

GLOBAL MACRO RESEARCH

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TOP *of* MIND

2021: 4 THEMES IN CHARTS

In this very special year-end edition of Top of Mind, Our favorite quotes and charts from our 2021 pieces you'll find. This report, which we hope you'll bend at the seams, Tells the story of four major 2021 themes.

We begin with inflation surprises across the globe, Only some of which were driven by the pernicious microbe. And in markets, stubbornly low interest rates led to risk-taking, With SPACs, meme stocks and cryptos many investors chasing.

2021 also had US, EU and China policy shocks, Some positive, some negative with various impacts on assets and stocks. And the last theme revolved around the major crises of our time, What COVID means for how we work, and solving climate change on the private sector's dime.

We hope you've found our 2021 themes useful, and the charts we highlighted too, We also include our annual crossword; in this year's pieces, you'll find answers to the clues. Thank you for your readership, and sending you holiday cheer, We look forward to engaging with you again in the New Year.

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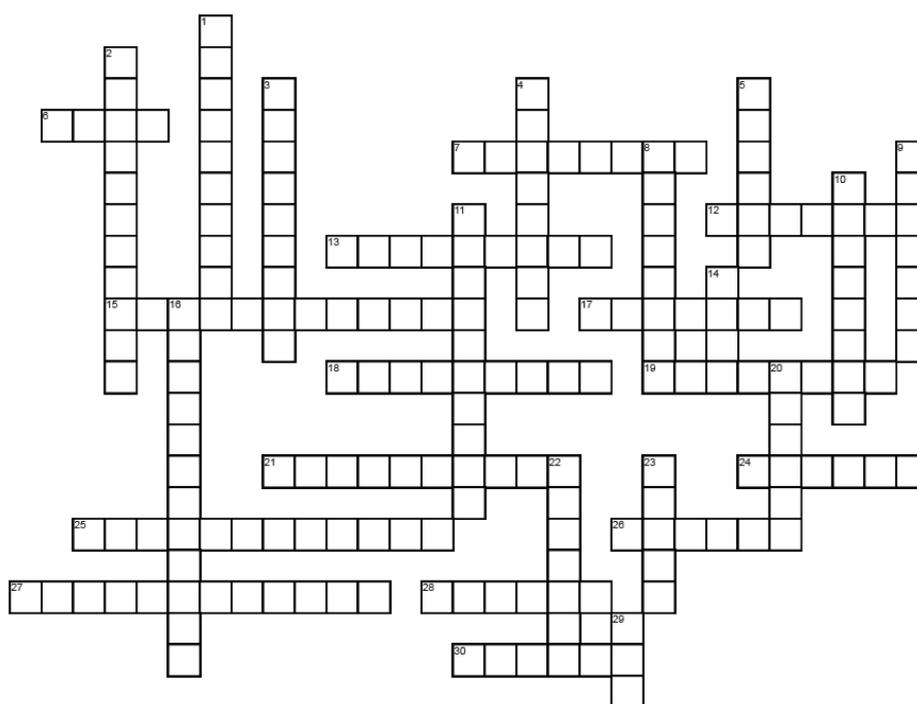
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Investors should consider this report as only a single factor in making their investment decision. For Reg AC certification, see the end of the text. Other important disclosures follow the Reg AC certification, or go to www.gs.com/research/hedge.html.

The Goldman Sachs Group, Inc.

Revisiting 2021 themes, crossword-style



Across:

6. Nicholas Bloom, Professor of Economics at Stanford University, finds that about _____ of all working days were spent working from home during the height of the pandemic (Issue 100).
7. Christian Mueller-Glissmann, GS Senior Multi-Asset Strategist, has found that _____ portfolios often suffer during or after periods of high and rising inflation (Issue 97).
12. In the process of going public, a SPAC sells units consisting of a common share and a fractional _____, with each whole _____ allowing an investor to purchase one common share (Issue 95).
13. According to George Magnus, Associate at the China Center, Oxford University, President Xi Jinping's personal agenda is to revamp the party-centered China model to put _____ back into the phrase " _____ with Chinese characteristics" (Issue 101).
15. Mohamed A. El-Erian, Chief Economic Advisor at Allianz, argues that survey-based inflation _____ are not well anchored, as both short and long-term _____ have risen lately (Issue 103).
17. The _____ Inflation Targeting framework was adopted by the Fed at the 2020 Jackson Hole Symposium (Issue 97).
18. Enrico Moretti, Professor of Economics at the University of California, Berkeley, argues that pandemic-related shifts in work are unlikely to cause a permanent shift in the economic _____ of the US (Issue 100).
19. David Brady, Professor of Political Economy at the Stanford Graduate School of Business, argues that the Senate tends to be more _____ than the House, and this more _____ tendency is apparent in the historic pattern of failed legislation (Issue 99).
21. _____ are the building blocks of technology, and are central inputs in many everyday devices (Issue 103).
24. Jeff Currie, GS Global Head of Commodities Research, argues that a _____ tax/price is the most efficient way to solve climate change (Issue 104).
25. In order to be approved to receive funds from the EU Recovery Fund, EU member states must commit to spending a minimum of 20% of expenditures on _____ (Issue 102).
26. Dean Baker, Co-Founder of the Center for Economic Policy Research, believes that there has been a permanent shift in thinking about the role of _____ policy in supporting the economy (Issue 99).
27. Political _____ in the US has increased over the past several decades as both the Democratic and Republican parties have become more ideological (Issue 99).
28. A Special Purpose Acquisition Company (SPAC) takes a company public through a _____ (Issue 95).
30. Nouriel Roubini, Professor of Economics at NYU's Stern School of Business, doesn't believe that cryptocurrencies are _____, because cryptocurrencies have no income or utility that can be used to determine their fundamental value (Issue 98).

Puzzle made at <http://www.puzzle-maker.com>. Solutions on pg. 27.

Down:

1. According to Michele Della Vigna, GS Head of Energy Industry Research, capital markets are driving de-carbonization through a _____ in the cost of capital between high and low carbon investments (Issue 104).
2. Jan Hatzius, GS Head of GIR and Chief Economist, doesn't find the discussion of _____ very illuminating in the context of one-off spending increases, because _____ are a longer-run concept (Issue 97).
3. According to Romano Prodi, former Prime Minister of Italy and former President of the European Commission, _____ is the biggest obstacle to further EU integration (Issue 102).
4. Michael Klausner, Professor of Business and Professor of Law at Stanford Law School, believes that the shareholder _____ inherent in the structure of SPACs has made them a bad deal for post-merger investors (Issue 95).
5. A wage-price _____ occurs when wage increases lead to prices increases, which in turn lead to further wage increases (Issue 103).
8. Many Decentralized Finance (DeFi) applications currently live on this network (Issue 98).
9. Michael Novogratz, CEO of Galaxy Digital Holdings, believes that _____ adoption and the macro factors behind it are a mega bull trend (Issue 98).
10. A-Shares, which are RMB-traded shares of China-based companies, represent the _____ of China's equity market (Issue 101).
11. A change of the _____ Treaty is required for a permanent change of EU fiscal rules (Issue 102).
14. David Li, Professor at Tsinghua University, notes that China still has significant work to do to catch up with other countries in _____ technologies, like high-quality electronic components (Issue 101).
16. Erik Brynjolfsson, Professor at the Stanford Institute for Human-Centered AI, believes that despite the big jump in _____ over the course of the pandemic, the opportunities that technologies like AI and machine learning offer mean that we're not even close to seeing peak _____ (Issue 100).
20. Evidence suggests that the volume and impact of _____ trading has grown a lot since the advent of widespread commission-free trading (Issue 96).
22. A short _____ occurs when the price of a heavily-shorted security moves sharply higher, forcing short-sellers to buy it back in order to cover their position (Issue 96).
23. Arthur Levitt, former chair of the SEC, and Owen Lamont, Associate Director of Multi-Asset Research for Wellington Management's Quantitative Investment Group, believe that despite a perception that short-sellers create volatility, they actually play a vital role in _____ discovery (Issue 96).
29. Chris James, Founder and Executive Chairman of Engine No. 1, has found a clear linkage between _____ criteria and a company's ability to create value over the long term (Issue 104).

