Asia in Focus

A practical guide to China's policy stimulus through the virus shock

- <u>Chinese growth in Q1</u> will be significantly affected by the coronavirus outbreak, and the government can be expected to do its best to move the economy back to trend. But how strong policy support will be in practice, and what policies the government will focus on, are not yet certain.
- н. While some stimulus is required for a prompt and sufficiently strong rebound, a massive GFC-sized stimulus is not necessary or likely, in our view. Compared to a big demand shock as we saw in GFC, this time, there has been both a significant supply shock and a demand shock. As long as supply can return to normal guickly, stimulus may not have to be particularly large to get the economy back to initial equilibrium, though it would be required if policymakers want to boost activity meaningfully above trend in H2 and "make up for" lost output early in the year. Policy stimulus would inevitably push macro leverage higher, but the government will try to avoid large deviation of credit growth from nominal GDP growth and mitigate costs through structural measures.
- Ramping up public investment is likely to be the most effective measure to boost demand, given the state-controlled banking sector and large SOE sector in China. Tax cuts and accommodative monetary policy are needed, particularly to help firms ease short-term liquidity pressures to mitigate spillover of supply shocks to the demand side. But their effects on boosting demand could be limited, particularly when firms/households do not have strong incentives to borrow and spend.
- We expect the augmented fiscal deficit ratio to increase by 3pp in 2020, driven primarily by greater special bond issuance and stronger policy bank support. We expect the total social financing (TSF)-to-GDP ratio to increase by 4pp this year to accommodate infrastructure investment, facilitated by further RRR cuts and relatively low interest rates. And measures to further increase banks' capital to strengthen their lending capability would also be important.
- In coming months, it will be important to monitor those data points that may suggest that cyclical policy is stronger/weaker than our expectations, such as the annual guota for special bonds, any new financing policy on infrastructure investment, or any data on the pace of infrastructure investment approvals.

Zhennan Li

+852-2978-6128 | zhennan.li@gs.com Goldman Sachs (Asia) L.L.C.

Hui Shan

+852-2978-6634 | hui.shan@gs.com Goldman Sachs (Asia) L.L.C

Yu Song +86(10)6627-3111 | yu.song@ghsl.cn Beijing Gao Hua Securities Company Limited

Maggie Wei +852-2978-0106 | maggie.wei@gs.com Goldman Sachs (Asia) L.L.C.

Helen Hu +852-2978-6962 | helen.hu@gs.com

Goldman Sachs (Asia) L.L.C. Andrew Tilton

+852-2978-1802 | andrew.tilton@gs.com Goldman Sachs (Asia) L.L.C.

A practical guide to China's policy stimulus through the virus shock

Chinese growth in Q1 will be significantly affected by the coronavirus outbreak. Furthermore, the growth path in coming quarters is highly dependent on the cyclical policy response (also of course on the development of the virus; we assume new infections slow materially by the end of Q1, but caution that we are not epidemiologists and this is an assumption rather than a forecast). The key questions are how strong policy support would be in practice, and which policies the government is mostly likely to emphasize. We summarize our expectation about policy stimulus in a Q&A format.

1. Will the government deliver a very large stimulus (as in the GFC)?

We think an outsized stimulus (of the order of the 2008-09 stimulus) is not necessary for the economy to rebound after the virus is controlled. While some stimulus is required to generate a prompt and sufficiently strong rebound, a GFC-like package is not very likely, for two major reasons:

- This shock is different. During the GFC, the primary shock was from the demand side, while this time there have been both a significant supply shock and a demand shock. In this case, even with the similar size of the initial negative impact on output, the cyclical policy stimulus needed to get the economy back to an initial equilibrium (or even above) could be notably smaller, after the virus spread is controlled. But if prolonged supply disruptions and lagged/insufficient policy responses lead to widespread shutdowns and a deterioration in employment and income, or global activity slows significantly in the meantime, there could be additional demand shocks. Then the needed stimulus could become larger. So the most important policy response at this point is to get supply back as soon as possible and mitigate these second-order effects on aggregate demand.
- The policy approach is different. The current approach is less likely to lead to a prolonged overshoot. This is shown by two major aspects: the change in the policy objective function from growth stability as the most important goal to a (tight but pragmatic) balance between growth stability and financial stability, and the change in underlying institutional features. Chinese policymakers have been criticized for disproportionately relying on a debt-fueled economic model. This model is related to some underlying institutional features—for example, a large fiscal imbalance for local governments and historically loose fiscal discipline. But a meaningful increase in government special bonds for financing and a notable strengthening of fiscal discipline in recent years could help avoid an overly large stimulus through affecting how the policy stimulus is implemented/financed. There could still be a risk of overshooting, though the likelihood/magnitude should be meaningfully less than in 2015/2016 and in 2008/2009.

