Goldman Sachs | Economics Research

7 January 2022 | 6:00PM GMT

Note: The following is a redacted version of the original report published Jan. 7, 2022 [14 pgs].

European Economics Analyst

10 Questions for 2022 (Stehn)

Sven Jari Stehn
+44(20)7774-8061 | jari.stehn@gs.com
Goldman Sachs International

Steffan Ball
+44(20)7774-0471 | steffan.ball@gs.com
Goldman Sachs International

Alain Durre
+33(1)4212-1127 | alain.durre@gs.com
Goldman Sachs Paris Inc. et Cie

Filippo Taddei
+44(20)7774-5458 |
filippo.taddei@gs.com
Goldman Sachs International

Christian Schnittker
+44(20)7774-2269 |
christian.schnittker@gs.com
Goldman Sachs International

Nikola Dacic
+44(20)7774-1633 | nikola.dacic@gs.com
Goldman Sachs International

Ibrahim Quadri
+44(20)7774-5864 |
ibrahim.quadri@gs.com
Goldman Sachs International

- Although the renewed surge in Covid infections is likely to weigh on services activity over the winter, we expect a more manageable hit to economic activity than last year. Given greater immunity levels, lower intrinsic virus severity and a lower sensitivity of activity to Covid restrictions compared with previous waves, we look for subdued but still positive Q1 growth in the Euro area and the UK. The near-term risk to our growth forecast, however, is to the downside in the case of a return to nationwide lockdowns.
- That said, we see significant pent-up demand in services spending across Europe—especially in Spain—and expect strong consumption growth as saving rates normalise this year. Moreover, we look for persistent fiscal support, given additional public investment by the new government in Germany, a strong investment boost via the Recovery Fund in Southern Europe, and recent expansionary budgets in the UK. We therefore project 2022 GDP growth of 4.4% in the Euro area (slightly above consensus) and 4.7% in the UK, both meaningfully above our forecast for the US.
- Although the Euro area unemployment rate has fallen back to pre-Covid levels and supply bottlenecks persist, we still see significant area-wide labour market slack, especially in the South. We look for a significant increase in German pay growth particularly in H2—due to wage negotiations and the agreed increase in the minimum wage—but expect wage pressures to build more slowly elsewhere in the Euro area as slack is absorbed gradually.
- Inflation has surged across Europe—fuelled by higher energy prices, base effects and bottlenecks—and we expect core inflation to have peaked at 2.6% in the Euro area in December and look for a peak of 4.7% in April in the UK (with headline inflation near 7%). But the speed of the decline will differ notably across the Channel given contrasting labour market pressures. We expect Euro area core inflation to fall back to 1.3% in December, while UK core inflation is likely to remain around 2.5% at the end of 2022, with risks skewed to the upside across Europe.
- We therefore look for continued divergence in monetary policy. The ECB raised its inflation projections notably in December and decided to begin the step-down of QE, but we believe that a 2022 hike is highly unlikely. We do not expect lift-off until 2024 given our inflation outlook, but see risks skewed towards earlier if

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

inflation decelerates less than expected and wage growth accelerates more strongly this year. Given the hawkish surprise on the BoE's reaction function at the December MPC Meeting, combined with strong labour-market and inflation data, we look for continued tightening in the UK this year. While the uncertainty remains significant, we expect 25bp hikes in February, May and November.

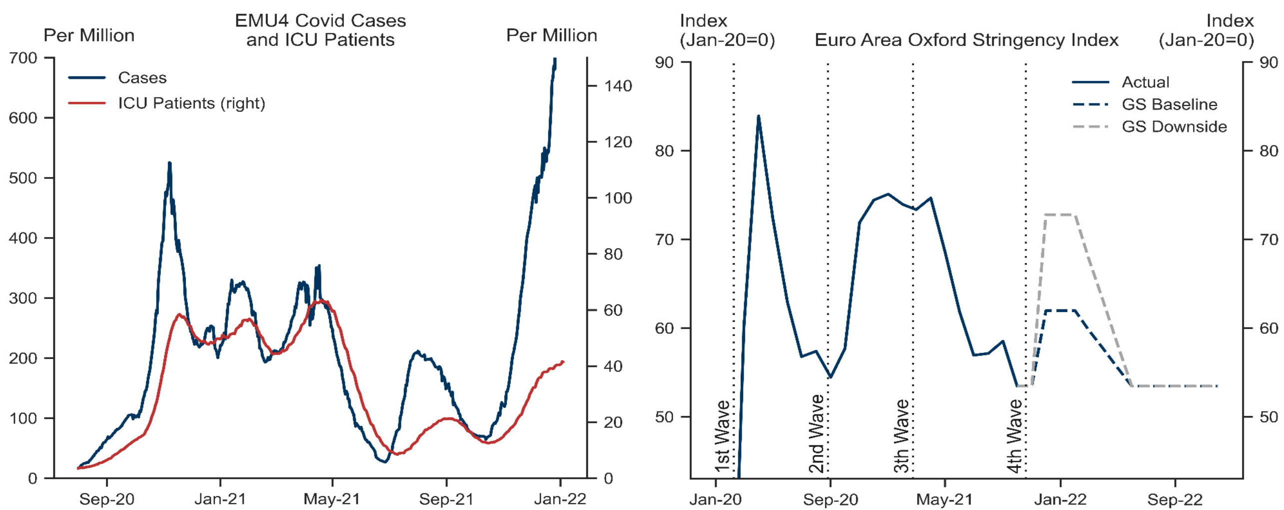
- Three risks could reignite Euro area institutional concerns this year. Our baseline is that Mario Draghi remains Italian Prime Minister, but his election to the Presidency could imply delays in the implementation of the Recovery Fund. In France, the latest opinion polls suggest that President Macron will face the centre-right candidate Valérie Pécresse in the second round, but much can happen in coming months. Finally, disappointing execution of the Recovery Fund, or tensions around the reinstatement of the EU fiscal rules, could bring fiscal risks—including debt sustainability and austerity—back into focus.

