Buy

Bravura Solutions Ltd. (BVS.AX)

Covid-19 uncertainty to impact near term pipeline, but medium term story remains solid; Remain Buy

BVS.AX	12m Price Target: **A$5.40**	Price: **A$3.61**	Upside: **49.6%**

Given material downgrades made to our Australian and UK economic growth outlooks, we revise down our estimates for BVS. Whilst we expect its pipeline of professional services and maintenance work to remain solid in the near-to-medium term, given a weaker macro environment and social distancing requirements, we expect this to result in delays to new client opportunities in the near term. We now forecast 0 and 1 new client wins in FY20 and FY21 respectively for BVS, down from 1 and 2 respectively, previously. Reductions to our new client win assumptions result in -7% cuts to our FY20-22E EPS. Our updated FY20 NPAT of $37.8mn now sits below the company's FY20 guidance for mid-teens NPAT growth + $3mn for recent acquisitions (15% NPAT growth + acquisitions implies NPAT of A$40.7mn).

Whilst we expect near term earnings to be weaker than previously expected, we continue to expect the business to generate positive net cash flow driven by BVS's pipeline of professional services and maintenance revenues from existing clients. BVS' balance sheet ended 1H20 with net cash of A$100.3mn further providing it with additional flexibility to withstand any significant near term headwinds and also to continue to pursue additional growth opportunities.

Earnings and valuation changes

Our estimate cuts and a mark-to-market of our EV/EBITDA based valuation result in an 22% reduction in our 12-m TP to A$5.40. With this presenting 48% upside, we remain Buy rated. We remain positive on BVS' medium term pipeline of opportunities and see its defensive attributes (high levels of recurring income, with clients typically on 7-10 year contracts) as favourable in this current environment.

Aaron Yeoh, CFA
+61(3)9679-1996 | aaron.yeoh@gs.com
Goldman Sachs Australia Pty Ltd

Key Data

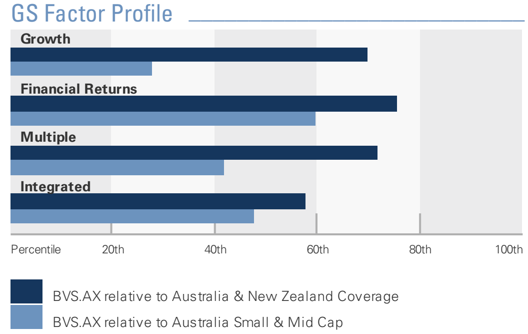
Market cap: A$879.4mn / $538.4mn
Enterprise value: A$752.1mn / $460.5mn
3m ADTV: A$9.5mn / $6.2mn
Australia
Australia Small & Mid Cap
M&A Rank: 3
Leases incl. in net debt & EV?: No

GS Forecast

	6/19	6/20E	6/21E	6/22E
Revenue (A$ mn) New	**257.7**	**283.6**	**311.0**	**341.0**
Revenue (A$ mn) Old	257.7	285.6	325.8	356.5
EBITDA (A$ mn)	48.6	52.2	64.9	74.2
EPS (A$) New	**0.15**	**0.16**	**0.18**	**0.21**
EPS (A$) Old	0.15	0.17	0.20	0.22
P/E (X)	29.8	23.3	19.8	17.3
P/B (X)	3.4	2.9	2.8	2.7
Dividend yield (%)	2.3	3.0	3.5	4.0
CROCI (%)	15.3	11.5	12.1	13.3

	6/19	**12/19**	**6/20E**	**--**
EPS (A$)	0.07	0.08	0.07	--

GS Factor Profile



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

Buy

Bravura Solutions Ltd. (BVS.AX)