In the words of our 2021 interviewees

"The volatility in individual stocks driven by casino-like trading is a by-product of a culture of extreme risk-taking... But today's investors also don't necessarily understand the amount of risk that they're taking."

– Arthur Levitt, Former Chair, US Securities and Exchange Commission

(Issue 96, February 25)

"Europe has seldom missed an opportunity to miss an opportunity over the last decade."

– Timothy Garton Ash, Professor, University of Oxford

(Issue 102, October 18)

"In surveying 50k full-time US and 15k UK workers, we've actually found that 20% of people don't want to work from home at all post-pandemic... Another 30% want to work from home five days a week and are happy to never return to the office again."

– Nicholas Bloom, Professor, Stanford University

(Issue 100, July 29)

"[SPACs] are by no means costless, in large part because their structure typically creates dilution for shareholders."

– Jay Ritter, Professor, University of Florida

(Issue 95, January 28)

"To oversimplify somewhat, the private sector will need to provide the capital investments required to execute the transition, and governments will need to provide the fiscal support to smooth the transition."

– Mark Carney, UN Special Envoy for Climate Action

(Issue 104, December 13)

"[Chinese markets] are much riskier than what we thought six months ago. So caution should be the key watch word, and investors should fully understand what they are buying, and that prices are discounted to reflect this risk."

– George Magnus, Associate at the China Center, Oxford University

(Issue 101, September 13)

"Bidenomics is big and progressive, but it's still on the continuum of policies proposed by recent Democratic administrations."

– Jason Furman, Professor, Harvard Kennedy School

(Issue 99, June 29)

"The party is not looking to move away from markets wholesale; it wants and needs markets. Xi Jinping is instead trying to ensure that markets are leveraged to drive the strategic outcomes that serve the Communist Party and China's national goals."

– Jude Blanchette,

Freeman Chair in China Studies, CSIS

(Issue 101, September 13)

"What's good for stakeholders is ultimately good for shareholders. The only difference between shareholder primacy and stakeholder capitalism is duration."

– Chris James, Founder and Executive Chairman, Engine No. 1

(Issue 104, December 13)

"A core group of crypto people see this as—and I quote from the Blue Brothers here— "a mission from god" ... They will never sell. And because of that, bitcoin and ether can't go to zero."

– Michael Novogratz, Co-Founder and CEO, Galaxy Digital Holdings

(Issue 98, May 21)

"The biggest obstacle [to further European integration] is unanimity. The EU Council is required to vote unanimously on matters that member states consider sensitive, including fiscal and foreign policy decisions."

– Romano Prodi, Former Prime Minister of Italy and President of the European Commission

(Issue 102, October 18)

"It would be a mistake for investors to ignore opportunities in China consumer tech."

– Fred Hu, Founder, Chairman and CEO,

Primavera Capital Group

(Issue 101, September 13)

"The Fed's delayed and slow reaction to inflationary pressures has unfortunately increased the probability that it will have to slam on the brakes by raising rates very quickly after tapering and at a more aggressive pace than it would have if it started to tighten policy earlier."

– Mohamed A. El-Erian, President, Queens' College, Cambridge University

(Issue 103, November 17)

"Bitcoin and other cryptocurrencies aren't assets. Assets have some cash flow or utility that can be used to determine their fundamental value... Bitcoin and other cryptocurrencies have no income or utility."

– Nouriel Roubini, Professor, New York University's Stern School of Business

(Issue 98, May 21)

"The pandemic compressed about 20 years of change into 20 weeks, marking the biggest shift in the way people work since WWII."

– Erik Brynjolfsson, Professor, Stanford Institute for Human-Centered AI

(Issue 100, July 29)

"[Euro area] growth beyond 2022 will depend quite significantly on fiscal policies, and I'm afraid some countries may waste the opportunity to pursue productive investments."

– Otmar Issing, Former Chief Economist, European Central Bank

(Issue 102, October 18)



"All major commodity bull markets and inflationary episodes have been invariably tied to re-distributional, or populist, policies that have reduced income and wealth inequality."

– Jeff Currie, GS Global Head of Commodities Research

(Issue 97, April 1)

"Moore's Law is slowing down, and how that impacts the tech cost structure going forward is a megatrend issue for the industry."

– Rick Tsai, Vice Chairman and CEO, MediaTek

(Issue 103, November 17)

Note: All quotes came from interviews that appeared in GS Top of Mind reports in 2021.

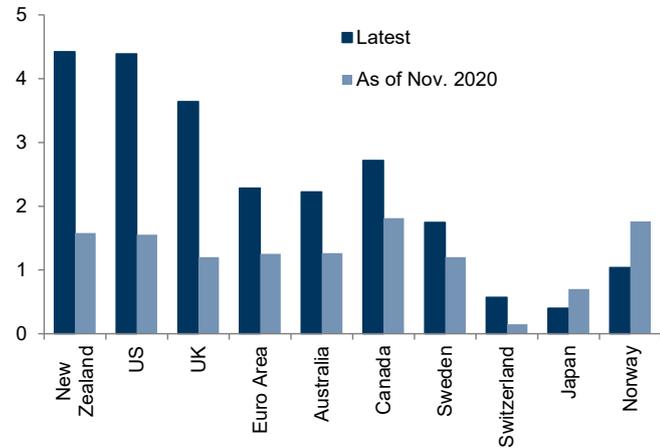
Source: Goldman Sachs GIR.

2021: the year of inflation surprises

Inflation surprised sharply to the upside in 2021, and should decline, but remain elevated, in 2022

Inflation has surprised to the upside across most of G10...

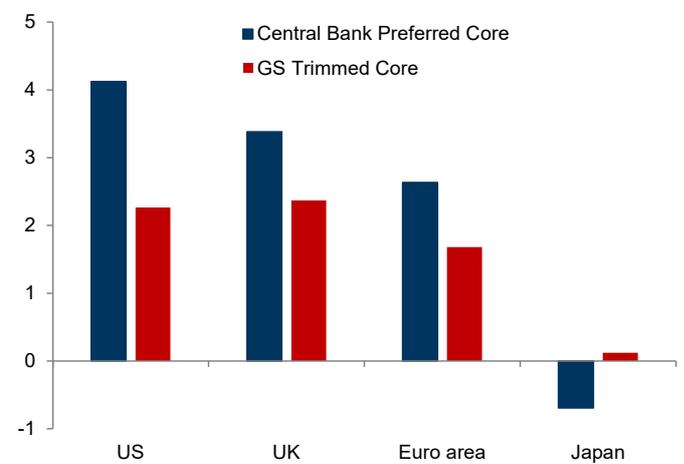
2021 Q4 GS core inflation forecasts: G10, % change vs. year ago



Source: Goldman Sachs GIR.

...but our GS trimmed core measure shows a more modest rise

CB preferred vs. GS trimmed core inflation, % change vs. year ago

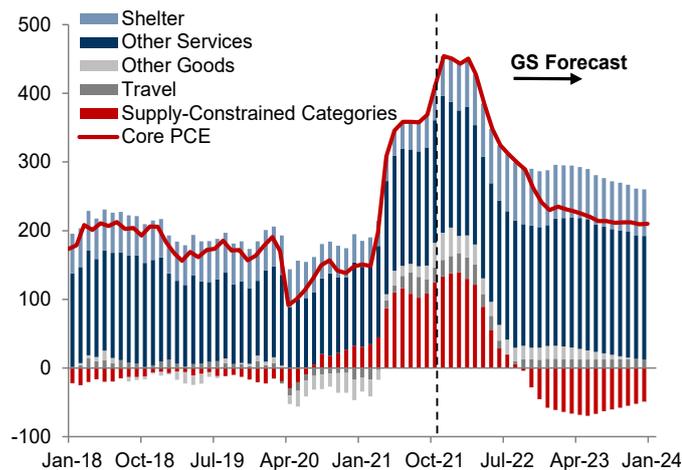


Note: For more detail on CB preferred core measure see [here](#); Central bank preferred core inflation is equal to realized print.