10 Questions for 2022

1. Will the winter virus wave push Europe into another recession?

No, but we look for weak growth over the winter. Covid infections have risen sharply across Europe as the Omicron variant has spread, and continued upward pressure on case growth seems likely in coming weeks given the high infectiousness of the new variant and cold winter weather (Exhibit 1, left). Euro area countries have adopted renewed Covid restrictions, and we expect these to remain in place through the winter, which is likely to weigh on services activity in coming months (Exhibit 1, right).

Exhibit 1: This Time is Different

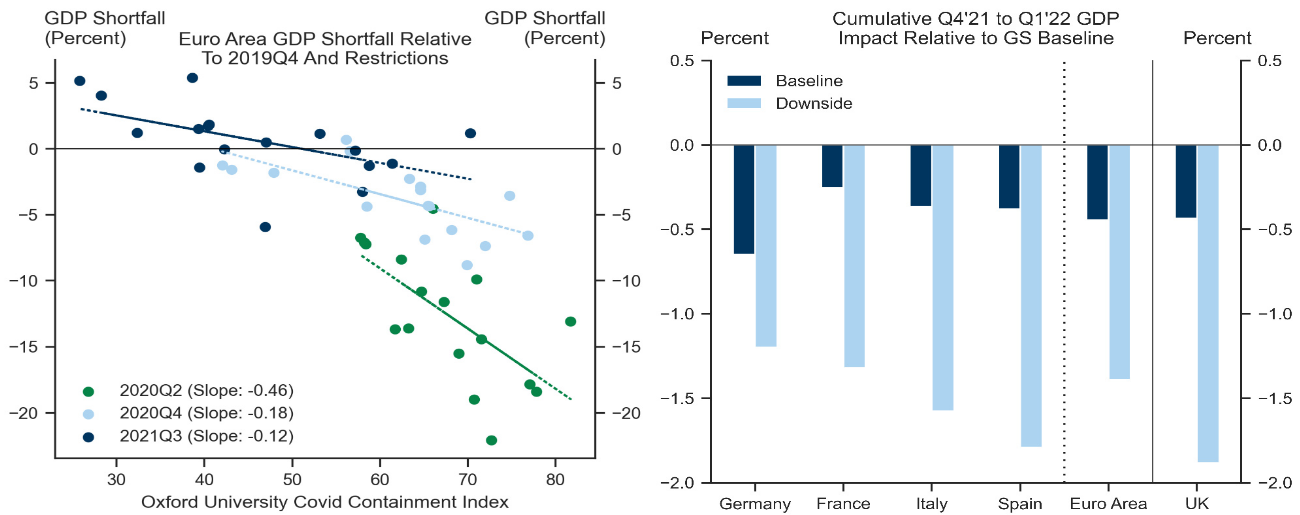


Source: Goldman Sachs Global Investment Research, ECDC, Oxford University Blavatnik School of Government

That said, we see a number of reasons why the economic hit should be more manageable than during the last winter. The Omicron variant looks less severe than earlier variants and Europe has greater immunity, which has helped protect hospital capacity. We therefore expect the containment measures to remain targeted and

regional, and do not look for a return to blanket national lockdowns. Moreover, the sensitivity of activity to Covid restrictions has fallen with each wave (Exhibit 2, left).

Exhibit 2: A More Manageable Hit



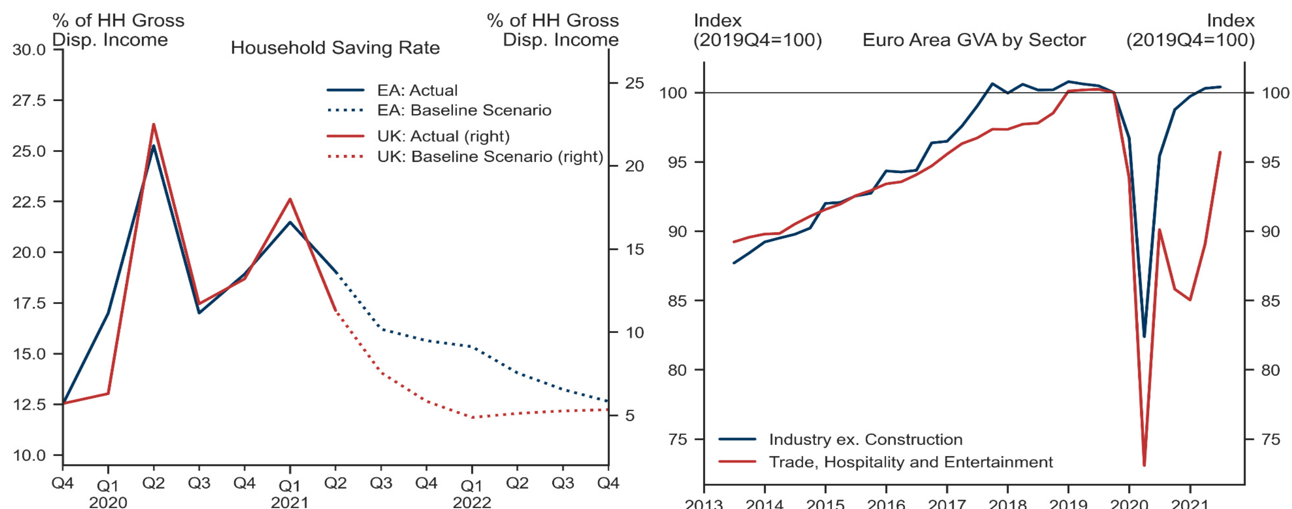
Source: Goldman Sachs Global Investment Research, Haver Analytics

We therefore look for a cumulative hit of about ½% to activity during the winter, with non-annualised growth of 0.6% in Q1 in both the Euro area and the UK. The risk to our Q1 forecast, however, is to the downside and we estimate that a return to nationwide lockdowns would reduce area-wide activity by around 1½%.

