Deutsche Bank
Research

Europe
Germany

Economics
Focus Germany

Date
25 May 2020

Global trade faces negative record and structural shift

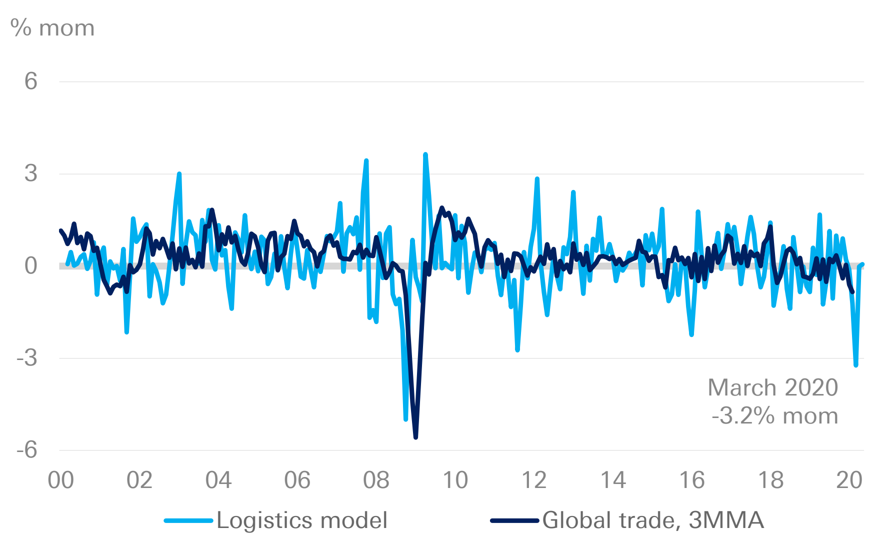
Jochen Moebert
Economist
+49-69-910-31727

- Plummeting shares of logistics companies indicate that global goods trade will contract by a whopping 3.2% mom in March. This would be the largest monthly contraction since the GFC. Subsequently, our model suggests an almost flat monthly growth in April and a marginal recovery in May.
- Based on DB's GDP forecast (base scenario), annual global goods trade will shrink by 13.6% in 2020 and will recover by only 7.5% in 2021. In the COVID-19 crisis, global goods trade is set to fall much heavier than during the financial crisis.
- Moreover, while the service exports were a shock absorber during the GFC, services exports are likely to drop at a similar rate as goods exports this time.
- Another difference between the COVID-19 shock and the GFC shock is the temporal distribution. The GFC was a synchronous economic shock whereas the COVID-19 crisis spread in "continental waves". At the beginning, this helped to manage the crisis. But during the recovery it increases the risk of repeated disruptions of global supply chains.
- The COVID-19 crisis might result in a reorganization of global value chains, at least in some sectors. For instance, there are requests to repatriate the provision of medicines and medical devices back to developed markets. However, a more balanced approach between today's global value chains and a complete repatriation could be continental production close to developed markets.

High-frequency indicators point to a sharp drop in goods trade

The latest available monthly data of real global goods trade (CPB) is January and February 2020. In both months global trade contracted by roughly 1.5% month on month. The COVID-19 crisis escalated in China towards the end of January and the WHO declared the crisis a pandemic on March 11. Hence, the first two months of 2020 only reflect the beginning of the COVID-19 impact on global trade. Based on the average share performance of large logistics corporations, we estimate the decline of real global trade in March, April and May. We calibrate a linear regression model using 12 months before and after the Lehman collapse in 2008. In January, global stock markets ignored the COVID-19 crisis in China by and large. Hence, the model clearly underestimated the development in January (-1.5% vs. model -0.1%). However, in February the minus of 1.2% is close to the released data point of -1.5%. Based on this model, we estimate that global trade contracted by 3.2% mom in March (a ~1%-percentile in the period from 2000 to 2020 with 242 monthly observations). The forecast in March would be the largest monthly decline excluding the GFC. This implies, for instance, that it is also bigger than the contraction in September 2001 (-1.6% vs. our model -2.2%). In April and May 2020 share prices of large logistics corporations moved on average mainly sideways. So our model implies that global trade growth was almost flat in April and moved marginally into positive territory in May. We expect that global trade bottoms in the second quarter. This is also in line with manufacturing data from Asia where leading indicators and production already surprised to the upside in March. In Europe and the US, the recent reopening of major industrial plants and the less restrictive lockdown measures should also help to revive the global economy, at least gradually.

