

## Oil Analyst

## Trump Scenarios: Upside Risk to Volatility; Downside Risk to Prices

- We still forecast a \$75-90 range for Brent given our base cases of trend-like growth in GDP and oil demand (under steady US policies), and OPEC+ market balancing. We analyze the risks to this call from a potential second Trump term.
- **No quick US policy supply boost.** The next US President will have limited tools to significantly boost 2025 oil supply. Regulatory easing may only significantly boost US long run supply, and SPR stocks are low. While OPEC+ decisions and US sanctions can in principle shift international supply, we don't expect a large US policy driven supply boost because 1) OPEC+ is independent, 2) sanctions don't significantly constrain Russia volumes, and 3) Iran supply is already high.
- **Downside to Iran supply.** The sanctions-driven drop in Iran supply under Trump in 2018 suggests that the risks to our flat Iran 2025 supply assumption skew to the downside. In a scenario where Iran supply drops 1mb/d, other OPEC+ producers would likely gradually fill in the shortfall, which would limit the peak boost to oil prices from reduced inventories and spare capacity to \$9/bbl.
- **Downside to demand from tariffs.** While there is a lot of uncertainty about trade policy, tariffs on US crude imports seem unlikely. We do estimate a peak hit to 2025 oil prices of \$11/bbl as a result of weaker GDP and oil demand in a scenario where the US imposes an across-the-board tariff of 10% on goods imports. Our estimated tariffs hit to oil prices rises to \$19/bbl in a scenario where the Fed delays cut beyond 2025 due to higher core inflation (with Brent at \$62/bbl in 2025Q4 vs. our \$81 forecast), but moderates to \$6/bbl if the Fed doesn't delay cuts and OPEC+ reverses its announced supply increases.
- **Upside risk to volatility.** While the ongoing observed drop in oil price volatility was always a key implication of our OPEC range framework, sizable two-sided US policy risks could trigger a pick up in volatility from record lows.
- **Downside risk to prices.** Downside risks from US policy strengthen our view that the risks to our 75-90 range skew to the downside given high spare capacity, and somewhat looser summer oil nowcasts than our balance. Given the drop in implied volatility to percentile 9 over the last 25 years, put options are now attractively priced to hedge 2025 price downside.

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

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

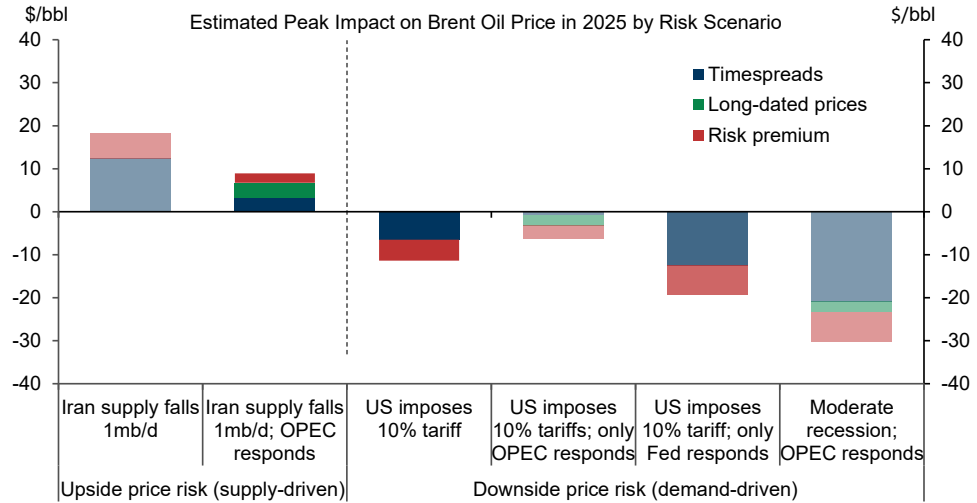
**Callum Bruce, CFA**  
+1(212)902-3053 | callum.bruce@gs.com  
Goldman Sachs & Co. LLC

**Alec Phillips**  
+1(202)637-3746 | alec.phillips@gs.com  
Goldman Sachs & Co. LLC

This report is intended for distribution to GS institutional clients only

Investors should consider this report as only a single factor in making their investment decision. For Reg AC certification and other important disclosures, see the Disclosure Appendix, or go to [www.gs.com/research/hedge.html](http://www.gs.com/research/hedge.html).

