

# Tesla Inc. (TSLA)

## Initial framing of robotaxi opportunity, and updated FSD scenarios

TSLA

12m Price Target: \$175.00

Price: \$155.45

Upside: 12.6%

Tesla's opportunity to sell ADAS/autonomy software, both with its Full Self Driving (FSD) offering for consumers and from robotaxis, has recently received increased interest from investors. This follows broader interest in AI driven technologies in the market, commentary from Tesla on X about improved FSD performance using an end to end neural net approach (FSD version 12.3), and after Tesla's CEO posted on 4/5/2024 on X that the company will unveil its Robotaxi on 8/8/24.

In this note we frame scenarios for the market/business opportunity for Tesla in robotaxis from what we know so far, and also update our FSD analysis (with Tesla lowering the monthly subscription cost to \$99 from \$199 on 4/12/24).

The bottom line is that we believe Tesla is among the leaders in autonomy/ADAS technology, and in the long-term we believe that software & digital services can be a meaningful driver of its business (as we discussed in our 2030 EPS scenarios from our November 2023 report, Contextualizing Tesla's AI and FSD opportunities). However, we believe it will take time before Tesla can drive more significant growth in either robotaxi or FSD revenue, as we believe Tesla would need to reach at least L3 (situationally eyes-off, for example on the highway) capability with FSD to drive material adoption at \$99 per month, and we think Tesla's efforts specific to robotaxis (L4/L5) are likely in the earlier phases based on permitting requests (and this is a technology that has historically faced difficulties including with respect to R&D and regulations). We appreciate that the latest GPUs in addition to Tesla's end to end neural net approach could allow Tesla to iterate and develop the technology faster than we currently expect, although our base case view is that developing and growing these businesses will take time.

Goldman Sachs does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. 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). Analysts employed by non-US affiliates are not registered/qualified as research analysts with FINRA in the U.S.

### Mark Delaney, CFA

+1(212)357-0535 | mark.delaney@gs.com  
Goldman Sachs & Co. LLC

### Will Bryant

+1(212)934-4705 | will.bryant@gs.com  
Goldman Sachs & Co. LLC

### Morgan Leung

+1(212)934-4683 | morgan.leung@gs.com  
Goldman Sachs & Co. LLC

### Aman Gupta

+1(212)357-1549 | aman.s.gupta@gs.com  
Goldman Sachs & Co. LLC

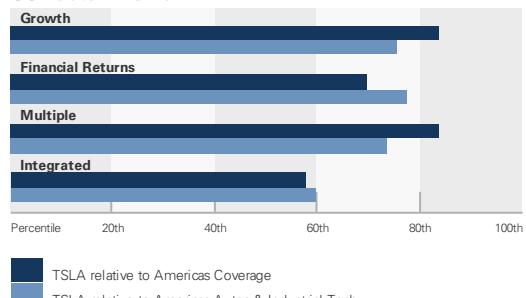
### Key Data

Market cap: \$542.8bn  
Enterprise value: \$526.6bn  
3m ADTV: \$18.7bn  
United States  
Americas Autos & Industrial Tech  
M&A Rank: 3

### GS Forecast

	12/23	12/24E	12/25E	12/26E
Revenue (\$ mn)	96,773.0	99,802.0	122,946.4	146,945.2
EBITDA (\$ mn)	16,633.0	16,076.1	24,189.2	31,649.5
EBIT (\$ mn)	8,891.0	7,090.9	12,628.6	18,017.5
EPS (\$)	2.60	1.90	3.25	4.45
P/E (X)	83.5	81.8	47.8	35.0
EV/EBITDA (X)	40.6	29.8	19.5	14.6
FCF yield (%)	0.6	0.4	2.0	2.9
Dividend yield (%)	0.0	0.0	0.0	0.0
Net debt/EBITDA (X)	(0.9)	(1.0)	(1.1)	(1.3)
		12/23	3/24E	6/24E
EPS (\$)		0.57	0.31	0.41
				9/24E
				0.54

### GS Factor Profile



Source: Company data, Goldman Sachs Research estimates.  
See disclosures for details.

Neutral

**Tesla Inc. (TSLA)**

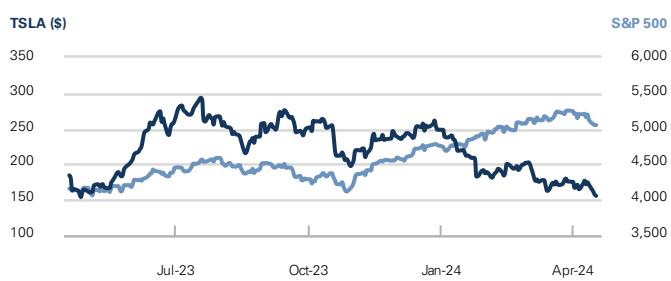
Rating since Jun 25, 2023

**Ratios & Valuation**

	12/23	12/24E	12/25E	12/26E
P/E (X)	83.5	81.8	47.8	35.0
EV/EBITDA (X)	40.6	29.8	19.5	14.6
EV/sales (X)	7.0	4.8	3.8	3.1
FCF yield (%)	0.6	0.4	2.0	2.9
EV/DACF (X)	45.2	37.2	24.4	18.0
CROCI (%)	33.9	21.8	27.4	30.9
ROE (%)	16.9	9.9	14.7	16.9
Net debt/EBITDA (X)	(0.9)	(1.0)	(1.1)	(1.3)
Net debt/equity (%)	(22.5)	(22.5)	(30.6)	(39.1)
Interest cover (X)	57.0	29.5	52.6	75.1
Inventory days	61.1	63.9	63.0	65.3
Receivable days	12.2	15.5	16.0	16.4
Days payable outstanding	68.5	67.0	64.9	65.8

**Growth & Margins (%)**

	12/23	12/24E	12/25E	12/26E
Total revenue growth	18.8	3.1	23.2	19.5
EBITDA growth	(22.1)	(6.6)	59.9	36.5
EPS growth	(28.2)	(27.0)	70.9	36.9
DPS growth	NM	NM	NM	NM
Gross margin	18.2	16.4	18.0	19.0
EBIT margin	9.2	7.1	10.3	12.3

**Price Performance**

	3m	6m	12m
Absolute	(27.9)%	(39.0)%	(16.9)%
Rel. to the S&P 500	(32.3)%	(47.2)%	(31.7)%

Source: FactSet. Price as of 17 Apr 2024 close.