2. Will the savings rate continue to fall?

Yes, and this should provide a significant boost to services spending. The household saving rate has remained significantly higher than before Covid in both the Euro area and UK, and consumers have accumulated significant 'excess' savings since the start of the pandemic. Our model for household saving—which incorporates confidence and wealth effects—points to a steady decline in saving rates, which should return to their pre-pandemic levels in late 2022 (Exhibit 3, left).

Exhibit 3: More Consumer Normalisation in the Pipeline



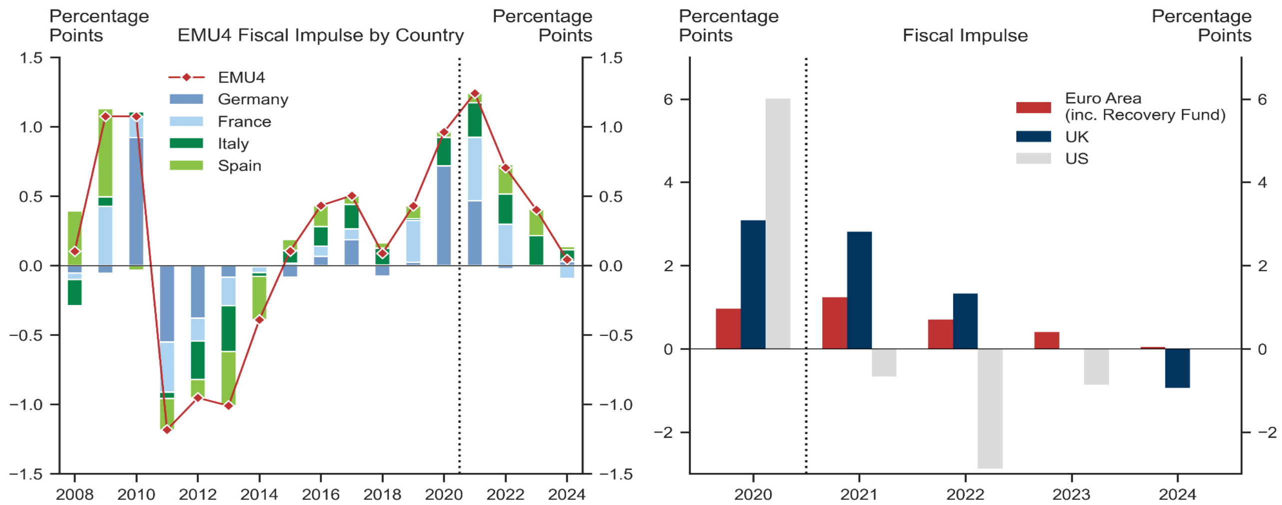
Source: Goldman Sachs Global Investment Research, Haver Analytics

The flip side of the normalisation of saving should be a continued rebound in household consumption as real disposable incomes continue to be shielded by income support measures, such as short-time work. While consumer spending on goods has largely recovered to pre-Covid levels, services spending (particularly in Covid-sensitive parts) remains depressed in large parts of Europe (Exhibit 3, right). While much of this shortfall clearly reflects the importance of Covid-sensitive activity (such as tourism) in Southern Europe, the magnitude of the remaining shortfall is surprising in light of Europe's high vaccination rate.

3. Will fiscal policy remain expansionary?

Yes, we look for persistent fiscal support in both the Euro area and the UK. In the Euro area, we estimate that the fiscal impulse will remain expansionary in 2022-23 given additional public investment by the new government in Germany, an extension of fiscal support in France ahead of the presidential election and a strong investment boost via the Recovery Fund in Italy and Spain. We specifically look for a growth impulse of 0.7pp in 2022 and 0.4pp in 2023, before turning neutral in 2024 (Exhibit 4, left).

Exhibit 4: Sustained Fiscal Support



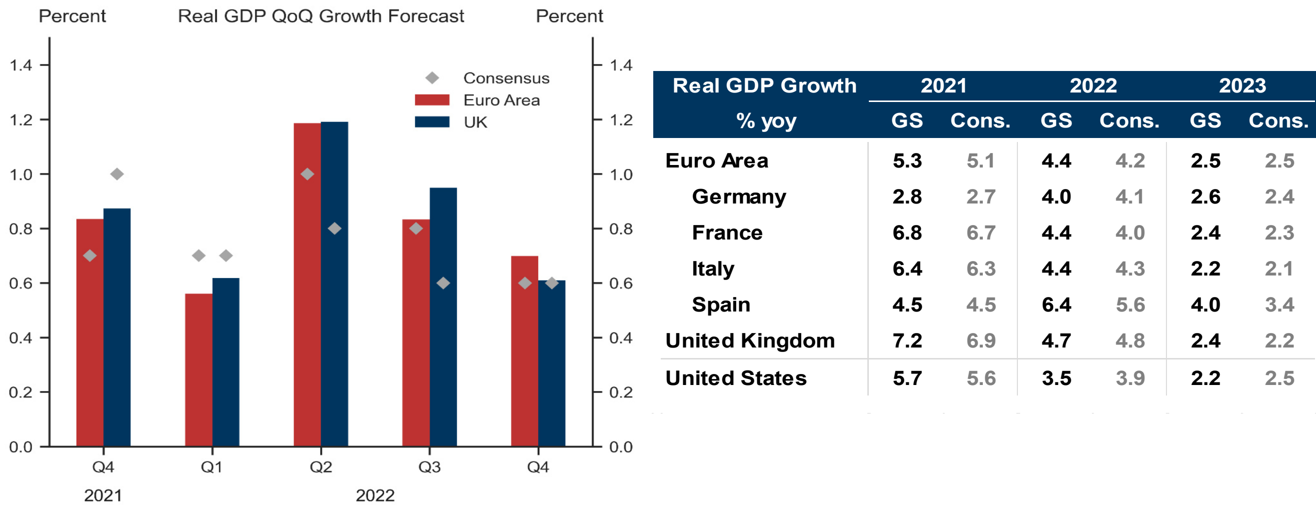
Source: Goldman Sachs Global Investment Research