2. What tools can policymakers in China potentially employ?

There is a wide range of tools for China's cyclical policy, although the effectiveness of different tools may vary (we elaborate on this in the next question).

- For fiscal policy, in addition to tax/fee cuts or discretionary government spending/subsidies (with the gap/deficit financed primarily by general government bonds), a ramp-up in infrastructure investment is frequently and heavily used by the Chinese government to stabilize growth (e.g., during the global financial crisis, and in 2015/2016). Infrastructure investment is basically state-driven discretionary spending—quasi-fiscal policy—but in big part is financed by off-budget sources (e.g., local government special bonds, policy bank support, local government financing vehicle (LGFV) bonds, land sales revenue, shadow banking). We have developed our augmented fiscal deficit measure to capture the broad fiscal policy stance including off-budget activity.
- For monetary policy, at present China essentially employs a hybrid policy framework—on the one hand the PBOC still directly affects bank lending (total amounts, pace or structure) through administrative policy such as window guidance (or macro-prudential policy), and on the other hand the PBOC targets the short-term interbank repo rate through open market operations. In addition, it still sets deposit benchmark rates and also has other policy rates related to liquidity tools, such as the OMO rate/medium-term lending facility (MLF) rate/standing lending facility (SLF) rate. With the reform of the loan prime rate (LPR) in August 2019, the MLF rate—the benchmark rate for the LPR—can also directly affect bank loan pricing.

3. What tools are most likely to be effective?

For policymakers, in addition to getting supply to return to normal as soon as possible, the aims of cyclical policy should be: first, alleviate liquidity pressures on firms (particularly on SMEs) to avoid widespread permanent shutdowns and high unemployment; second, restore demand as quickly as possible (this would be particularly the case given that the Chinese government <u>still intends</u> to achieve decent full-year growth).

- To alleviate liquidity pressures, the government has announced several measures (especially targeting SMEs), such as the PBOC providing liquidity support directly through relending/rediscount tools, pushing banks to provide short-term loans/roll over matured loans/allow firms to postpone repayment, reducing tax/fee burdens (such as VAT and social security contributions), and subsidizing firms for stabilizing employment. It would not be surprising if the government were to announce more of these types of measures in the near future. In our view, such measures are crucial to mitigate the spillover of supply shocks to the demand side.
- To restore demand, ramping up public investment (quasi-fiscal) is likely to be the most effective measure to boost demand. This is particularly the case in China given the large roles of state-controlled banking sector and a still-large SOE sector (as well as local government financing vehicles). Private demand, including household consumption (particularly services) and private investment is likely to remain sluggish in the near term.

Tax cuts would help firms to ease short-term costs and payment pressures. However, from a cyclical perspective, the impact of tax cuts in boosting short-term demand may be relatively limited (a low/ insignificant multiplier), particularly when the incentive of

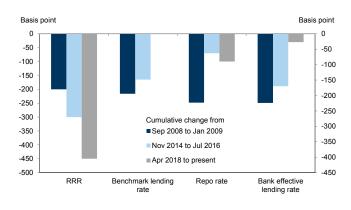
firms/household to invest/spend is weak, which currently seems to be the case (Exhibit 1). Also, a limited increase in the on-budget fiscal deficit target would mean that a large tax cut package would have to be offset to some extent by cutbacks in spending. Overall, we may see further tax cuts, but it is hard to envision a package as large as the Rmb 2tr in 2019.

An accommodative monetary policy is needed, particular given the high interdependence of fiscal policy and monetary policy in China. But currently the <u>effectiveness of monetary policy</u> in China has been an issue, hampered by factors such as bank capital constraints and high risk aversion at banks (Exhibit 2).