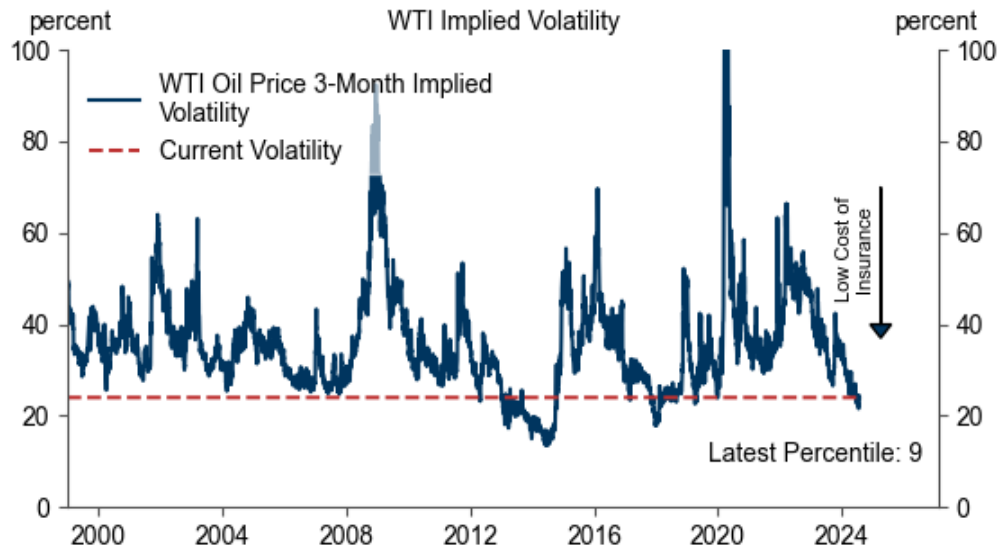
**Hedging Downside Risk to 2025 Oil Prices Screens Attractive as 1) Risks to our \$75-90 Range Forecast for Brent Skew to the Downside...**



The saturation of the bars rises with our subjective probability for each risk scenario.

Source: Goldman Sachs Global Investment Research

**... and 2) Crude Oil Price Implied Volatility Has Dropped to Percentile 9 Over the Last 25 Years**



Source: Bloomberg, Goldman Sachs Global Investment Research

## Trump Scenarios: Upside Risk to Volatility; Downside Risk to Prices

The Polymarket betting market [assigns](#) a 62% probability to former President Trump winning the 2024 US presidential election. We analyze the risks to our oil price call from a potential second Trump term.

### **Q0. Can you remind us of your range call for oil prices in your base case assuming US steady policies?**

We forecast a \$75-90 range for Brent and a 2025 average price of \$82/bbl given our base cases of trend-like growth in GDP and oil demand under steady US policies, and OPEC+'s commitment to balance the market. Because OPEC has announced a data-dependent plan to gradually unwind voluntary production cuts from Q4 if the market tightens and because spare capacity is high, we continue to see \$90 as a ceiling on Brent. Our base case is that OPEC raises production from October 2024 through February 2025. The mechanisms limiting the downside to prices in our base case are the ability for OPEC to forego or reverse the announced production increases, price elastic demand from China and Strategic Petroleum Reserves (SPR), and price elastic US supply.

### **US Policy Tools**

#### **Q1. Many investors are asking whether a second Trump term could lead to significantly higher supply and lower oil prices. Which tools does the US federal government have to rapidly boost the availability of oil?**

On the domestic front, the Strategic Petroleum Reserve (SPR) is the main US federal policy tool that may theoretically boost available oil in the short-term, while regulatory easing may only significantly boost US private sector oil production over the longer term.

On the international front, OPEC+ decisions and US sanctions can in principle significantly shift international supply. But we don't expect a large US policy driven supply boost in 2025 because 1) OPEC+ is independent in pursuing its mission of market stability, 2) sanctions don't significantly constrain Russia volumes (which are self-constrained by OPEC+ cuts), and 3) supply in Iran and Venezuela is already high.

### **US Supply: Some Long-Run Upside**

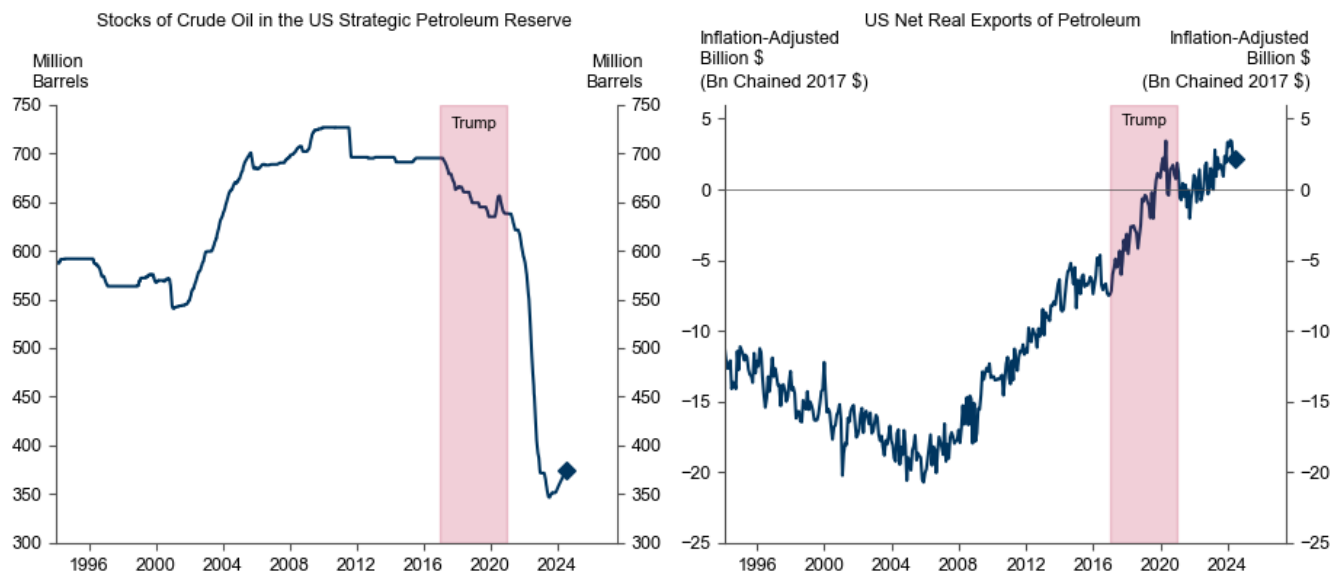
#### **Q2. Could US SPR policy change significantly?**

A major shift in US SPR policy, which is being refilled at a slow pace of 2¾ to 3 million barrels per month this year, is not very likely (unless prices move sharply).

