

## Oil Tracker: Record Low Financial Demand vs. Resilient Physical Demand

The Brent crude price continued sliding down over the last week to the lowest level since December 2021, with the disappointing US jobs report on Friday pushing Brent close to our \$70/bbl floor in tandem with the broader risk asset sell-off. An extension of OPEC+ production cuts till December helped to keep the floor under crude prices last week. Brent edged up on Monday as well on increasing risks to Gulf of Mexico oil production from the strengthening Tropical Storm Francine and on higher US SPR purchases.

Despite the macro-driven selloff, our trackable net supply decreased by -0.6mb/d last week on lower Russia and Canada production and on a moderate recovery in our China demand nowcast. In contrast to stronger physical demand, oil financial demand dropped to its new all-time low, and has plummeted by a massive average 7mb/d over the past two months. Together with the tightening physical market, any normalization from the currently extremely low speculative positioning and sizable undervaluation of the Brent 1M/36M timespread should help crude prices to recover further, and we expect Brent to average at \$77/bbl next quarter. However, with the risks to our \$70-85 range still skewed to the downside and a broadly anticipated 2025 surplus, positioning and valuation may remain lower for longer.

**Yulia Zhestkova Grigsby**  
+1(646)446-3905 |  
yulia.grigsby@gs.com  
Goldman Sachs & Co. LLC

**Daan Struyven**  
+1(212)357-4172 |  
daan.struyven@gs.com  
Goldman Sachs & Co. LLC

**Callum Bruce, CFA**  
+1(212)902-3053 |  
callum.bruce@gs.com  
Goldman Sachs & Co. LLC

### Chart of the Week

入群：qxcaijing2023

## 读者群福利：

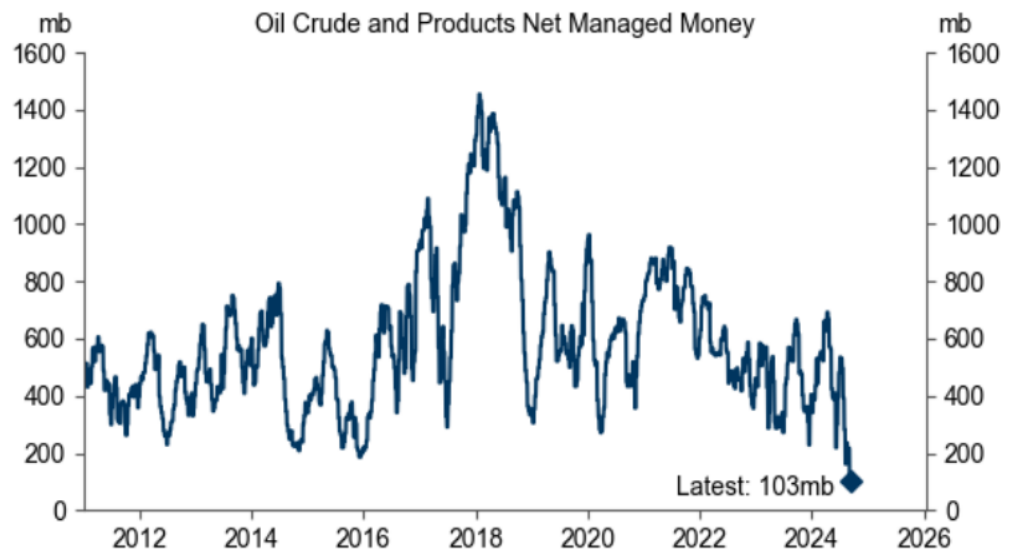
- 1、每日微信群内分享证券报、**华尔街日报**、金融时报
- 2、每日分享热门研报、热门会议纪要及优质资讯
- 3、不定时分享**最新热门书籍**、**外刊杂志**
- 5、所有内容均为内部学习交流使用，不可用作商业用途

**扫一扫加小助手微信，马上入群~**



专业财经分享群

### Exhibit 1: Oil Net Managed Money Positioning Plummeted to Its New All Time Low Driven by Crude and Middle Distillates



Source: CFTC, Goldman Sachs Global Investment Research

#### Key Trends

- Our chart of the week shows that oil net managed money positioning dropped to its new all-time low in the data starting from 2011 — 58mb below its month ago record-low.
  - Crude and middle distillates positioning drove the decline in oil financial demand, with gasoline positioning holding steady (in the CFTC's latest report capturing positioning up till last Tuesday).
  - Financial demand plummeted by over 7mb/d over the last two months, and although it tends to mean revert historically, positioning may remain depressed in the absence of a catalyst on broader expectations of softer 2025 balances.
- Further on the positive side for prices:
  - Our Russia production nowcast decreased by 0.2mb/d last week as seaborne exports decreased, largely driven by maintenance at an offshore Arctic field.
  - Our Canada oil production nowcast edged down last week, but is still roughly in line with our August expectations.
  - Our China oil demand nowcast increased by 0.3mb/d last week in the first early September reading on draws in products stocks and higher refinery runs.
    - The recent pick-up in China traffic congestion index also implies that July and August weather-related activity weakness is reversing.
    - Our China economists expect China GDP growth to pick up in 2024H2 as the government remains committed to the “around 5%” GDP target.
  - Our OECD Europe oil demand nowcast remained at 14.2mb/d last week, 0.6mb/d above IEA July expectations on strong gasoline and jet fuel demand.

- The steep front-driven selloff increased Brent 1M/36M undervaluation to \$5-10/bbl while our OECD oil commercial stocks nowcast edged down last week.
  - Our tracking of visible global oil commercial stocks decreased by 21mb last week on larger EM draws on water.
- On the negative side for prices:
  - The Canada oil and gas rig count increased by 25 in August (or by 13%) from July.
  - Our Libya production nowcast remained in line with our August expectations of 1.1mb/d, while some tankers were reportedly loading crude from storage and some oil fields started to receive orders to bring back production.
    - Libya's eastern and western governments reportedly moved closer to an agreement last week, and we now expect Libya oil production to recover by early October.
    - However, Murban prompt timespreads remained high last week as Libya production disruptions put an upside pressure on the prices of other regional light grades.
  - Despite some press reports indicating fading chances of a ceasefire in Israel-Hamas war, the call options implied volatility skew dropped to its year-to-date low.

#### Exhibit 2: Our Trackable Net Supply Decreased by 0.6mb/d Week-on-Week

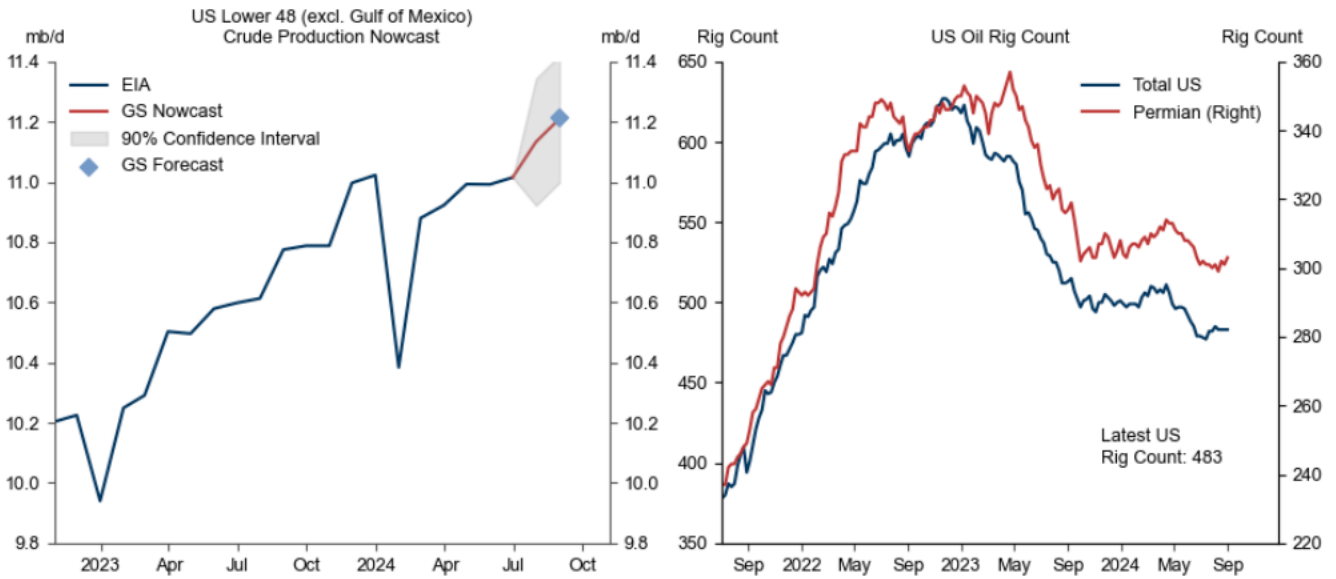
Indicator	Current value	Change from last week	Change from 4 weeks ago
<b>Supply</b>			
US Lower 48 crude nowcast (mb/d)	11.2	0	0
Oil rig count	483	0	-2
Canada liquids nowcast (mb/d)	6.1	-0.1	0.1
Russia liquids nowcast (mb/d)	10.3	-0.2	-0.7
Iran crude nowcast (mb/d)	3.6	0	0.1
Libya crude nowcast (mb/d)	1.1	0	-0.1
<b>Demand</b>			
China oil (mb/d)	16.1	0.3	0.3
OECD Europe oil	14.2	0	0.4
<b>Total change in trackable imbalance, Supply-Demand (mb/d)</b>		<b>-0.6</b>	<b>-1.3</b>
<b>Inventories</b>			
OECD commercial stocks (mb)	2815	-3	-9
Global commercial stocks (mb)	4787	-21	-25
<b>Timespreads</b>			
Brent 1M/36M gap with fair value (pp)	-14	-3	-10
Average crude basis (% change in pp)	1.4	-0.5	0.3
Average crude prompt timespread (% change in pp)	0.9	0.0	-0.4
<b>Oil net managed money positioning (mb)</b>	<b>103</b>	<b>-113</b>	<b>-58</b>

Our 1- and 4-week changes are based on the real-time values recorded as of 1 week or 4 weeks ago. Red color highlights changes in our trackable imbalance that are bullish for prices, blue color highlights changes that are bearish for prices.