**Income Statement (\$ mn)**

	12/23	12/24E	12/25E	12/26E
Total revenue	96,773.0	99,802.0	122,946.4	146,945.2
Cost of goods sold	(79,113.0)	(83,394.7)	(100,827.7)	(119,075.7)
SG&A	(4,800.0)	(4,895.8)	(4,922.2)	(5,082.4)
R&D	(3,969.0)	(4,420.6)	(4,567.9)	(4,769.6)
Other operating inc./exp.)	—	—	—	—
<b>EBITDA</b>	<b>13,558.0</b>	<b>12,666.1</b>	<b>20,254.2</b>	<b>27,654.5</b>
Depreciation & amortization	(4,667.0)	(5,575.2)	(7,625.6)	(9,637.0)
<b>EBIT</b>	<b>8,891.0</b>	<b>7,090.9</b>	<b>12,628.6</b>	<b>18,017.5</b>
Net interest inc./exp.)	910.0	1,320.0	1,810.0	1,960.0
Income/(loss) from associates	—	—	—	—
<b>Pre-tax profit</b>	<b>9,975.0</b>	<b>8,410.9</b>	<b>14,438.6</b>	<b>19,977.5</b>
Provision for taxes	(926.0)	(1,682.2)	(2,887.7)	(3,995.5)
Minority interest	23.0	(75.0)	(75.0)	(175.0)
Preferred dividends	—	—	—	—
<b>Net inc. (pre-exceptionals)</b>	<b>9,072.0</b>	<b>6,653.7</b>	<b>11,475.8</b>	<b>15,807.0</b>
<b>Net inc. (post-exceptionals)</b>	<b>9,072.0</b>	<b>6,653.7</b>	<b>11,475.8</b>	<b>15,807.0</b>
<b>EPS (basic, pre-except) (\$)</b>	<b>2.86</b>	<b>2.09</b>	<b>3.58</b>	<b>4.90</b>
<b>EPS (diluted, pre-except) (\$)</b>	<b>2.60</b>	<b>1.90</b>	<b>3.25</b>	<b>4.45</b>
<b>EPS (ex-ESO exp., dil.) (\$)</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>
DPS (\$)	—	—	—	—
Div. payout ratio (%)	0.0	0.0	0.0	0.0
Wtd avg shares out. (basic) (mn)	3,173.5	3,188.9	3,208.9	3,228.9
Wtd avg shares out. (diluted) (mn)	3,482.8	3,499.9	3,532.2	3,553.9

**Balance Sheet (\$ mn)**

	12/23	12/24E	12/25E	12/26E
Cash & cash equivalents	17,189.0	19,084.7	29,018.6	43,254.4
Accounts receivable	3,508.0	4,984.2	5,773.7	7,466.9
Inventory	13,626.0	15,575.5	19,245.7	23,334.1
Other current assets	15,498.0	15,498.0	15,498.0	15,498.0
<b>Total current assets</b>	<b>49,821.0</b>	<b>55,142.4</b>	<b>69,535.9</b>	<b>89,553.4</b>
Net PP&E	33,905.0	38,901.8	41,356.2	42,799.2
Net intangibles	431.0	359.0	279.0	199.0
Total investments	0.0	0.0	0.0	0.0
Other long-term assets	22,666.0	22,766.0	22,866.0	22,966.0
<b>Total assets</b>	<b>106,618.0</b>	<b>116,964.3</b>	<b>133,832.2</b>	<b>155,312.6</b>
Accounts payable	14,431.0	16,198.5	19,630.6	23,334.1
Short-term debt	—	—	—	—
Current lease liabilities	2,373.0	2,373.0	2,373.0	2,373.0
Other current liabilities	11,944.0	11,944.0	11,944.0	11,944.0
<b>Total current liabilities</b>	<b>28,748.0</b>	<b>30,515.5</b>	<b>33,947.6</b>	<b>37,651.1</b>
Long-term debt	2,857.0	2,857.0	2,857.0	2,857.0
Non-current lease liabilities	—	—	—	—
Other long-term liabilities	11,404.0	11,404.0	11,404.0	11,404.0
<b>Total long-term liabilities</b>	<b>14,261.0</b>	<b>14,261.0</b>	<b>14,261.0</b>	<b>14,261.0</b>
<b>Total liabilities</b>	<b>43,009.0</b>	<b>44,776.5</b>	<b>48,208.6</b>	<b>51,912.1</b>
Preferred shares	—	—	—	—
<b>Total common equity</b>	<b>62,634.0</b>	<b>71,212.7</b>	<b>84,648.6</b>	<b>102,425.5</b>
Minority interest	975.0	975.0	975.0	975.0
<b>Total liabilities &amp; equity</b>	<b>106,618.0</b>	<b>116,964.3</b>	<b>133,832.2</b>	<b>155,312.6</b>
BVPS (\$)	17.98	20.35	23.97	28.82