Rating since Nov 27, 2019

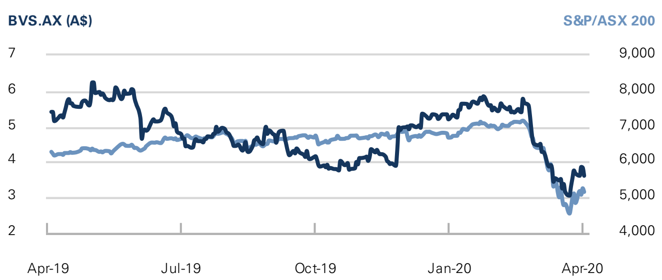
Ratios & Valuation

	6/19	6/20E	6/21E	6/22E
P/E (X)	29.8	23.3	19.8	17.3
P/B (X)	3.4	2.9	2.8	2.7
FCF yield (%)	2.9	3.9	3.9	4.6
EV/EBITDAR (X)	16.1	14.4	11.5	10.0
EV/EBITDA (excl. leases) (X)	16.1	14.4	11.5	10.0
CROCI (%)	15.3	11.5	12.1	13.3
ROE (%)	16.2	12.7	14.3	15.7
Net debt/equity (%)	(66.8)	(42.1)	(41.2)	(40.6)
Net debt/equity (excl. leases) (%)	(66.8)	(42.1)	(41.2)	(40.6)
Interest cover (X)	222.7	60.9	–	–
Days inventory outst, sales	–	–	–	–
Receivable days	51.7	37.0	28.8	28.9
Days payable outstanding	NM	NM	NM	NM
DuPont ROE (%)	11.3	12.5	14.0	15.4
Turnover (X)	0.7	0.7	0.8	0.8
Leverage (X)	1.3	1.3	1.3	1.3
Gross cash invested (ex cash) (A$)	304.9	392.9	413.4	435.4
Average capital employed (A$)	93.0	136.0	180.6	191.3
BVPS (A$)	1.33	1.24	1.30	1.36

Growth & Margins (%)

	6/19	6/20E	6/21E	6/22E
Total revenue growth	16.4	10.1	9.7	9.6
EBITDA growth	25.9	7.5	24.4	14.3
EPS growth	19.0	3.3	17.5	14.7
DPS growth	12.2	6.2	17.5	14.9
EBIT margin	16.3	15.1	17.6	18.5
EBITDA margin	18.8	18.4	20.9	21.8
Net income margin	12.7	13.3	14.3	14.9

Price Performance



	3m	6m	12m
Absolute	(31.6)%	(11.1)%	(32.6)%
Rel. to the S&P/ASX 200	(11.2)%	14.5%	(18.4)%

Source: FactSet. Price as of 2 Apr 2020 close.

Income Statement (A$ mn)

	6/19	6/20E	6/21E	6/22E
Total revenue	257.7	283.6	311.0	341.0
Cost of goods sold	0.0	0.0	0.0	0.0
SG&A	–	–	–	–
R&D	(2.2)	(2.3)	(2.5)	(6.8)
Other operating inc./(exp.)	(37.7)	(39.6)	(40.7)	(42.0)
EBITDA	**48.6**	**52.2**	**64.9**	**74.2**
Depreciation & amortization	(6.5)	(9.2)	(10.1)	(11.1)
EBIT	**42.1**	**43.0**	**54.8**	**63.1**
Net interest inc./(exp.)	0.3	1.0	0.6	0.5
Income/(loss) from associates	–	–	–	–
Pre-tax profit	**41.5**	**43.9**	**55.4**	**63.6**
Provision for taxes	(8.7)	(6.2)	(11.1)	(12.7)
Minority interest	–	–	–	–
Preferred dividends	–	–	–	–
Net inc. (pre-exceptionals)	**32.8**	**37.8**	**44.4**	**50.9**
Post-tax exceptionals	–	0.0	–	–
Net inc. (post-exceptionals)	**32.8**	**37.8**	**44.4**	**50.9**
EPS (basic, pre-except) (A$)	**0.15**	**0.16**	**0.18**	**0.21**
EPS (diluted, pre-except) (A$)	**0.15**	**0.16**	**0.18**	**0.21**
EPS (basic, post-except) (A$)	**0.15**	**0.16**	**0.18**	**0.21**
EPS (diluted, post-except) (A$)	**0.15**	**0.15**	**0.18**	**0.21**
DPS (A$)	0.10	0.11	0.13	0.14
Div. payout ratio (%)	67.3	69.2	69.2	69.3

Balance Sheet (A$ mn)

	6/19	6/20E	6/21E	6/22E
Cash & cash equivalents	194.8	127.4	130.2	134.7
Accounts receivable	34.0	23.5	25.7	28.2
Inventory	–	–	–	–
Other current assets	7.8	7.8	7.8	7.8
Total current assets	**236.6**	**158.7**	**163.8**	**170.7**
Net PP&E	21.2	30.6	39.4	48.5
Net intangibles	113.5	190.2	190.5	190.6
Total investments	0.0	0.0	0.0	0.0
Other long-term assets	8.8	8.8	8.8	8.8
Total assets	**380.2**	**388.3**	**402.4**	**418.6**
Accounts payable	11.6	8.4	9.2	10.1
Short-term debt	0.0	0.0	0.0	–
Short-term lease liabilities	–	–	–	–
Other current liabilities	65.3	65.3	65.3	65.3
Total current liabilities	**76.9**	**73.7**	**74.5**	**75.4**
Long-term debt	–	–	–	–
Long-term lease liabilities	–	–	–	–
Other long-term liabilities	11.8	11.8	11.8	11.8
Total long-term liabilities	**11.8**	**11.8**	**11.8**	**11.8**
Total liabilities	**88.7**	**85.5**	**86.3**	**87.2**
Preferred shares	–	–	–	–
Total common equity	**291.5**	**302.8**	**316.1**	**331.4**
Minority interest	**--**	**--**	**--**	**--**
Total liabilities & equity	**380.2**	**388.3**	**402.4**	**418.6**
Net debt, adjusted	(194.8)	(127.4)	(130.2)	(134.7)