Source: Goldman Sachs GIR.

We see US core PCE inflation falling to 2.4% by end-2022...

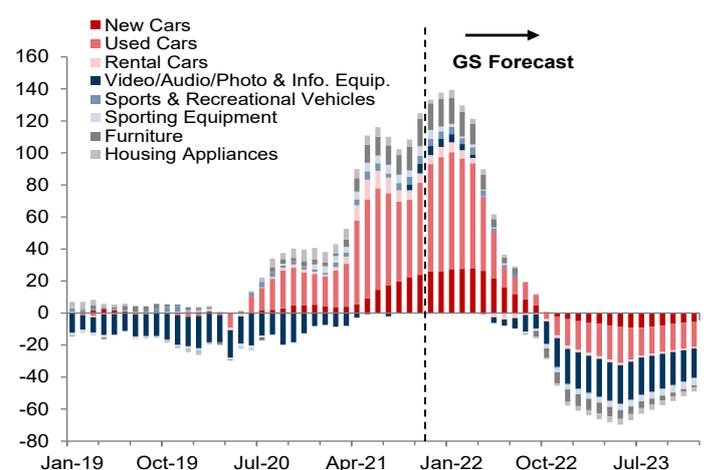
Contributions to yoy core PCE inflation, bp



Source: US Bureau of Economic Analysis, Goldman Sachs GIR.

...with a sizable swing in the boost from supply-constrained goods

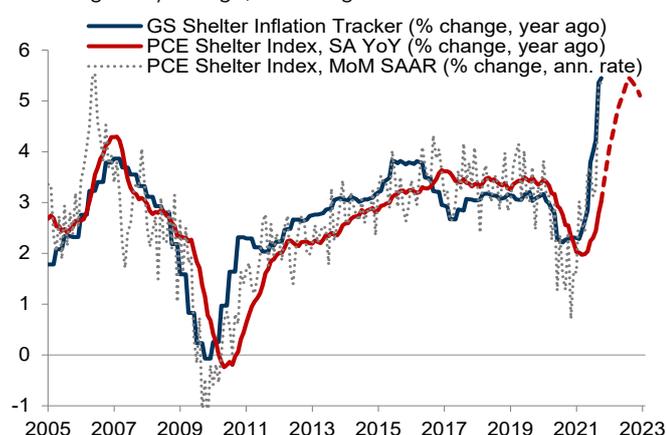
Contribution to yoy core PCE from supply-constrained categories, bp



Source: US Bureau of Economic Analysis, Goldman Sachs GIR.

US shelter inflation should peak ~5.5% yoy in mid-2022...

% change vs year ago, % change ann. rate

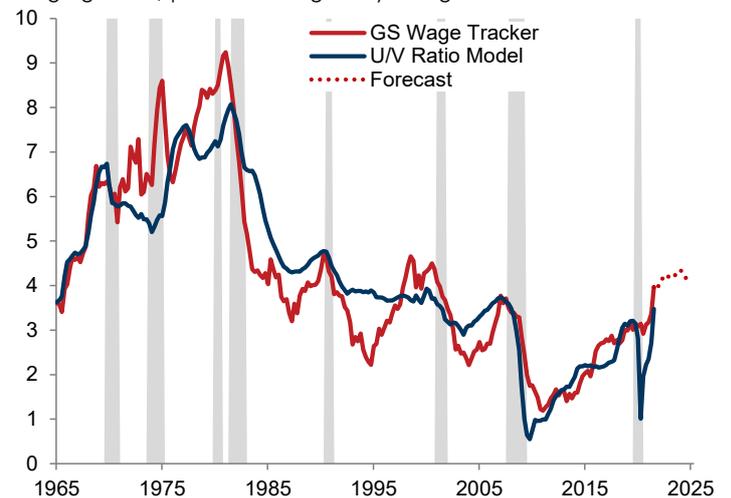


Note: GS Tracker is a weighted average of four alternative rent measures: Zillow Observed Rent Index; CoStar National Asking Rent; REIS Effective Rent per Apartment; Census Vacant Multifamily Median Rent.

Source: Department of Commerce, Costar, Zillow, REIS, Goldman Sachs GIR.

...and high demand for workers should keep US wage growth >4%

Wage growth, percent change vs year ago



Note: Composition-adjusted tracker shown post-2000; shading indicates recessions.

Source: US Department of Labor, Goldman Sachs GIR.

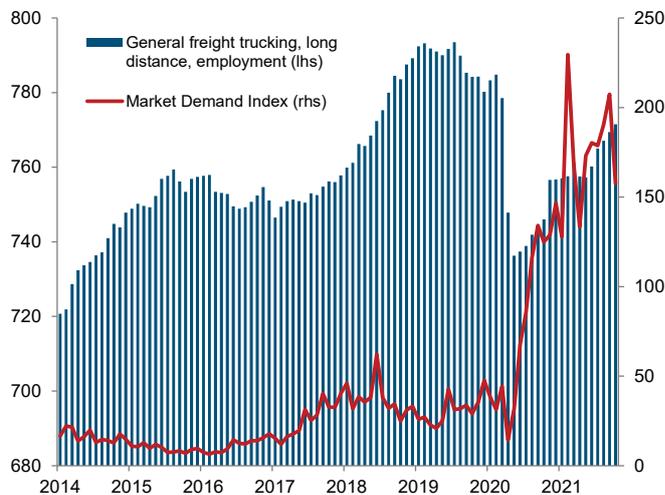
Supply chain bottlenecks were a key source of inflationary pressure, but they should ease next year

94 ships are currently anchored off the coast of California
Container ships anchored at Ports of LA and Long Beach



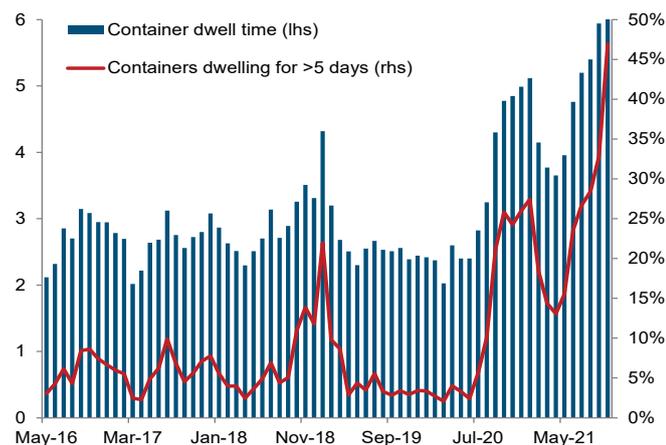
Source: Marine Exchange of Southern California, Goldman Sachs GIR.

Long-haul truckers are in short supply amid high demand
Thousands (sa, lhs), index (rhs)



Source: Truckstop, US Bureau of Labor Statistics, Goldman Sachs GIR.

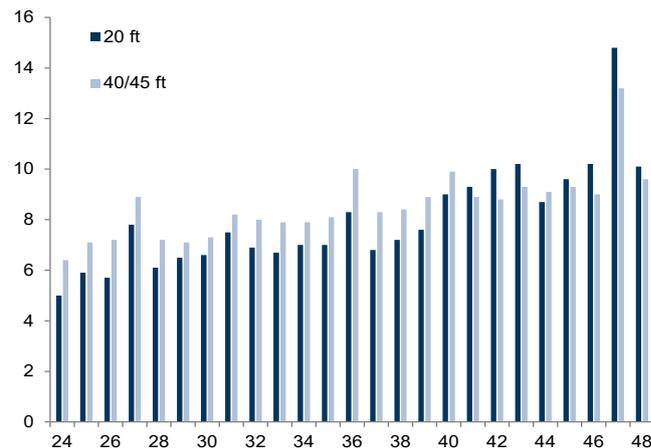
Containers are dwelling for record times at WC ports
Days (weighted average, lhs), % of total containers (rhs)



Source: Pacific Merchant Shipping Association, Goldman Sachs GIR.

