estimtes

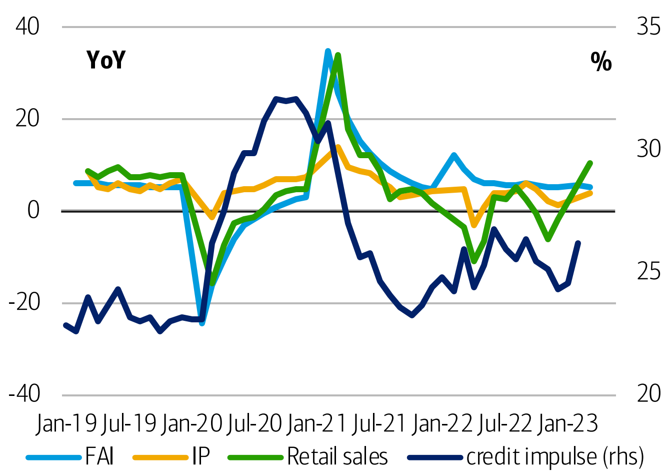
BofA GLOBAL RESEARCH

…at a time China's economy shows signs of a recovery

To be fair, weaker OECD oil demand does not mean a contraction in global oil demand, as Emerging Markets should carry consumption higher as they have almost every year for decades. In China, we note that retail sales and its credit impulse are showing signs of life, even if industrial activity is not (Exhibit 35) for the time being. And yet much of the demand battle is being fought at the petroleum product level (see Oil takes a vacation report). Ultimately, demand for oil is very cyclical, with for example fuel oil demand depending very much on global trade (Exhibit 36).

Exhibit 34: China credit impulse and FAI, IP, retail sales growth

China retail sales and its credit impulse are showing signs of life, even if IP is not

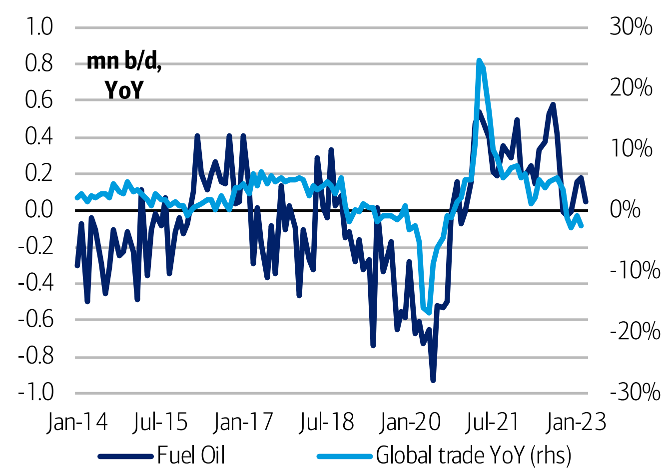


Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 35: Global fuel oil demand vs global trade growth

Ultimately, demand for oil is very cyclical, with fuel oil demand depending very much on global trade



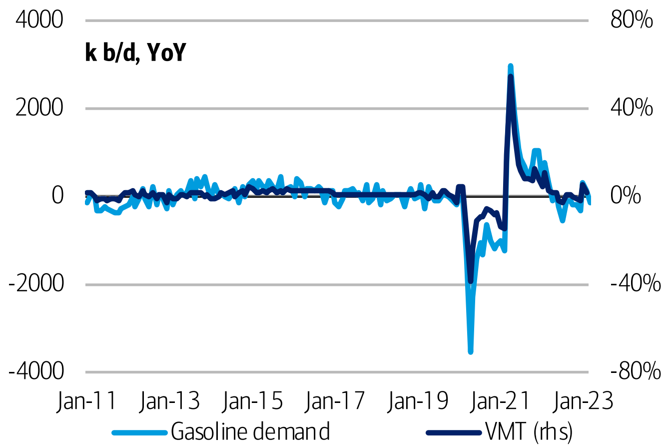
Source: Woodmac, Bloomberg

BofA GLOBAL RESEARCH

The battle between industry and services is not over yet…

In contrast to the more cyclical demand segments of the petroleum complex like naphtha or diesel, gasoline demand in the US and elsewhere is strongly associated to vehicle miles travelled (Exhibit 37). As long as the US unemployment rate remains low at 3.4%, it should hold up. Then again, we should not lose sight from the fact that the labor market is precisely the variable that the Fed is targeting to help bring down inflation. Meanwhile, air travel is closely linked to jet fuel demand through the number of flights up in the air every month (Exhibit 38), and we expect this metric to continue to grow in the post pandemic world.