Figure 1: 2000 to 2020 Global trade vs. logistics stocks

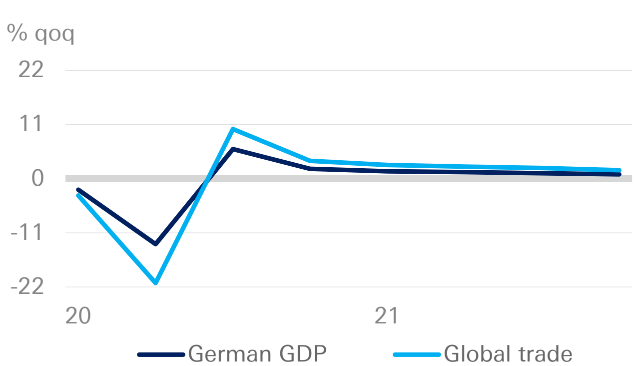


Source : Bloomberg Finance LP, CPB, Deutsche Bank Research

2020 and 2021: Goods trade growth

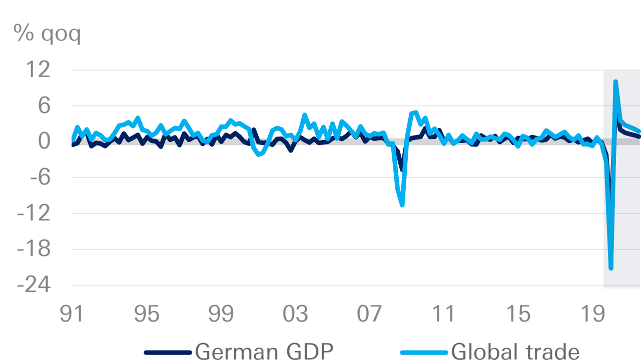
It seems clear that the main shock to the global economy materializes in Q2 2020. In our Special Report "World Outlook Update: Turning Gloomier"[1] we assume in our base case a heavy loss of economic activity in the second quarter and subsequently a gradual economic recovery. To assess the impact on global trade for the full year 2020 and 2021, we apply DB's current GDP forecasts in our base scenario and the historic relationship between global trade and German GDP. We forecast German GDP to drop by -14% in the second quarter in 2020. Our calculations imply that global trade will collapse by 21% quarter on quarter in the second quarter and will be back at the pre-crisis level late in 2022. The quarterly loss in Q2 is clearly larger than during the GFC where global trade nosedived by 10% qoq in Q1 2009. The assumed recovery in the second half of 2020 will result in an annual decline of -13.6% in 2020 and an annual expansion of 7.5% in 2021. Therefore, both from peak-to-trough as well as in annual terms, the COVID-19 shock is bigger than the GFC shock in 2008/09, at least in our scenario where we assume only a gradual recovery. In DB's protracted scenario, an even more severe drop in German GDP of -16% is assumed in the second quarter of 2020 and subsequently only a fairly muted, rather L-shaped recovery. As a consequence, the annual decline in global trade would be almost -20% in 2020 and remain just about flat in 2021. This would be clearly worse than the GFC shock and only surpassed by the Great Depression or WWII. In its April economic outlook the IMF forecasts a decline in global trade of -11% in 2020 and a recovery of 8.4% in 2021. So even our base scenario foresees a heavier contraction than the IMF scenario.