First, the relatively low level of SPR inventories (374 million barrels) leaves less room for large drops ([Exhibit 1](#), left panel). At the same time, the US shift from an oil net importer to an oil net exporter ([Exhibit 1](#), right panel) likely reduces the need for large increases.

Second, SPR inventories were relatively stable under Trump's first presidency.<sup>1</sup> Third, major shifts in SPR policy may face political resistance because the US is both a major consumer and producer of oil.

### Exhibit 1: Low Level of SPR Stocks Leaves Less Room for Large SPR Drops; The Reduction in Net US Oil Imports Reduces the Need for Large SPR Increases



Source: Department of Commerce, Department of Energy, Goldman Sachs Global Investment Research

### Q3. Can regulatory easing significantly boost short-term US oil production?

Oil executives are focused on regulation with 8% of the Dallas Fed Energy Survey respondents perceiving government regulation as the most important factor for profitability in 2023. While our DC economists expect that a potential Trump administration would likely expand oil leases on federal land and offshore energy development, and roll back rules on methane emissions from oil and gas production, we estimate only very small effects from such changes on 2025-2026 oil production.

#### Expanding Oil Leases

For fiscal year (FY) 2022, federal water and land production accounted for about a quarter of US oil production with contributions from offshore and the Federal mineral estate of approximately 15% and 11%, respectively. In principle, expanding offshore energy development and oil leases on federal land may meaningfully boost long-run production because the acres managed by the Bureau of Ocean Energy Management (BOEM) and the Bureau of Land Management (BLM) are very large<sup>2</sup>, and because the availability of high quality assets is one driver of production (although less important than oil prices and capital discipline).<sup>3</sup>

<sup>1</sup> Stocks in the SPR declined moderately from 695 million barrels when he took office in January 2017 to 638 million barrels when he left office in January 2021. Trump proposed to buy 77 million barrels for the SPR as prices collapsed in March 2020, but the Democratic-controlled Congress rejected the \$3bn in funding, and the Trump Administration then offered 30 million barrels of space for lease instead.

<sup>2</sup> The BOEM and BLM acres equal 2.5 billion acres and 700 million acres or 30% of the US, respectively.

<sup>3</sup> Researchers at the Dallas Fed have also estimated meaningful long-run effects of potential changes in federal leasing with a restrictive policy scenario lowering Permian production by 9% after 4 years.

The impact of expanding oil leases on production in 2025-2026, however, is likely to be very small. On the sea side, expanding the five-year leasing schedule Biden approved through the BOEM may eventually significantly increase US offshore production, but only after a decade or so because offshore greenfield projects are long-cycle.<sup>4</sup> On the land side, the industry has already leased the most promising federal land, and the exploration phase before actual production tends to be long. In fact, 46% of the federal acres leased saw no production in fiscal year 2023, and many leases see no activity for the duration of the lease.<sup>5</sup> History also shows no statistically significant link between the party controlling the White House and the share of new oil wells on federal land.

### Rolling Back Methane Charges

The IRA introduced a methane fee for petroleum and natural gas production facilities, that overlaps with the Final Methane Rule that the Environmental Protection Agency (EPA) released in December 2023.<sup>6</sup> President Trump would likely roll back the EPA methane rule, and repealing the IRA would require Congressional support. While rolling back these fees would reduce costs for smaller oil producers, we estimate an only modestly positive impact on US oil production (<10kb/d) in 2025 based on CBO estimates of gross revenues from methane charges, EPA cost estimates, and our estimate of the elasticity of US supply. In addition, in our conversations, US oil and gas producers tend to refer to methane emission regulations as only a modest factor in their production plans.