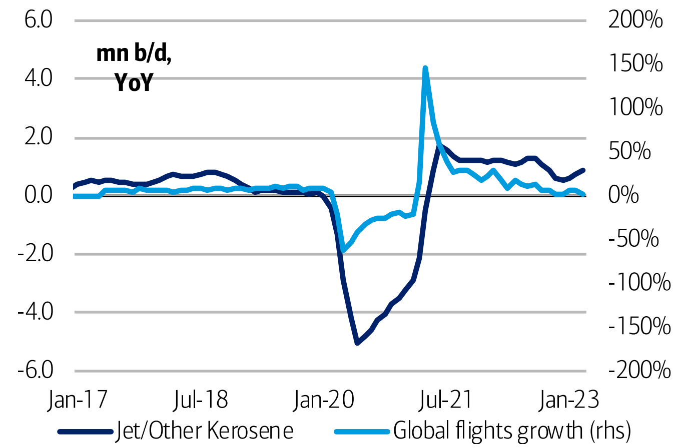
Exhibit 36: US gasoline demand and VMT growth
Gasoline demand in the US and elsewhere, in contrast, is strongly associated to vehicle miles travelled



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 37: Global jet/kero demand and flights growth
Air travel is closely linked to jet fuel demand through the number of flights up in the air every month



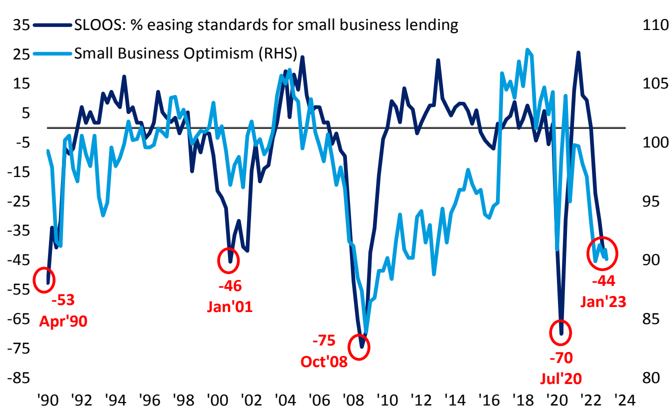
Source: Woodmac, Bloomberg

BofA GLOBAL RESEARCH

...but tighter money risks triggering a credit contraction...

The bottom line is that there are enough negative economic signs to get increasingly concerned about oil demand in the US and across the OECD more broadly. Small business optimism has collapsed as a result of tighter credit standards (Exhibit 39), with the most recent readings pointing to a steep compression in credit availability. Needless to say, jobless claims tend to track loan availability for small businesses (Exhibit 40) with a 6 to 12 month lag. Put differently, it is only a matter of months before small businesses stop adding new workers.

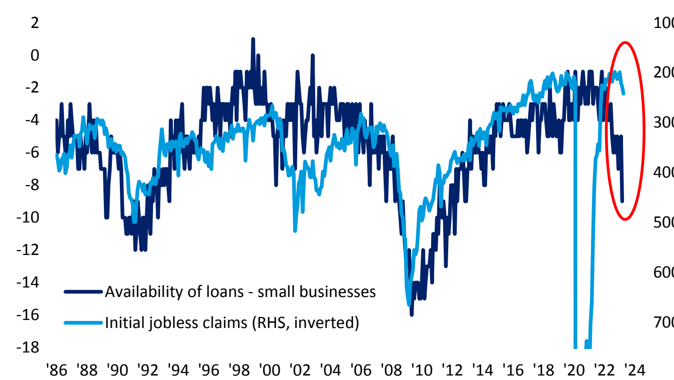
Exhibit 39: Small businesses responding to tighter lending conditions
Small business optimism has collapsed as a result of tighter credit standards...



Source: BofA Global Investment Strategy, Bloomberg.

BofA GLOBAL RESEARCH

Exhibit 40: US labor market responding to tighter lending conditions
...and generally jobless claims tend to track loan availability for small businesses



Source: BofA Global Investment Strategy, Bloomberg.

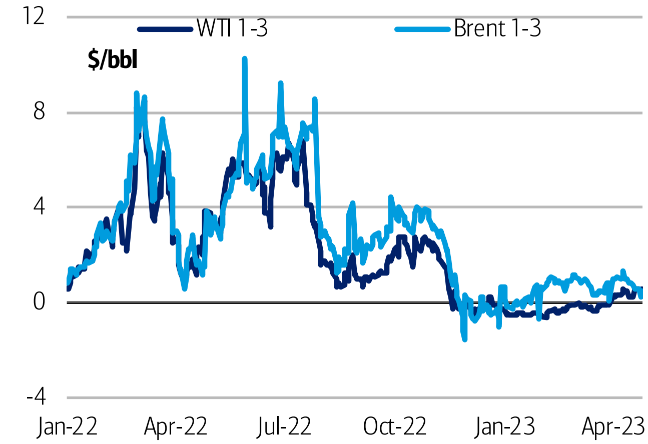
BofA GLOBAL RESEARCH

...that drags demand down and commodity prices lower

Should small businesses stop hiring in 2H23, gasoline demand could suffer, and oil could lose some of its core strength. These dynamics are already at play because of the lack of cyclical demand momentum. After a robust period of backwardation in 2022, oil timespreads have been weak since the start of the year (Exhibit 41) and front to third month Brent spreads are sitting at $0.58/bbl now compared to an average of $3.50/bbl last year. The shift, of course, is partly driven by the fundamental fact that global crude oil inventories have been pressing higher during the past few months (Exhibit 42).