**Cash Flow (\$ mn)**

	12/23	12/24E	12/25E	12/26E
Net income	14,974.0	6,653.7	11,475.8	15,807.0
D&A add-back	4,667.0	5,575.2	7,625.6	9,637.0
Minority interest add-back	—	—	—	—
Net (inc)/dec working capital	(2,564.0)	(1,658.1)	(1,027.6)	(2,078.1)
Others	(3,821.0)	1,925.0	1,960.0	1,970.0
<b>Cash flow from operations</b>	<b>13,256.0</b>	<b>12,495.7</b>	<b>20,033.8</b>	<b>25,335.9</b>
Capital expenditures	(8,898.0)	(10,500.0)	(10,000.0)	(11,000.0)
Acquisitions	(6,685.0)	—	—	—
Divestitures	—	—	—	—
Others	(1.0)	(100.0)	(100.0)	(100.0)
<b>Cash flow from investing</b>	<b>(15,584.0)</b>	<b>(10,600.0)</b>	<b>(10,100.0)</b>	<b>(11,100.0)</b>
Dividends paid	—	—	—	—
Share issuance/(repurchase)	—	—	—	—
Inc/(dec) in debt	2,591.0	0.0	—	—
Others	342.0	—	—	—
<b>Cash flow from financing</b>	<b>2,593.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>Total cash flow</b>	<b>265.0</b>	<b>1,895.7</b>	<b>9,933.8</b>	<b>14,235.9</b>
Free cash flow	4,358.0	1,995.7	10,033.8	14,335.9
Free cash flow per share (basic) (\$)	1.27	0.63	3.13	4.44

Source: Company data, Goldman Sachs Research estimates.

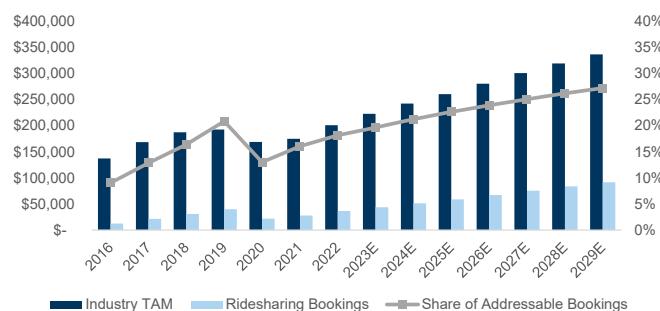
We believe that our current \$175 price target already gives Tesla credit for growing long-term in software related businesses such as autonomy, in particular selling FSD software to Tesla's own installed base of vehicles. This is because we believe software and digital services would be needed to drive the 20-40% type EPS CAGR beyond 2025 necessary to justify the 50X target P/E multiple we use on Q5-Q8E EPS including SBC to derive our price target (based on PEG ratios for tech and industrial stocks in the S&P 500).

### Rideshare market and TAM sizing

The rideshare market and TAM is large. Our colleagues Eric Sheridan, Ben Miller, and team estimate that the US/Canada ridesharing industry TAM will grow at a 7% CAGR (2023-2029E) and reach over \$300 bn, and that ridesharing bookings of about \$44 bn in 2023 (implying roughly 20% penetration) will grow at a 13% CAGR through 2029. With Tesla focusing its R&D efforts with autonomy to date on North America, we believe this is helpful to contextualize the market.

Globally, Uber has framed the long-term global personal mobility TAM at 11.9 tn miles per year, which represents a \$5.7 tn market opportunity per the company (across 175 countries).

**Exhibit 1: Our GS colleagues estimate ridesharing bookings in US/Canada will grow at a mid-teens CAGR through 2029**



Source: Company data, Goldman Sachs Global Investment Research, World Bank, McKinsey, Federal Reserve Bank of St. Louis, Second Measure, Statistics Canada

While Tesla has not recently commented on how it would seek to scale/deploy robotaxis, for illustrative purposes, we show scenarios assuming a commercial fleet that Tesla would own.

We show the early stage revenue opportunity from robotaxis based on trips per day, total robotaxis deployed, and an assumed revenue per mile of ~\$2-\$2.25 (in line with current market pricing in the US on average for ride sharing) in [Exhibit 2](#). We assumed an average of 9 miles driven per trip (similar to the current rideshare market), and 50-1,000 vehicles deployed (similar to the scale of early AV deployments from Waymo and Baidu).

**Exhibit 2: Annual revenue opportunity (\$ mn) from initial deployment of robottaxis**

Trips per robotaxi per day	Annual revenue in mns from robottaxis				
	Tesla robottaxis in operation				
5	\$2	\$3	\$9	\$17	\$35
8	\$3	\$6	\$14	\$28	\$56
10	\$3	\$7	\$17	\$35	\$70
12	\$4	\$8	\$21	\$42	\$84
15	\$5	\$10	\$26	\$52	\$105
18	\$6	\$13	\$31	\$63	\$126
20	\$7	\$14	\$35	\$70	\$140

Source: Company data, Goldman Sachs Global Investment Research

As we show in [Exhibit 3](#), revenue from robottaxis could be significant longer-term with a range of scenarios around trips per day, average revenue per trip, and number of robottaxis in operation.