Source: Goldman Sachs Global Investment Research

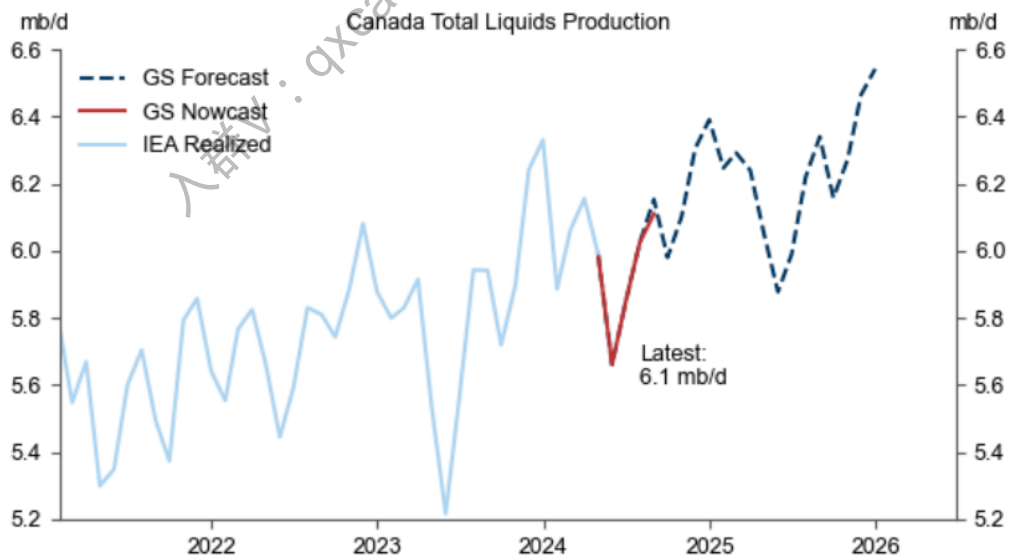
### Supply

**Exhibit 3: Our US Lower 48 (excl Gulf of Mexico) Crude Production Nowcast Remained at 11.2mb/d, in Line With Our August Expectation; the US Oil Rig Count Remained Unchanged at 483**



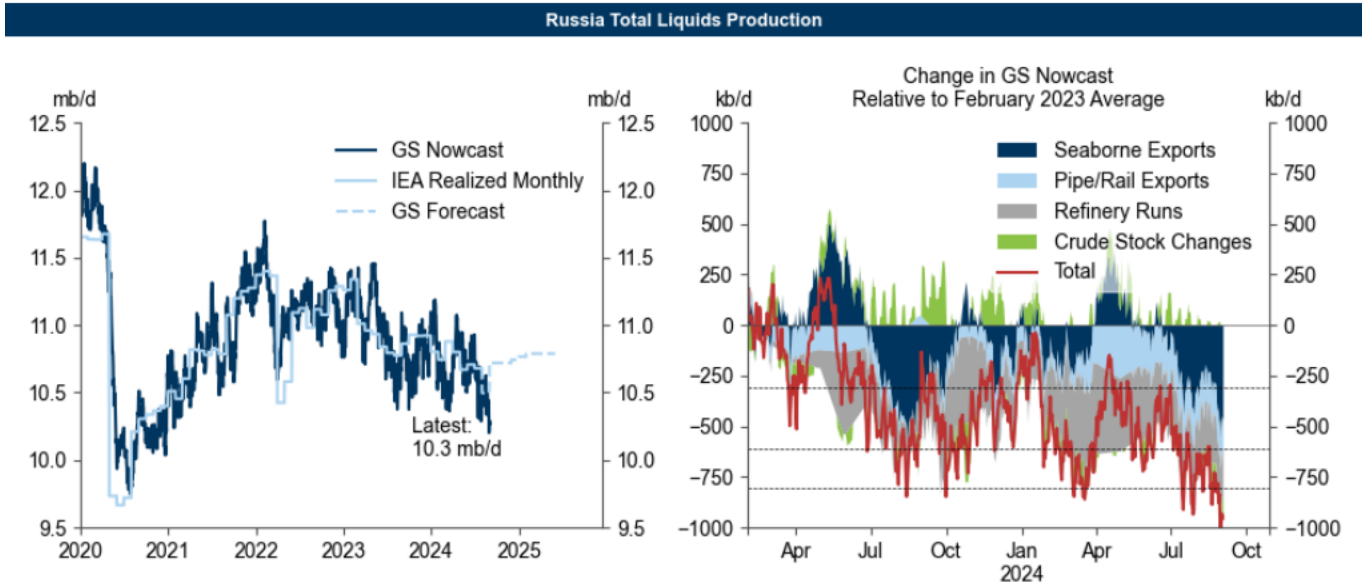
Source: EIA, Genscape, Baker Hughes, Haver Analytics, Bloomberg, Primary Vision, Goldman Sachs Global Investment Research

**Exhibit 4: Our Canada Total Liquids Production Nowcast Edged Down by 0.1mb/d to 6.1mb/d Last Week but Remains Roughly in Line With Our August Expectation**



Source: IEA, AER, EIA, Kpler, IIR, Goldman Sachs Global Investment Research

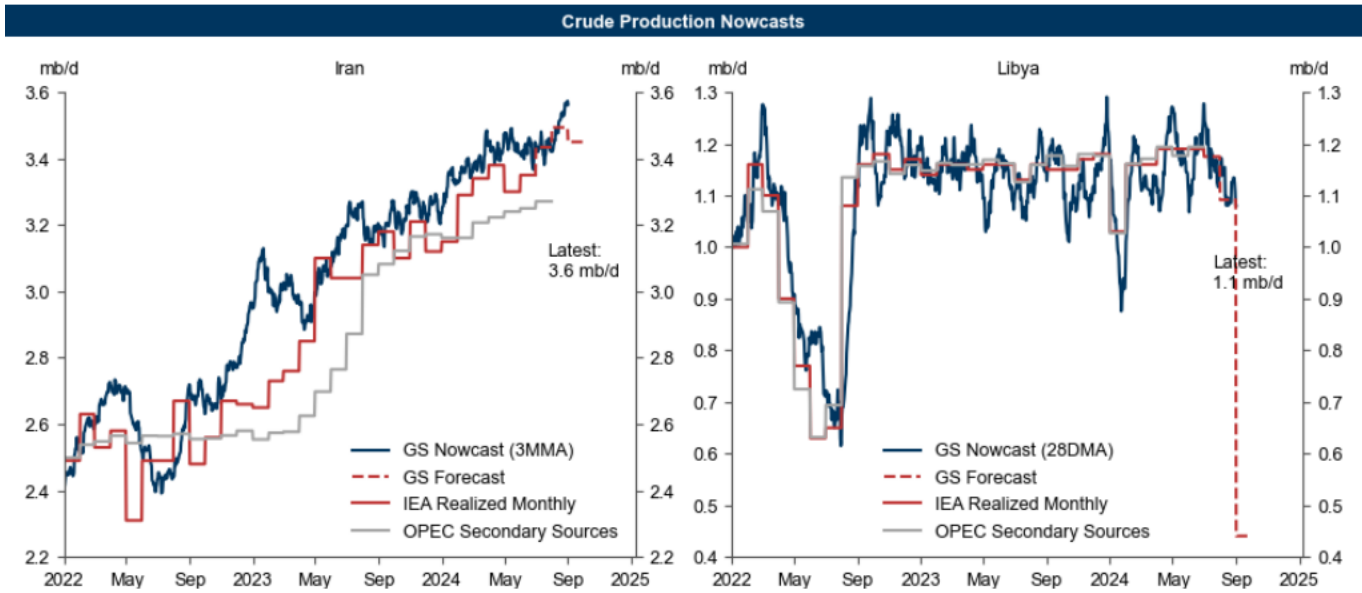
**Exhibit 5: Our Russia Production Nowcast Decreased by 0.2mb/d to 10.3mb/d Last Week (and Is Now 0.4mb/d Below Our September Expectation) on Lower Seaborne Exports**



Nowcast is a 28-day moving average. Dashed lines on the right show pledged cuts of 0.5, 0.8, and 1.0mb/d cumulatively vs. revised February 2023 level. The combination of output (0.5mb/d) and export (0.5mb/d) cut pledges creates uncertainty about the size of the total supply cut pledge. The war may reduce the ability to measure maintenance and refinery runs in Russia. We have limited visibility of stock changes from the satellite data as a large share of Russia's stocks is stored within the pipeline system. As a result, we may underestimate reallocation of crude to stocks after the recent refinery attacks, and thus understate production.