Exhibit 1: Incentive of firms to invest has been weak and has dropped sharply recently



Exhibit 2: Monetary policy transmission appears to be less effective than before



Source: Wind

Source: Wind, Goldman Sachs Global Investment Research

4. What constraints could cyclical policy potentially need to take into account?

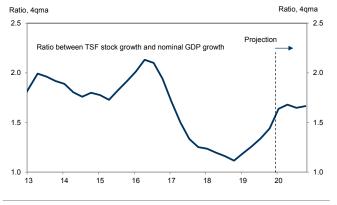
The government's policy reaction function has apparently shifted towards a focus on growth stability, and this may continue in coming months. But there are potential constraints to the implementation of cyclical stimulus, which arise from three aspects of the balance/trade-off relationship considered by policymakers: growth stability vs. financial stability (leverage/debt); growth vs inflation; and internal balance (growth) vs external balance (FX):

Debt/leverage concerns: Policy stimulus would inevitably push macro leverage higher, and what the government could do in the short term is 1) avoid over-stimulating; and 2) mitigate debt risks through structural measures. On the first aspect, in addition to the notable strengthening of fiscal discipline, the government has been emphasizing that TSF growth should be roughly in line with nominal GDP growth. This has in recent years led to a much smaller deviation of TSF growth from nominal GDP growth, and accordingly less pressure on macro leverage (e.g., the latest monetary policy report mentioned that because of this, the increase in macro leverage has been much smaller than the previous period between 2009 and 2017 when leverage ratios increased by at least 10pp per year on average). This approach could put an upper bound (range) on TSF growth—although we expect this bound could be higher this year due to the virus shock (Exhibit 3), the increase in the leverage ratio would still be smaller than that in 2016/2009. On the second aspect, the Chinese government has been taking structural measures (such as <u>debt-to-debt</u>

or <u>debt-to-equity</u> swap programs) in an effort to deal with risks related to outstanding debt in the SOE sector and local governments, which have been the major drivers of China's leverage issue.

- Housing prices and speculation: The Chinese government has in recent years been taking a different approach to housing regulation—a combination of short-term regulations through various restrictions to squeeze the housing bubble and the development of long-term mechanisms (e.g., development of a rental market, land system reform, fiscal regime reform) to ensure a healthy and less speculative housing sector. While <u>some city-specific loosening</u> is likely, a full relaxation of short-term regulations would jeopardize the effectiveness and credibility of efforts in developing long-term mechanism. This is the major reason why we are unlikely to see a nationwide relaxation in controls and a return of the housing sector as the cyclical tool we saw in previous years. On the other hand, it is also very unlikely that we would see a further tightening in housing regulations.
- FX stability: Accommodative monetary policy could potentially add depreciation pressure to the RMB. In order to have a more independent monetary policy (to take care of internal factors), the PBOC could either increase the flexibility of the RMB or strengthen its expectation guidance, or do both. Indeed, the PBOC has been tolerating mild CNY depreciation as long as that does not lead to significant risks in the FX market—e.g., deviation of the closing rate from the fixing has been small, and the countercyclical factor (CCF) has been also mild recently. With the Fed's 50bp intermeeting cut (further Fed cuts expected by our US team) and some other foreign central banks likely to cut rates in coming weeks, FX stability could be less a constraint for monetary policy.
- Inflation: Headline CPI inflation is likely to remain elevated in coming months primarily because of pork inflation (the coronavirus could also add<u>upward pressure</u> on food prices in the near term; Exhibit 4). However, we do not think this will be a major constraint for monetary policy, due to the shift in the balance of the PBOC's reaction function towards growth stability (e.g., R007 down by around 30bp to 2.4% on average in February and DR007 down by around 20bp to 2.2%), which was also recently mentioned by <u>senior PBOC officials</u>. We expect the balance towards growth stability to continue in the near term. But elevated inflation may limit the room for interest rates to decline rapidly.

Exhibit 3: The government may tolerate higher credit growth, but would try to avoid big deviation from nominal GDP growth



Source: Wind, Goldman Sachs Global Investment Research

Source: Goldman Sachs Global Investment Research, Wind

5. What policy mix would be implemented?

Policymakers will deploy a range of tools, including on-budget and off-budget fiscal policy and monetary policy. We expect off-budget fiscal policy to be a primary lever.