**Exhibit 3: Analysis of the annual revenue opportunity (\$mn) from a larger fleet of robottaxis in a range of scenarios**

Revenue per trip	Trips per robotaxi per day	Annual revenue in mns from robottaxis							
		Tesla robottaxis in operation							
\$15	5	\$137	\$274	\$684	\$1,369	\$2,738	\$6,844	\$13,688	\$27,375
	8	\$219	\$438	\$1,095	\$2,190	\$4,380	\$10,950	\$21,900	\$43,800
	10	\$274	\$548	\$1,369	\$2,738	\$5,475	\$13,688	\$27,375	\$54,750
	12	\$329	\$657	\$1,643	\$3,285	\$6,570	\$16,425	\$32,850	\$65,700
	15	\$411	\$821	\$2,053	\$4,106	\$8,213	\$20,531	\$41,063	\$82,125
	18	\$493	\$986	\$2,464	\$4,928	\$9,855	\$24,638	\$49,275	\$98,550
	20	\$548	\$1,095	\$2,738	\$5,475	\$10,950	\$27,375	\$54,750	\$109,500
\$25	5	\$228	\$456	\$1,141	\$2,281	\$4,563	\$11,406	\$22,813	\$45,625
	8	\$365	\$730	\$1,825	\$3,650	\$7,300	\$18,250	\$36,500	\$73,000
	10	\$456	\$913	\$2,281	\$4,563	\$9,125	\$22,813	\$45,625	\$91,250
	12	\$548	\$1,095	\$2,738	\$5,475	\$10,950	\$27,375	\$54,750	\$109,500
	15	\$684	\$1,369	\$3,422	\$6,844	\$13,688	\$34,219	\$68,438	\$136,875
	18	\$821	\$1,643	\$4,106	\$8,213	\$16,425	\$41,063	\$82,125	\$164,250
	20	\$913	\$1,825	\$4,563	\$9,125	\$18,250	\$45,625	\$91,250	\$182,500
\$35	5	\$319	\$639	\$1,597	\$3,194	\$6,388	\$15,969	\$31,938	\$63,875
	8	\$511	\$1,022	\$2,555	\$5,110	\$10,220	\$25,550	\$51,100	\$102,200
	10	\$639	\$1,278	\$3,194	\$6,388	\$12,775	\$31,938	\$63,875	\$127,750
	12	\$767	\$1,533	\$3,833	\$7,665	\$15,330	\$38,325	\$76,650	\$153,300
	15	\$958	\$1,916	\$4,791	\$9,581	\$19,163	\$47,906	\$95,813	\$191,625
	18	\$1,150	\$2,300	\$5,749	\$11,498	\$22,995	\$57,488	\$114,975	\$229,950
	20	\$1,278	\$2,555	\$6,388	\$12,775	\$25,550	\$63,875	\$127,750	\$255,500

Source: Company data, Goldman Sachs Global Investment Research

To help understand some of the key costs, [Lyft](#) has estimated that driver costs such as fuel, repair/maintenance, depreciation, and cleaning averaged \$0.31 per mile and, specifically for EVs, noted a cost per mile of \$0.23 (with lower fuel costs than ICE vehicles). In addition, commercial insurance that rideshare companies provide can average roughly \$0.30 per mile as implied by 10-K reports. Similarly, [Car and Driver](#) notes that taxi insurance (which Waymo commented is similar to the insurance an AV gets per [Marketwatch](#)) can range from \$5,000-\$10,000 annually and [Inshur](#) provides a range of \$3,000-\$10,000 annually based on driving history and coverage amount. This implies that insurance per mile for a robottaxi could be >\$0.50 to start (with a likely higher cost of repairs for an AV than a typical consumer vehicle), but could decline to well under \$0.30 per mile if AV accident rates are eventually significantly lower than

human drivers.

For Tesla, we believe a robotaxi would be built on Tesla's low-cost next generation platform and lack a steering wheel (per comments from Tesla at the 2023 investor day and 1Q23 earnings call), and we believe a robotaxi could have either more cameras than current consumer Tesla vehicles (with some observers noting the front placement on the B-pillars can reduce visibility) and/or potentially use advanced imaging radar to compliment vision (Tesla has been open to radar in the past and some of its vehicles still ship with radar, and there would be no human for redundancy; we do not expect Tesla would use lidar given past comments from management). We also believe that Tesla could have a cost advantage at scale vs. other AVs given the reduced sensor inputs and its ability to vertically integrate (including with its own ASICs on the vehicle).

### **Other ridehailing company snapshots**

#### **Uber**

Uber has framed the long-term global personal mobility TAM at 11.9 tn miles per year, which represents a \$5.7 tn market opportunity (across 175 countries).

Within US & Canada ridesharing specifically, our GS TMT colleagues estimate Uber & Lyft have exposure to a potential \$242 bn TAM in 2024 (growing to \$337 bn in 2029), based on the total US & Canada working age population. Within that, total bookings of ~\$44 bn represent 20% penetration of addressable industry bookings in 2023.

At its 2024 investor update, Uber noted that it has about 150 mn monthly active platform consumers as of 4Q23 and nearly 7 mn drivers and couriers globally.

At the 2022 investor update event, Uber commented that it expects autonomous vehicles to be an increasingly important part of the transportation ecosystem, and thus Uber's business over time. Uber also believes that lower prices through autonomous innovation will materially increase the size of the mobility-as-a-service TAM. The company estimates that reducing the price to \$1 per mile will meaningfully expand the category.

Rather than building its own AVs, Uber has decided to partner with AV developers including Waymo, Motional, and Aurora. Moreover, Uber noted at its 2024 investor event that it expects to leverage a hybrid network of autonomous and human drivers in order to expedite AV commercialization while maintaining reliability and managing the consumer experience, per the company.

According to industry observers, Uber pays ~60-70% of a passenger's pre-incentive fare to the driver, excluding any pass-through costs (e.g. tolls, city taxes, etc.).

#### **Lyft**

Lyft commented on its 4Q23 earnings call that it had 22.4 mn active riders and provided ~191 mn rides within the quarter and provided 709 mn rides across 2023. Lyft noted that ~66% of its US drivers had stated they also worked on other app-based platforms (e.g. Uber and Doordash).

On autonomy, Lyft has partnered with Motional to provide driverless rides in Las Vegas which has resulted

in 100k+ paid driverless riders per [Lyft's autonomous website](#). While the company had previously partnered with Waymo to provide rides in Metro Phoenix per [Waymo's blog](#), Lyft does not highlight Waymo as a partner on its autonomous website at present.