Chassis dwell times remain high

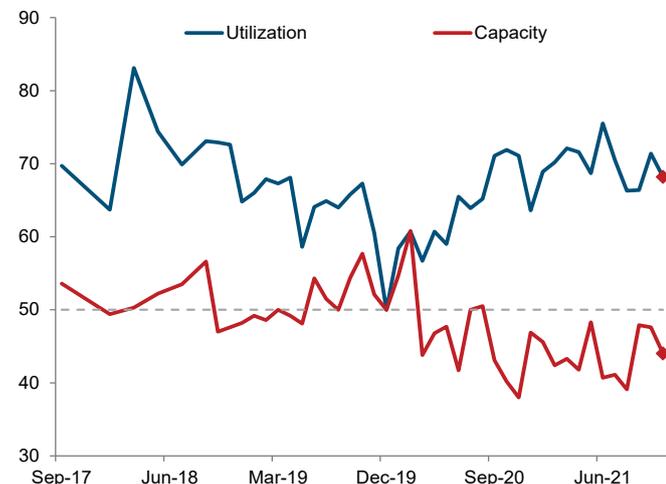
Chassis street dwell times by size, week # (x-axis), days (y-axis)



Source: Pool of Pools, Goldman Sachs GIR.

Warehouse space is very tight

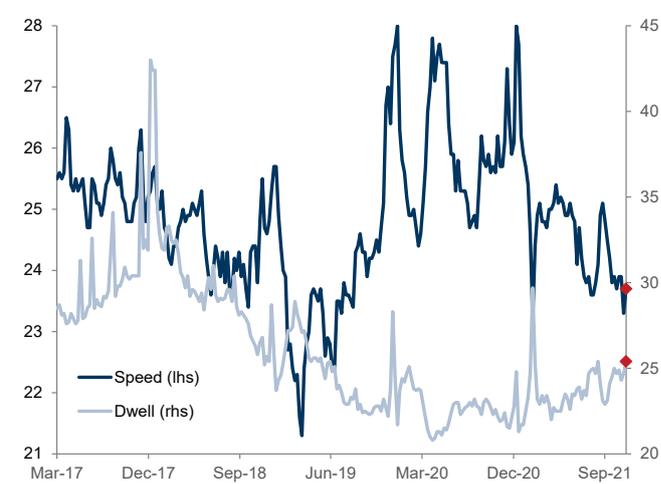
LMI Warehouse Utilization and Capacity Indices



Note: Capacity below 50 indicates capacity is contracting; utilization above 50 indicates an increase in utilization.
Source: Logistics Managers' Index, Goldman Sachs GIR.

Rail velocity and dwell times have improved, but still lagging

UNP train speed (mph, lhs) and dwell time (hours, rhs)

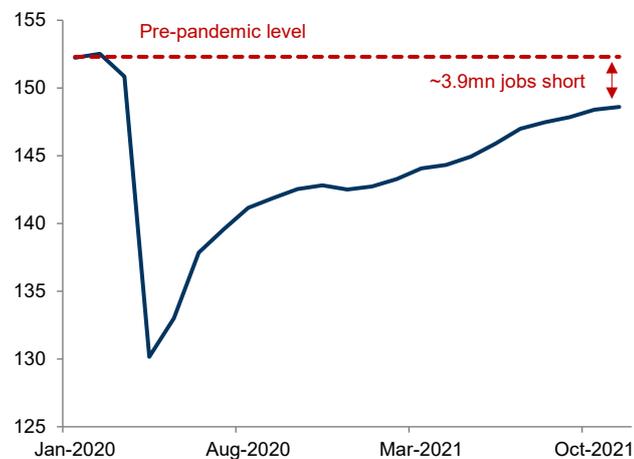


Source: STB, Goldman Sachs GIR.

Labor market gains should continue in 2022, paving the way for three Fed hikes next year

Employment is still ~3.9mn short of pre-pandemic level...

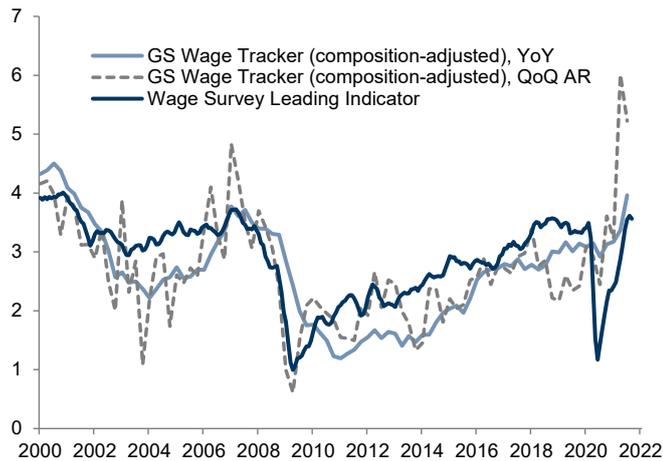
Current vs. pre-pandemic employment, millions



Source: US Bureau of Labor Statistics, Goldman Sachs GIR.

Wage growth has accelerated in 2H2021...

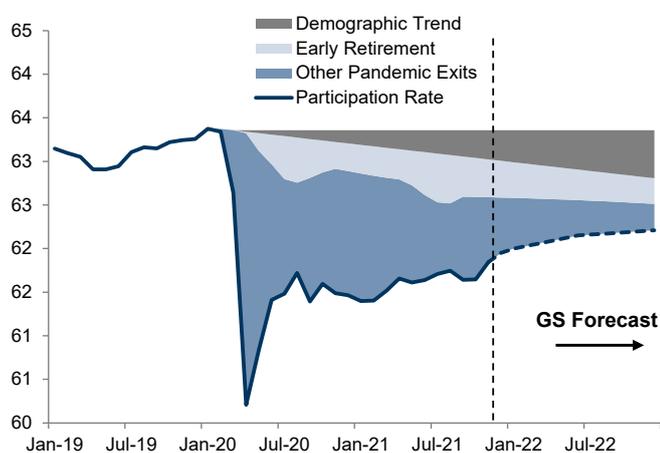
% change vs year ago, % change QoQ ann. rate



Note: QoQ AR based on quarterly data for av. hourly earnings and ECI.
Source: US Department of Labor, Goldman Sachs GIR.

Labor force participation will likely remain below trend

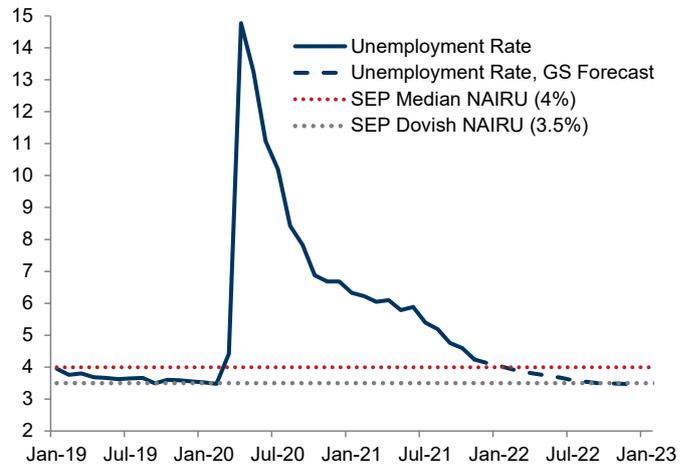
Labor force participation rate decomposition, percent



Source: US Bureau of Labor Statistics, Goldman Sachs GIR.

...but we see unemployment falling below neutral rate in '22

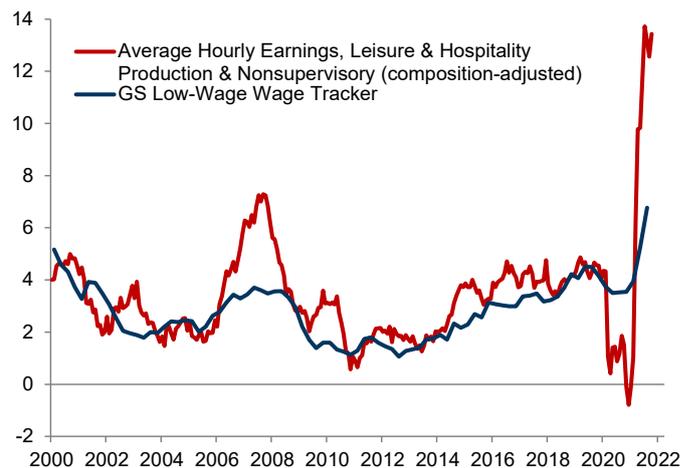
US unemployment rate and Fed SEP NAIRU estimates, %



Source: Federal Reserve, US Bureau of Labor Statistics, Goldman Sachs GIR.