Cash Flow (A$ mn)

	6/19	6/20E	6/21E	6/22E
Net income	32.8	37.8	44.4	50.9
D&A add-back	6.5	9.2	10.1	11.1
Minority interest add-back	–	–	–	–
Net (inc)/dec working capital	4.3	7.3	(1.5)	(1.6)
Other operating cash flow	2.3	(6.0)	(5.0)	(5.1)
Cash flow from operations	**45.9**	**48.3**	**48.0**	**55.3**
Capital expenditures	(17.3)	(14.3)	(14.1)	(15.2)
Acquisitions	–	(75.0)	–	–
Divestitures	–	–	–	–
Others	–	–	–	–
Cash flow from investing	**(17.3)**	**(89.3)**	**(14.1)**	**(15.2)**
Repayment of lease liabilities	–	–	–	–
Dividends paid (common & pref)	(21.0)	(26.4)	(31.0)	(35.6)
Inc/(dec) in debt	(12.4)	67.4	–	–
Other financing cash flows	162.2	0.0	0.0	0.0
Cash flow from financing	**128.8**	**41.0**	**(31.0)**	**(35.6)**
Total cash flow	**157.4**	**0.0**	**2.9**	**4.4**
Free cash flow	28.6	34.0	33.9	40.1

Source: Company data, Goldman Sachs Research estimates.

Covid-19 likely to impact timing of new client wins

At the time of its 1H20 result, the company noted that its sales pipeline remained strong, driven by continued project activity with existing clients and sales opportunities from new clients, supported by expansion into new markets, segments. However, it did note that given the nature of these opportunities, the timing of closure (i.e., new clients wins) was more difficult to predict.

Following material downgrades to economic growth outlooks made by our Australia and Europe economics teams (AU note here, Euro/UK note here) relating to social distancing measures introduced to contain the spread of COVID-19, we expect this to further increase the potential risk relating to timing of deal closures in the near term, as such we lower our new client win assumptions in FY20 and FY21.

We now forecast 0 and 1 new client wins in FY20 and FY21 respectively for BVS, down from 1 and 2 respectively. This is in line with our Australia economists view of a strong recovery to be likely delayed to 2021. With this largely resulting in lower upfront license fees, which are highest margin for BVS, this also results in a reduction in segment EBITDA margin assumptions.

Reductions to our new client win assumptions result in c.-7% EPS cuts to our FY20-22E EPS. Our updated FY20 NPAT of $37.8mn now sits below the company's FY20 guidance for mid-teens NPAT growth + $3mn for recent acquistions (15% NPAT growth + acquisitions implies NPAT of A$40.7mn).

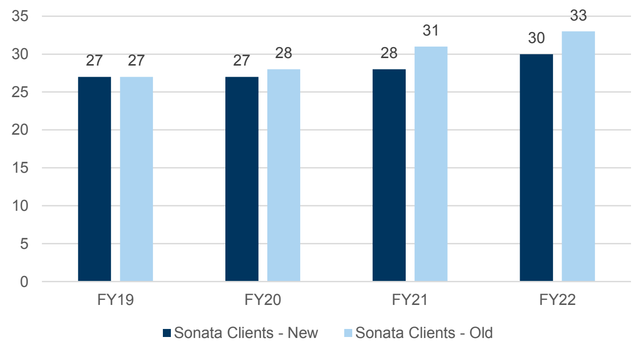
Exhibit 1: We lower our FY20-22E EPS by -7%

	NPAT (A$ mn)			EPS (A¢)			DPS (A¢)		
	Old	**New**	% Chg	Old	**New**	% Chg	Old	**New**	% Chg
FY19	32.8	32.8	0.0%	15.0	15.0	0.0%	10.1	10.1	0.0%
FY20E	40.7	37.8	-7.1%	16.7	15.5	-7.1%	11.6	10.7	-7.1%
FY21E	47.7	44.4	-6.9%	19.6	18.2	-6.9%	13.5	12.6	-6.9%
FY22E	54.4	50.9	-6.5%	22.4	20.9	-6.5%	15.5	14.5	-6.5%
CAGR ('19-'22)	18%	16%		14%	12%		15%	13%	