## International Supply: Downside Risks

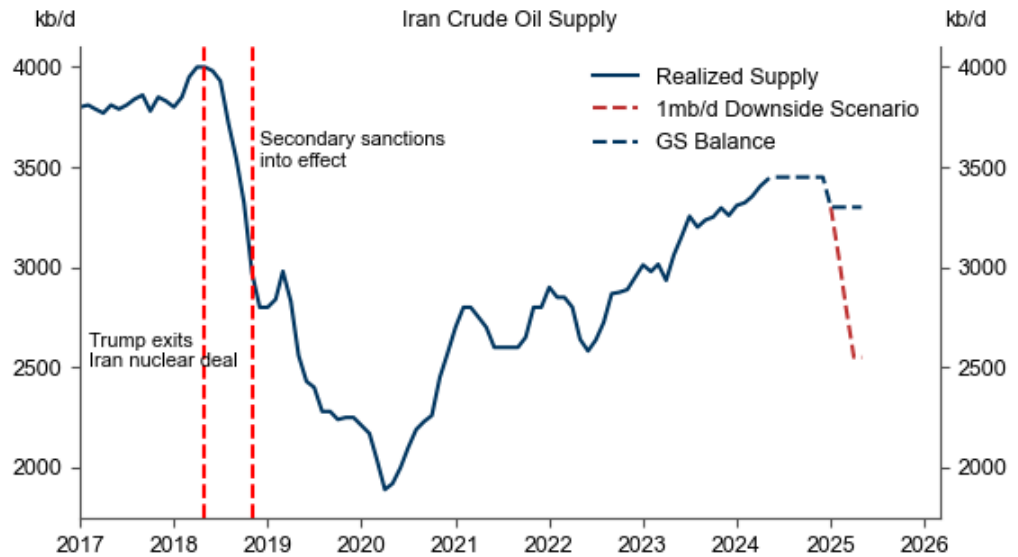
### Q4. What are the risks to supply from Iran?

The drop in Iran production after Trump exited the nuclear deal in 2018, and its recent recovery near our 3¾mb/d estimate of production capacity suggest that the risks to our roughly flat Iran 2025 forecast of 3.3mb/d skew to the downside. We believe that Iran crude supply could drop by around 1mb/d drop in a second Trump term (Exhibit 2). While Iran has reportedly built an alternative supply chain to ship most of its oil to small Chinese independent refineries (“teapots”) using dark fleet tankers against payments in renminbi through small Chinese banks, a very strict enforcement of secondary sanctions by the US, including on shipping companies, could still lead to a drop in Iran supply.

<sup>4</sup> The five-year leasing schedule allows for just three leasing rounds in 2025, 2027, and 2029.

<sup>5</sup> According to a Congressional Budget Office (CBO) study, the slow increase in production after leasing partly reflects that “leaseholders are waiting for more information about potential oil and gas resources before developing their parcels.” Only 5% of royalty receipts collected in 2013 from onshore parcels came from parcels that were leased in the previous 10 years. The CBO also estimated that most of the receipts from opening the Arctic National Wildlife Refuge (ANWR) to oil production would occur outside of the 10-year period used for budget estimates. Using data from the Louisiana shale natural gas boom, researchers at Texas A&M and Chicago University show that wells’ drilling timing is substantially bunched just before the lease expires at the end of the primary term, which is typically 3 to 10 years.

<sup>6</sup> The IRA methane fee is applied on the number of reported tons of methane that exceed 0.2% of the natural gas sent to sale. The rule achieving the greatest emissions is currently set to apply.

**Exhibit 2: Downside Risk to Iran Supply**

Source: Goldman Sachs Global Investment Research

### Q5. How would a potential drop in supply from Iran and the response from other OPEC producers affect oil prices?

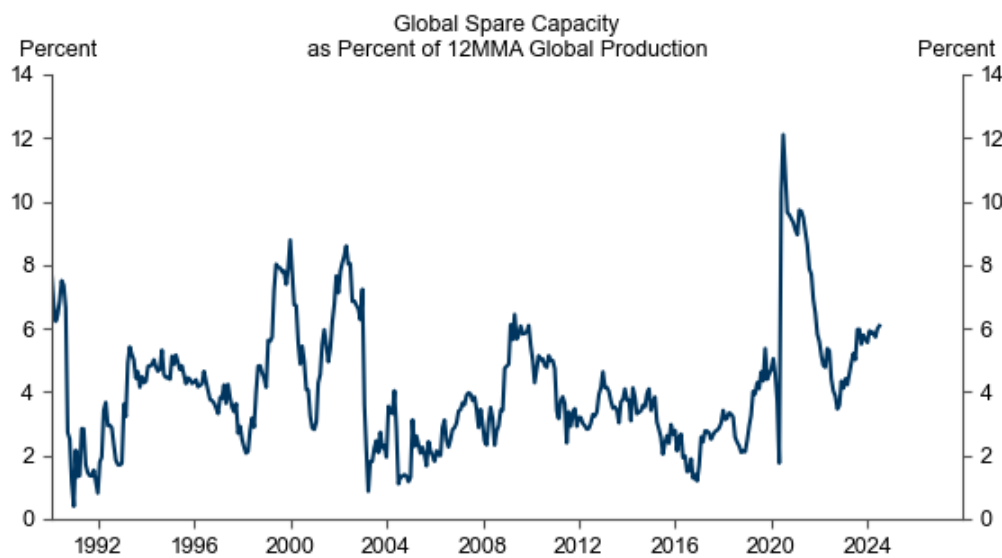
In June 2024, 8 OPEC+ countries signaled to gradually phase out the 2.2mb/d of extra voluntary production cuts over 2024Q4-2025Q3 subject to market conditions. In our base case, Iran supply is roughly stable in 2025, and the 8 OPEC+ countries stop raising production in February 2025 to preserve market stability. We consider two scenarios where Iran supply drops quickly by 1mb/d in January-April 2025.