...and it's especially elevated for low-wage workers

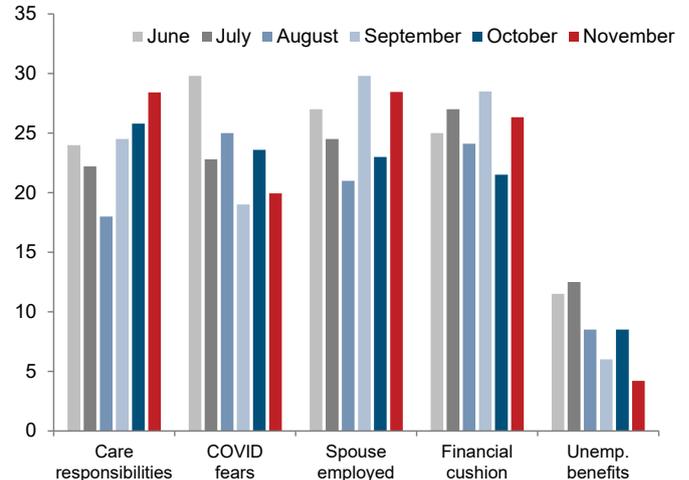
Percent change vs. year ago



Source: US Department of Labor, Goldman Sachs GIR.

Non-economic reasons are still holding some workers back

Reasons not urgently searching for a job, unemp. workers, %

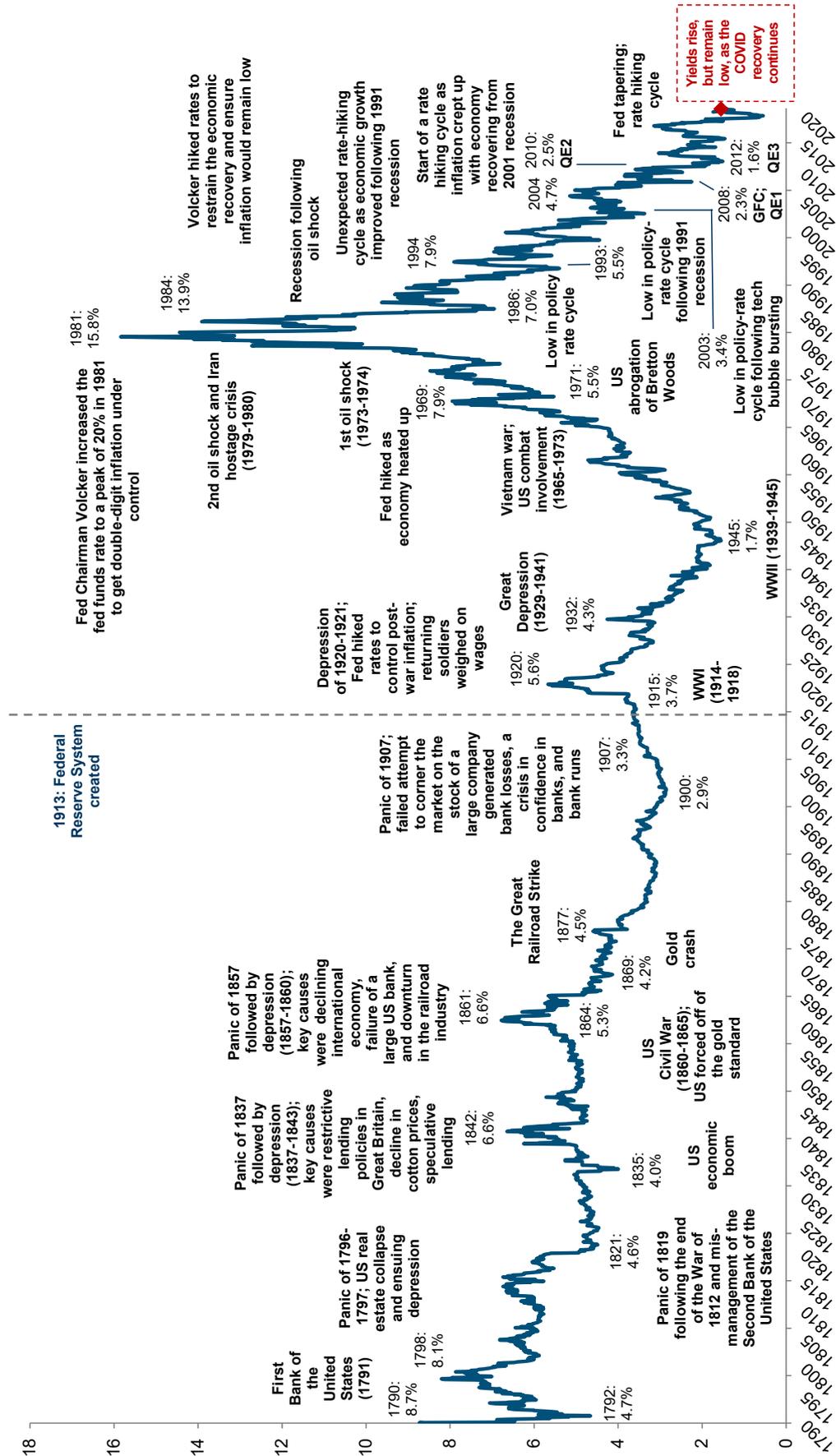


Source: Indeed, Goldman Sachs GIR.

2021 markets: SPACs, memes, cryptos

Stubbornly low rates set the stage for...

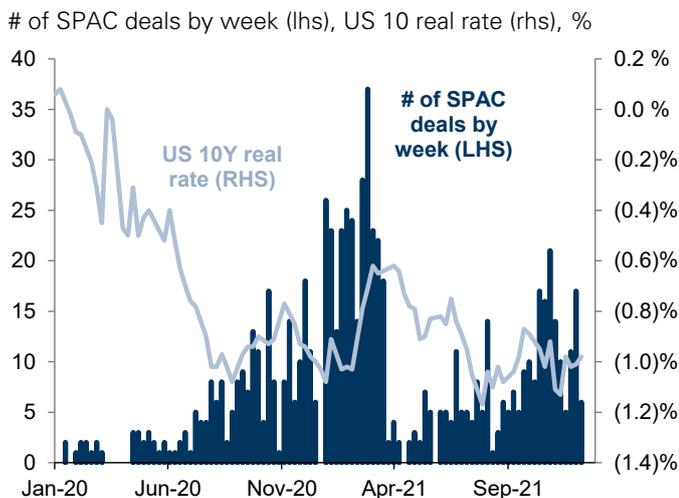
10-year US Treasury yield



Source: Global Financial Data, Inc., Federal Reserve Board, Haver Analytics, Goldman Sachs GIR.