Exhibit 40: Brent and WTI 1-3 month timespreads

After a strong period of backwardation in 2022, oil timespreads have been weak since the start of the year...

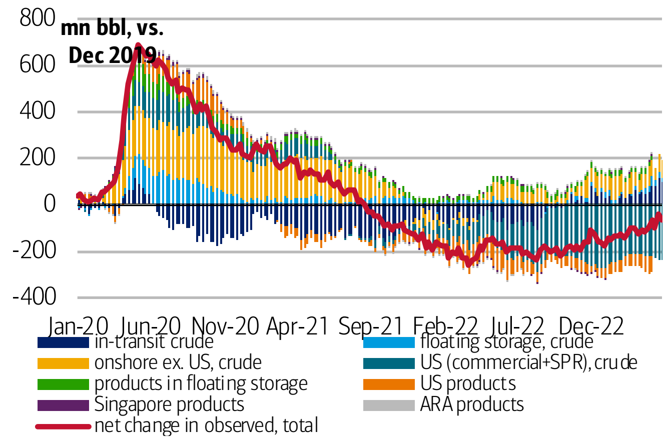


Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 41: Observed global inventory changes

...as global crude oil inventories have been pressing higher during the past few months



Source: Kayrros, Bloomberg, Clarksons, BofA Global Research

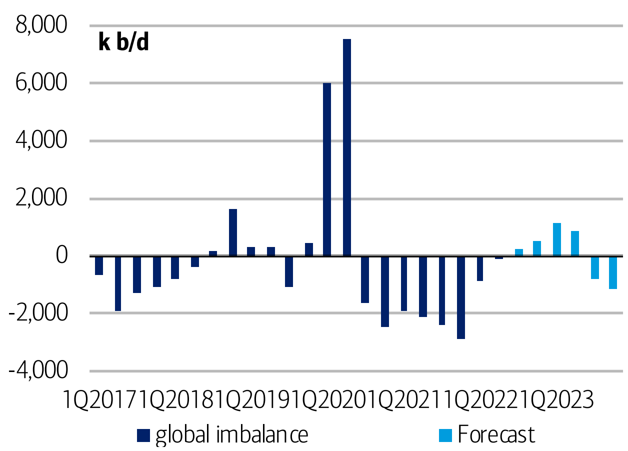
BofA GLOBAL RESEARCH

We adjust our 2023 Brent crude oil forecast to $80/bbl

So, what does this macro environment mean for oil balances and oil prices? While more modest, we still see oil market deficits building into 2H23 even with lower demand expectations (Exhibit 43) to the tune of 1.2mn b/d for 2H23 and 1mn b/d for 2024. These deficits could grow wider if OPEC+ chooses to amplify its production cuts by another 0.5 or 1mn b/d. With negative macro trends pointing to further demand weakness ahead, we cut our average Brent crude oil price forecast to $80/bbl in 2023. Even then, we leave our 2024 Brent crude oil forecast at $90/bbl as we believe OECD demand will eventually improve and OPEC+ will keep pro-actively managing supply (Exhibit 44).

Exhibit 42: Global oil demand imbalance

While more modest, we still see oil market deficits building into 2H23 even with lower demand expectations

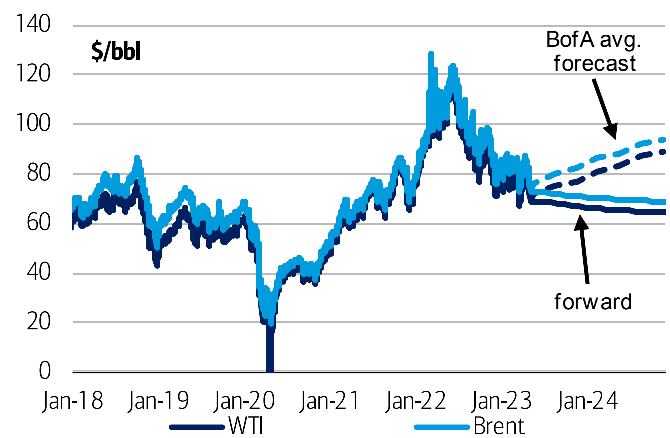


Source: IEA, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 43: Oil price history, forecast, and forward curve

We cut our Brent crude oil price forecast to $80 in 2023 to reflect weaker demand growth



Source: Bloomberg, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 45: BofA global oil supply forecast (in thousand b/d)