In the UK, we look for continued fiscal support in 2022—helped by the expansionary October budget—but then expect the fiscal impulse to turn negative from 2024. In addition, we expect additional fiscal support to both businesses and households to help with the surge in energy prices. The backloaded nature of the fiscal support across Europe is thus striking compared with the sharp turn in the fiscal impulse in the US (Exhibit 4, right).

4. Will Europe outgrow the US?

Yes. For the Euro area as a whole, we look for growth of 4.4% in 2022 and 2.5% in 2023, only slightly above consensus but notably above our US growth forecasts of 3.5% and 2.2%. Looking across the EMU, we are relatively cautious on Germany in 2022 (given the importance of slower growth in China and industrial bottlenecks) but above consensus for 2023 (when we expect investment spending by the new government to support growth). We are more clearly above consensus in Italy and (especially) Spain, where we see substantial room to grow and strong fiscal support through the Recovery Fund.

Exhibit 5: A Robust Recovery



Real GDP Growth % yoy	2021 GS	2021 Cons.	2022 GS	2022 Cons.	2023 GS	2023 Cons.
Euro Area	5.3	5.1	4.4	4.2	2.5	2.5
Germany	2.8	2.7	4.0	4.1	2.6	2.4
France	6.8	6.7	4.4	4.0	2.4	2.3
Italy	6.4	6.3	4.4	4.3	2.2	2.1
Spain	4.5	4.5	6.4	5.6	4.0	3.4
United Kingdom	7.2	6.9	4.7	4.8	2.4	2.2
United States	5.7	5.6	3.5	3.9	2.2	2.5

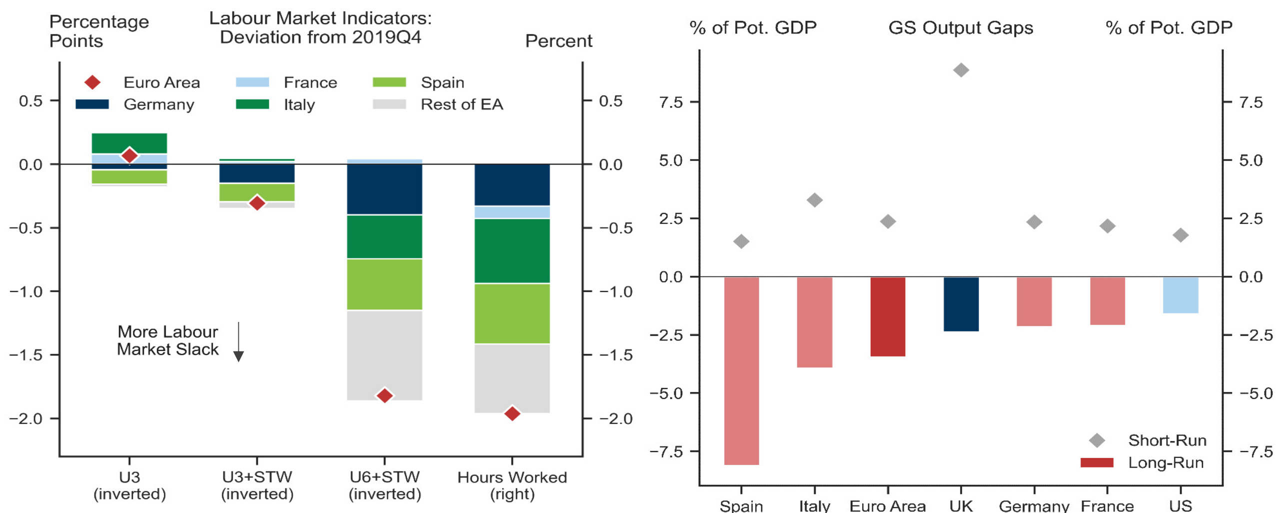
Source: Goldman Sachs Global Investment Research, Bloomberg

We hold a similar view for growth in the rest of Europe. In the UK, we look for 4.7% in 2022 and 2.4% in 2023, given room to grow (once the severe short-term bottlenecks have eased) and continued fiscal support. We likewise look for strong growth in Sweden, Norway and Switzerland over the next couple of years.

5. Will the Euro area return to full employment?

No, given significant labour market slack in Southern Europe. Although the Euro area unemployment rate has fallen back to pre-pandemic levels, we still see significant broader labour market slack. Taking into account people in short-time work schemes, workers on the fringes of the labour market and reduced hours worked suggests that plenty of labour market slack remains relative to pre-Covid levels, especially in Spain (Exhibit 6, left).