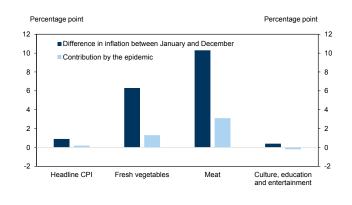
On-budget fiscal policy

We expect the official on-budget fiscal deficit target-to-GDP ratio to increase from 2.8% to 3.2% in 2020. Although this would be the highest over the past years, it would be only a mild increase, reflecting a relatively conservative stance on the on-budget deficit. The government could also employ fiscal deposits, which would effectively make the on-budget deficit higher than the official ratio. In 2019, the effective deficit ratio was 4.9% (we calculate this by adding net decline in fiscal deposits to the official on-budget deficit), and we expect it to increase modestly to 5.5% in 2020.

Off-budget fiscal policy (infrastructure investment)

On how to finance, off-budget fiscal spending is largely financed by local government special bonds, LGFV bonds, policy bank support, shadow banking lending, and land sale revenue. Some of the sources are relatively rigid, for instance government bonds, which are basically constrained by the government budget. We expect the quota for new special bonds for this year to increase to Rmb3.3tn from Rmb2.15tn in 2019. So far, around Rmb950bn of special bonds have been issued. One thing to note is that this quota reflects financing sources for new spending and is different from refinancing bonds, which are used to repay matured bonds.

Some other elements of off-budget financing are relatively flexible, but highly correlated to market conditions. For instance, LGFV bond issuance is heavily influenced by liquidity conditions in the interbank market and the market perception of credit risks. Shadow bank lending is affected largely by regulatory policies and risk appetite. A looser monetary policy stance and more flexible regulatory policies (as we expect) could support higher LGFV bond issuance and higher trust loans (or less contraction). Policy bank support is the most flexible among these major quasi-fiscal financing channels, and could serve as the last resort to stabilize growth, based on experience in previous years.



<u>Recent meetings</u> have also mentioned the role of policy banks. So we expect the support from policy banks would be notably stronger, either through larger bond issuance, more pledged supplementary lending (PSL), and/or some special tools (such as special construction fund established in 2015).

On where to spend, in contrast to the most pessimistic views, we still see <u>ample room</u> for targeted infrastructure investment demand in China, given it remains a developing country with large regional disparities. There are several potential areas in which the government is likely to do more, for instance, investment related to poverty reduction in poor regions, high-speed railway construction in middle/west regions (though the <u>investment efficiency</u> in these regions could be lower), inter-city transportation (railway, road, airport) to facilitate regional development strategy (which President Xi has been pushing, e.g., Being/Tianjin/Hebei, Great Bay area, Chengdu/Chongqing), water/energy/environment related infrastructure investment (there are many national key projects), rural area infrastructure investment, and information and telecommunications.

Overall, we expect our augmented fiscal deficit to GDP ratio, which captures broad fiscal policy stance, to increase by 3pp in 2020, up from around 2pp in 2019 (Exhibit 5). This is smaller than around 5pp in 2016. The increase would be driven primarily by higher off-budget financing, particularly due to higher special bond issuance and stronger policy bank support.

		Percent of GDP	2018	2019	2020 forecast	Change in 2020
1	=3-(2+4)	Official on-budget deficit	2.6	2.8	3.2	0.4
2		Budget revenue	20.2	19.2	18.8	-0.4
3		Budget expenditure	24.4	24.1	24.3	0.2
4		Net drawdown of fiscal deposit and transfer from other fiscal accounts	1.6	2.1	2.3	0.2
5	=3-2	Effective on-budget deficit	4.2	4.9	5.5	0.6
6		New special bond net issuance	1.5	2.2	3.2	1.0
7		LGFV bond net issuance	0.7	1.2	1.5	0.3
8		Policy bank support (include PSL)	1.9	1.4	2.4	1.0
9		Trust loans	-0.4	-0.2	0.0	0.2
10		Land sales revenue	1.8	2.0	2.0	0.0
11	=5+6+7+8+9+10	Augmented deficit	9.7	11.5	14.5	3.0

Exhibit 5: We expect a significant increase in augmented fiscal deficit, reflecting the primary role of quasi-fiscal policy