Lyft committed to paying drivers at least 70% of rider payments per week after external fees like commercial insurance are subtracted, and estimates that there are ~\$0.31/mi of expenses associated with operating the car for the driver (i.e. fuel costs, maintenance, cleaning, and depreciation). Lyft also noted that the median US driver on their platform drove 1,647 engaged miles and spent 75 hours on the platform in 2023 per a [blog post on the company's website](#). On a per engaged hour basis, Lyft estimated that it paid the median US driver \$30.68 (inclusive of driver incentives and average tip of \$2.41). Using the metrics, we estimate that the median Lyft driver in the US would be receiving \$1.29/mi from Lyft and \$1.40/mi when including tip.

## **Robotaxi effort snapshots**

### **Waymo**

Waymo currently operates 24/7 driverless robotaxis in a 225+ sq. mi. area of Metro Phoenix, all of San Francisco, 63 square miles of Los Angeles (from Santa Monica to Downtown), and is planning to expand to Austin later this year. Additionally, the company announced on 4/3/24 that Uber Eats customers can now have their meals delivered by a fully autonomous Waymo vehicle within its 225+ square mile Metro Phoenix service area as part of Waymo's ongoing partnership with Uber. Waymo has a permit for 250 robotaxis in San Francisco and deploys about 100 at any given time as of August 2023, [per media reports](#). Recall on 1/11/24, the DMV approved an expanded ODD for Waymo that authorizes Waymo to deploy driverless AVs in portions of the Los Angeles area and additional portions of the San Francisco Peninsula.

Per a 2/13/24 press release, Waymo had driven over 10 mn fully autonomous miles and served over 1 mn ride-hail trips to date. [Research](#) conducted by Swiss Re, a reinsurer that Waymo began partnering with in 2022, shows that in over 7 mn rider-only miles, the Waymo Driver demonstrated: 1) an 85% reduction or 6.8 times lower crash rate involving any injury, from minor to severe and fatal cases (0.41 incidence per million miles for the Waymo Driver vs 2.78 for the human benchmark) and 2) a 57% reduction or 2.3 times lower police-reported crash rate (2.1 incidence per million miles for the Waymo Driver vs. 4.85 for the human benchmark).

While Waymo has not provided a specific pricing formula or cost per mile, we note that [per media reports](#), costs per trip have ranged from \$4.99 for a 1-mile, 6-minute trip to \$23.14 for a 15.5-mile, 43-minute trip (resulting in a cost per mile ranging from \$1.49 to \$4.99, though we note it is likely that there is a flat fee and a per mile and minute cost, similar to other rideshare/AV platform costs).

### **Cruise**

On 4/9/24, Cruise (General Motors' self-driving subsidiary) announced that it is resuming manual driving to create maps and gather road information in select cities, starting in Phoenix, using human-driven vehicles without autonomous systems engaged. Cruise plans to expand this effort to other select cities as it

continues to engage with officials and community leaders. Cruise has not set a timeline for deployment yet and is in the process of meeting with officials in select markets to rebuild trust and share updates.

GM commented on its 4Q23 EPS call that its planned 2024 investment in Cruise (~\$1 bn lower in 2024 than in 2023) reflects its more deliberate and cadenced go-to-market strategy. GM said that it is in the process of developing new financial targets and a new roadmap and that it would share updates on Cruise as it finalizes the technology and relaunch plans.

Recall that in October 2023, the California DMV suspended Cruise's permit for autonomous driving, and Cruise paused operations of its fleet to redesign its approach to safety following two pedestrian injuries that involved Cruise vehicles, per press releases. Cruise had been testing/operating in 15 cities, and GM stated that Cruise had eclipsed > 5mn driverless miles as of its 3Q23 earnings call.

Per media sources, prior to halting paid autonomous drives, Cruise charged a base fare of \$5 and an additional \$0.90/mi and \$0.40 per minute, and any city specific taxes (e.g. 1.5% for San Francisco).

### Apollo Go

In 2023, Apollo Go, Baidu's robotaxi service, provided more than 3 million rides. The total rides provided to the public by Apollo Go since inception exceeded 5 million as of January 2, 2024 (including those with a safety operator present).

Baidu has been operating fully driverless commercial AVs since August of 2022, including in cities such as Beijing and Wuhan.

### Regulatory landscape for AVs

**US:** Laws and regulations for autonomous vehicle deployment vary state by state with regard to testing and whether or not the vehicle can be deployed without a backup human driver present. We also note that companies would need to apply for an exemption to NHTSA if a vehicle were to lack specific mandatory features like a rear view mirror. NHTSA and the US DOT have said that they are committed to overseeing the safe testing, development and deployment of these systems – currently in limited, restricted and designated locations and conditions.

**Europe:** The European Commission adopted technical legislation for fully driverless vehicles (level 4 of automation, e.g. urban shuttles or robotaxis) that establish a comprehensive assessment of the safety and maturity of the fully automated vehicles before they go onto the EU market. The rules will cover testing procedures, cybersecurity requirements, data recording rules, as well as safety performance monitoring and incident reporting requirements for manufacturers of fully driverless vehicles.

For automated vehicles replacing the driver on motorways (level 3 automation), EU legislation aligns with the UN level rules on level 3 automation. The Regulation sets out clear performance-based requirements that must be complied with by car manufacturers before equipped vehicles can be sold within countries mandating the

Regulation. It includes provisions governing type approval, technical requirements, audit and reporting, and testing both on test tracks and in real-world conditions. The updated functionalities will also have to be compliant with the cybersecurity and software update requirements laid out in the relevant UN Regulations.