Exhibit 6: Lots of Spare Capacity in Europe's South



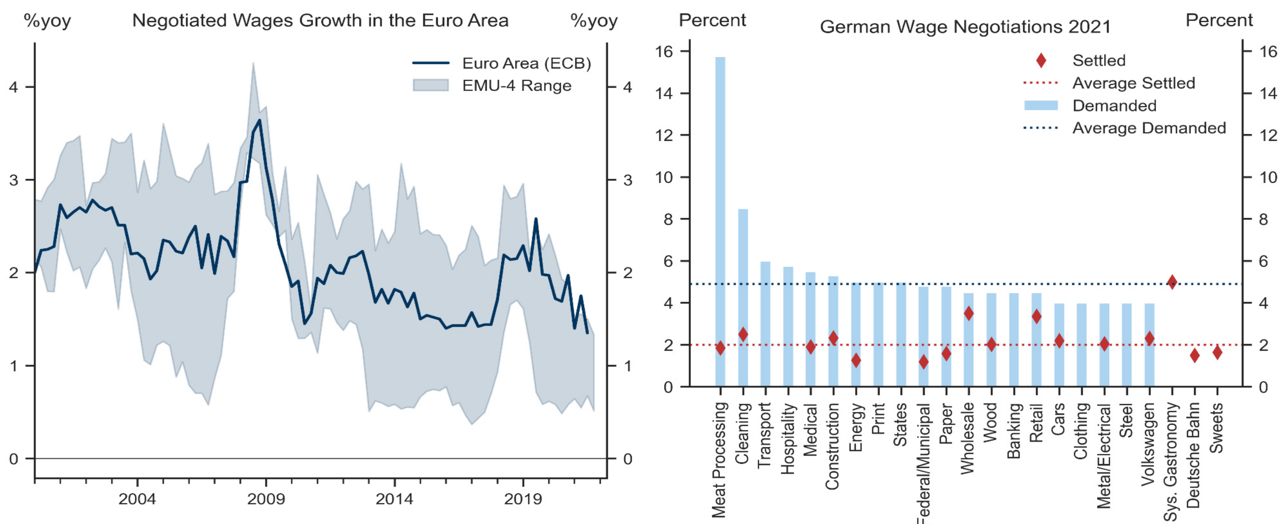
Source: Goldman Sachs Global Investment Research, Haver Analytics

Bottlenecks in the goods sector point to little economy-wide spare capacity in the short run and these frictions could be amplified by restrictions associated with the Omicron wave (Exhibit 6, right). But looking beyond the near term, we estimate that the Euro area still has notable spare capacity because the South entered the Covid crisis with plenty of slack, and we see limited scarring from the pandemic. Our models point to an area-wide long-run output gap of about -4%, which we do not expect to approach zero until late 2024.

6. Will underlying wage growth return to pre-Covid levels in the Euro area?

No, but we do expect a pickup in pay growth during 2022. Although various pandemic distortions complicate the assessment and cross-country comparison, Euro area wage growth remains notably below pre-pandemic rates, in contrast to the acceleration seen in the US and the UK. Negotiated wage growth—probably the cleanest measure of underlying wage growth at the moment—stands at about 1½%, well below the pre-pandemic rate due to remaining spare capacity in the labour market (Exhibit 7, left).

Exhibit 7: A Gradual Increase in Wage Growth



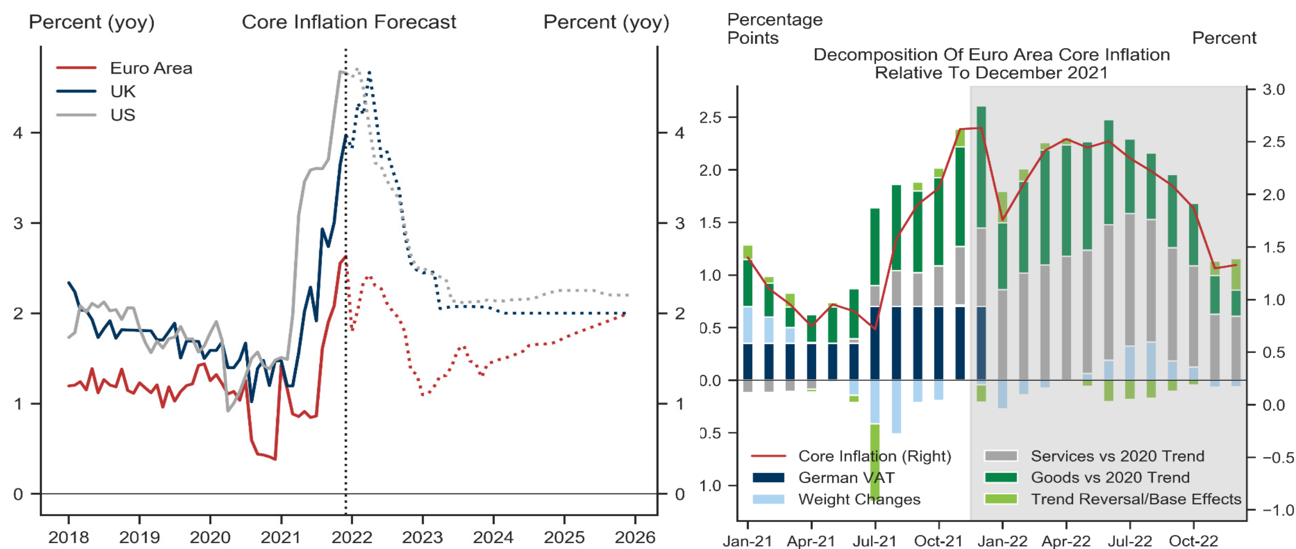
Source: Haver Analytics, Data compiled by Goldman Sachs Global Investment Research

Looking ahead, we expect wage growth to build gradually over the course of the year. In Germany, we look for a significant increase in pay growth in H2 due to ongoing wage negotiations (which have come in at 2% on average for 2022) and the agreed increase in the minimum wage to EUR 12/hour. But wage pressures are likely to build more gradually elsewhere in the Euro area as the recovery proceeds and slack is absorbed.