Figure 2: 2020/21: German GDP vs. global trade



Source : Deutsche Bank Research, Federal Statistical Office

Figure 3: 1991 to 2021 Global trade vs. German GDP



Source : Deutsche Bank Research, Federal Statistical Office

COVID-19 shock with continental time lags

The COVID-19 shock is expected to be deeper than the GFC shock. However, there are also at least two major structural differences. First, in 2006 and 2007 the global economy expanded rapidly fueled by very strong credit growth, resulting in an annual global goods trade growth of 9.6% and 6%. By contrast, pre-COVID-19 there was already high uncertainty due to Brexit, the re-calibration of the US trade policy and a generally perceived higher political uncertainty in many countries. In 2018, global trade increased by only 3.1% annually and was already contracting slightly (-0.4%) in 2019. Second, in the GFC the world faced a synchronous shock. While

1 Peter Hooper et al. „Special report: World Outlook Update: Turning Gloomier", 7 May 2020

there was already a simmering financial crisis before autumn 2008, it was the Lehman collapse that led to an unexpected simultaneous global economic collapse. In the summer of 2008 global trade continued to expand rapidly and 2008 annual global trade was still positive despite the collapse in Q4. The COVID-19 crisis is different, as it gradually infected the global economy. The lockdown of the Hubei Province grabbed the global headlines already in January. The European COVID-19 crisis reached its peak end-March/early April and the climax of the US crisis seems to be in May. Therefore, these time lags allowed learning from relative successful countries and avoiding an even heavier loss of economic activity. Accordingly, goods trade in Asian EMs already declined sharply in January and where still negative in February. By contrast goods trade in advanced economies was almost unscathed by the COVID-19 crisis in the first two months of 2020. The recovery is also expected to be non-synchronous. Most Asian and some European countries already loosened the most restrictive social distancing measures, and other European countries are likely to follow soon as the number of infected persons has started to decline in nearly all European countries. Finally, the experiences in Asia and Europe led us to assume that the US will also likely overcome the crisis in the coming weeks. Although it is more uncertain that the number of infections will peak soon, and the planned reopening of the US economy might be riskier than in other countries with flatter epi curves. In our base scenario, we expect all major economies to experience a gradual recovery in the second half of 2020. Therefore, global trade should also gain ground. However, there are at least two major challenges for a more rapid recovery and that is the grim side of a non-synchronous shock. First, global value chains might be impaired for an extended period of time as some countries may choose to loosen social distancing measures relatively slowly. Second, the unlocking of the economy could unleash a second COVID-19 wave. Both factors could undermine the economic normalization. Therefore, we expect a fairly muted recovery in global trade.

This time is different – service exports are in the doldrums

In the GFC, service exports closely related to the manufacturing sector also nosedived. However, many other services were hardly affected in the financial crisis. By contrast, currently many services have been severely restricted. It seems clear that the tourism industry and airlines bear the bore of the burden. However, even small businesses like catering services and hairdressers were forced to temporarily close their business for the public. As a consequence, densely populated regions with soft borders to their neighbor countries should be hard hit. This is particularly important as for services, a broader export definition is applied in global statistics than for goods. For instance, service exports will increase if a consumer of one country goes to the neighboring country to buy a haircut, at least if the transaction is registered.[2] By contrast, if the consumer purchases a pair of scissors it will not be defined in statistical terms as a goods exports until it crosses borders. A prime location where service exports should have crashed is the EU where the Schengen agreement enacted in 1985 tore down traditional borders, as during the COVID-19 crisis many EU countries unilaterally abandoned the agreement. Many non-European countries also closed their borders. Therefore, service exports are rather an additional liability than a stabilizing factor for global trade. This view is also corroborated by global PMIs where services hit a new all-time low of 24 (GFC minimum in Nov 2008: 37.8) in April 2020 whereas the manufacturing PMI declined less sharply and stands at 39.8 (Dec 2008: 33.8).

2 See OECD (2002): "Manual on Statistics of international trade in services".

The reshaping of global value chains

In our view, there is another noteworthy difference between the COVID-19 crisis and the GFC. The structure of global export markets was only slightly adjusted in the aftermath of the financial crisis. The production hubs in the manufacturing sector remained China, Germany and the US. The global division of labor and global value chains were not questioned. By contrast, they were further enhanced to reap the benefits of low production costs in emerging markets. This time is likely to be different. The COVID-19 crisis taught us a lesson. Efficient markets are very vulnerable to unforeseen occurrences. Some even argue that the provision of goods that are essential for a well-functioning society should remain under national control and be domestically produced. In the aftermath of the COVID-19 crisis, important production lines, probably not only in the medical sector, might be repatriated or at least relocated close to national borders of developed economies. Moreover, there might be much more sophisticated industrial emergency plans which guarantee a smooth production even in the case of a pandemic or another major global disaster which cripples at least some important sections or regions of the global economy. We think that a balanced approach between today's global value chains and a complete repatriation of production lines could be continental value chains combined with higher inventory levels which may guarantee a good balance between efficiency and the newly increasing demand for safety. Such a shift of production lines would also reduce the potential economic fallout of global trade disputes and is likely to reduce our global CO_2 footprint. Hence, the foundations for continental value chains were already laid before the COVID-19 crisis.