**China:** China issued additional safety guidelines for the use of autonomous vehicles in public transport in December 2023. The guidelines apply to autonomous vehicles for passengers including taxis as well as for freight and cover vehicles of various degrees of automation, per the Ministry of Transport. Autonomous vehicles for freight transport and conditional autonomous taxis are required to carry one driver. With the approval of local governments, fully autonomous taxis could be operated unmanned over designated areas with one security inspector overseeing them remotely. They also require companies using autonomous vehicles for public transport to be qualified and licensed and state that companies can work together with automakers on such operations. Roboshuttles or robotrucks still need to have in-car safety operators, while robotaxis can use remote operators. The ratio of robotaxis to remote operators cannot exceed 3:1, and operators need to pass certain skill tests. There are also rules specifying what data the companies need to report when accidents happen. Additionally, the document noted that autonomous driving technology should be used cautiously for passenger transport services, and autonomous taxis should be operated in areas with good traffic conditions where risks are more manageable. By 2025, China said it aims to fully establish a system to encourage technology development and investment, platform/traffic infrastructure, the implementation of laws and regulations, etc., as it strives to achieve large-scale production of conditionally autonomous vehicles.

### **Updated Tesla FSD scenarios**

As we wrote in our November 2023 note Contextualizing Tesla's AI and FSD opportunities, under various ASP and take rate scenarios (shown in Exhibit 4 and Exhibit 5), Tesla could eventually derive tens of billions of dollars in revenue from FSD subscriptions or purchases, up from what we believe is a few billion dollars per year currently. We note that on 4/12/24, Tesla reduced the price of a monthly FSD subscription to US\$99 from \$199 for those users who had not purchased Enhanced Autopilot. We show updated scenarios for revenue from FSD below.

**Exhibit 4: Tesla revenue potential from monthly subscriptions of FSD**

Monthly ASP	Attach Rate	Annual revenue in mns from monthly FSD subscriptions					
		25	30	35	40	45	50
\$25.0	10%	750	900	1,050	1,200	1,350	1,500
	20%	1,500	1,800	2,100	2,400	2,700	3,000
	30%	2,250	2,700	3,150	3,600	4,050	4,500
	40%	3,000	3,600	4,200	4,800	5,400	6,000
	50%	3,750	4,500	5,250	6,000	6,750	7,500
\$50.0	10%	1,500	1,800	2,100	2,400	2,700	3,000
	20%	3,000	3,600	4,200	4,800	5,400	6,000
	30%	4,500	5,400	6,300	7,200	8,100	9,000
	40%	6,000	7,200	8,400	9,600	10,800	12,000
	50%	7,500	9,000	10,500	12,000	13,500	15,000
\$100.0	10%	3,000	3,600	4,200	4,800	5,400	6,000
	20%	6,000	7,200	8,400	9,600	10,800	12,000
	30%	9,000	10,800	12,600	14,400	16,200	18,000
	40%	12,000	14,400	16,800	19,200	21,600	24,000
	50%	15,000	18,000	21,000	24,000	27,000	30,000
\$150.0	10%	4,500	5,400	6,300	7,200	8,100	9,000
	20%	9,000	10,800	12,600	14,400	16,200	18,000
	30%	13,500	16,200	18,900	21,600	24,300	27,000
	40%	18,000	21,600	25,200	28,800	32,400	36,000
	50%	22,500	27,000	31,500	36,000	40,500	45,000
\$200.0	10%	6,000	7,200	8,400	9,600	10,800	12,000
	20%	12,000	14,400	16,800	19,200	21,600	24,000
	30%	18,000	21,600	25,200	28,800	32,400	36,000
	40%	24,000	28,800	33,600	38,400	43,200	48,000
	50%	30,000	36,000	42,000	48,000	54,000	60,000

Source: Goldman Sachs Global Investment Research

**Exhibit 5: Tesla revenue opportunity from upfront FSD purchase**

ASP	Attach Rate	Revenue in mns from upfront FSD purchase					
		5	6	7	8	9	10
\$5,000.0	10%	2,500	3,000	3,500	4,000	4,500	5,000
	20%	5,000	6,000	7,000	8,000	9,000	10,000
	30%	7,500	9,000	10,500	12,000	13,500	15,000
	40%	10,000	12,000	14,000	16,000	18,000	20,000
	50%	12,500	15,000	17,500	20,000	22,500	25,000
\$7,500.0	10%	3,750	4,500	5,250	6,000	6,750	7,500
	20%	7,500	9,000	10,500	12,000	13,500	15,000
	30%	11,250	13,500	15,750	18,000	20,250	22,500
	40%	15,000	18,000	21,000	24,000	27,000	30,000
	50%	18,750	22,500	26,250	30,000	33,750	37,500
\$12,000.0	10%	6,000	7,200	8,400	9,600	10,800	12,000
	20%	12,000	14,400	16,800	19,200	21,600	24,000
	30%	18,000	21,600	25,200	28,800	32,400	36,000
	40%	24,000	28,800	33,600	38,400	43,200	48,000
	50%	30,000	36,000	42,000	48,000	54,000	60,000
\$15,000.0	10%	7,500	9,000	10,500	12,000	13,500	15,000
	20%	15,000	18,000	21,000	24,000	27,000	30,000
	30%	22,500	27,000	31,500	36,000	40,500	45,000
	40%	30,000	36,000	42,000	48,000	54,000	60,000
	50%	37,500	45,000	52,500	60,000	67,500	75,000
\$20,000.0	10%	10,000	12,000	14,000	16,000	18,000	20,000
	20%	20,000	24,000	28,000	32,000	36,000	40,000
	30%	30,000	36,000	42,000	48,000	54,000	60,000
	40%	40,000	48,000	56,000	64,000	72,000	80,000
	50%	50,000	60,000	70,000	80,000	90,000	100,000

Source: Goldman Sachs Global Investment Research

### Valuation considerations

We believe that our \$175 12-month price target (based on 50X Q5-Q8 EPS including SBC) gives Tesla future credit for growing in new areas such as FSD and robotaxis.