7. Will inflation fall below 2% across Europe?

Yes, in the Euro area, but not in the UK. While the activity outlook looks quite synchronised across Europe, notable differences emerge on the inflation side. Inflation has surged everywhere—fuelled by similar factors, including higher energy prices, base effects and bottlenecks—and we expect core inflation to have peaked at 2.6% in the Euro area in December and look for a peak of 4.7% in April in the UK.

Exhibit 8: Different Degrees of Transitory



Note: The right panel December value is a model forecast. The final HICP print, which contains the component breakdown, has not yet been released.

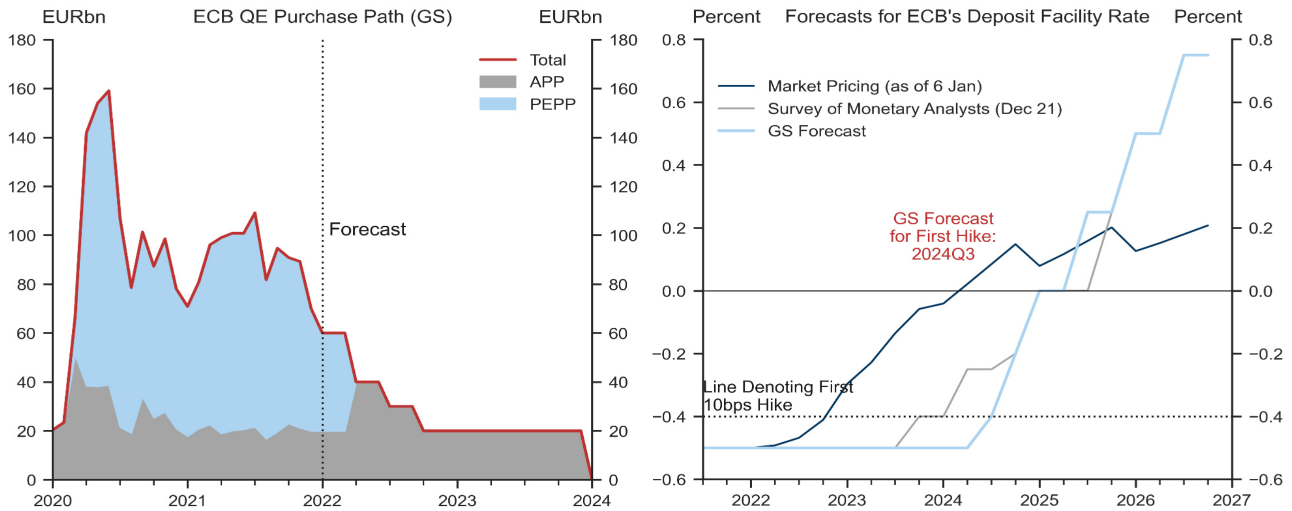
Source: Haver Analytics, Goldman Sachs Global Investment Research

But the speed of the decline will differ notably across the Channel. In the Euro area, we see strong distortions from temporary factors (such as the reversal of the German VAT cut and HICP weight changes) with core inflation falling back to 1.3% in December 2022. While uncertainty around the unwind of energy price inflation and supply-chain disruptions poses upside risks, we expect sequential inflation pressures to ease from now onwards as goods price inflation slows. In the UK, inflation pressures have strengthened on a more persistent basis, and we expect headline inflation to reach almost 7% in April and look for core inflation of around 2.5% at the end of 2022.

8. Will the ECB hike the deposit rate?

No. Although the ECB raised its inflation projections notably at the December meeting and decided to begin the step-down of QE, we believe that the Governing Council will look through the current inflation surge and keep the deposit rate on hold. The Governing Council's new forward guidance sets a high hurdle for the first Deposit Rate hike—requiring that the one-year-ahead inflation projection reaches 2% and measures of underlying inflation firm sufficiently—and we think it is very unlikely that ECB officials would renege on this guidance and hike while conducting net asset purchases. Given our inflation projections, we believe that a 2022 hike is highly unlikely and expect APP purchases to run until the end of 2023, followed by the first 10bp Deposit Rate hike in 2024Q3.

Exhibit 9: The ECB Keeps its Nerve



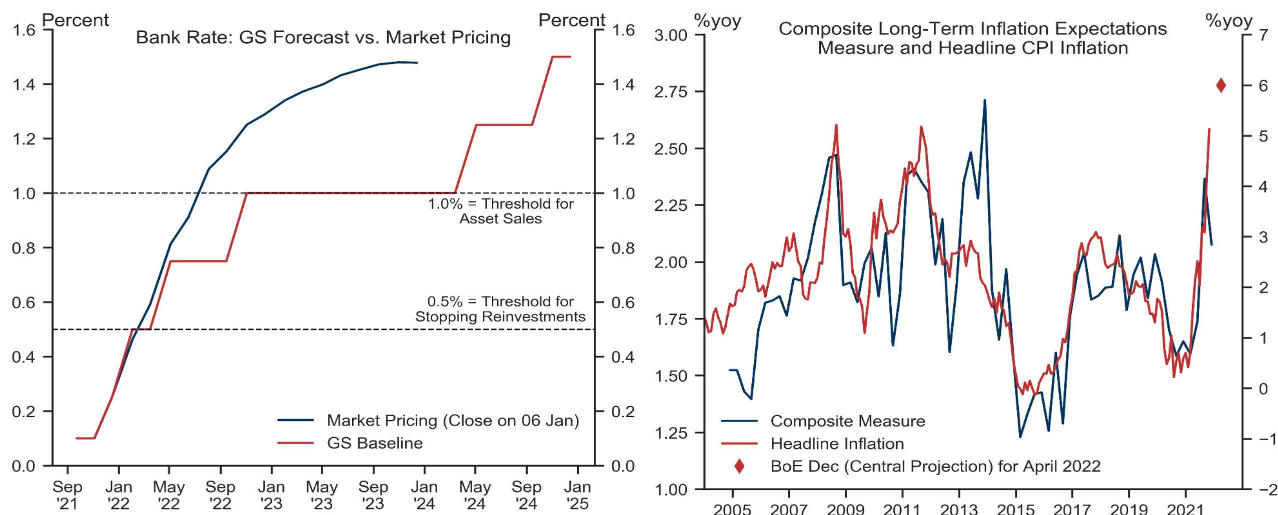
Source: Goldman Sachs Global Investment Research, ECB, Bloomberg