In the first and most likely scenario, other OPEC+ producers gradually fill in the shortfall by continuing their announced monthly increases through 2025Q3 (vs. February 2025 in our baseline). Although this would leave our 2025Q4 global balance unchanged vs. our baseline, we estimate a peak \$9/bbl boost to oil prices in this first scenario as the sum of increases in: 1) inventory-implied timespreads by \$3/bbl (the early 2025 deficit reduces inventories), 2) long-dated oil prices (reduced spare capacity boosts long-dated prices) by \$3/bbl, and 3) the risk premium by \$2/bbl (which we assume initially rises to its 70th percentile as the market prices in some additional geopolitical supply drops).<sup>7</sup>

In the second scenario, other OPEC+ producers don't fill in the shortfall, and Dec 2025 Brent ends up at \$100/bbl, \$19 above our baseline.

<sup>7</sup> We define the risk premium as the gap between realized Brent 1m/36m timespreads and our estimate of the fundamental value based on 1-4m ahead OECD commercial stocks as a share of OECD demand and US interest rates. We consider the distribution of weekly risk premia since 2005.

**Exhibit 3: Elevated Spare Capacity Implies That Core OPEC+ Producers Would Likely Fill in the Shortfall From a Potential Reduction in Iran Supply**



Source: Goldman Sachs Global Investment Research

**Q6. What are the US policy risks to oil prices from Venezuela?**

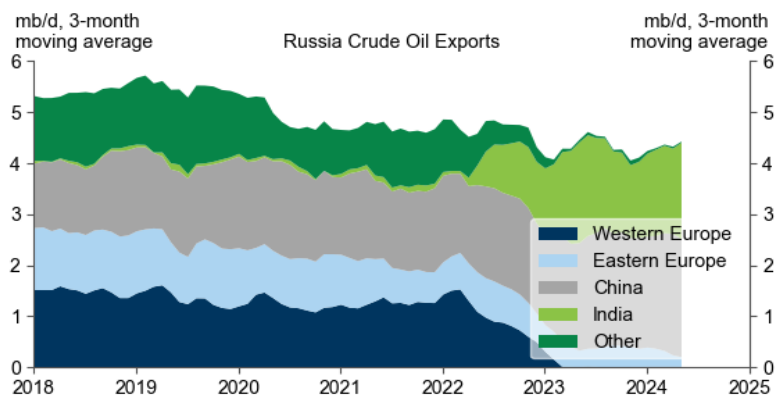
We see modest downside risk to Venezuela supply in a potential second Trump term.

Venezuela crude supply declined from 2.1mb/d when Trump entered office in January 2017 to 780kb/d in 2019Q4 following underinvestment, and additional financial sanctions in [August 2017](#) and in [August 2019](#). Venezuela supply has partly recovered by 0.2mb/d over the past two years to 870kb/d after the US government [issued](#) licenses in November 2022 (allowing Chevron to resume production at its existing joint ventures in Venezuela) and in [October 2023](#) (authorizing transactions in the oil and gas sector) after President Maduro and the opposition agreed on a roadmap to competitive elections. A second Trump Administration would be unlikely to lift existing sanctions on Venezuela, in our view. The probability of a re-tightening in sanctions would likely rise if the Venezuela elections on July 28 led to a contested election of Maduro. We estimate a modest boost to 2025 oil prices of \$2-3/bbl if Venezuela crude supply were to decline by 0.2mb/d (assuming no OPEC+ offset nor change in risk premia).

**Q7. Could a potential easing of sanctions on Russian oil significantly boost oil production in 2025-2026?**

Unlikely. The reason is that the drop in Russia liquids production from 11.4mb/d in January 2022 to around 10.7mb/d today is driven by OPEC+ production cuts rather than sanctions. As Western policymakers intended, the combination of the G7 oil embargo and the price cap on Russia oil have been effective in keeping Russian barrels on the global market with redirection from Europe to India and China ([Exhibit 4](#)).

**Exhibit 4: Russian Oil Flows Have Been Redirected**



Source: Global Trade Tracker, Goldman Sachs Global Investment Research

**Global Demand: Downside Risks from Tariffs**

**Q8. What are the risk of tariffs on US oil imports or US export restrictions?**

We think that US tariffs on oil imports or restrictions on US oil exports are unlikely. Former President Trump has proposed tariffs with a focus on trade deficits, while the US is a net energy exporter, and on countries—primarily China—that are not major energy suppliers. Imposing a tariff directly on oil, which could be easily linked to a rise in retail gasoline prices, would also have obvious political downsides that we would expect a potential Trump administration to avoid.



## Q9. What could be the impact of a trade war on oil demand and oil prices?

There is a lot of uncertainty about what policies former President Trump would impose if he returned to office. To get a reference point, our economists have investigated a scenario<sup>8</sup> where:

1. The US imposes an across-the-board tariff of 10% on all goods imports.
2. Everyone else responds with a 10% tariff on imports from the US.
3. Each government recycles the tariff revenue into tax cuts.
4. The trade war raises global trade policy uncertainty to the levels observed at the peak of the 2018-2019 trade war.