Source: IEA, Petro-Logistics, Kpler, IIR, Goldman Sachs Global Investment Research

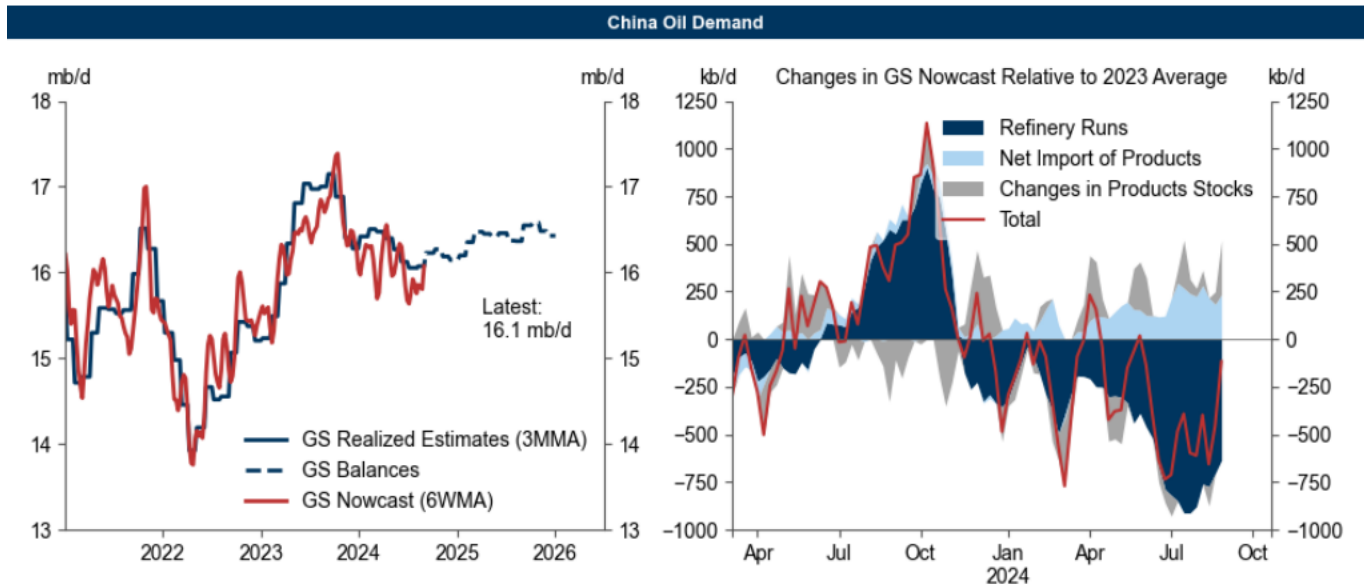
**Exhibit 6: Our Iran Crude Production Nowcast Remained at 3.6mb/d and 1.1mb/d Last Week, Respectively (Libya Production Disruptions Are Captured in Our September Forecast)**



Source: Kpler, JODI, GTT, IEA, OPEC, Goldman Sachs Global Investment Research

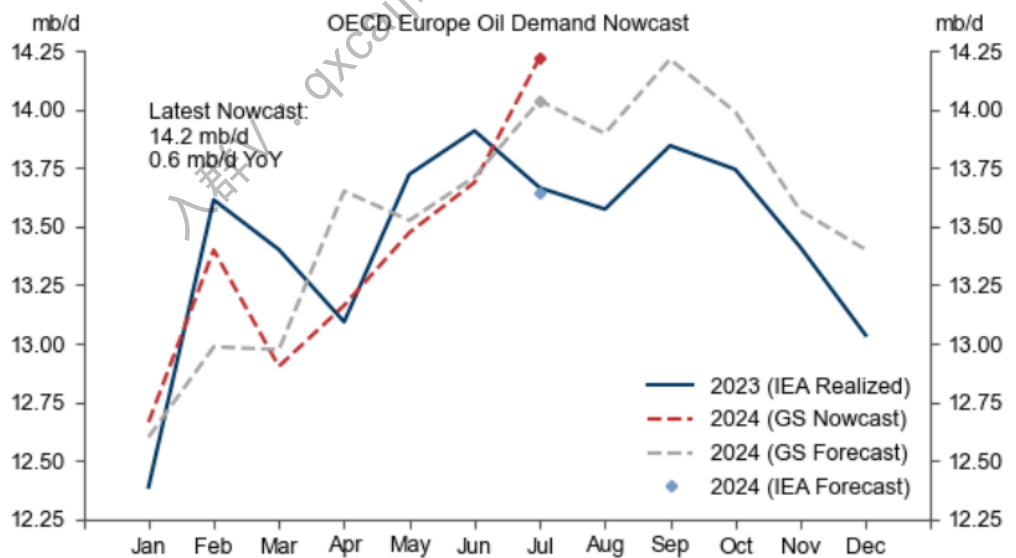
**Demand**

**Exhibit 7: Our China Oil Demand Increased by 0.3mb/d Last Week to 16.1mb/d on Larger Draws in Products Stocks, and Is Now in Line With Our September Expectations**



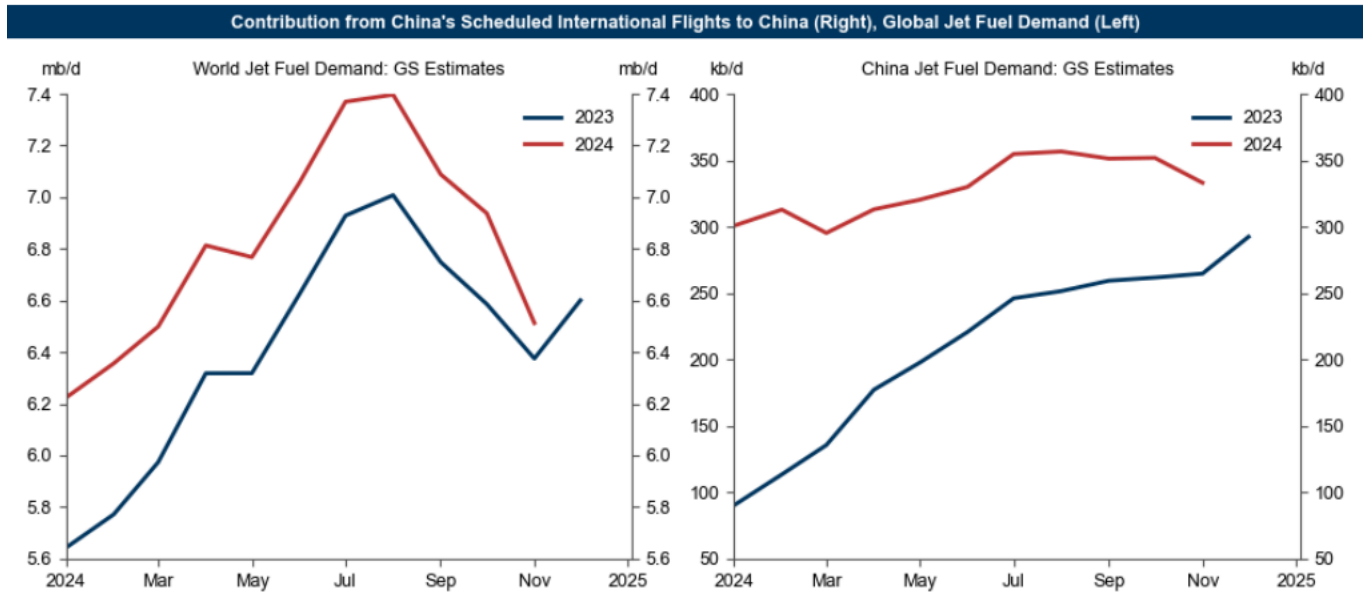
Source: IEA, S&P, Kpler, GTT, Oilchem, MySteel, Bloomberg, Goldman Sachs Global Investment Research

**Exhibit 8: Our OECD Europe Oil Demand Nowcast Remained Unchanged Last Week at 14.2mb/d (0.2mb/d and 0.6mb/d Above Our and IEA July Expectations, Respectively)**



Source: IEA, Goldman Sachs Global Investment Research

**Exhibit 9: We Expect Global Jet Fuel Demand to Decrease Sharply Next Month, With China Jet Fuel Demand Moving Sideways and Edging Down Later in the Fall**

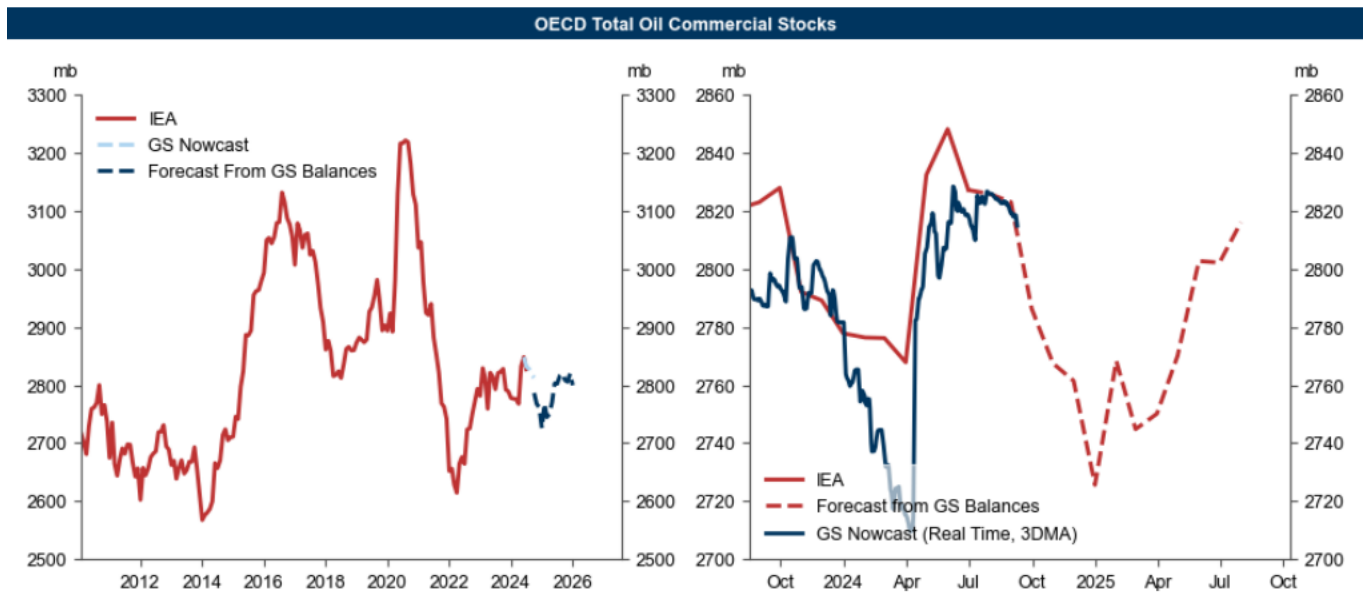


RHS: Left axis is scaled by 2 because only half of the total fuel demand from international China flights enters China demand.