That said, the ECB's recent projections and communication suggest that it does not take a lot to flip the baseline towards a 2023 hike. The December staff projections end 2024 at 1.9% (just a touch below target) and core inflation is projected at 1.7% in 2023. We therefore see risks skewed towards a 2023 hike should inflation decelerate less in the course of 2022 than we currently expect and should wage growth accelerate more strongly than we anticipate.

9. Will the BoE raise Bank Rate by at least 75bp?

Yes, although the near-term outlook is highly uncertain given the Omicron outbreak. Given the hawkish surprise on the BoE's reaction function at the December MPC Meeting, combined with strong labour-market and inflation data, we expect 25bp hikes in February, May and November (Exhibit 10, left). However, significant risks remain, particularly given the uncertainty over the path of the virus. If Omicron turns out to cause more severe infections with hospital capacity under threat, then we think the BoE would likely keep Bank Rate on hold in February, as the meeting is likely to coincide with peak NHS pressures. Alternatively, if Omicron is seen as net inflationary and wage growth firms further, then there is the risk of an additional hike in March, taking Bank Rate to 1.0% by the May MPC Meeting (Exhibit 10, right).

Exhibit 10: BoE Tightening Continues



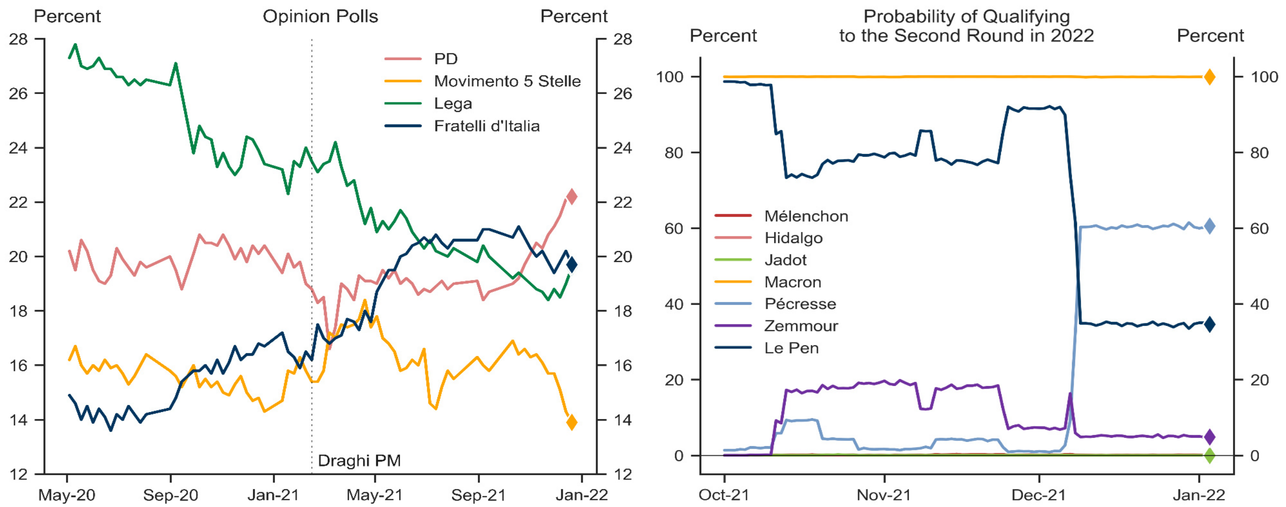
Source: Goldman Sachs Global Investment Research, Bloomberg, Bank of England, Haver Analytics

Turning to the BoE's balance sheet, we expect reinvestments to cease following the February meeting as Bank Rate reaches 0.5%. We think the BoE is likely to announce a fixed and gradual schedule of asset sales in 2022Q4, after hitting the stated 1.0% threshold, of around £20 billion per quarter.

10. Will Euro area sovereign risk re-emerge?

No, although 2022 brings a number of political and institutional risks. First, Italian Prime Minister Mario Draghi could be elected President in late January, triggering his resignation as PM and the need to appoint a new cabinet. Although the consensus view is that Mr Draghi will be the next President, recent shifts in political momentum suggest that Draghi will stay on as PM and oversee speedy implementation of the Recovery Fund (Exhibit 11, left). While PM Draghi's election to the Presidency would strengthen Italy's ties to Europe, this election would likely entail a delay to the implementation of the Recovery Fund and related reforms. Moreover, in the unlikely event that Draghi's presidency triggers an early general election, policy continuity would be severely affected, weakening Italy's commitment to the Recovery Fund.

Exhibit 11: Italian-Franco Political Risk



Source: SWG, Goldman Sachs Global Investment Research

Second, France will hold Presidential elections on April 10 (first round) and 24 (second round). Although political fragmentation remains similar to that at the time of the 2017 election, the campaign is likely to take a different tack given new candidates on the right of the political spectrum. The latest opinion polls suggest that President Macron will face centre-right candidate Valérie Pécresse in the second round, as the far-right candidates split the vote in the first round (Exhibit 11, right). Recent market predictions imply a 67% probability that President Macron will be re-elected but a lot can happen in the run-up to the election over the coming months.