	Old	**New**	% Chg
Target price (A$/share):	6.90	5.40	-21.7%

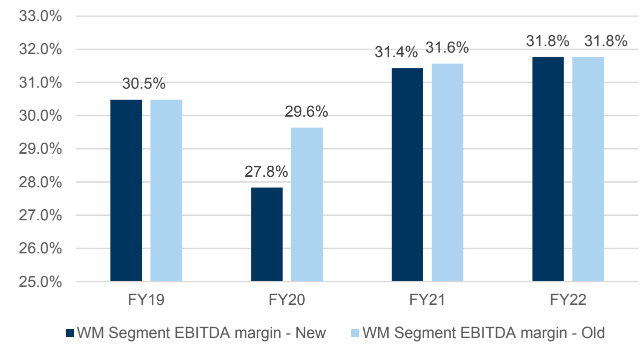
Source: Company data, Goldman Sachs Global Investment Research

Exhibit 2: We lower
Sonata clients - new vs old GSE



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 3: Lower license fees drive a reduction in our EBITDA margin assumptions, particularly in FY20



Source: Company data, Goldman Sachs Global Investment Research

Our estimate cuts and a mark-to-market of our EV/EBITDA based valuation result in an 22% reduction in our 12-m TP to A$5.40. Our 12 m TP remains based on equal weighted blend of our DCF (WACC of 8.8%/ terminal growth 2.5%) and EV/EBITDA (18.6x FY20E EV/EBITDA applied to FY21E EBITDA, from 26.6x on mark-to-market to peers) methodologies.

Exhibit 4: Summary of our PT change (A$)

	New	Old	% Change
DCF valuation (WACC 8.8%; TGR 2.5%)	$5.69	$6.25	-9%
Multiple based approach (18.6x EV/EBITDA capitalised on FY21 EBITDA)	$5.04	$7.48	-33%
12-m TP (Equal weighted DCF and multiple based approach)	**$5.40**	**$6.90**	**-22%**

Source: Goldman Sachs Global Investment Research

Key downside risks: Rapidly changing technology requires ongoing investment; Fewer contract wins (since forecasts are contingent on the ability to win new clients); Contract losses.

The following factors remain key drivers behind our positive view:

- **Global product offering:** BVS has invested c. A$160mn developing its core Sonata product which is predominantly sold to wealth managers in the UK and to superannuation funds in Australia. Sonata is built on an open source platform, with an increasing % of new functionality funded by individual clients, which can then by rolled out to BVS' other clients. We see Sonata's track record with an established client base and continued product development as key selling points.
- **Solid client base with low client churn**: client churn is extremely low, with all contracts typically operating on a c.7 to 10 year basis. BVS estimates that c. 75% of its revenues are on a recurring basis.
- **Regulatory change continues to be a structural driver:** regulatory changes in the UK which include the Pension Freedoms reform and Retail Distribution review were the initial driver of software upgrades for the wealth management platform market in the UK. Whilst we expect that most of the opportunities within the UK wealth management platform market have been largely realised, we see further opportunities for BVS in the workplace pensions market, driven by 'auto enrollment'

reform. Based on statistics provided by the Office of National Statistics (ONS), over 76% of UK employees were members of a workplace pension scheme in 2018, up from 73% in 2017, and vs. 44% in 2012.

- **Continued improvement on margins:** the company has noted that as its customer base continues to scale, it should see improvement in margins on maintenance revenue. As a comparison, the Wealth Management segment, which is the main growth driver of the business, had a segment EBITDA margin of 30.5% in FY19, in comparison to the more mature Funds Admin segment which had a segment EBITDA margin of 40.0% in FY19.
- **Balance sheet flexibility:** BVS' balance sheet is in a strong position with net cash of c.A$105mn at 1H20.

Disclosure Appendix

Reg AC

I, Aaron Yeoh, CFA, hereby certify that all of the views expressed in this report accurately reflect my personal views about the subject company or companies and its or their securities. I also certify that no part of my 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 (DACF) (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

Coverage group(s) of stocks by primary analyst(s)

Aaron Yeoh, CFA: Australia-Small & Mid Cap.