Appendix 1

Important Disclosures

*Other information available upon request

*Prices are current as of the end of the previous trading session unless otherwise indicated and are sourced from local exchanges via Reuters, Bloomberg and other vendors . Other information is sourced from Deutsche Bank, subject companies, and other sources. For disclosures pertaining to recommendations or estimates made on securities other than the primary subject of this research, please see the most recently published company report or visit our global disclosure look-up page on our website at https://research.db.com/Research/Disclosures/CompanySearch. Aside from within this report, important risk and conflict disclosures can also be found at https://research.db.com/Research/Topics/Equities?topicId=RB0002. Investors are strongly encouraged to review this information before investing.

Analyst Certification

The views expressed in this report accurately reflect the personal views of the undersigned lead analyst(s). In addition, the undersigned lead analyst(s) has not and will not receive any compensation for providing a specific recommendation or view in this report. Jochen Moebert.

Additional Information

The information and opinions in this report were prepared by Deutsche Bank AG or one of its affiliates (collectively 'Deutsche Bank'). Though the information herein is believed to be reliable and has been obtained from public sources believed to be reliable, Deutsche Bank makes no representation as to its accuracy or completeness. Hyperlinks to third-party websites in this report are provided for reader convenience only. Deutsche Bank neither endorses the content nor is responsible for the accuracy or security controls of those websites.

If you use the services of Deutsche Bank in connection with a purchase or sale of a security that is discussed in this report, or is included or discussed in another communication (oral or written) from a Deutsche Bank analyst, Deutsche Bank may act as principal for its own account or as agent for another person.

Deutsche Bank may consider this report in deciding to trade as principal. It may also engage in transactions, for its own account or with customers, in a manner inconsistent with the views taken in this research report. Others within Deutsche Bank, including strategists, sales staff and other analysts, may take views that are inconsistent with those taken in this research report. Deutsche Bank issues a variety of research products, including fundamental analysis, equity-linked analysis, quantitative analysis and trade ideas. Recommendations contained in one type of communication may differ from recommendations contained in others, whether as a result of differing time horizons, methodologies, perspectives or otherwise. Deutsche Bank and/or its affiliates may also be holding debt or equity securities of the issuers it writes on. Analysts are paid in part based on the profitability of Deutsche Bank AG and its affiliates, which includes investment banking, trading and principal trading revenues.

Opinions, estimates and projections constitute the current judgment of the author as of the date of this report. They do not necessarily reflect the opinions of Deutsche Bank and are subject to change without notice. Deutsche Bank provides liquidity for buyers and sellers of securities issued by the companies it covers. Deutsche Bank research analysts sometimes have shorter-term trade ideas that may be inconsistent with Deutsche Bank's existing longer-term ratings. Some trade ideas for equities are listed as Catalyst Calls on the Research Website (https://research.db.com/Research/) , and can be found on the general coverage list and also on the covered company's page. A Catalyst Call represents a high-conviction belief by an analyst that a stock will outperform or underperform the market and/or a specified sector over a time frame of no less than two weeks and no more than three months. In addition to Catalyst Calls, analysts may occasionally discuss with our clients, and with Deutsche Bank salespersons and traders, trading strategies or ideas that reference catalysts or events that may have a near-term or medium-term impact on the market price of the securities discussed in this report, which impact may be directionally counter to the analysts' current 12-month view of total return or investment return as described herein. Deutsche Bank has no obligation to update, modify or amend this report or to otherwise notify a recipient thereof if an opinion, forecast or estimate changes or becomes inaccurate. Coverage and the frequency of changes in market conditions and in both general and company-specific economic prospects make it difficult to update research at defined intervals. Updates are at the sole discretion of the coverage analyst or of the Research Department Management, and the majority of reports are published at irregular intervals. This report is provided for informational purposes only and does not take into account the particular investment objectives, financial situations, or needs of individual clients. It is not an offer or a solicitation of an offer to buy or sell any financial instruments or to participate in any particular trading strategy. Target prices are inherently imprecise and a product of the analyst's judgment. The financial instruments discussed in this report may not be suitable for all investors, and investors must make their own informed investment decisions. Prices and availability of financial instruments are subject to change without notice, and investment transactions can lead to losses as a result of price fluctuations and other factors. If a financial instrument is denominated in a currency other than an investor's currency, a change in exchange rates may adversely affect the investment. Past performance is not necessarily indicative of future results. Performance calculations exclude transaction costs, unless otherwise indicated. Unless otherwise indicated, prices are current as of the end of the previous trading session and are sourced from local exchanges via Reuters, Bloomberg and other vendors. Data is also sourced from Deutsche Bank, subject companies, and other parties.