Finally, risks remain around the implementation of the Recovery Fund and overhaul of the fiscal rules. Our central view is that (1) the Recovery Fund will promote investment and structural reform in Southern Europe; and (2) the EU fiscal rules will be interpreted more flexibly from 2023, affording Southern European countries time to adjust gradually. Inefficient use of the Recovery Fund and/or tensions around the tweaking of the EU fiscal rules, however, could reignite worries about sovereign risks in the South.

Sven Jari Stehn

Disclosure Appendix

Reg AC

We, Sven Jari Stehn, Steffan Ball, Alain Durre, Filippo Taddei, Christian Schnittker, Nikola Dacic and Ibrahim Quadri, 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 Resolution n. 20 is available at https://www.gs.com/worldwide/brazil/area/gir/index.html. Where applicable, the Brazil-registered analyst primarily responsible for the content of this research report, as defined in Article 20 of CVM Resolution n. 20, is the first author named at the beginning of this report, unless indicated otherwise at the end of the text. **Canada:** 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:** Goldman Sachs (Singapore) Pte. (Company Number: 198602165W), which is regulated by the Monetary Authority of Singapore, accepts legal responsibility for this research, and should be contacted with respect to any matters arising from, or in connection with, this research. **Taiwan:** This material is for reference only and must not be reprinted without permission. Investors should carefully consider their own investment risk. Investment results are the responsibility of the individual investor. **United Kingdom:** Persons who would be categorized as retail clients in the United Kingdom, as such term is defined in the rules of the Financial Conduct Authority, should read this research in conjunction with prior Goldman Sachs research on the covered companies referred to herein and should refer to the risk warnings that have been sent to them by Goldman Sachs International. A copy of these risks warnings, and a glossary of certain financial terms used in this report, are available from Goldman Sachs International on request.

European Union and United Kingdom: Disclosure information in relation to Article 6 (2) of the European Commission Delegated Regulation (EU) (2016/958) supplementing Regulation (EU) No 596/2014 of the European Parliament and of the Council (including as that Delegated Regulation is implemented into United Kingdom domestic law and regulation following the United Kingdom's departure from the European Union and the European Economic Area) with regard to regulatory technical standards for the technical arrangements for objective presentation of investment recommendations or other information recommending or suggesting an investment strategy and for disclosure of particular interests or indications of conflicts of interest is available at https://www.gs.com/disclosures/europeanpolicy.html which states the European Policy for Managing Conflicts of Interest in Connection with Investment Research.

Japan: Goldman Sachs Japan Co., Ltd. is a Financial Instrument Dealer registered with the Kanto Financial Bureau under registration number Kinsho 69, and a member of Japan Securities Dealers Association, Financial Futures Association of Japan 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.; Public Communication Channel Goldman Sachs Brazil: 0800 727 5764 and / or contatogoldmanbrasil@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Canal de Comunicação com o Público Goldman Sachs Brasil: 0800 727 5764 e/ou contatogoldmanbrasil@gs.com. 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.

Effective from the date of the United Kingdom's departure from the European Union and the European Economic Area ("Brexit Day") the following information with respect to distributing entities will apply:

Goldman Sachs International ("GSI"), authorised by the Prudential Regulation Authority ("PRA") and regulated by the Financial Conduct Authority ("FCA") and the PRA, has approved this research in connection with its distribution in the United Kingdom.

European Economic Area: GSI, authorised by the PRA and regulated by the FCA and the PRA, disseminates research in the following jurisdictions within the European Economic Area: the Grand Duchy of Luxembourg, Italy, the Kingdom of Belgium, the Kingdom of Denmark, the Kingdom of Norway, the Republic of Finland, Portugal, the Republic of Cyprus and the Republic of Ireland; GS -Succursale de Paris (Paris branch) which, from Brexit Day, will be authorised by the French Autorité de contrôle prudentiel et de resolution ("ACPR") and regulated by the Autorité de contrôle prudentiel et de resolution and the Autorité des marches financiers ("AMF") disseminates research in France; GSI - Sucursal en España (Madrid branch) authorized in Spain by the Comisión Nacional del Mercado de Valores disseminates research in the Kingdom of Spain; GSI - Sweden Bankfilial (Stockholm branch) is authorized by the SFSA as a "third country branch" in accordance with Chapter 4, Section 4 of the Swedish Securities and Market Act (Sw. lag (2007:528) om värdepappersmarknaden) disseminates research in the Kingdom of Sweden; Goldman Sachs Bank Europe SE ("GSBE") is a credit institution incorporated in Germany and, within the Single Supervisory Mechanism, subject to direct prudential supervision by the European Central Bank and in other respects supervised by German Federal Financial Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin) and Deutsche Bundesbank and disseminates research in the Federal Republic of Germany and those jurisdictions within the European Economic Area where GSI is not authorised to disseminate research and additionally, GSBE, Copenhagen Branch filial af GSBE, Tyskland, supervised by the Danish Financial Authority disseminates research in the Kingdom of Denmark; GSBE - Sucursal en España (Madrid branch) subject (to a limited extent) to local supervision by the Bank of Spain disseminates research in the Kingdom of Spain; GSBE - Succursale Italia (Milan branch) to the relevant applicable extent, subject to local supervision by the Bank of Italy (Banca d'Italia) and the Italian Companies and Exchange Commission (Commissione Nazionale per le Società e la Borsa "Consob") disseminates research in Italy; GSBE - Succursale de Paris (Paris branch), supervised by the AMF and by the ACPR disseminates research in France; and GSBE - Sweden Bankfilial (Stockholm branch), to a limited extent, subject to local supervision by the Swedish Financial Supervisory Authority (Finansinpektionen) disseminates research in the Kingdom of Sweden.

General disclosures

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. The information, opinions, estimates and forecasts contained herein are as of the date hereof and are subject to change without prior notification. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by 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.

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.

© 2022 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.