Quarterly forecast

	2021	1Q2022	2Q2022	3Q2022	4Q2022	2022	1Q2023F	2Q2023F	3Q2023F	4Q2023F	2023F	2024F
OECD Americas	24,310	24,890	25,260	26,060	26,260	25,620	26,410	26,830	27,100	27,160	26,880	27,470
United States	16,750	17,170	17,700	18,240	18,290	17,850	18,540	19,020	19,120	19,080	18,940	19,550
-Crude	*11,250*	*11,470*	*11,700*	*12,060*	*12,300*	*11,880*	*12,460*	*12,500*	*12,530*	*12,630*	*12,530*	*12,880*
-NGL	*5,420*	*5,610*	*5,910*	*6,090*	*5,900*	*5,880*	*5,980*	*6,300*	*6,370*	*6,200*	*6,210*	*6,460*
Canada	5,590	5,710	5,570	5,790	5,950	5,760	5,770	5,700	5,880	5,980	5,830	5,900
Mexico	1,950	2,000	1,990	2,020	2,020	2,010	2,090	2,100	2,100	2,100	2,100	2,010
OECD Asia Oceania	510	490	510	430	480	480	470	470	470	460	470	450
Australia	440	420	450	370	420	410	400	410	400	400	400	390
OECD Europe	3,390	3320	3030	3080	3200	3160	3280	3230	3310	3420	3,310	3,330
Norway	2,050	1,980	1,740	1,910	1,970	1,900	2,010	2,000	2,080	2,150	2,060	2,130
United Kingdom	890	910	850	750	810	830	830	810	810	850	830	820
Non-OECD Europe	110	110	110	100	100	110	100	100	100	100	100	100
Former Soviet Union	13,770	14,400	13,430	13,670	14,090	13,900	14,090	13,560	13,560	13,560	13,690	13,730
Russia	10,870	11,380	10,700	11,070	11,210	11,090	11,140	10,700	10,700	10,700	10,810	10,700
Azerbaijan	700	700	670	660	670	670	640	640	640	640	640	710
Kazakhstan	1,850	1,980	1,760	1,630	1,910	1,820	1,990	1,900	1,900	1,900	1,920	2,030
Non-OPEC Africa	1,330	1,290	1,290	1,300	1,290	1,290	1,260	1,280	1,270	1,270	1,270	1,180
Egypt	590	590	610	600	600	600	600	590	590	580	590	570
Sudan	210	200	200	210	200	200	170	190	190	190	190	170
Non-OPEC Asia	6,910	7,000	6,950	6,780	6,820	6,890	7,000	6,880	6,860	6,820	6,890	6,710
India	730	720	710	700	690	700	680	670	670	660	670	660
Malaysia	570	570	560	540	570	560	560	550	550	540	550	520
China	4,060	4,230	4,230	4,120	4,130	4,180	4,320	4,250	4,250	4,230	4,260	4,230
Non-OPEC Latin America*	5,300	5,440	5,460	5,770	5,900	5,640	5,990	5,970	6,030	6,170	6,040	6,300
Argentina	640	690	700	720	740	710	750	760	770	780	770	800
Brazil	3,000	3,080	3,000	3,160	3,230	3,120	3,320	3,350	3,400	3,450	3,380	3,500
Colombia	740	750	760	760	780	760	780	740	740	740	750	710
Non-OPEC Middle East	3,080	3,150	3,200	3,250	3,210	3,200	3,200	3,220	3,220	3,230	3,220	3,160
Oman	979	1,044	1,065	1,098	1,080	1,072	1,072	1,077	1,082	1,087	1,080	1,028
Qatar	1,822	1,817	1,845	1,843	1,842	1,837	1,853	1,850	1,850	1,850	1,851	1,850
Processing Gains	2,250	2,280	2,290	2,330	2,320	2,310	2,300	2,380	2,380	2,350	2,350	2,400
Global Biofuels	2,780	2,510	3,080	3,300	2,900	2,950	2,640	3,240	3,510	3,130	3,130	3,240
Non-OPEC** (incl. processing gains)	63,750	64,890	64,620	66,060	66,580	65,540	66,740	67,170	67,820	67,670	67,350	68,070
OPEC crude	26,420	28,550	28,720	29,590	29,370	29,060	29,170	28,690	27,910	27,860	28,410	28,180
Saudi Arabia crude	9,150	10,170	10,440	10,920	10,570	10,530	10,420	10,150	9,700	9,700	9,990	9,700
Kuwait	2,410	2,610	2,670	2,800	2,710	2,700	2,680	2,590	2,500	2,500	2,570	2,500
UAE	2,760	3,130	3,330	3,450	3,370	3,320	3,310	3,100	3,000	3,000	3,100	3,080
Iraq crude	4,030	4,290	4,450	4,540	4,500	4,440	4,390	4,350	4,250	4,250	4,310	4,300
Iran crude	2,420	2,550	2,460	2,550	2,630	2,550	2,640	2,650	2,650	2,650	2,650	2,700
Libya crude	1,150	1,080	770	960	1,170	990	1,150	1,150	1,150	1,150	1,150	1,200
Nigeria crude	1,310	1,300	1,150	1,000	1,130	1,150	1,270	1,300	1,300	1,300	1,290	1,300
Venezuela crude	610	720	740	660	680	700	710	750	750	750	740	830
other OPEC crude	2,580	2,700	2,720	2,710	2,600	2,680	2,590	2,640	2,610	2,560	2,600	2,580
Total OPEC NGLs + Non-conventional	5,160	5,270	5,310	5,320	5,280	5,300	5,350	5,350	5,350	5,350	5,350	5,400
Total OPEC	31,580	33,820	34,030	34,910	34,650	34,350	34,520	34,030	33,260	33,210	33,760	33,580
Total World Supply	95,330	98,700	98,650	100,970	101,240	99,890	101,260	101,210	101,080	100,870	101,110	101,650