Source: OAG, IEA, JODI, Goldman Sachs Global Investment Research

### Inventories

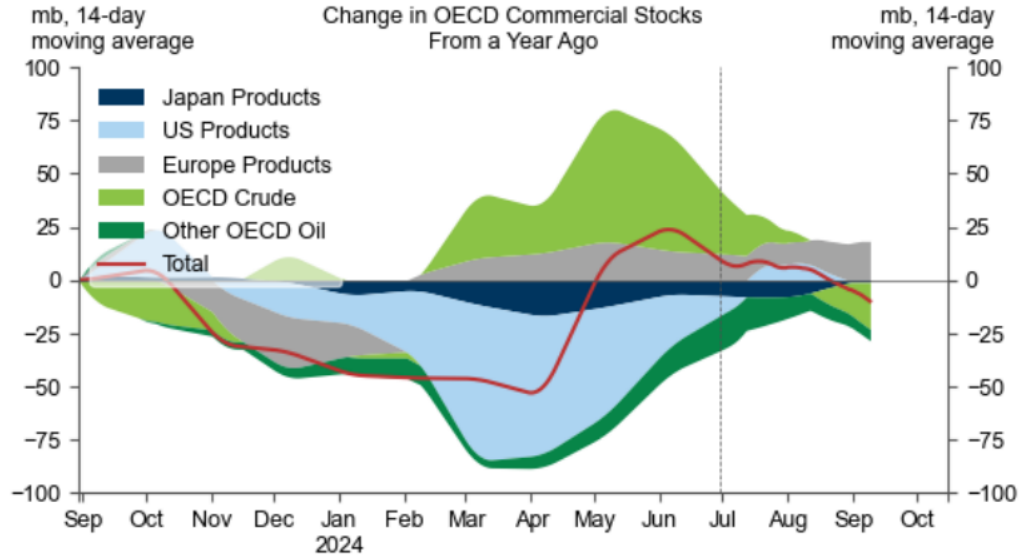
**Exhibit 10: Our OECD Total Oil Commercial Stocks Nowcast (as of Early September) Decreased by 3mb Last Week to 2,815mb, and Is Now 29mb Above Our End-of-September Balance Forecast of 2,786mb**



Source: IEA, Kpler, DOE, Euroilstocks, ARA PJK, PAJ, Haver, Goldman Sachs Global Investment Research



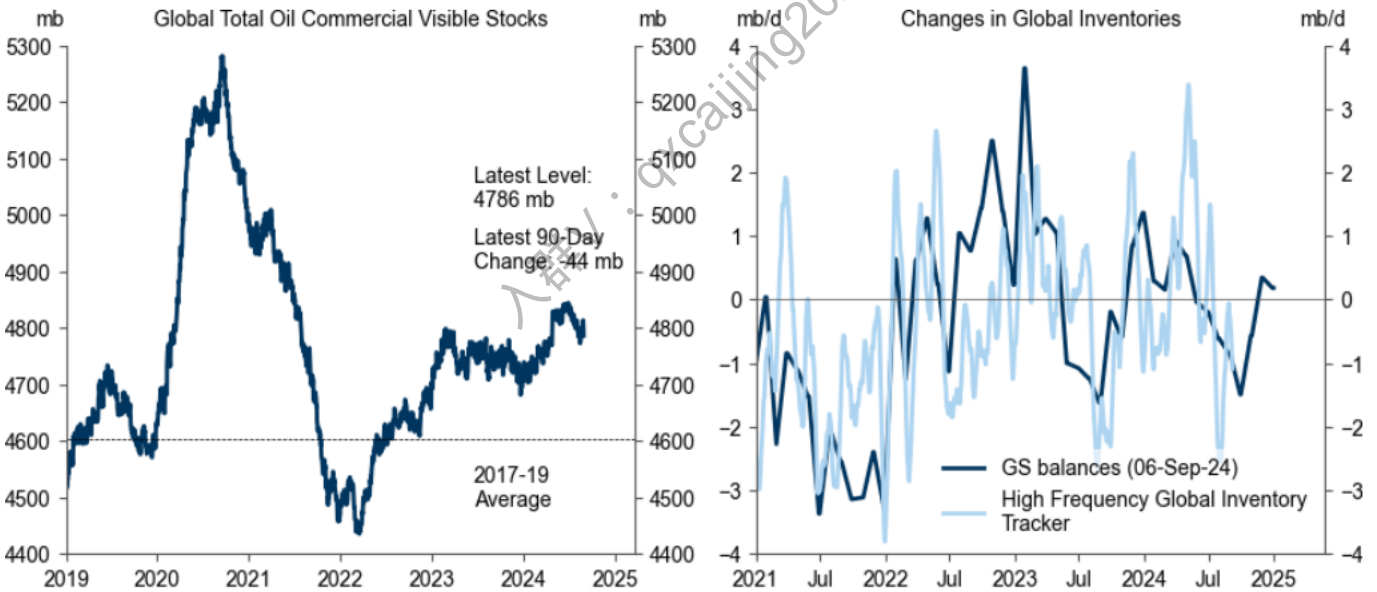
**Exhibit 11: Our OECD Commercial Stocks Nowcast Is Down 10mb From Its September 2023 Level**



The dotted line indicates the latest realized observation from the IEA (end of June).

Source: IEA, Kpler, DOE, Euroilstocks, PAJ, ARA PJK, Haver, Goldman Sachs Global Investment Research

**Exhibit 12: Our Tracking of Global Oil Commercial Stocks Drew by 0.5mb/d Over the Last 90 Days**



LHS: The chart shows the sum of all data available through the coverage period of the last US DoE Weekly Petroleum Report, and assumes a few datapoints not reported yet remain stable (by forward-filling). RHS: GS Balance series is a 28-day moving average of monthly balances. The high frequency global inventory tracker is a 28-day change, 14-day moving average that uses all visible crude and product stocks data with rescalings to estimate invisible stocks. Areas of coverage include the US, ARA (Antwerp-Rotterdam-Amsterdam) in Europe, Fujairah in the Middle East, and Singapore and the locations covered by Longzhong in China.

Source: Kpler, DOE, Euroilstocks, ARA PJK, PAJ, Singapore Enterprise, Fujairah, OilChem, Goldman Sachs Global Investment Research

**Exhibit 13: Global Total Oil Commercial Visible Stocks Decreased by 21mb (0.4%) Last Week on EM Draws on Water and Are Now Down 26mb (-0.6%) From 4 Weeks Ago (Although Uncertainty Around Satellite Data Is Always Significant)**

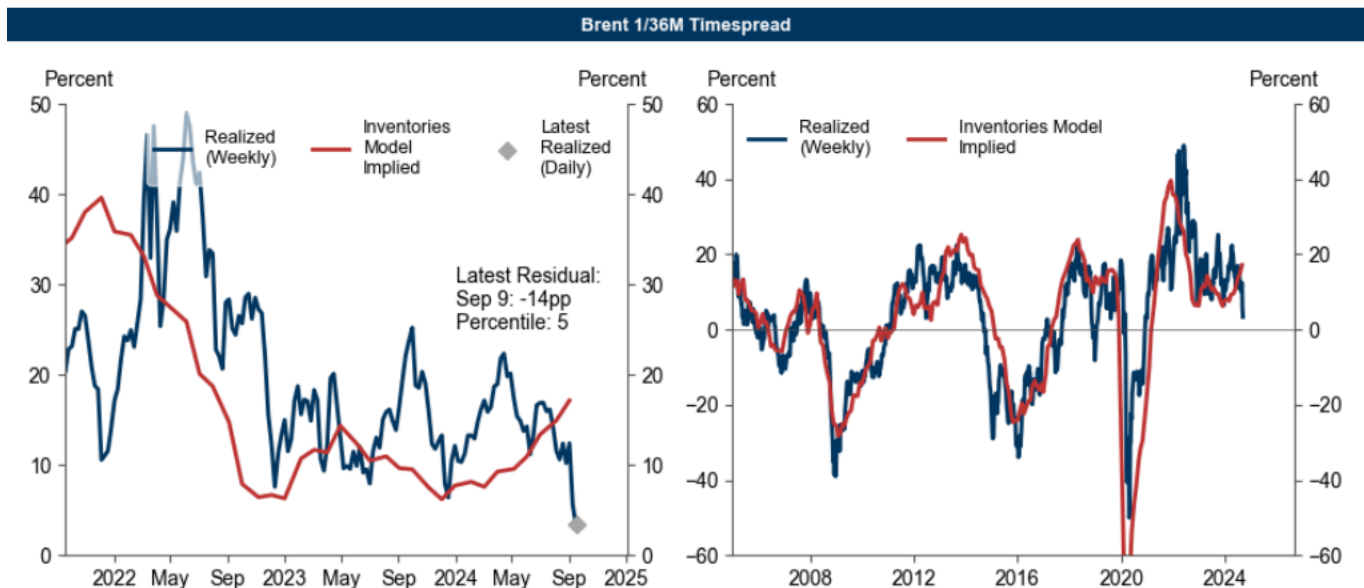
Global Total Oil Commercial Visible Stocks						
Timely Stocks Data	Region	Change From Week Ago		Change From 4 Weeks Ago		Last Date of Most Recent Coverage
		in mb	in %	in mb	in %	
Kpler Crude	DM	-8	-0.9	-13	-1.4	9/6/2024
	EM	-3	-0.2	-3	-0.2	9/6/2024
DOE Products	US	-1	-0.1	-9	-1.0	8/30/2024
Euroilstocks Products	Europe	0	0.0	0	0.0	7/31/2024
ARA Products	Netherlands and Belgium	-1	-2.3	3	6.3	9/1/2024
PAJ Products	Japan	0	0.8	3	6.1	8/31/2024
Singapore Enterprise Products	Singapore	1	3.3	0	0.5	9/1/2024
Fujairah Products	UAE	-1	-5.3	0	0.7	9/2/2024
Longzhong Products	China	-1	-0.4	-7	-3.1	9/4/2024
Kpler Oil on Water	DM	3	2.1	14	10.8	9/6/2024
	EM	-11	-2.4	-15	-3.2	9/6/2024
Total Landed Crude		-11	-0.5	-17	-0.7	
Total Landed Products		-2	-0.1	-9	-0.5	
Total Oil on Water		-8	-1.3	0	0.0	
<b>Total Oil</b>		<b>-21</b>	<b>-0.4</b>	<b>-26</b>	<b>-0.5</b>	