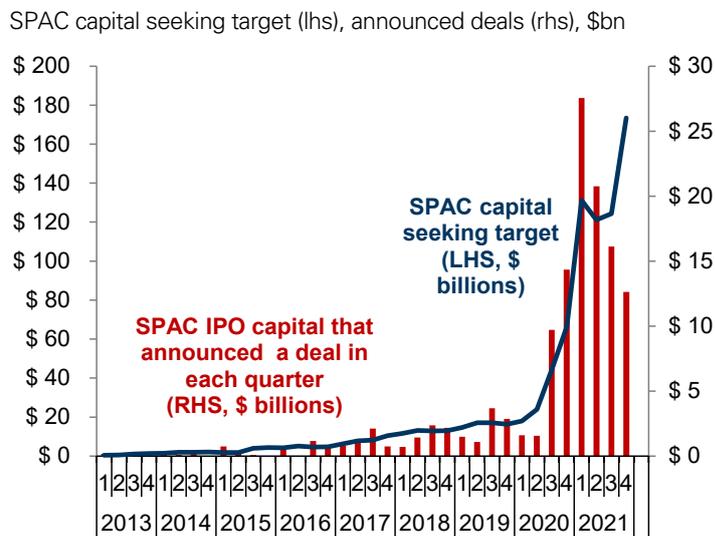
...the surge in SPAC IPOs at the start of the year, but SPAC momentum lost some steam

SPAC IPOs surged amid falling US real rates



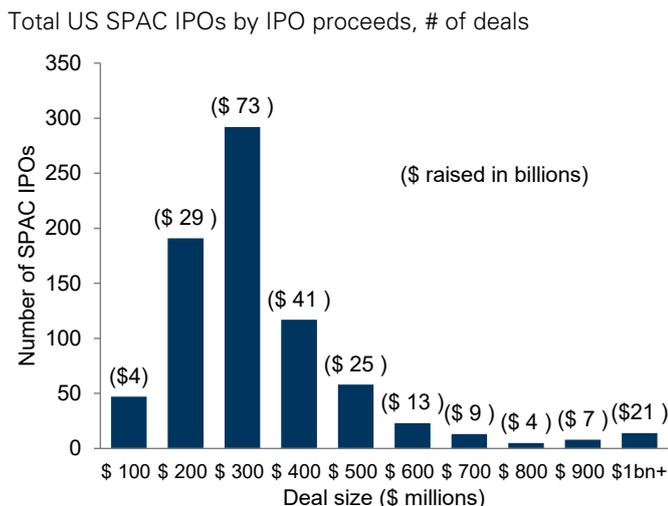
Source: Dealogic, Goldman Sachs GIR.

But the number of closed SPAC mergers has started to slow



Source: Dealogic, Goldman Sachs GIR.

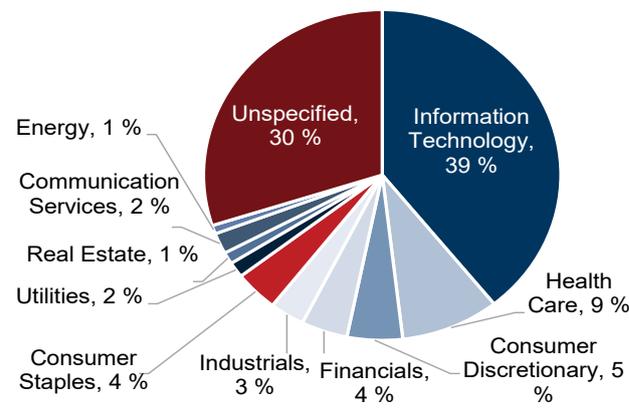
A majority of SPAC IPOs have been <\$500mn



Source: Dealogic, Goldman Sachs GIR.

SPAC deals have been concentrated in Tech

2020/21 US SPAC IPO acquisitions by target, % total funds raised



Note: SPAC IPOs 2020-2021. Source: Dealogic, Goldman Sachs GIR.

SPACs trade in line with other measures of retail activity

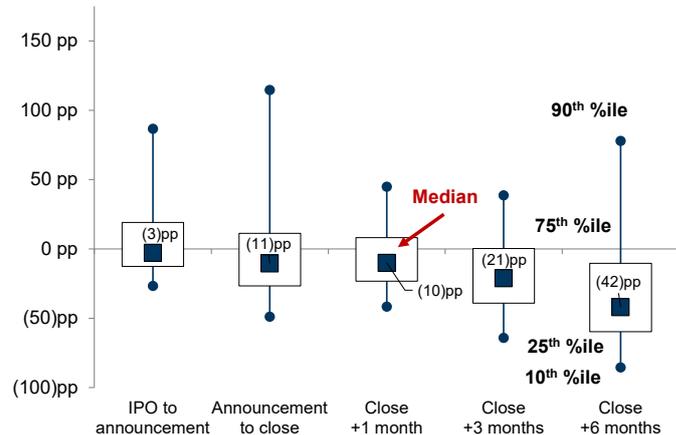
SPAC ETF (lhs), index; US equity call option vol (rhs), 1mma, mns



Source: Goldman Sachs GIR.

SPAC returns are highly dependent on point in the lifecycle

SPAC returns in excess of Russell 3000, pp



Note: Covers SPACs that have closed a merger since the start of 2000. Source: Dealogic, Factset, Goldman Sachs GIR.

For those of us who still don't know what a SPAC is...

Special Purpose Acquisition Companies:

A guide



1 A sponsor decides to launch a SPAC



6 The SPAC sponsor looks for a target company to merge with, and either completes a merger within two years or returns the funds raised to investors and liquidates the SPAC



2 A holding company is created and investor roadshow completed



7 If a target company is identified, terms of a merger are negotiated and a letter of intent (LOI) is signed; additional capital is often raised to fund the transaction through a private investment in public equity (PIPE) raise



3 The sponsor covers the SPAC's operating costs and acquires a block of shares typically amounting to 20% of post-IPO equity (the "promote")*



8 The shareholders in the SPAC vote on the proposed merger ("de-SPAC" process); if the merger is not approved, the sponsor can continue to look for a target



4 The SPAC is listed on an exchange and units costing \$10 and consisting of a common share and a fractional warrant are sold to investors**. The proceeds raised from the SPAC IPO are held in a trust account and invested in Treasury notes



9 If shareholders approve, the merger is executed; shareholders can choose to keep their shares, redeem them and receive their initial investment back plus interest, or sell them in the market



5 The units of the SPAC trade on the open market; the common shares and warrants are often separated and traded independently



10 The SPAC merges with the target company and begins trading under a new ticker

*Some SPACs include smaller promotes or have the sponsor receive warrants rather than a percentage of the common shares. Some SPACs also build an earn-out into the promote to allow the target company to recoup shares if its stock price hits a predetermined level.

**Each whole warrant entitles the investor to purchase one common share.

Source: CBInsights, Harvard Law School Forum on Corporate Governance, various news sources, Goldman Sachs GIR.

Amid the meme stock frenzy, retail traders left their mark on markets...

Retail activity: Up, but still a modest share of the market

While the dollar value of retail trades has continued to rise... retail activity still accounts for a small share of the market



Note: We define a small-lot share trade as trades of less than \$2,000 and use as a proxy for retail trading.

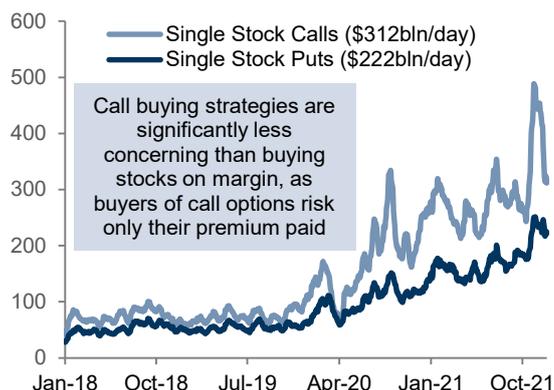
While all trading volumes are up, single stock options continue to see exceptional growth

Total options volumes are +122% of total share volumes... and single stock call volumes have risen by \$10bn+ since Feb

Single stock options volumes as % of share volumes (notional)



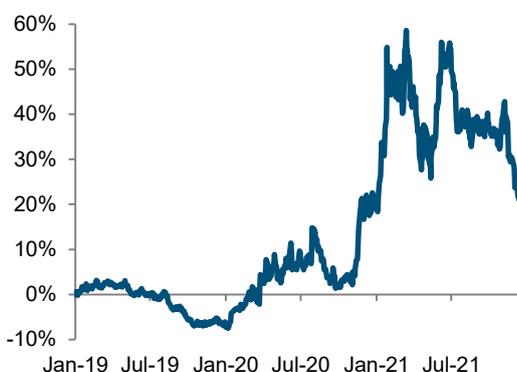
Daily notional call/put options volume, \$bn



Retail trading activity has continued to be a valuable signal for stock differentiation

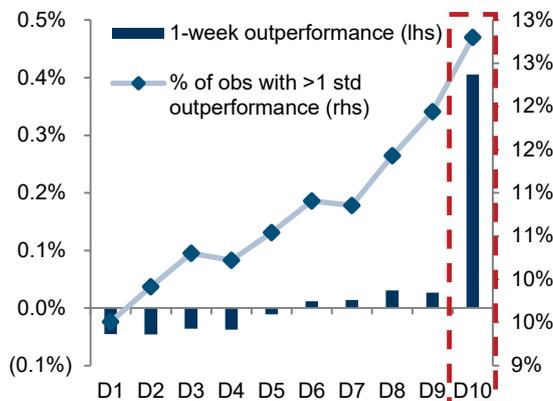
Highly retail-traded stocks have outperformed...