Source: IEA, EIA, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 46: BofA global oil demand forecast (in thousand b/d)
Quarterly forecast

	2021	1Q2022	2Q2022	3Q2022	4Q2022	2022	1Q2023F	2Q2023F	3Q2023F	4Q2023F	2023F	2024F
TOTAL OECD Demand	44,810	45,810	45,400	46,620	45,970	45,950	45,420	44,920	46,080	45,760	45,540	45,340
OECD Americas Demand	24,310	24,770	24,980	25,330	24,950	25,010	24,620	24,740	24,980	24,630	24,740	24,560
United States	20,030	20,380	20,410	20,620	20,320	20,430	20,160	20,170	20,290	20,000	20,150	20,000
Canada	2,260	2,240	2,210	2,380	2,300	2,280	2,180	2,190	2,340	2,270	2,250	2,220
Mexico	1,650	1,760	1,990	1,960	1,950	1,920	1,890	2,010	1,980	1,990	1,970	1,940
Chile	370	390	380	380	380	380	400	370	370	370	380	390
OECD Europe Demand	13,120	13,190	13,430	14,060	13,340	13,500	12,980	13,240	13,690	13,330	13,310	13,230
OECD Pacific Demand	7,380	7,850	6,980	7,220	7,680	7,430	7,810	6,930	7,410	7,800	7,490	7,560
TOTAL NON-OECD Demand	52,830	53,750	53,300	54,070	54,720	53,960	54,700	55,390	55,770	56,230	55,520	56,730
China	15,420	15,390	14,400	14,820	15,390	15,000	15,590	15,540	15,850	16,290	15,820	16,230
India	4,770	5,250	5,160	4,880	5,290	5,150	5,440	5,410	5,100	5,480	5,360	5,530
Other Asia (ex. China & India)	8,590	8,890	8,890	8,580	8,690	8,760	8,940	9,310	8,930	9,020	9,050	9,230
Middle East	8,480	8,570	9,120	9,510	8,980	9,050	8,830	9,330	9,700	9,160	9,260	9,480
Latin America	5,940	5,920	6,090	6,280	6,210	6,120	6,040	6,190	6,250	6,170	6,160	6,180
FSU	4,850	4,730	4,720	5,080	5,060	4,900	4,830	4,610	4,980	4,970	4,850	4,880
Africa	4,010	4,210	4,160	4,120	4,290	4,200	4,270	4,220	4,190	4,360	4,260	4,410
Non-OECD Europe	770	780	770	790	800	780	780	770	780	780	780	790
TOTAL Demand	97,640	99,560	98,700	100,690	100,680	99,910	100,110	100,300	101,850	102,000	101,070	102,070
Market imbalance (supply - demand)	-2,310	-860	-50	280	560	-20	1,150	910	-770	-1,130	40	-420

Source: IEA, EIA, BofA Global Research estimates

BofA GLOBAL RESEARCH

Options Risk Statement

Options and other related derivatives instruments are considered unsuitable for many investors. **Options strategy is by definition governed by a finite duration. The most severe risks associated with general options trading are total loss of capital invested and delivery/assignment risk, all which can occur in a short period.**

Disclosures

Important Disclosures

BofA Global Research personnel (including the analyst(s) responsible for this report) receive compensation based upon, among other factors, the overall profitability of Bank of America Corporation, including profits derived from investment banking. The analyst(s) responsible for this report may also receive compensation based upon, among other factors, the overall profitability of the Bank's sales and trading businesses relating to the class of securities or financial instruments for which such analyst is responsible.
BofA Securities fixed income analysts regularly interact with sales and trading desk personnel in connection with their research, including to ascertain pricing and liquidity in the fixed income markets.

Other Important Disclosures

Prices are indicative and for information purposes only. Except as otherwise stated in the report, for any recommendation in relation to an equity security, the price referenced is the publicly traded price of the security as of close of business on the day prior to the date of the report or, if the report is published during intraday trading, the price referenced is indicative of the traded price as of the date and time of the report and in relation to a debt security (including equity preferred and CDS), prices are indicative as of the date and time of the report and are from various sources including BofA Securities trading desks.
The date and time of completion of the production of any recommendation in this report shall be the date and time of dissemination of this report as recorded in the report timestamp.