The chart shows all the visible stocks released through this week.

Source: Kpler, DOE, Euroilstocks, ARA PJK, PAJ, Singapore Enterprise, Fujairah, OilChem, Goldman Sachs Global Investment Research

### Prices

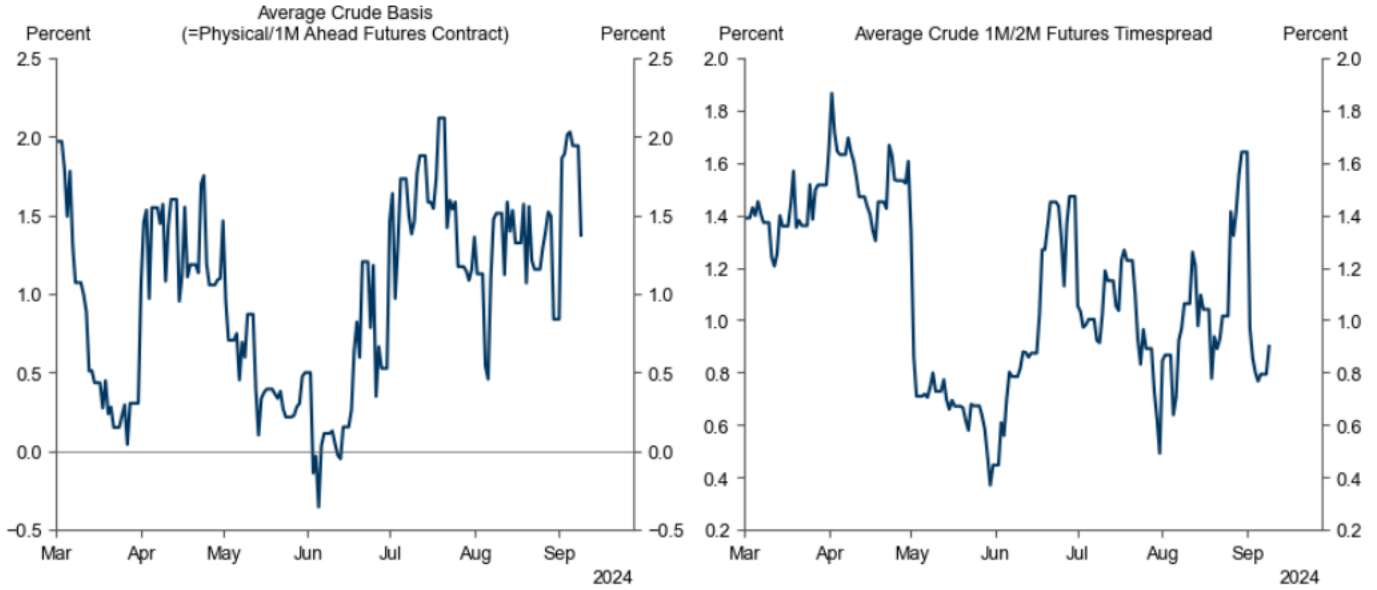
**Exhibit 14: The Gap Between the Brent 1/36M Timespread and Its Inventory-Implied Fair Value Decreased to the Lowest Decile**



We report the percentile of the timespread's residual in a sample from January 1st, 2005 till the most recent observation.

Source: IEA, CME, Goldman Sachs Global Investment Research

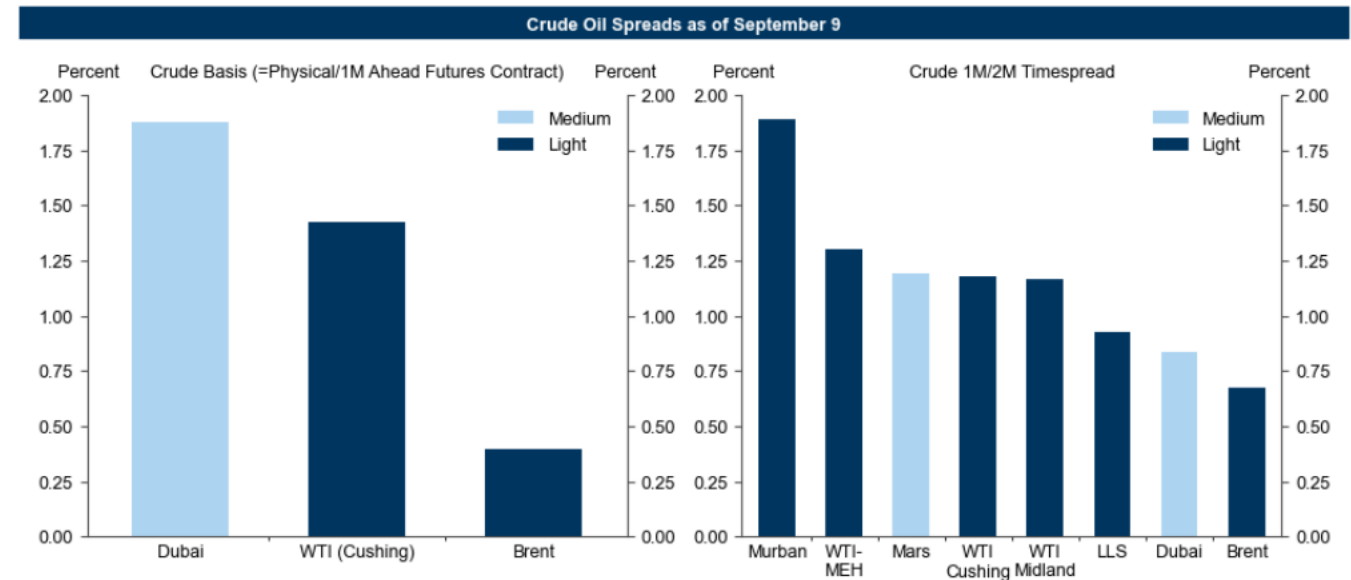
**Exhibit 15: The Average Crude Basis Decreased by -0.5pp Last Week, While the Average Prompt Timespread Remained Unchanged**



Basis represents the difference (in % of 1M ahead futures) between spot physical crude futures and 1M ahead financial futures. We include Brent, Dubai, and WTI in crude basis on the left panel and Brent, Dubai, WTI, Mars, Midland, LLS, and WTI-MEH in 1M/2M timespreads on the right panel. We construct average crude spreads by first taking an unweighted average of crude types within a region and then taking a production-weighted average across regions.

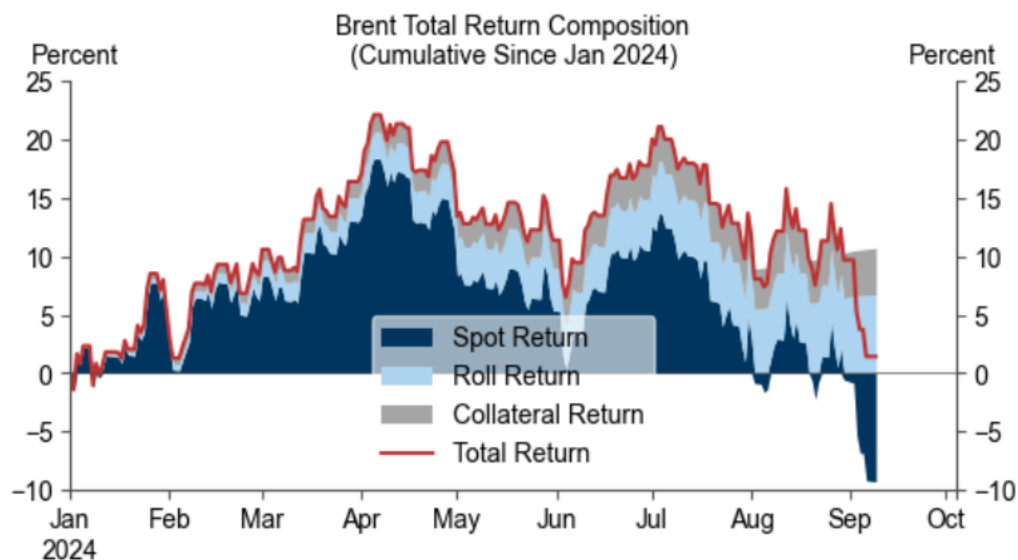
Source: Platts, CME, Goldman Sachs Global Investment Research

**Exhibit 16: Libya Production Disruptions Continued to Support a Strong Murban Prompt Timespread Last Week**



We measure WTI Cushing crude basis as WTI Calendar Delta in percent of 1M ahead WTI futures.