Total return of buying stocks in the top quintile and selling other quintiles on the basis of % options volume from retail trades



...as have stocks with a high probability of a short squeeze

Stock performance for each probability decile of our short squeeze model; probability based on retail activity, volume and short interest metrics



Note: We define a small-lot options trade as any trade where the number of contracts*stock price is less than 5,000.

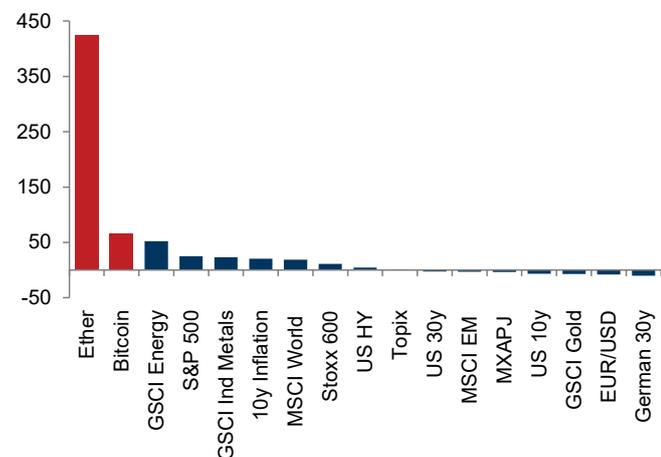
Source: Ivy, Goldman Sachs GIR.

Special thanks to John Marshall, Head of Derivatives Research in GS Global Investment Research, and his team for these charts, which they compiled using a proprietary "big data" approach of analyzing the size of every trade in every stock on every day to track trends in retail trading activity.

...and cryptocurrencies remained all the rage...

BTC and ETH are the highest returning assets YTD...

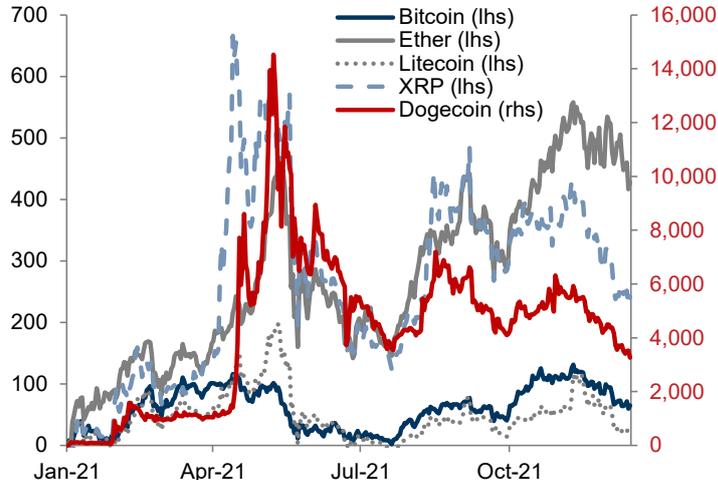
Total returns YTD, %



Note: Total returns in USD; all market prices as of December 14, 2021. Source: Bloomberg, Goldman Sachs GIR.

...and ETH has mostly recovered from the mid-year crypto selloff

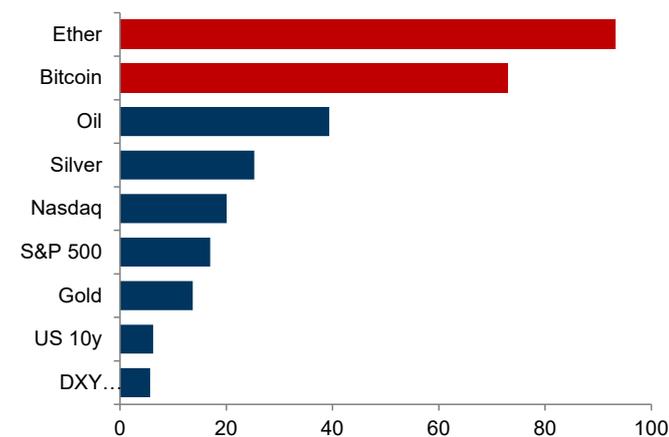
Total returns YTD, %



Note: Total returns in USD. Source: Bloomberg, Goldman Sachs GIR.

Crypto remains far more volatile than other assets

Average daily volatility in ann. terms, %



Note: Based on returns since 2014 and since 2015 for ether. Source: Bloomberg, Goldman Sachs GIR.

Activity on Bitcoin and Ethereum networks is around 2018 highs

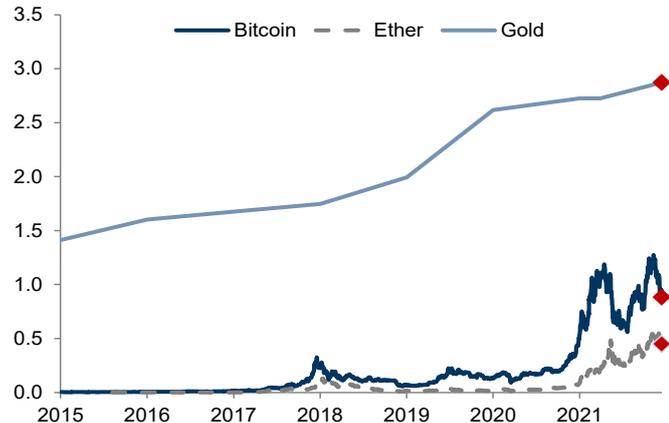
Total active addresses, million



Source: Coin Metrics, Goldman Sachs GIR.

The mkt cap of BTC & ETH is ~\$1.4tn vs. ~\$2.9tn for gold

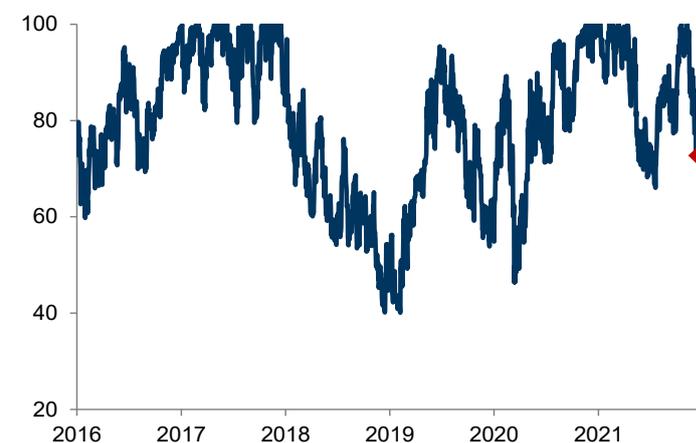
Crypto market cap. vs private investment gold stock, \$tn



Note: Private investment gold stock based on ETFs and bars/coins held privately. Source: World Gold Council, CoinMarketCap, Goldman Sachs GIR.