In this scenario, our economists estimate hits to GDP in the Euro Area and the US of 1.0% and 0.5%, respectively. With the additional assumption of a ¾% hit to GDP in the rest of the world<sup>9</sup> and our 1.0 GDP elasticity of oil demand, these estimates imply a hit to global oil demand of 760kb/d. The impact on oil prices depends on the reaction of the Fed and OPEC (vs. our baselines of 100bp of Fed cuts in 2025, and OPEC supply increases in October 2024-February 2025):

- **No Fed response; no OPEC response:** We estimate a peak hit to Brent in 2025 of \$11/bbl in this scenario based on higher inventories and assuming a drop in the risk premium to its 20th percentile (as the market may assign a probability to further escalation and demand downside). This would reduce Brent in 2025Q4 to \$70/bbl (vs. our \$81 forecast).
- **Fed responds only:** If higher core inflation as a result of tariffs were to lead the Fed to delay cuts (a possibility our economists discuss) and stay on hold in 2025, then our Fed commodities framework implies that the peak hit to 2025 oil prices rises to \$19/bbl, with Brent dropping to \$62/bbl by end 2025, well below our \$81 forecast.
- **OPEC responds only:** If OPEC were to reverse the October 2024-February 2025 production increase our baseline assumes, then the peak hit from the 10% tariffs downside scenario diminishes to \$6/bbl. That said, high spare capacity may incrementally complicate a return from production increases to production cuts.<sup>10</sup>

## Q10. Beyond trade, what are the other macro spillovers from a potential Trump election to the oil market?

Our economists have identified trade policy as the most important area of policy differences between a Trump and a Democratic White House for GDP in the US, the Euro Area and China. The following differences across political scenarios seem quantitatively less important for the oil market than trade policy:

<sup>8</sup> Other potential scenarios include tariffs targeting goods imports from China to the US or tariffs on auto imports.

<sup>9</sup> This assumption equals the average of the estimated impacts in the US and the Euro Area.

<sup>10</sup> In a fourth 10% tariffs scenario, both the Fed and OPEC respond by delaying interest rate cuts and cutting oil production, respectively, with a peak hit to 2025 oil prices of around \$12/bbl. Arguably, a Fed response to tariffs makes OPEC more likely to respond (i.e. OPEC may respond to the negative demand hit to oil prices from a hawkish Fed response by cutting production) and vice versa (i.e. the Fed may respond to the boost to oil prices and headline inflation from OPEC production cuts by delaying cuts).

- **Fiscal.** The fiscal and tax impulses on US GDP growth are relatively similar across the four political scenarios (i.e. Republican sweep, a Democratic sweep, Republican President but divided government, and Democratic President but divided government) with only modestly more expansionary policy under a Republican sweep.
- **Financial conditions.** Our cross-assets strategists have previously estimated boosts to the dollar and interest rates from fiscal, tax, and trade policy shifts under Trump with divided government (+10bp for UST 10Y and 3.6% for the USD TWI) and under the Republican sweep (+37bp for UST 10Y and 3.6% for the USD TWI), which are relatively limited but directionally negative for oil demand and oil prices.<sup>11</sup> Based on our -0.03 FX elasticity of non-US oil demand, we estimate a 0.1mb/d hit to oil demand from a potential 3.6% dollar appreciation, worth \$1 of downside to 2025 oil prices in our pricing model.
- **Non-energy regulation.** While reduced regulation could boost activity, our economists' analysis suggests that the impact of regulatory policy changes under the first Trump term was limited at a macroeconomic level.

## US Demand: Some Long-Run Upside

### Q11. How would a rollback in the IRA EV tax credit impact gasoline demand ?

Our auto equity analysts estimate that reducing the number of vehicles eligible for IRA credits could reduce US EV sales by 5-15%<sup>12</sup>. They also estimate that repealing all the IRA related EV tax credits (which would also require Congressional support) could reduce EV sales by 10-30% given the loss of the 45X advanced manufacturing credit for batteries.

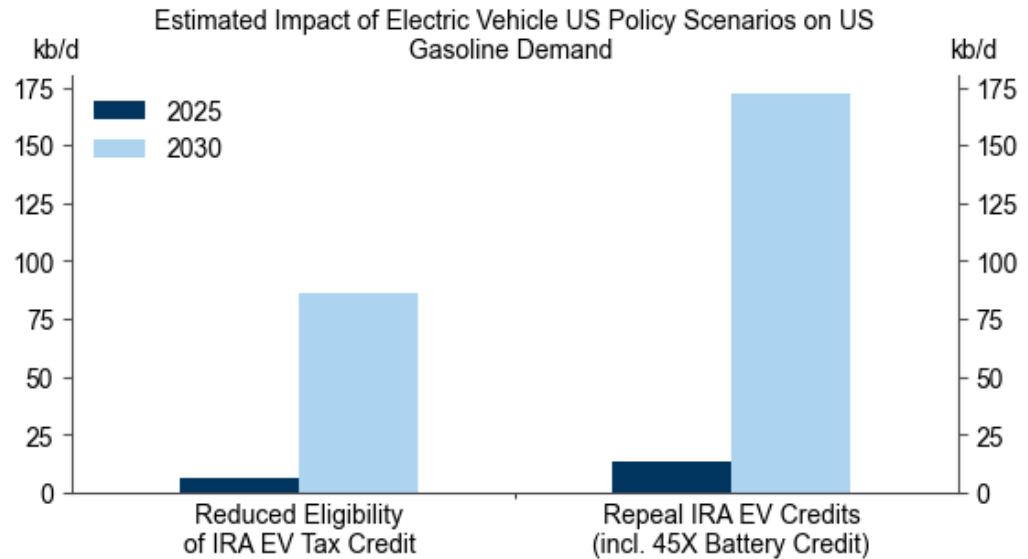
We estimate small boosts to gasoline demand from these policy scenarios, especially in the short term, because gasoline demand depends on the stock of ICE cars, and because our auto equity analysts forecast only moderate US sales for New Electric Vehicles (NEVs) of 2.2 million in 2025 in their baseline.<sup>13</sup> Specifically, we estimate US gasoline demand boosts from reducing the eligibility of the \$7,500 IRA new clean vehicle tax credit of under 10kb/d in 2025 and 90kb/d in 2030, and from repealing the IRA EV provisions of 10-20kb/d in 2025 and 170kb/d in 2030, with a negligible boost to late 2025 oil prices (<\$0.2/bbl).<sup>14</sup>