Source: Platts, CME, Goldman Sachs Global Investment Research

**Exhibit 17: The Total Return on Brent Futures Dropped to 1.4% Year-to-Date After the Last Week's Selloff**

The collateral return corresponds to the interest earned on a hypothetical fully collateralized contract position on Brent futures.

Source: Platts, Haver, ICE, Goldman Sachs Global Investment Research

## Performance of Open Trade Recommendations

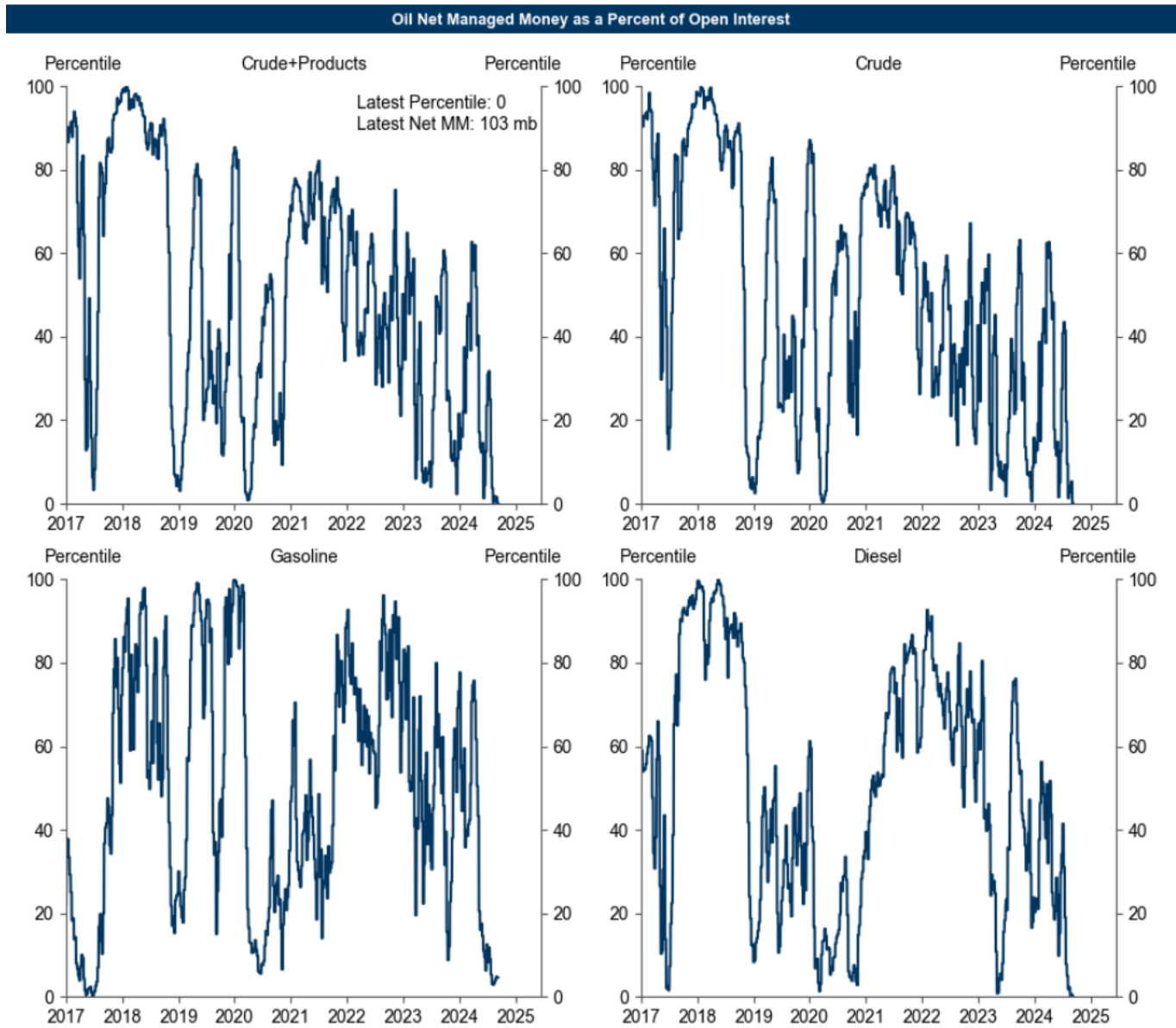
**Exhibit 18: We Continue to Recommend a Long Position in Distillate Cracks Reflecting Our Structurally Bullish View on Refining**

Open Trade Performances (\$/bbl)						
Trade Name	Trade Specification	Opening Date	Value at Opening	Current Level	Change Since Opening	7-Day Change
<b>Structurally Strong Diesel</b>	Long Dec-24 NW European (ARA) Gasoil-Brent Cracks	2024-03-11	23.58	16.71	-6.86	-1.12
Performance of Trades Closed Since Jan 1st 2024 (\$/bbl)						
Trade Name	Trade Specification	Opening Date	Value at Opening	Closing Date	Value at Closing	Profit at Closing
<b>Summer Gasoline Tightness</b>	Long summer (2Q24 & 3Q24) EBOB gasoline-Brent cracks	2023-10-03	11.44	2024-02-06	17.28	5.84
<b>OPEC Range Summer24</b>	Short Jun24 Brent \$70 put, long \$80/\$90 call spread	2023-12-17	-0.22	2024-02-25	2.29	2.51
<b>Constructive Crude</b>	Long Dec24 Brent	2022-09-27	71.25	2024-03-13	79.69	8.44
<b>OPEC Range Winter24 Short Put</b>	Short Dec24 Brent \$70 put	2024-02-23	4.26	2024-03-13	3.07	1.19
<b>Summer24 Deficit</b>	Long Aug/Sep-24 Brent spreads	2023-11-16	0.26	2024-04-07	0.96	0.70
<b>OPEC Range Winter24</b>	Long Dec24 Brent \$80/\$90 call spread	2024-02-23	3.30	2024-06-25	4.43	1.13

Source: Goldman Sachs Global Investment Research

Positioning

Exhibit 19: Total Oil Net Managed Money Plummeted to Its New All-Time Low of 103mb (in a Sample From 2011)

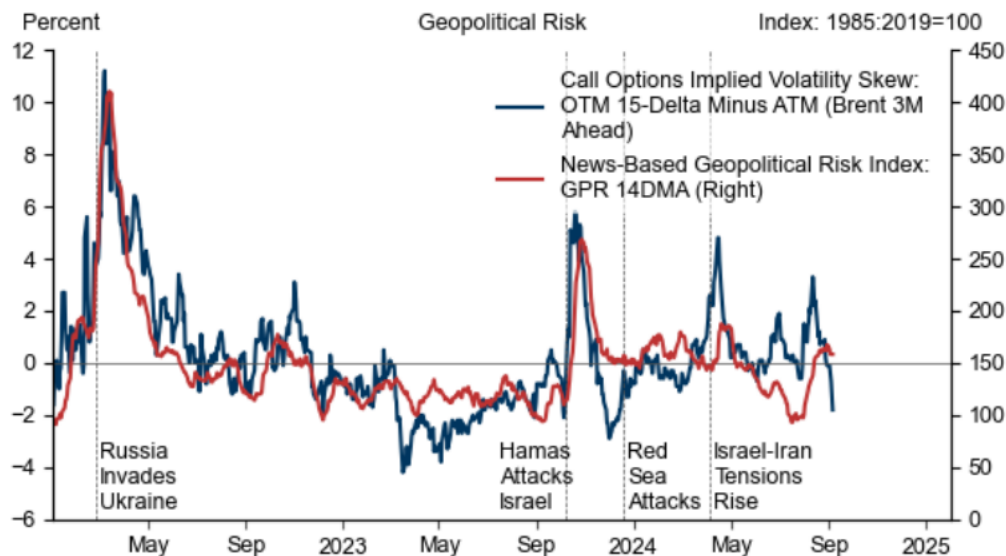


We report the percentile of net managed money, not including other reportables, for Brent, WTI, Nymex HO, Nymex RBOB, and ICE Gasoil as a percent of open interest in a sample from January 1st, 2017 till the most recent observation.