The Deutsche Bank Research Department is independent of other business divisions of the Bank. Details regarding our organizational arrangements and information barriers we have to prevent and avoid conflicts of interest with respect to our research are available on our website (https://research.db.com/Research/) under Disclaimer.

Macroeconomic fluctuations often account for most of the risks associated with exposures to instruments that promise to pay fixed or variable interest rates. For an investor who is long fixed-rate instruments (thus receiving these cash flows), increases in interest rates naturally lift the discount factors applied to the expected cash flows and thus cause a loss. The longer the maturity of a certain cash flow and the higher the move in the discount factor, the higher will be the loss. Upside surprises in inflation, fiscal funding needs, and FX depreciation rates are among the most common adverse macroeconomic shocks to receivers. But counterparty exposure, issuer creditworthiness, client segmentation, regulation (including changes in assets holding limits for different types of investors), changes in tax policies, currency convertibility (which may constrain currency conversion, repatriation of profits and/or liquidation of positions), and settlement issues related to local clearing houses are also important risk factors. The sensitivity of fixed-income instruments to macroeconomic shocks may be mitigated by indexing the contracted cash flows to inflation, to FX depreciation, or to specified interest rates – these are common in emerging markets. The index fixings may – by construction – lag or mis-measure the actual move in the underlying variables they are intended to track. The choice of the proper fixing (or metric) is particularly important in swaps markets, where floating coupon rates (i.e., coupons indexed to a typically short-dated interest rate reference index) are exchanged for fixed coupons. Funding in a currency that differs from the currency in which coupons are denominated carries FX risk. Options on swaps (swaptions) the risks typical to options in addition to the risks related to rates movements.

Derivative transactions involve numerous risks including market, counterparty default and illiquidity risk. The appropriateness of these products for use by investors depends on the investors' own circumstances, including their tax position, their regulatory environment and the nature of their other assets and liabilities; as such, investors should take expert legal and financial advice before entering into any transaction similar to or inspired by the contents of this publication. The risk of loss in futures trading and options, foreign or domestic, can be substantial. As a result of the high degree of leverage obtainable in futures and options trading, losses may be incurred that are greater than the amount of funds initially deposited – up to theoretically unlimited losses. Trading in options involves risk and is not suitable for all investors. Prior to buying or selling an option, investors must review the 'Characteristics and Risks of Standardized Options", at http://www.optionsclearing.com/about/publications/character-risks.jsp. If you are unable to access the website, please contact your Deutsche Bank representative for a copy of this important document.

Participants in foreign exchange transactions may incur risks arising from several factors, including the following: (i) exchange rates can be volatile and are subject to large fluctuations; (ii) the value of currencies may be affected by numerous market factors, including world and national economic, political and regulatory events, events in equity and debt markets and changes in interest rates; and (iii) currencies may be subject to devaluation or government-imposed exchange controls, which could affect the value of the currency. Investors in securities such as ADRs, whose values are affected by the currency of an underlying security, effectively assume currency risk.