We are Neutral rated on the stock, with our positive view of Tesla's long-term growth potential and position in the market offset by what we believe is full valuation and weaker near-term fundamentals.

We believe an upside scenario for the stock over the next 12-24 months could be ~\$220-\$300 using a multiple of 50X-60X applied to 2026E EPS (note we model 2026 EPS including SBC of \$4.45 and excluding SBC of \$5.00), and the market could be more forward looking/ascribe a higher multiple should Tesla demonstrate improved traction with software and services products such as FSD. We believe a downside scenario, including if investors become less optimistic on the software and services opportunity, could be ~\$55-\$75 using a multiple of ~30X applied to 2024 EPS (note that we model 2024E EPS including SBC at \$1.90 and excluding SBC at \$2.45).

Key downside risks to our view relate to potentially larger vehicle price reductions than we expect, increased competition in EVs, slower EV demand, delays with products/capabilities like FSD/the third generation platform/4680, key person risk, the internal control environment, margins, and operational risks associated with Tesla's high degree of vertical integration. Upside risks include faster EV adoption and/or share gain from Tesla, a stronger macroeconomic environment for new vehicle sales more generally, earlier new product launches than we expect (e.g., a vehicle using the third generation platform), and an earlier/larger impact from AI enabled products (e.g., FSD, Optimus and robotaxis) than we currently anticipate.

# Disclosure Appendix

## Reg AC

We, Mark Delaney, CFA, Will Bryant, Morgan Leung and Aman Gupta, hereby certify that all of the views expressed in this report accurately reflect our personal views about the subject company or companies and its or their securities. We also certify that no part of our compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

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

## GS Factor Profile

The Goldman Sachs Factor Profile provides investment context for a stock by comparing key attributes to the market (i.e. our coverage universe) and its sector peers. The four key attributes depicted are: Growth, Financial Returns, Multiple (e.g. valuation) and Integrated (a composite of Growth, Financial Returns and Multiple). Growth, Financial Returns and Multiple are calculated by using normalized ranks for specific metrics for each stock. The normalized ranks for the metrics are then averaged and converted into percentiles for the relevant attribute. The precise calculation of each metric may vary depending on the fiscal year, industry and region, but the standard approach is as follows:

**Growth** is based on a stock's forward-looking sales growth, EBITDA growth and EPS growth (for financial stocks, only EPS and sales growth), with a higher percentile indicating a higher growth company. **Financial Returns** is based on a stock's forward-looking ROE, ROCE and CROCI (for financial stocks, only ROE), with a higher percentile indicating a company with higher financial returns. **Multiple** is based on a stock's forward-looking P/E, P/B, price/dividend (P/D), EV/EBITDA, EV/FCF and EV/Debt Adjusted Cash Flow (DACP) (for financial stocks, only P/E, P/B and P/D), with a higher percentile indicating a stock trading at a higher multiple. The **Integrated** percentile is calculated as the average of the Growth percentile, Financial Returns percentile and (100% - Multiple percentile).

Financial Returns and Multiple use the Goldman Sachs analyst forecasts at the fiscal year-end at least three quarters in the future. Growth uses inputs for the fiscal year at least seven quarters in the future compared with the year at least three quarters in the future (on a per-share basis for all metrics).

For a more detailed description of how we calculate the GS Factor Profile, please contact your GS representative.

## M&A Rank

Across our global coverage, we examine stocks using an M&A framework, considering both qualitative factors and quantitative factors (which may vary across sectors and regions) to incorporate the potential that certain companies could be acquired. We then assign a M&A rank as a means of scoring companies under our rated coverage from 1 to 3, with 1 representing high (30%-50%) probability of the company becoming an acquisition target, 2 representing medium (15%-30%) probability and 3 representing low (0%-15%) probability. For companies ranked 1 or 2, in line with our standard departmental guidelines we incorporate an M&A component into our target price. M&A rank of 3 is considered immaterial and therefore does not factor into our price target, and may or may not be discussed in research.

## Quantum

Quantum is Goldman Sachs' proprietary database providing access to detailed financial statement histories, forecasts and ratios. It can be used for in-depth analysis of a single company, or to make comparisons between companies in different sectors and markets.

## Disclosures

**The rating(s) for Tesla Inc. is/are relative to the other companies in its/their coverage universe:** Amphenol Corp., Aptiv Plc, Aurora Innovation Inc., Belden Inc., BorgWarner Inc., Cerence Inc., ChargePoint Holdings, Flex, Ford Motor Co., General Motors Co., Gentex Corp., Innoviz Technologies, Jabil Circuit Inc., Keysight Technologies Inc., Lear Corp., Luminar Technologies Inc., Magna International Inc., Mobileye Global Inc., QuantumScape Corp., Rivian Automotive Inc., Sensata Technologies Holding, Symbotic Inc., TE Connectivity Ltd., Tesla Inc., Vertiv Holdings, View Inc., Visteon Corp.

## Company-specific regulatory disclosures

The following disclosures relate to relationships between The Goldman Sachs Group, Inc. (with its affiliates, "Goldman Sachs") and companies covered by Goldman Sachs Global Investment Research and referred to in this research.