Source: CFTC, Refinitiv Eikon, Goldman Sachs Global Investment Research

## Geopolitical Risks

**Exhibit 20: The Call Implied Volatility Skew Dropped to Its Year-to-Date Low Despite Persisting Tensions in the Middle East**



Source: Federal Reserve Board, ICE, Goldman Sachs Global Investment Research

## Methodology Notes for GS High Frequency Oil Indicators

- 1. Russia total liquids production nowcast:** Our Russia supply nowcast estimates total liquids production as the sum of refinery runs, crude stock changes at ports and refineries, and crude seaborne and pipeline exports (latest methodology [here](#)).
- 2. US Lower 48 crude production nowcast:** Our Lower 48 crude production nowcast includes all crude production from the US excluding Alaska and the Gulf of Mexico. We estimate crude production using daily pipeline-implied flows from Genscape, equipment needed to fracture oil wells (frac spreads), and the gap between official EIA and pipeline-based production estimates (latest methodology [here](#).)
- 3. Iran crude production nowcast:** Our Iran supply nowcast estimates crude production as the sum of tracked crude exports, untracked crude exports, refinery intake of crude, and changes in crude inventories (latest methodology [here](#)).
- 4. Libya crude production nowcast:** Our Libya supply nowcast estimates crude production as the sum of tracked crude exports, refinery intake of crude, and changes in crude inventories.
- 5. Canada total liquids production nowcast:** Our Canada supply nowcast estimates total liquids production using changes in Alberta production and changes in implied production defined as the sum of exports, refinery runs, and changes in crude inventories (latest methodology [here](#))
- 6. OPEC model implied probability:** Our estimated probability of OPEC production decision is based on an unweighted average of five ordered multinomial logit models that regress OPEC decisions to decrease, hold, or increase production on

OECD commercial stocks, cyclical oil price moves, Saudi's market share, and speculative positioning (latest methodology [here](#)).

- 7. China demand:** We perform a bottom-up nowcast of China oil products demand as the sum of refinery runs, net products imports, and product stock draws. We model monthly changes in S&P refinery runs as a function of monthly changes in refinery utilization rates from Mysteel, and monthly changes in capacity utilization from IIR. We then estimate model-implied 4-week changes in weekly refinery runs from 4-week changes in the 4-week moving average of refinery utilization rates and slow-moving changes in capacity. We initialize our refinery runs nowcast to match the level of "realized" refinery runs over the last 2 years. Similarly, we model changes in GTT net imports of products as a function of monthly changes in Kpler net imports of the corresponding products. We smooth the final nowcast using a 2-week moving average (latest methodology [here](#)).
- 8. OECD Europe demand:** We estimate OECD Europe demand based on demand in the EU4 (Germany, France, Spain and Italy), and incorporate jet demand using our jet fuel demand model. Our nowcast uses timely inputs on oil markets (e.g. refinery runs), macro activity (e.g. PMIs), fuel retail sales, preliminary national oil demand releases, and flight schedules (latest methodology [here](#)).
- 9. Jet demand:** Our methodology for measuring jet fuel demand uses global commercial flight schedule data combined with our aircraft efficiency database. We further calibrate this model on monthly IEA/JODI/Woodmac jet-type kerosene demand data for the OECD and a handful of other countries to estimate non-commercial flight demand (latest methodology [here](#)).
- 10. Global total oil commercial visible stocks:** We add up all visible oil stocks for both crude and products without any rescaling. Our data includes onshore crude stocks, crude oil on water, products on water, and measures of products stocks at various locations. The locations are the US, 16 European Majors, ARA (Antwerp-Rotterdam-Amsterdam) in Europe, Japan, Fujairah in the Middle East, and Singapore and the locations covered by Longzhong in China. The China Longzhong stocks cover all stocks except for those at SOE refineries, gas stations, and the national strategic reserves.
- 11. OECD commercial stocks:** Our OECD commercial stocks nowcast consists of several region- and product-specific models, which regress IEA monthly historical data on high frequency stocks measures. We model monthly changes in OECD commercial stocks components using relevant high-frequency stocks and trade data, seasonality, Covid effects, and lagged stock changes for products (latest methodology [here](#)).
- 12. Brent timespreads:** We estimate timespreads using our OECD commercial stocks nowcast and our OECD demand forecast. We estimate Brent 1/36M timespreads based on the historical relationship with 1-4M ahead OECD commercial stocks as days of demand covered (DoDC) vs their 5-yr average after accounting for the impact of 3-Year US Treasury yields. We keep stocks as DoDC vs their 5-yr average constant over the next 1-4 months at the most recent observation based on our nowcast (latest methodology [here](#)). Finally, we remove March 2020-February 2023

observations from our sample to calculate the 5-year average for OECD commercial stocks DoDc.

- 13. Release lags for nowcasts using Kpler exports and inventories data:** Given the frequent and sizable revisions to the early vintages of high frequency data, we wait 3 and 7 days before publishing nowcasts using high frequency inventories and exports Kpler data, respectively.



# Disclosure Appendix

## Reg AC

We, Yulia Zhestkova Grigsby, Daan Struyven and Callum Bruce, CFA, hereby certify that all of the views expressed in this report accurately reflect our personal views, which have not been influenced by considerations of the firm's business or client relationships.

Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

## Disclosures

### Regulatory disclosures

#### Disclosures required by United States laws and regulations

See company-specific regulatory disclosures above for any of the following disclosures required as to companies referred to in this report: manager or co-manager in a pending transaction; 1% or other ownership; compensation for certain services; types of client relationships; managed/co-managed public offerings in prior periods; directorships; for equity securities, market making and/or specialist role. Goldman Sachs trades or may trade as a principal in debt securities (or in related derivatives) of issuers discussed in this report.

The following are additional required disclosures: **Ownership and material conflicts of interest:** Goldman Sachs policy prohibits its analysts, professionals reporting to analysts and members of their households from owning securities of any company in the analyst's area of coverage. **Analyst compensation:** Analysts are paid in part based on the profitability of Goldman Sachs, which includes investment banking revenues. **Analyst as officer or director:** Goldman Sachs policy generally prohibits its analysts, persons reporting to analysts or members of their households from serving as an officer, director or advisor of any company in the analyst's area of coverage. **Non-U.S. Analysts:** Non-U.S. analysts may not be associated persons of Goldman Sachs & Co. LLC and therefore may not be subject to FINRA Rule 2241 or FINRA Rule 2242 restrictions on communications with subject company, public appearances and trading securities held by the analysts.

#### Additional disclosures required under the laws and regulations of jurisdictions other than the United States

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. **Australia:** Goldman Sachs Australia Pty Ltd and its affiliates are not authorised deposit-taking institutions (as that term is defined in the Banking Act 1959 (Cth)) in Australia and do not provide banking services, nor carry on a banking business, in Australia. This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act, unless otherwise agreed by Goldman Sachs. In producing research reports, members of Global Investment Research of Goldman Sachs Australia may attend site visits and other meetings hosted by the companies and other entities which are the subject of its research reports. In some instances the costs of such site visits or meetings may be met in part or in whole by the issuers concerned if Goldman Sachs Australia considers it is appropriate and reasonable in the specific circumstances relating to the site visit or meeting. To the extent that the contents of this document contains any financial product advice, it is general advice only and has been prepared by Goldman Sachs without taking into account a client's objectives, financial situation or needs. A client should, before acting on any such advice, consider the appropriateness of the advice having regard to the client's own objectives, financial situation and needs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests and a copy of Goldman Sachs' Australian Sell-Side Research Independence Policy Statement are available at: <https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html>. **Brazil:** Disclosure information in relation to CVM Resolution n. 20 is available at <https://www.gs.com/worldwide/brazil/area/gir/index.html>. Where applicable, the Brazil-registered analyst primarily responsible for the content of this research report, as defined in Article 20 of CVM Resolution n. 20, is the first author named at the beginning of this report, unless indicated otherwise at the end of the text. **Canada:** This information is being provided to you for information purposes only and is not, and under no circumstances should be construed as, an advertisement, offering or solicitation by Goldman Sachs & Co. LLC for purchasers of securities in Canada to trade in any Canadian security. Goldman Sachs & Co. LLC is not registered as a dealer in any jurisdiction in Canada under applicable Canadian securities laws and generally is not permitted to trade in Canadian securities and may be prohibited from selling certain securities and products in certain jurisdictions in Canada. If you wish to trade in any Canadian securities or other products in Canada please contact Goldman Sachs Canada Inc., an affiliate of The Goldman Sachs Group Inc., or another registered Canadian dealer. **Hong Kong:** Further information on the securities of covered companies referred to in this research may be obtained on request from Goldman Sachs (Asia) L.L.C. **India:** Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (India) Securities Private Limited, Research Analyst - SEBI Registration Number INH000001493, 951-A, Rational House, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400 025, India, Corporate Identity Number U74140MH2006FTC160634, Phone +91 22 6616 9000, Fax +91 22 6616 9001. Goldman Sachs may beneficially own 1% or more of the securities (as such term is defined in clause 2 (h) the Indian Securities Contracts (Regulation) Act, 1956) of the subject company or companies referred to in this research report. Investment in securities market are subject to market risks. Read all the related documents carefully before investing. Registration granted by SEBI and certification from NISM in no way guarantee performance of the intermediary or provide any assurance of returns to investors. Goldman Sachs (India) Securities Private Limited Investor Grievance E-mail: [india-client-support@gs.com](mailto:india-client-support@gs.com). Compliance Officer: Anil Rajput [Tel: + 91 22 6616 9000 | Email: [anil.m.rajput@gs.com](mailto:anil.m.rajput@gs.com)]. **Japan:** See below. **Korea:** This research, and any access to it, is intended only for "professional investors" within the meaning of the Financial Services and Capital Markets Act, unless otherwise agreed by Goldman Sachs. Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (Asia) L.L.C., Seoul Branch. **New Zealand:** Goldman Sachs New Zealand Limited and its affiliates are neither "registered banks" nor "deposit takers" (as defined in the Reserve Bank of New Zealand Act 1989) in New Zealand. This research, and any access to it, is intended for "wholesale clients" (as defined in the Financial Advisers Act 2008) unless otherwise agreed by Goldman Sachs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests is available at: <https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html>. **Russia:** Research reports distributed in the Russian Federation are not advertising as defined in the Russian legislation, but are information and analysis not having product promotion as their main purpose and do not provide appraisal within the meaning of the Russian legislation on appraisal activity. Research reports do not constitute a personalized investment recommendation as defined in Russian laws and regulations, are not addressed to a specific client, and are prepared without analyzing the financial circumstances, investment profiles or risk profiles of clients. Goldman Sachs assumes no responsibility for any investment decisions that may be taken by a client or any other person based on this research report. **Singapore:** Goldman Sachs (Singapore) Pte. (Company Number: 198602165W), which is regulated by the Monetary Authority of Singapore, accepts legal responsibility for this research, and should be contacted with respect to any matters arising from, or in connection with, this research. **Taiwan:** This material is for reference only and must not be reprinted without permission. Investors should carefully consider their own investment risk. Investment results are the responsibility of the individual investor. **United Kingdom:** Persons who would be categorized as retail clients in the United Kingdom, as such term is defined in the rules of the Financial Conduct Authority, should read this research in conjunction with prior Goldman Sachs research on the covered companies referred to herein and should refer to the risk warnings that have been sent to them by Goldman Sachs International. A copy of these risks warnings, and a glossary of certain financial terms used in this report, are available from Goldman Sachs International on request.