<sup>11</sup> These Republican impact estimates were benchmarked to a 50-50 split across Republican and Democratic outcomes, and would be slightly lower if re-benchmarked to current betting market odds.

<sup>12</sup> A Trump administration would likely tighten the interpretation of EV domestic content requirements. This assumes a 10-15% price increase for a quarter to half of US EV sales.

<sup>13</sup> We define NEVs as the sum of Battery Electric Vehicles (BEVs) and Plug-in Hybrids (PHEVs) excluding traditional Hybrids (HEVs).

<sup>14</sup> We use the midpoint of our auto equity analysts' estimates of the impact of IRA changes on demand, and our estimate that replacing 1 million of NEV cars with 1 million of ICE cars boosts US gasoline demand by 30kb/d.

**Exhibit 5: Upside Risk to US Gasoline Demand From Potential IRA Changes Is Small in the Short Term**

Source: Goldman Sachs Global Investment Research

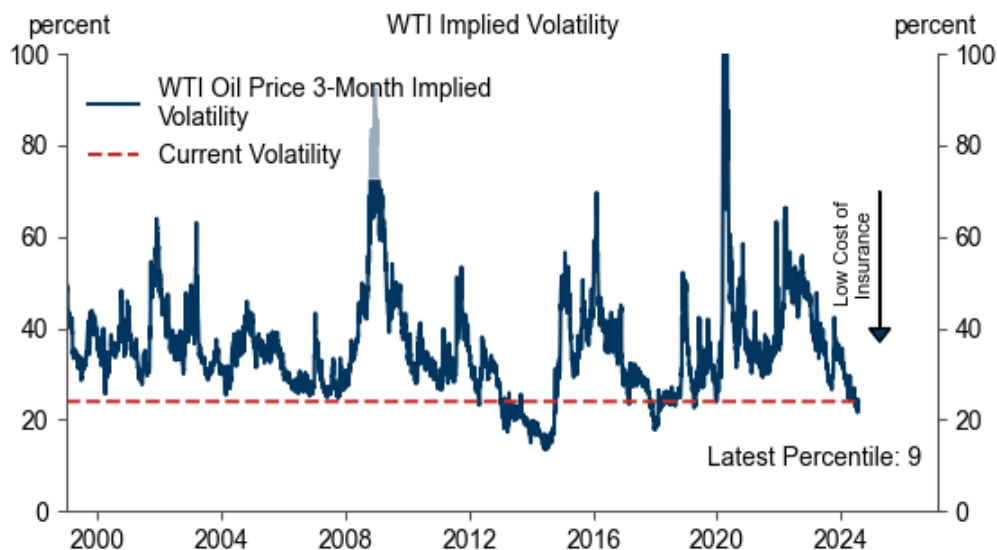
We see the risks to these estimates of Trump auto policy scenarios as balanced. On the one hand, the long-run policy boost to gasoline demand could be smaller because the percent impact of IRA changes on NEV sales is likely to diminish as the affordability and convenience of NEVs rise. On the other hand, the total policy gasoline boost could be larger because a second potential Trump administration would likely seek to relax the EPA's recently finalized light and medium duty 2027-2032 auto emissions limits, which automakers would likely satisfy by selling more NEVs.<sup>15</sup>

### Upside Risk to Volatility; Downside Risk to Prices

#### Q12. How do you see the risks from US policy and other factors to oil price volatility and to your \$75-90 range Brent oil price forecast?

While the ongoing observed drop in oil price volatility was always a key implication of our analysis of OPEC market management and our range framework, sizable and two-sided US policy risks to prices could trigger a pick up in implied volatility from currently very low levels (Exhibit 6).

<sup>15</sup> Given the rule making process has periods for comments/feedback, the process to change EPA requirements can take a few years.

**Exhibit 6: US Policy Risks Could Trigger a Pick Up In Implied Oil Price Volatility From Very Low Levels**

Source: Bloomberg, Goldman Sachs Global Investment Research

Downside price risks from US policy strengthen our view that the risks to our 75-90 range skew to the downside.

First, while increased US policy risks to the oil balance are two-sided, elevated spare capacity makes it easier to absorb tightening shocks (e.g. lower Iran supply) than to absorb easing shocks (e.g. lower demand from tariffs).

Second, our main oil nowcasts are tracking looser than our balance, including for China demand, US supply, and OECD commercial stocks.