Goldman Sachs has received compensation for investment banking services in the past 12 months: Tesla Inc. (\$155.45)

Goldman Sachs expects to receive or intends to seek compensation for investment banking services in the next 3 months: Tesla Inc. (\$155.45)

Goldman Sachs has received compensation for non-investment banking services during the past 12 months: Tesla Inc. (\$155.45)

Goldman Sachs had an investment banking services client relationship during the past 12 months with: Tesla Inc. (\$155.45)

Goldman Sachs had a non-investment banking securities-related services client relationship during the past 12 months with: Tesla Inc. (\$155.45)

Goldman Sachs had a non-securities services client relationship during the past 12 months with: Tesla Inc. (\$155.45)

Goldman Sachs makes a market in the securities or derivatives thereof: Tesla Inc. (\$155.45)

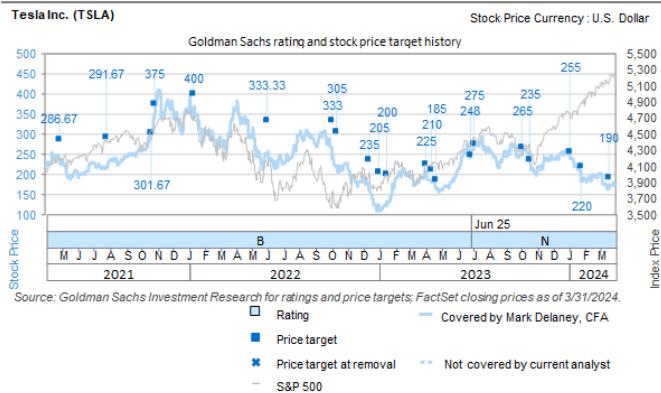
## Distribution of ratings/investment banking relationships

Goldman Sachs Investment Research global Equity coverage universe

	Rating Distribution			Investment Banking Relationships		
	Buy	Hold	Sell	Buy	Hold	Sell
Global	48%	36%	16%	64%	56%	41%

As of April 1, 2024, Goldman Sachs Global Investment Research had investment ratings on 2,885 equity securities. Goldman Sachs assigns stocks as Buys and Sells on various regional Investment Lists; stocks not so assigned are deemed Neutral. Such assignments equate to Buy, Hold and Sell for the purposes of the above disclosure required by the FINRA Rules. See 'Ratings, Coverage universe and related definitions' below. The Investment Banking Relationships chart reflects the percentage of subject companies within each rating category for whom Goldman Sachs has provided investment banking services within the previous twelve months.

## Price target and rating history chart(s)



The price targets shown should be considered in the context of all prior published Goldman Sachs research, which may or may not have included price targets, as well as developments relating to the company, its industry and financial markets.

## 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.

**Distribution of ratings:** See the distribution of ratings disclosure above. **Price chart:** See the price chart, with changes of ratings and price targets in prior periods, above, or, if electronic format or if with respect to multiple companies which are the subject of this report, on the Goldman Sachs website at <https://www.gs.com/research/hedge.html>.

### 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@goldmansachs.com. Compliance Officer: Anil Rajput | Tel: + 91 22 6616 9000 | Email: anil.m.rajput@goldmansachs.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.

## Ratings, coverage universe and related definitions

**Buy (B), Neutral (N), Sell (S)** Analysts recommend stocks as Buys or Sells for inclusion on various regional Investment Lists. Being assigned a Buy or Sell on an Investment List is determined by a stock's total return potential relative to its coverage universe. Any stock not assigned as a Buy or a Sell on an Investment List with an active rating (i.e., a stock that is not Rating Suspended, Not Rated, Coverage Suspended or Not Covered), is deemed Neutral. Each region manages Regional Conviction lists, which are selected from Buy rated stocks on the respective region's Investment lists and represent investment recommendations focused on the size of the total return potential and/or the likelihood of the realization of the return across their respective areas of coverage. The addition or removal of stocks from such Conviction lists are managed by the Investment Review Committee or other designated committee in each respective region and do not represent a change in the analysts' investment rating for such stocks.

**Total return potential** represents the upside or downside differential between the current share price and the price target, including all paid or anticipated dividends, expected during the time horizon associated with the price target. Price targets are required for all covered stocks. The total return potential, price target and associated time horizon are stated in each report adding or reiterating an Investment List membership.

**Coverage Universe:** A list of all stocks in each coverage universe is available by primary analyst, stock and coverage universe at <https://www.gs.com/research/hedge.html>.

**Not Rated (NR).** The investment rating, target price and earnings estimates (where relevant) are not provided or have been suspended pursuant to Goldman Sachs policy when Goldman Sachs is acting in an advisory capacity in a merger or in a strategic transaction involving this company, when there are legal, regulatory or policy constraints due to Goldman Sachs' involvement in a transaction, when the company is an early-stage biotechnology company, and in certain other circumstances. **Rating Suspended (RS).** Goldman Sachs Research has suspended the investment rating and price target for this stock, because there is not a sufficient fundamental basis for determining an investment rating or target price. The previous investment rating and target price, if any, are no longer in effect for this stock and should not be relied upon. **Coverage Suspended (CS).** Goldman Sachs has suspended coverage of this company. **Not Covered (NC).** Goldman Sachs does not cover this company. **Not Available or Not Applicable (NA).** The information is not available for display or is not applicable. **Not Meaningful (NM).** The information is not meaningful and is therefore excluded.

## 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 contato@goldmanbrasil@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Canal de Comunicação com o Público Goldman Sachs Brasil: 0800 727 5764 e/ou contato@goldmanbrasil@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 resolution ("ACPR") and regulated by the Autorité de contrôle prudentiel et de resolution 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 (Finansinpektionen) 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.

The analysts named in this report may have from time to time discussed with our clients, including Goldman Sachs salespersons and traders, or may discuss in this report, trading strategies that reference catalysts or events that may have a near-term impact on the market price of the equity securities discussed in this report, which impact may be directionally counter to the analyst's published price target expectations for such stocks. Any such trading strategies are distinct from and do not affect the analyst's fundamental equity rating for such stocks, which rating reflects a stock's return potential relative to its coverage universe as described herein.

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 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.**

**No part of this material may be (i) copied, photocopied or duplicated in any form by any means or (ii) redistributed without the prior written consent of The Goldman Sachs Group, Inc.**