Recipients who are not institutional investors or market professionals should seek the advice of their independent financial advisor before considering information in this report in connection with any investment decision, or for a necessary explanation of its contents.
Officers of BofAS or one or more of its affiliates (other than research analysts) may have a financial interest in securities of the issuer(s) or in related investments.
Refer to BofA Global Research policies relating to conflicts of interest.
"BofA Securities" includes BofA Securities, Inc. ("BofAS") and its affiliates. Investors should contact their BofA Securities representative or Merrill Global Wealth Management financial advisor if they have questions concerning this report or concerning the appropriateness of any investment idea described herein for such investor. "BofA Securities" is a global brand for BofA Global Research.
Information relating to Non-US affiliates of BofA Securities and Distribution of Affiliate Research Reports:
BofAS and/or Merrill Lynch, Pierce, Fenner & Smith Incorporated ("MLPF&S") may in the future distribute, information of the following non-US affiliates in the US (short name: legal name, regulator): Merrill Lynch (South Africa): Merrill Lynch South Africa (Pty) Ltd., regulated by The Financial Service Board; MLI (UK): Merrill Lynch International, regulated by the Financial Conduct Authority (FCA) and the Prudential Regulation Authority (PRA); BofASE (France): BofA Securities Europe SA is authorized by the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and regulated by the ACPR and the Autorité des Marchés Financiers (AMF). BofA Securities Europe SA ("BofASE") with registered address at 51, rue La Boétie, 75008 Paris is registered under no. 842 602 690 RCS Paris. In accordance with the provisions of French Code Monétaire et Financier (Monetary and Financial Code), BofASE is an établissement de crédit et d'investissement (credit and investment institution) that is authorised and supervised by the European Central Bank and the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and regulated by the ACPR and the Autorité des Marchés Financiers. BofASE's share capital can be found at www.bofaml.com/BofASEdisclaimer; BofA Europe (Milan): Bank of America Europe Designated Activity Company, Milan Branch, regulated by the Bank of Italy, the European Central Bank (ECB) and the Central Bank of Ireland (CBI); BofA Europe (Frankfurt): Bank of America Europe Designated Activity Company, Frankfurt Branch regulated by BaFin, the ECB and the CBI; BofA Europe (Madrid): Bank of America Europe Designated Activity Company, Sucursal en España, regulated by the Bank of Spain, the ECB and the CBI; Merrill Lynch (Australia): Merrill Lynch Equities (Australia) Limited, regulated by the Australian Securities and Investments Commission; Merrill Lynch (Hong Kong): Merrill Lynch (Asia Pacific) Limited, regulated by the Hong Kong Securities and Futures Commission (HKSFC); Merrill Lynch (Singapore): Merrill Lynch (Singapore) Pte Ltd, regulated by the Monetary Authority of Singapore (MAS); Merrill Lynch (Canada): Merrill Lynch Canada Inc, regulated by the Investment Industry Regulatory Organization of Canada; Merrill Lynch (Mexico): Merrill Lynch Mexico, SA de CV, Casa de Bolsa, regulated by the Comisión Nacional Bancaria y de Valores; Merrill Lynch (Argentina): Merrill Lynch Argentina SA, regulated by Comisión Nacional de Valores; BofAS Japan: BofA Securities Japan Co., Ltd., regulated by the Financial Services Agency; Merrill Lynch (Seoul): Merrill Lynch International, LLC Seoul Branch, regulated by the Financial Supervisory Service; Merrill Lynch (Taiwan): Merrill Lynch Securities (Taiwan) Ltd., regulated by the Securities and Futures Bureau; BofAS India: BofA Securities India Limited, regulated by the Securities and Exchange Board of India (SEBI); Merrill Lynch (Israel): Merrill Lynch Israel Limited, regulated by Israel Securities Authority; Merrill Lynch (DIFC): Merrill Lynch International (DIFC Branch), regulated by the Dubai Financial Services Authority (DFSA); Merrill Lynch (Brazil): Merrill Lynch S.A. Corretora de Títulos e Valores Mobiliários, regulated by Comissão de Valores Mobiliários; Merrill Lynch KSA Company: Merrill Lynch Kingdom of Saudi Arabia Company, regulated by the Capital Market Authority.
This information: has been approved for publication and is distributed in the United Kingdom (UK) to professional clients and eligible counterparties (as each is defined in the rules of the FCA and the PRA) by MLI (UK), which is authorized by the PRA and regulated by the FCA and the PRA - details about the extent of our regulation by the FCA and PRA are available from us on request; has been approved for publication and is distributed in the European Economic Area (EEA) by BofASE (France), which is authorized by the ACPR and regulated by the ACPR and the AMF; has been considered and distributed in Japan by BofAS Japan, a registered securities dealer under the Financial Instruments and Exchange Act in Japan, or its permitted affiliates; is issued and distributed in Hong Kong by Merrill Lynch (Hong Kong) which is regulated by HKSFC; is issued and distributed in Taiwan by Merrill Lynch (Taiwan); is issued and distributed in India by BofAS India; and is issued and distributed in Singapore to institutional investors and/or accredited investors (each as defined under the Financial Advisers Regulations) by Merrill Lynch (Singapore) (Company Registration No 198602883D). Merrill Lynch (Singapore) is regulated by MAS. Merrill Lynch Equities (Australia) Limited (ABN 65 006 276 795), AFS License 235132 (MLEA) distributes this information in Australia only to 'Wholesale' clients as defined by s.761G of the Corporations Act 2001. With the exception of Bank of America N.A., Australia Branch, neither MLEA nor any of its affiliates involved in preparing this information is an Authorised Deposit-Taking Institution under the Banking Act 1959 nor regulated by the Australian Prudential Regulation Authority. No approval is required for publication or distribution of this information in Brazil and its local distribution is by Merrill Lynch (Brazil) in accordance with applicable regulations. Merrill Lynch (DIFC) is authorized and regulated by the DFSA. Information prepared and issued by Merrill Lynch (DIFC) is done so in accordance with the requirements of the DFSA conduct of business rules. BofA Europe (Frankfurt) distributes this information in Germany and is regulated by BaFin, the ECB and the CBI. BofA Securities entities, including BofA Europe and BofASE (France), may outsource/delegate the marketing and/or provision of certain research services or aspects of research services to other branches or members of the BofA Securities group. You may be contacted by a different BofA Securities entity acting for and on behalf of your service provider where permitted by applicable law. This does not change your service provider. Please refer to the Electronic Communications Disclaimers for further information.
This information has been prepared and issued by BofAS and/or one or more of its non-US affiliates. The author(s) of this information may not be licensed to carry on regulated activities in your jurisdiction and, if not licensed, do not hold themselves out as being able to do so. BofAS and/or MLPF&S is the distributor of this information in the US and accepts full responsibility for information distributed to BofAS and/or MLPF&S clients in the US by its non-US affiliates. Any US person receiving this information and wishing to effect any transaction in any security discussed herein should do so through BofAS and/or MLPF&S and not such foreign affiliates. Hong Kong recipients of this information should contact Merrill Lynch (Asia Pacific) Limited in respect of any matters relating to dealing in securities or provision of specific advice on securities or any other matters arising from, or in connection with, this information. Singapore recipients of this information should contact Merrill Lynch (Singapore) Pte Ltd in respect of any matters arising from, or in connection with, this information. For clients that are not accredited investors, expert investors or institutional investors Merrill Lynch (Singapore) Pte Ltd accepts full responsibility for the contents of this information distributed to such clients in Singapore.
General Investment Related Disclosures:
Taiwan Readers: Neither the information nor any opinion expressed herein constitutes an offer or a solicitation of an offer to transact in any securities or other financial instrument. No part of this report may be used or reproduced or quoted in any manner whatsoever in Taiwan by the press or any other person without the express written consent of BofA Securities.
This document provides general information only, and has been prepared for, and is intended for general distribution to, BofA Securities clients. Neither the information nor any opinion expressed constitutes an offer or an invitation to make an offer, to buy or sell any securities or other financial instrument or any derivative related to such securities or instruments (e.g., options, futures, warrants, and contracts for differences). This document is not intended to provide personal investment advice and it does not take into account the specific investment objectives, financial situation and the particular needs of, and is not directed to, any specific person(s). This document and its content do not constitute, and should not be considered to constitute,