Unless governing law provides otherwise, all transactions should be executed through the Deutsche Bank entity in the investor's home jurisdiction. Aside from within this report, important conflict disclosures can also be found at https://research.db.com/Research/ on each company's research page. Investors are strongly encouraged to review this information before investing.

Deutsche Bank (which includes Deutsche Bank AG, its branches and affiliated companies) is not acting as a financial adviser, consultant or fiduciary to you or any of your agents (collectively, "You" or "Your") with respect to any information provided in this report. Deutsche Bank does not provide investment, legal, tax or accounting advice, Deutsche Bank is not acting as your impartial adviser, and does not express any opinion or recommendation whatsoever as to any strategies, products or any other information presented in the materials. Information contained herein is being provided solely on the basis that the recipient will make an independent assessment of the merits of any investment decision, and it does not constitute a recommendation of, or express an opinion on, any product or service or any trading strategy.

The information presented is general in nature and is not directed to retirement accounts or any specific person or account type, and is therefore provided to You on the express basis that it is not advice, and You may not rely upon it in making Your decision. The information we provide is being directed only to persons we believe to be financially sophisticated, who are capable of evaluating investment risks independently, both in general and with regard to particular transactions and investment strategies, and who understand that Deutsche Bank has financial interests in the offering of its products and services. If this is not the case, or if You are an IRA or other retail investor receiving this directly from us, we ask that you inform us immediately.

In July 2018, Deutsche Bank revised its rating system for short term ideas whereby the branding has been changed to Catalyst Calls ("CC") from SOLAR ideas; the rating categories for Catalyst Calls originated in the Americas region have been made consistent with the categories used by Analysts globally; and the effective time period for CCs has been reduced from a maximum of 180 days to 90 days.

During the period November 2018 to March 2020 Deutsche Bank may have been showing incomplete information regarding Disclosure 1 in some parts of the equity research and debt research coverage. If you require any further information please contact DVS.Support@db.com.

United States: Approved and/or distributed by Deutsche Bank Securities Incorporated, a member of FINRA, NFA and SIPC. Analysts located outside of the United States are employed by non-US affiliates that are not subject to FINRA regulations.

Germany: Approved and/or distributed by Deutsche Bank AG, a joint stock corporation with limited liability incorporated in the Federal Republic of Germany with its principal office in Frankfurt am Main. Deutsche Bank AG is authorized under German Banking Law and is subject to supervision by the European Central Bank and by BaFin, Germany's Federal Financial Supervisory Authority.

United Kingdom: Approved and/or distributed by Deutsche Bank AG acting through its London Branch at Winchester House, 1 Great Winchester Street, London EC2N 2DB. Deutsche Bank AG in the United Kingdom is authorised by the Prudential Regulation Authority and is subject to limited regulation by the Prudential Regulation Authority and Financial Conduct Authority. Details about the extent of our authorisation and regulation are available on request.

Hong Kong SAR: Distributed by Deutsche Bank AG, Hong Kong Branch, except for any research content relating to futures contracts within the meaning of the Hong Kong Securities and Futures Ordinance Cap. 571. Research reports on such futures contracts are not intended for access by persons who are located, incorporated, constituted or resident in Hong Kong. The author(s) of a research report may not be licensed to carry on regulated activities in Hong Kong, and if not licensed, do not hold themselves out as being able to do so. The provisions set out above in the 'Additional Information' section shall apply to the fullest extent permissible by local laws and regulations, including without limitation the Code of Conduct for Persons Licensed or Registered with the Securities and Futures Commission. This report is intended for distribution only to 'professional investors' as defined in Part 1 of Schedule of the SFO. This document must not be acted or relied on by persons who are not professional investors. Any investment or investment activity to which this document relates is only available to professional investors and will be engaged only with professional investors.

India: Prepared by Deutsche Equities India Private Limited (DEIPL) having CIN: U65990MH2002PTC137431 and registered office at 14th Floor, The Capital, C-70, G Block, Bandra Kurla Complex Mumbai (India) 400051. Tel: + 91 22 7180 4444. It is registered by the Securities and Exchange Board of India (SEBI) as a Stock broker bearing registration no.: INZ000252437; Merchant Banker bearing SEBI Registration no.: INM000010833 and Research Analyst bearing SEBI Registration no.: INH000001741. DEIPL may have received administrative warnings from the SEBI for breaches of Indian regulations. Deutsche Bank and/or its affiliate(s) may have debt holdings or positions in the subject company. With regard to information on associates, please refer to the “Shareholdings” section in the Annual Report at: https://www.db.com/ir/en/annual-reports.htm.