**European Union and United Kingdom:** Disclosure information in relation to Article 6 (2) of the European Commission Delegated Regulation (EU) (2016/958) supplementing Regulation (EU) No 596/2014 of the European Parliament and of the Council (including as that Delegated Regulation is

implemented into United Kingdom domestic law and regulation following the United Kingdom's departure from the European Union and the European Economic Area) with regard to regulatory technical standards for the technical arrangements for objective presentation of investment recommendations or other information recommending or suggesting an investment strategy and for disclosure of particular interests or indications of conflicts of interest is available at <https://www.gs.com/disclosures/europeanpolicy.html> which states the European Policy for Managing Conflicts of Interest in Connection with Investment Research.

**Japan:** Goldman Sachs Japan Co., Ltd. is a Financial Instrument Dealer registered with the Kanto Financial Bureau under registration number Kinsho 69, and a member of Japan Securities Dealers Association, Financial Futures Association of Japan Type II Financial Instruments Firms Association, The Investment Trusts Association, Japan, and Japan Investment Advisers Association. Sales and purchase of equities are subject to commission pre-determined with clients plus consumption tax. See company-specific disclosures as to any applicable disclosures required by Japanese stock exchanges, the Japanese Securities Dealers Association or the Japanese Securities Finance Company.

## Global product; distributing entities

Goldman Sachs Global Investment Research produces and distributes research products for clients of Goldman Sachs on a global basis. Analysts based in Goldman Sachs offices around the world produce research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy. This research is disseminated in Australia by Goldman Sachs Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs do Brasil Corretora de Títulos e Valores Mobiliários S.A.; Public Communication Channel Goldman Sachs Brazil: 0800 727 5764 and / or [contatogoldmanbrasil@gs.com](mailto:contatogoldmanbrasil@gs.com). Available Weekdays (except holidays), from 9am to 6pm. Canal de Comunicação com o Público Goldman Sachs Brasil: 0800 727 5764 e/ou [contatogoldmanbrasil@gs.com](mailto:contatogoldmanbrasil@gs.com). Horário de funcionamento: segunda-feira à sexta-feira (exceto feriados), das 9h às 18h; in Canada by Goldman Sachs & Co. LLC; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs New Zealand Limited; in Russia by OOO Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman Sachs & Co. LLC. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom.

Goldman Sachs International ("GSI"), authorised by the Prudential Regulation Authority ("PRA") and regulated by the Financial Conduct Authority ("FCA") and the PRA, has approved this research in connection with its distribution in the United Kingdom.

**European Economic Area:** GSI, authorised by the PRA and regulated by the FCA and the PRA, disseminates research in the following jurisdictions within the European Economic Area: the Grand Duchy of Luxembourg, Italy, the Kingdom of Belgium, the Kingdom of Denmark, the Kingdom of Norway, the Republic of Finland and the Republic of Ireland; GSI - Succursale de Paris (Paris branch) which is authorised by the French Autorité de contrôle prudentiel et de résolution ("ACPR") and regulated by the Autorité de contrôle prudentiel et de résolution and the Autorité des marchés financiers ("AMF") disseminates research in France; GSI - Sucursal en España (Madrid branch) authorized in Spain by the Comisión Nacional del Mercado de Valores disseminates research in the Kingdom of Spain; GSI - Sweden Bankfilial (Stockholm branch) is authorized by the SFSA as a "third country branch" in accordance with Chapter 4, Section 4 of the Swedish Securities and Market Act (Sw. lag (2007:528) om värdepappersmarknaden) disseminates research in the Kingdom of Sweden; Goldman Sachs Bank Europe SE ("GSBE") is a credit institution incorporated in Germany and, within the Single Supervisory Mechanism, subject to direct prudential supervision by the European Central Bank and in other respects supervised by German Federal Financial Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin) and Deutsche Bundesbank and disseminates research in the Federal Republic of Germany and those jurisdictions within the European Economic Area where GSI is not authorised to disseminate research and additionally, GSBE, Copenhagen Branch filial af GSBE, Tyskland, supervised by the Danish Financial Authority disseminates research in the Kingdom of Denmark; GSBE - Sucursal en España (Madrid branch) subject (to a limited extent) to local supervision by the Bank of Spain disseminates research in the Kingdom of Spain; GSBE - Succursale Italia (Milan branch) to the relevant applicable extent, subject to local supervision by the Bank of Italy (Banca d'Italia) and the Italian Companies and Exchange Commission (Commissione Nazionale per le Società e la Borsa "Consob") disseminates research in Italy; GSBE - Succursale de Paris (Paris branch), supervised by the AMF and by the ACPR disseminates research in France; and GSBE - Sweden Bankfilial (Stockholm branch), to a limited extent, subject to local supervision by the Swedish Financial Supervisory Authority (Finansinspektionen) disseminates research in the Kingdom of Sweden.

## General disclosures

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. The information, opinions, estimates and forecasts contained herein are as of the date hereof and are subject to change without prior notification. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by Global Investment Research. Goldman Sachs & Co. LLC, the United States broker dealer, is a member of SIPC (<https://www.sipc.org>).

Our salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients and principal trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, principal trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

We and our affiliates, officers, directors, and employees will from time to time have long or short positions in, act as principal in, and buy or sell, the securities or derivatives, if any, referred to in this research, unless otherwise prohibited by regulation or Goldman Sachs policy.

The views attributed to third party presenters at Goldman Sachs arranged conferences, including individuals from other parts of Goldman Sachs, do not necessarily reflect those of Global Investment Research and are not an official view of Goldman Sachs.

Any third party referenced herein, including any salespeople, traders and other professionals or members of their household, may have positions in the products mentioned that are inconsistent with the views expressed by analysts named in this report.

This research is focused on investment themes across markets, industries and sectors. It does not attempt to distinguish between the prospects or performance of, or provide analysis of, individual companies within any industry or sector we describe.

Any trading recommendation in this research relating to an equity or credit security or securities within an industry or sector is reflective of the investment theme being discussed and is not a recommendation of any such security in isolation.

This research is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Clients should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The price and value of investments referred to in this research and the income from them may fluctuate. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options and futures disclosure documents which are available from Goldman Sachs sales representatives or at <https://www.theocc.com/about/publications/character-risks.jsp> and [https://www.fiadocumentation.org/fia/regulatory-disclosures\\_1/fia-uniform-futures-and-options-on-futures-risk-disclosures-booklet-pdf-version-2018](https://www.fiadocumentation.org/fia/regulatory-disclosures_1/fia-uniform-futures-and-options-on-futures-risk-disclosures-booklet-pdf-version-2018). Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

**Differing Levels of Service provided by Global Investment Research:** The level and types of services provided to you by Goldman Sachs Global Investment Research may vary as compared to that provided to internal and other external clients of GS, depending on various factors including your individual preferences as to the frequency and manner of receiving communication, your risk profile and investment focus and perspective (e.g., marketwide, sector specific, long term, short term), the size and scope of your overall client relationship with GS, and legal and regulatory constraints. As an example, certain clients may request to receive notifications when research on specific securities is published, and certain clients may request that specific data underlying analysts' fundamental analysis available on our internal client websites be delivered to them electronically through data feeds or otherwise. No change to an analyst's fundamental research views (e.g., ratings, price targets, or material changes to earnings estimates for equity securities), will be communicated to any client prior to inclusion of such information in a research report broadly disseminated through electronic publication to our internal client websites or through other means, as necessary, to all clients who are entitled to receive such reports.

All research reports are disseminated and available to all clients simultaneously through electronic publication to our internal client websites. Not all research content is redistributed to our clients or available to third-party aggregators, nor is Goldman Sachs responsible for the redistribution of our research by third party aggregators. For research, models or other data related to one or more securities, markets or asset classes (including related services) that may be available to you, please contact your GS representative or go to <https://research.gs.com>.

Disclosure information is also available at <https://www.gs.com/research/hedge.html> or from Research Compliance, 200 West Street, New York, NY 10282.

© 2024 Goldman Sachs.

You are permitted to store, display, analyze, modify, reformat, and print the information made available to you via this service only for your own use. You may not resell or reverse engineer this information to calculate or develop any index for disclosure and/or marketing or create any other derivative works or commercial product(s), data or offering(s) without the express written consent of Goldman Sachs. You are not permitted to publish, transmit, or otherwise reproduce this information, in whole or in part, in any format to any third party without the express written consent of Goldman Sachs. This foregoing restriction includes, without limitation, using, extracting, downloading or retrieving this information, in whole or in part, to train or finetune a machine learning or artificial intelligence system, or to provide or reproduce this information, in whole or in part, as a prompt or input to any such system.