investment advice for purposes of ERISA, the US tax code, the Investment Advisers Act or otherwise. Investors should seek financial advice regarding the appropriateness of investing in financial instruments and implementing investment strategies discussed or recommended in this document and should understand that statements regarding future prospects may not be realized. Any decision to purchase or subscribe for securities in any offering must be based solely on existing public information on such security or the information in the prospectus or other offering document issued in connection with such offering, and not on this document.

Securities and other financial instruments referred to herein, or recommended, offered or sold by BofA Securities, are not insured by the Federal Deposit Insurance Corporation and are not deposits or other obligations of any insured depository institution (including, Bank of America, N.A.). Investments in general and, derivatives, in particular, involve numerous risks, including, among others, market risk, counterparty default risk and liquidity risk. No security, financial instrument or derivative is suitable for all investors. Digital assets are extremely speculative, volatile and are largely unregulated. In some cases, securities and other financial instruments may be difficult to value or sell and reliable information about the value or risks related to the security or financial instrument may be difficult to obtain. Investors should note that income from such securities and other financial instruments, if any, may fluctuate and that price or value of such securities and instruments may rise or fall and, in some cases, investors may lose their entire principal investment. Past performance is not necessarily a guide to future performance. Levels and basis for taxation may change.

Futures and options are not appropriate for all investors. Such financial instruments may expire worthless. Before investing in futures or options, clients must receive the appropriate risk disclosure documents. Investment strategies explained in this report may not be appropriate at all times. Costs of such strategies do not include commission or margin expenses.

BofA Securities is aware that the implementation of the ideas expressed in this report may depend upon an investor's ability to "short" securities or other financial instruments and that such action may be limited by regulations prohibiting or restricting "shortselling" in many jurisdictions. Investors are urged to seek advice regarding the applicability of such regulations prior to executing any short idea contained in this report.

Foreign currency rates of exchange may adversely affect the value, price or income of any security or financial instrument mentioned in this report. Investors in such securities and instruments effectively assume currency risk.

BofAS or one of its affiliates is a regular issuer of traded financial instruments linked to securities that may have been recommended in this report. BofAS or one of its affiliates may, at any time, hold a trading position (long or short) in the securities and financial instruments discussed in this report.