Australia-Small & Mid Cap: A2 Milk Co., A2 Milk Co., Adairs Ltd., Afterpay Ltd., Altium Ltd., AMA Group, Bega Cheese Ltd., Bingo Industries Ltd., Blackmores Ltd., Bravura Solutions Ltd., Breville Group, City Chic Collective Ltd., Costa Group, Freedom Foods Group, GUD Holdings, HUB24 Ltd., HUON Aquaculture Group, IDP Education Ltd., IMF Bentham Ltd., Ingenia Communities Group, Inghams Group, IPH Ltd., Johns Lyng Group, Lifestyle Communities Ltd., Megaport Ltd., Nearmap Ltd., Netwealth Group, OneVue Holdings, Praemium Ltd., Pushpay Holdings, Pushpay Holdings, Redbubble Ltd., Synlait Milk Ltd., Synlait Milk Ltd., Tassal Group, The Reject Shop Ltd..

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 the Global Investment Research Division of Goldman Sachs and referred to in this research.

Goldman Sachs beneficially owned 1% or more of common equity (excluding positions managed by affiliates and business units not required to be aggregated under US securities law) as of the second most recent month end: Bravura Solutions Ltd. (A$3.61)

Goldman Sachs had a non-securities services client relationship during the past 12 months with: Bravura Solutions Ltd. (A$3.61)

Goldman Sachs makes a market in the securities or derivatives thereof: Bravura Solutions Ltd. (A$3.61)

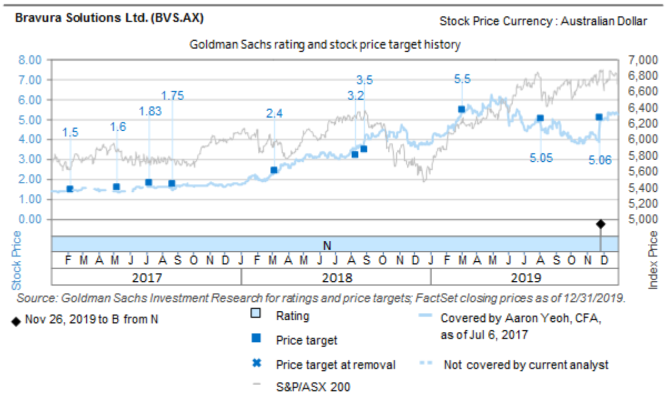
Distribution of ratings/investment banking relationships

Goldman Sachs Investment Research global Equity coverage universe

	Rating Distribution			Investment Banking Relationships		
	Buy	Hold	Sell	Buy	Hold	Sell
Global	44%	40%	16%	63%	57%	51%

As of January 1, 2020, Goldman Sachs Global Investment Research had investment ratings on 3,054 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 groups 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 the Global Investment Research Division 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 Instruction 598 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 Instruction 598, is the first author named at the beginning of this report, unless indicated otherwise at the end of the text. **Canada:** Goldman Sachs Canada Inc. is an affiliate of The Goldman Sachs Group Inc. and therefore is included in the company specific disclosures relating to Goldman Sachs (as defined above). Goldman Sachs Canada Inc. has approved of, and agreed to take responsibility for, this research report in Canada if and to the extent that Goldman Sachs Canada Inc. disseminates this research report to its clients. **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. **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:** Further information on the covered companies referred to in this research may be obtained from Goldman Sachs (Singapore) Pte. (Company Number: 198602165W). **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: 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 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 and Type II Financial Instruments Firms 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 groups 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. 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's Investment Review Committee manages Regional Conviction lists, which 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 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 groups: A list of all stocks in each coverage group is available by primary analyst, stock and coverage group at https://www.gs.com/research/hedge.html.

Not Rated (NR). The investment rating and target price have been removed pursuant to Goldman Sachs policy when Goldman Sachs is acting in an advisory capacity in a merger or strategic transaction involving this 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, or there are legal, regulatory or policy constraints around publishing, an investment rating or target. The previous investment rating and price target, 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

The Global Investment Research Division of Goldman Sachs 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.; Ombudsman Goldman Sachs Brazil: 0800 727 5764 and / or ouvidoriagoldmansachs@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Ouvidoria Goldman Sachs Brasil: 0800 727 5764 e/ou ouvidoriagoldmansachs@gs.com. Horário de funcionamento: segunda-feira à sexta-feira (exceto feriados), das 9h às 18h; in Canada by either Goldman Sachs Canada Inc. or 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 and European Union.

European Union: Goldman Sachs International authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority, has approved this research in connection with its distribution in the European Union and United Kingdom.

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 our Global Investment Research Division. 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 group as described herein.

We and our affiliates, officers, directors, and employees, excluding equity and credit analysts, 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.

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. 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 the Global Investment Research division of GS 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.