Japan: Approved and/or distributed by Deutsche Securities Inc.(DSI). Registration number - Registered as a financial instruments dealer by the Head of the Kanto Local Finance Bureau (Kinsho) No. 117. Member of associations: JSDA, Type II Financial Instruments Firms Association and The Financial Futures Association of Japan. Commissions and risks involved in stock transactions - for stock transactions, we charge stock commissions and consumption tax by multiplying the transaction amount by the commission rate agreed with each customer. Stock transactions can lead to losses as a result of share price fluctuations and other factors. Transactions in foreign stocks can lead to additional losses stemming from foreign exchange fluctuations. We may also charge commissions and fees for certain categories of investment advice, products and services. Recommended investment strategies, products and services carry the risk of losses to principal and other losses as a result of changes in market and/or economic trends, and/or fluctuations in market value. Before deciding on the purchase of financial products and/or services, customers should carefully read the relevant disclosures, prospectuses and other documentation. 'Moody's', 'Standard Poor's', and 'Fitch' mentioned in this report are not registered credit rating agencies in Japan unless Japan or 'Nippon' is specifically designated in the name of the entity. Reports on Japanese listed companies not written by analysts of DSI are written by Deutsche Bank Group's analysts with the coverage companies specified by DSI. Some of the foreign securities stated on this report are not disclosed according to the Financial Instruments and Exchange Law of Japan. Target prices set by Deutsche Bank's equity analysts are based on a 12-month forecast period..

Korea: Distributed by Deutsche Securities Korea Co.

South Africa: Deutsche Bank AG Johannesburg is incorporated in the Federal Republic of Germany (Branch Register Number in South Africa: 1998/003298/10).

Singapore: This report is issued by Deutsche Bank AG, Singapore Branch (One Raffles Quay #18-00 South Tower Singapore 048583, 65 6423 8001), which may be contacted in respect of any matters arising from, or in connection with, this report. Where this report is issued or promulgated by Deutsche Bank in Singapore to a person who is not an accredited investor, expert investor or institutional investor (as defined in the applicable Singapore laws and regulations), they accept legal responsibility to such person for its contents.

Taiwan: Information on securities/investments that trade in Taiwan is for your reference only. Readers should independently evaluate investment risks and are solely responsible for their investment decisions. Deutsche Bank research may not be distributed to the Taiwan public media or quoted or used by the Taiwan public media without written consent. Information on securities/instruments that do not trade in Taiwan is for informational purposes only and is not to be construed as a recommendation to trade in such securities/instruments. Deutsche Securities Asia Limited, Taipei Branch may not execute transactions for clients in these securities/instruments.

Qatar: Deutsche Bank AG in the Qatar Financial Centre (registered no. 00032) is regulated by the Qatar Financial Centre Regulatory Authority. Deutsche Bank AG - QFC Branch may undertake only the financial services activities that fall within the scope of its existing QFCRA license. Its principal place of business in the QFC: Qatar Financial Centre, Tower, West Bay, Level 5, PO Box 14928, Doha, Qatar. This information has been distributed by Deutsche Bank AG. Related financial products or services are only available only to Business Customers, as defined by the Qatar Financial Centre Regulatory Authority.

Russia: The information, interpretation and opinions submitted herein are not in the context of, and do not constitute, any appraisal or evaluation activity requiring a license in the Russian Federation.

Kingdom of Saudi Arabia: Deutsche Securities Saudi Arabia LLC Company (registered no. 07073-37) is regulated by the Capital Market Authority. Deutsche Securities Saudi Arabia may undertake only the financial services activities that fall within the scope of its existing CMA license. Its principal place of business in Saudi Arabia: King Fahad Road, Al Olaya District, P.O. Box 301809, Faisaliah Tower - 17th Floor, 11372 Riyadh, Saudi Arabia.