BofA Securities, through business units other than BofA Global Research, may have issued and may in the future issue trading ideas or recommendations that are inconsistent with, and reach different conclusions from, the information presented herein. Such ideas or recommendations may reflect different time frames, assumptions, views and analytical methods of the persons who prepared them, and BofA Securities is under no obligation to ensure that such other trading ideas or recommendations are brought to the attention of any recipient of this information.

In the event that the recipient received this information pursuant to a contract between the recipient and BofAS for the provision of research services for a separate fee, and in connection therewith BofAS may be deemed to be acting as an investment adviser, such status relates, if at all, solely to the person with whom BofAS has contracted directly and does not extend beyond the delivery of this report (unless otherwise agreed specifically in writing by BofAS). If such recipient uses the services of BofAS in connection with the sale or purchase of a security referred to herein, BofAS may act as principal for its own account or as agent for another person. BofAS is and continues to act solely as a broker-dealer in connection with the execution of any transactions, including transactions in any securities referred to herein.

Copyright and General Information:

Materials prepared by BofA Global Research personnel are based on public information. Facts and views presented in this material have not been reviewed by, and may not reflect information known to, professionals in other business areas of BofA Securities, including investment banking personnel. BofA Securities has established information barriers between BofA Global Research and certain business groups. As a result, BofA Securities does not disclose certain client relationships with, or compensation received from, such issuers. To the extent this material discusses any legal proceeding or issues, it has not been prepared as nor is it intended to express any legal conclusion, opinion or advice. Investors should consult their own legal advisers as to issues of law relating to the subject matter of this material. BofA Global Research personnel's knowledge of legal proceedings in which any BofA Securities entity and/or its directors, officers and employees may be plaintiffs, defendants, co-defendants or co-plaintiffs with or involving issuers mentioned in this material is based on public information. Facts and views presented in this material that relate to any such proceedings have not been reviewed by, discussed with, and may not reflect information known to, professionals in other business areas of BofA Securities in connection with the legal proceedings or matters relevant to such proceedings.

This information has been prepared independently of any issuer of securities mentioned herein and not in connection with any proposed offering of securities or as agent of any issuer of any securities. None of BofAS any of its affiliates or their research analysts has any authority whatsoever to make any representation or warranty on behalf of the issuer(s). BofA Global Research policy prohibits research personnel from disclosing a recommendation, investment rating, or investment thesis for review by an issuer prior to the publication of a research report containing such rating, recommendation or investment thesis.

Any information relating to the tax status of financial instruments discussed herein is not intended to provide tax advice or to be used by anyone to provide tax advice. Investors are urged to seek tax advice based on their particular circumstances from an independent tax professional.

The information herein (other than disclosure information relating to BofA Securities and its affiliates) was obtained from various sources and we do not guarantee its accuracy. This information may contain links to third-party websites. BofA Securities is not responsible for the content of any third-party website or any linked content contained in a third-party website. Content contained on such third-party websites is not part of this information and is not incorporated by reference. The inclusion of a link does not imply any endorsement by or any affiliation with BofA Securities. Access to any third-party website is at your own risk, and you should always review the terms and privacy policies at third-party websites before submitting any personal information to them. BofA Securities is not responsible for such terms and privacy policies and expressly disclaims any liability for them.

All opinions, projections and estimates constitute the judgment of the author as of the date of publication and are subject to change without notice. Prices also are subject to change without notice. BofA Securities is under no obligation to update this information and BofA Securities ability to publish information on the subject issuer(s) in the future is subject to applicable quiet periods. You should therefore assume that BofA Securities will not update any fact, circumstance or opinion contained herein.

Certain outstanding reports or investment opinions relating to securities, financial instruments and/or issuers may no longer be current. Always refer to the most recent research report relating to an issuer prior to making an investment decision.

In some cases, an issuer may be classified as Restricted or may be Under Review or Extended Review. In each case, investors should consider any investment opinion relating to such issuer (or its security and/or financial instruments) to be suspended or withdrawn and should not rely on the analyses and investment opinion(s) pertaining to such issuer (or its securities and/or financial instruments) nor should the analyses or opinion(s) be considered a solicitation of any kind. Sales persons and financial advisors affiliated with BofAS or any of its affiliates may not solicit purchases of securities or financial instruments that are Restricted or Under Review and may only solicit securities under Extended Review in accordance with firm policies.

Neither BofA Securities nor any officer or employee of BofA Securities accepts any liability whatsoever for any direct, indirect or consequential damages or losses arising from any use of this information.

Research Analysts

Global Commodity Research
BofA Europe (Madrid)

Francisco Blanch
Commodity & Deriv Strategist
BofA Europe (Madrid)
+34 91 514 3070
francisco.blanch@bofa.com

Michael Widmer
Commodity Strategist
MLI (UK)
+44 20 7996 0694
michael.widmer@bofa.com

Warren Russell, CFA
Commodity Strategist
BofAS
+1 646 855 5211
warren.russell@bofa.com

Danica Averion
Commodity Strategist
MLI (UK)
+44 20 7996 2325
danica_ana.averion@bofa.com