Third, and independently of the US election outcome and the current macro setup (our US economists estimate a 15% probability of a US recession in the next 12 months), recession risk generally skews the distribution of global GDP and oil demand outcomes to the downside.

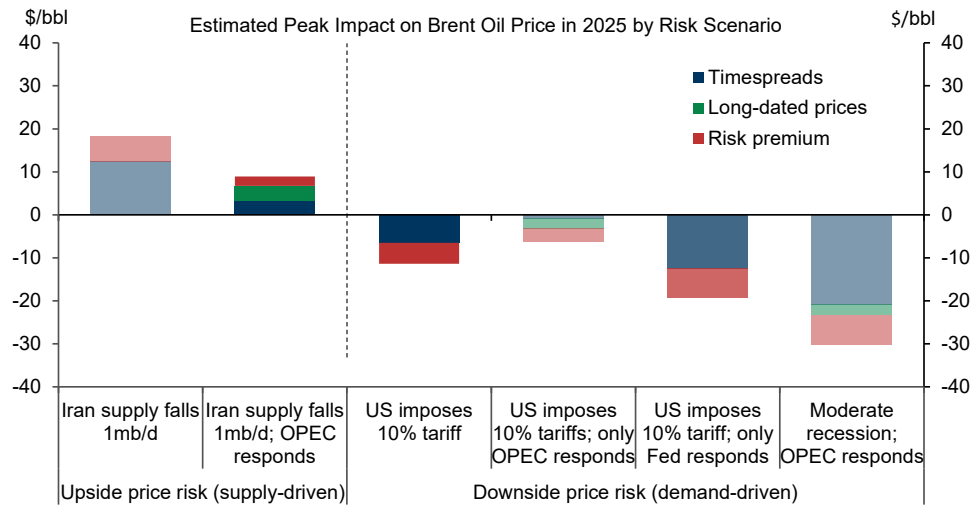
Our chart with the key risk scenarios ([Exhibit 7](#)) also includes a \$30 peak hit to 2025 oil prices with Brent falling to \$51/bbl by end-2025 in a moderate recession scenario. This scenario assumes a peak 4% hit to global GDP<sup>16</sup> (relative to the baseline) and a reversal of the OPEC supply increases we expect from October 2024. While this simple scenario leaves out some balancing mechanisms that may directionally limit the price downside (i.e. opportunistic buying by US and China SPR, US shale production slowdown, and further OPEC cuts below current production levels), the key point is that high spare capacity makes incremental production cuts more challenging, and that these mechanisms are likely too small to absorb large negative demand shocks.

Given the drop in implied volatility to percentile 9 over the last 25 years, put options are now attractively priced to hedge 2025 price downside for oil producers, in our view.

<sup>16</sup> A peak 4% hit to the level of GDP relative to potential would be slightly more moderate than the median historical recession in G10 economies.

Dec-25 Brent put options currently reflect a c.15% probability of expiring below \$60/bbl, equal to the unconditional average annual recession probability and our economists' estimate of the probability of a US recession in the next 12 months. Our scenario analysis, however, suggests that Brent would likely fall to around \$50/bbl even in a moderate recession.

**Exhibit 7: We See the Risks to our \$75-90 Range Forecast for Brent Oil Prices as Moderately Skewed to the Downside**



The saturation of the bars rises with our subjective probability for each risk scenario.

Source: Goldman Sachs Global Investment Research

For the exclusive use of GIULIA.LORIA@COMMUNITY.IT

# Disclosure Appendix

## Reg AC

We, Daan Struyven, Yulia Zhestkova Grigsby, Callum Bruce, CFA and Alec Phillips, 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

### Option Specific Disclosures

**Price target methodology:** Please refer to the analyst's previously published research for methodology and risks associated with equity price targets.

**Pricing Disclosure:** Option prices and volatility levels in this note are indicative only, and are based on our estimates of recent mid-market levels (unless otherwise noted). All prices and levels exclude transaction costs unless otherwise stated.

**General Options Risks** – The risks below and any other options risks mentioned in this research report pertain both to specific derivative trade recommendations mentioned and to discussion of general opportunities and advantages of derivative strategies. Unless otherwise noted, options strategies mentioned in this report may be a combination of the strategies below and therefore carry with them the risks of those strategies.

**Buying Options** - Investors who buy call (put) options risk loss of the entire premium paid if the underlying security finishes below (above) the strike price at expiration. Investors who buy call or put spreads also risk a maximum loss of the premium paid. The maximum gain on a long call or put spread is the difference between the strike prices, less the premium paid.

**Selling Options** - Investors who sell calls on securities they do not own risk unlimited loss of the security price less the strike price. Investors who sell covered calls (sell calls while owning the underlying security) risk having to deliver the underlying security or pay the difference between the security price and the strike price, depending on whether the option is settled by physical delivery or cash-settled. Investors who sell puts risk loss of the strike price less the premium received for selling the put. Investors who sell put or call spreads risk a maximum loss of the difference between the strikes less the premium received, while their maximum gain is the premium received.

**For options settled by physical delivery**, the above risks assume the options buyer or seller, buys or sells the resulting securities at the settlement price on expiry.

## 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. **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 third-party 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.