United Arab Emirates: Deutsche Bank AG in the Dubai International Financial Centre (registered no. 00045) is regulated by the Dubai Financial Services Authority. Deutsche Bank AG - DIFC Branch may only undertake the financial services activities that fall within the scope of its existing DFSA license. Principal place of business in the DIFC: Dubai International Financial Centre, The Gate Village, Building 5, PO Box 504902, Dubai, U.A.E. This information has been distributed by Deutsche Bank AG. Related financial products or services are available only to Professional Clients, as defined by the Dubai Financial Services Authority.

Australia and New Zealand: This research is intended only for 'wholesale clients' within the meaning of the Australian Corporations Act and New Zealand Financial Advisors Act, respectively. Please refer to Australia-specific research disclosures and related information at https://australia.db.com/australia/content/research-information.html Where research refers to any particular financial product recipients of the research should consider any product disclosure statement, prospectus or other applicable disclosure document before making any decision about whether to acquire the product. In preparing this report, the primary analyst or an individual who assisted in the preparation of this report has likely been in contact with the company that is the subject of this research for confirmation/clarification of data, facts, statements, permission to use company-sourced material in the report, and/or site-visit attendance. Without prior approval from Research Management, analysts may not accept from current or potential Banking clients the costs of travel, accommodations, or other expenses incurred by analysts attending site visits, conferences, social events, and the like. Similarly, without prior approval from Research Management and Anti-Bribery and Corruption ("ABC") team, analysts may not accept perks or other items of value for their personal use from issuers they cover.

Additional information relative to securities, other financial products or issuers discussed in this report is available upon request. This report may not be reproduced, distributed or published without Deutsche Bank's prior written consent.

Backtested, hypothetical or simulated performance results have inherent limitations. Unlike an actual performance record based on trading actual client portfolios, simulated results are achieved by means of the retroactive application of a backtested model itself designed with the benefit of hindsight. Taking into account historical events the backtesting of performance also differs from actual account performance because an actual investment strategy may be adjusted any time, for any reason, including a response to material, economic or market factors. The backtested performance includes hypothetical results that do not reflect the reinvestment of dividends and other earnings or the deduction of advisory fees, brokerage or other commissions, and any other expenses that a client would have paid or actually paid. No representation is made that any trading strategy or account will or is likely to achieve profits or losses similar to those shown. Alternative modeling techniques or assumptions might produce significantly different results and prove to be more appropriate. Past hypothetical backtest results are neither an indicator nor guarantee of future returns. Actual results will vary, perhaps materially, from the analysis.

David Folkerts-Landau
Group Chief Economist and Global Head of Research

Pam Finelli
Global Chief Operating Officer
Research

Anthony Klarman
Global Head of
Debt Research

Michael Spencer
Head of APAC Research

Steve Pollard
Head of Americas Research
Global Head of Company
Research

Gerry Gallagher
Head of European
Company Research

Andreas Neubauer
Head of Germany Research

Peter Milliken
Head of APAC
Company Research

Jim Reid
Global Head of
Thematic Research

Francis Yared
Global Head of Rates Research

George Saravelos
Global Head of FX Research

Peter Hooper
Global Head of
Economic Research

International Production Locations

Deutsche Bank AG
Deutsche Bank Place
Level 16
Corner of Hunter & Phillip Streets
Sydney, NSW 2000
Australia
Tel: (61) 2 8258 1234

Deutsche Bank AG
Equity Research
Mainzer Landstrasse 11-17
60329 Frankfurt am Main
Germany
Tel: (49) 69 910 00

Deutsche Bank AG
Filiale Hongkong
International Commerce Centre,
1 Austin Road West,Kowloon,
Hong Kong
Tel: (852) 2203 8888

Deutsche Securities Inc.
2-11-1 Nagatacho
Sanno Park Tower
Chiyoda-ku, Tokyo 100-6171
Japan
Tel: (81) 3 5156 6000

Deutsche Bank AG London
1 Great Winchester Street
London EC2N 2EQ
United Kingdom
Tel: (44) 20 7545 8000

Deutsche Bank Securities Inc.
60 Wall Street
New York, NY 10005
United States of America
Tel: (1) 212 250 2500