Source: Goldman Sachs Global Investment Research, Wind

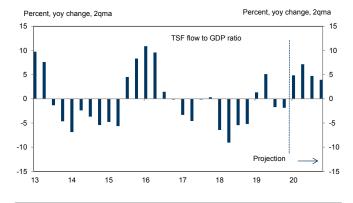
Monetary policy

Although broad fiscal policy would be the major policy lever as always in China, and the effectiveness of monetary policy and magnitude of loosening could be constrained, a supportive monetary stance is still needed to accommodate any ramp-up in infrastructure investment and also to mitigate crowding-out of private demand. We expect total social financing (TSF) stock growth to increase from 10.9% in 2019 to 12.8% in 2020. In flow terms, this implies that the TSF-to-GDP ratio could increase by around 5pp in 2020, up from around 1pp in 2019. This is roughly similar to 2016 (but

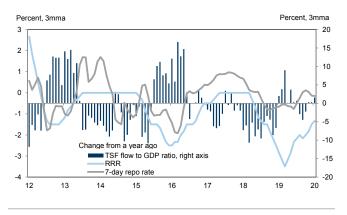
much lower than in 2009), reflecting that <u>credit availability</u> for private firms seems to be notably worse now compared to 2016, even with a smaller fiscal stimulus. On a quarterly basis, the government will likely front-load (relatively to typical seasonality) credit supply, so we expect credit growth to be stronger in H1 and modestly lower in H2, as shown by Exhibit 6.

In order to support the credit supply, RRR cuts and relatively low interest rates would be needed (Exhibit 7). And measures to further increase capital at banks (particularly in small banks) to strengthen their lending capability would be important. In addition, to improve monetary policy transmission and more effectively lower borrowing costs in the real economy, we expect further cuts in the MLF rate, which could also drive down the LPR.

Exhibit 6: And this needs to be accommodated by higher credit growth







Source: Wind, Goldman Sachs Global Investment Research

6. What should we watch for in coming months?

Since early February, President Xi has hosted a series of meetings, emphasizing the need to strive to achieve economic targets and setting the tone for cyclical policy—fiscal policy needs to be more proactive and monetary policy needs to be more flexible. Many measures have been announced/implemented, for instance, measures to ease liquidity pressures on firms as we mentioned above, rate cuts, pre-allocation of another part of the special bond quota, and an acceleration in infrastructure project construction. In coming months, in addition to implementation of those measures, additional tax cuts/ liquidity relief measures could also be announced.

What's important in coming months is to monitor those data points that may suggest whether cyclical policy is stronger/weaker than our expectation, including:

- The annual on-budget fiscal deficit target and annual quota for new special bonds
- Any new forms of policy bank support, such as the 2015 special construction fund
- Any new financing policy on infrastructure investment, such as the 2019 <u>announcement</u> on allowing local government special bonds to be used as equity
- Any news or data on the pace of infrastructure investment approvals (see <u>recent</u> <u>news</u>), which could provide leading information on infrastructure investment

The interbank 7-day repo and other monetary policy tools (we expect another 150bp cut in the RRR, a 40bp cut in the MLF rate, and the DR007 average at 2.2%)

Disclosure Appendix

Reg AC

We, Zhennan Li, Hui Shan, Yu Song, Maggie Wei, Helen Hu and Andrew Tilton, hereby certify that all of the views expressed in this report accurately reflect our personal views, which have not been influenced by considerations of the firm's business or client relationships.

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

Disclosures

Regulatory disclosures

Disclosures required by United States laws and regulations

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

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

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

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. Australia: Goldman Sachs Australia Pty Ltd and its affiliates are not authorised deposit-taking institutions (as that term is defined in the Banking Act 1959 (Cth)) in Australia and do not provide banking services, nor carry on a banking business, in Australia. This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act, unless otherwise agreed by Goldman Sachs. In producing research reports, members of 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.

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 Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Ouvidoria Goldman Sachs Brazil: 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 (<u>https://www.sipc.org</u>).

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

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

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

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

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

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

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

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options and futures disclosure documents which are available from Goldman Sachs sales representatives or at https://www.theocc.com/about/publications/character-risks.jsp and

https://www.fiadocumentation.org/fia/regulatory-disclosures_1/fia-uniform-futures-and-options-on-futures-risk-disclosures-booklet-pdf-version-2018. 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.

© 2020 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.