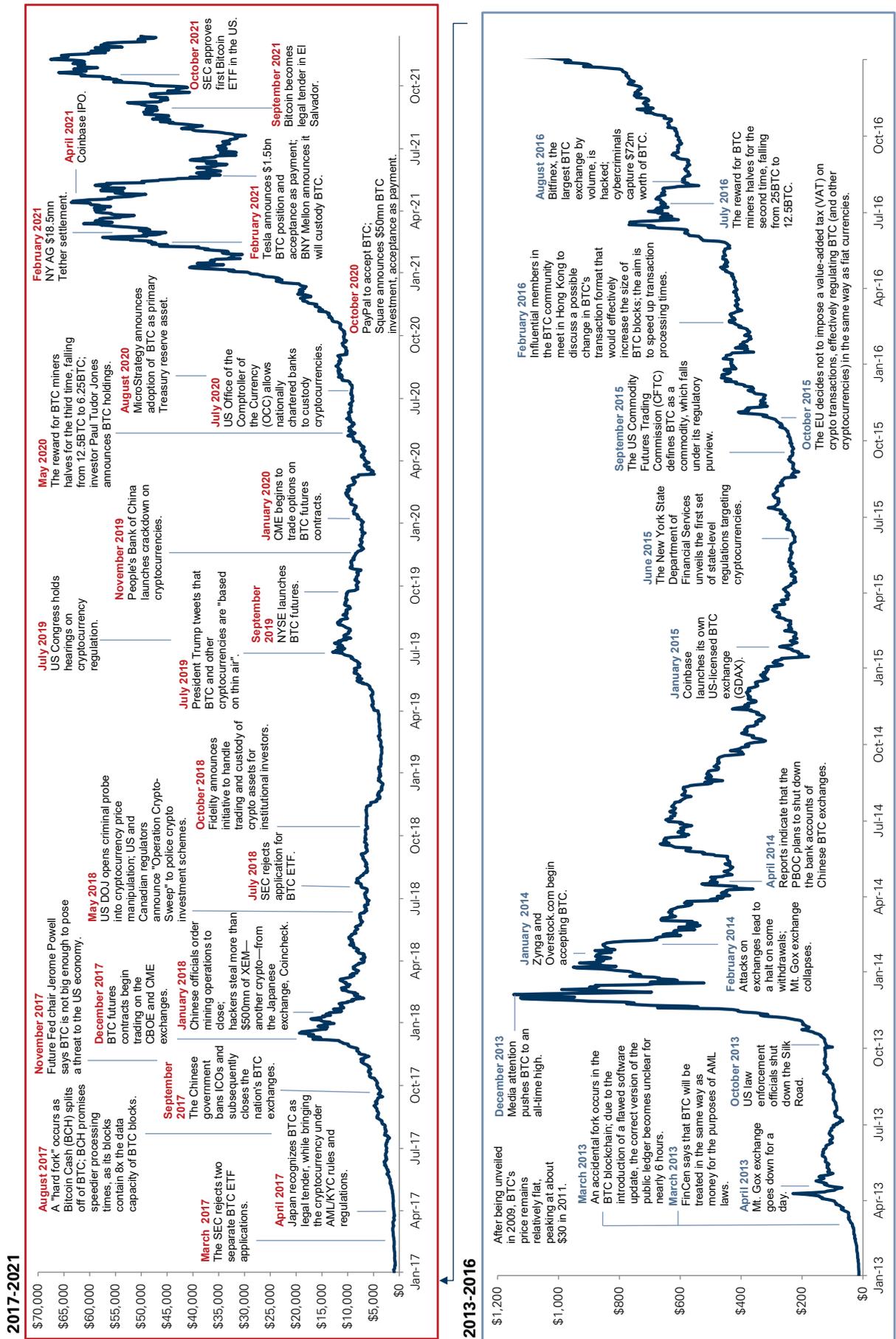
More than 75% of BTC is held in profit today

Percent of total supply in the network with positive balance, %



Source: Coin Metrics, Goldman Sachs GIR.

...with bitcoin continuing its wild ride

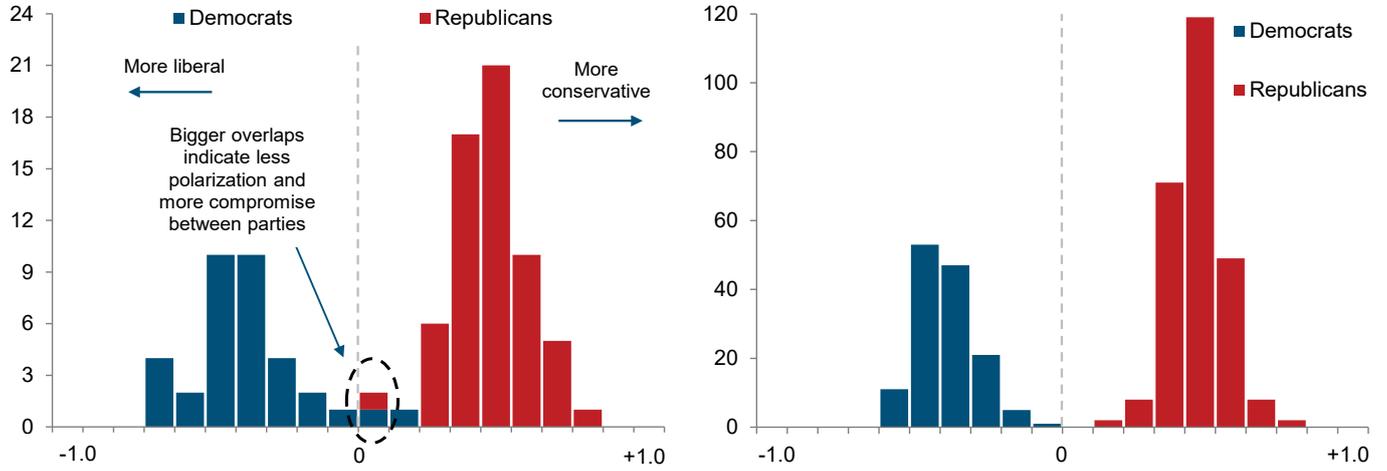


Source: CoinDesk, 99bitcoins, Bloomberg, various news sources, Goldman Sachs GfR.

...where politics is quite polarized

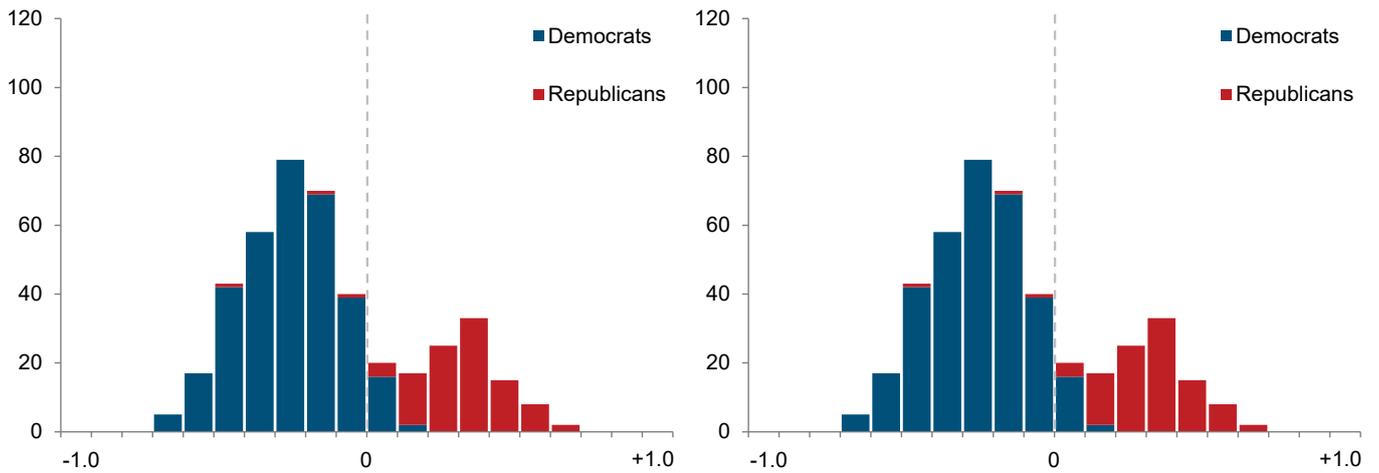
The Progressive Era was marked by relatively ideological parties and political polarization...

Ideological scores of Senate (left) and House (right) members of the 59th Congress (1905-1907)



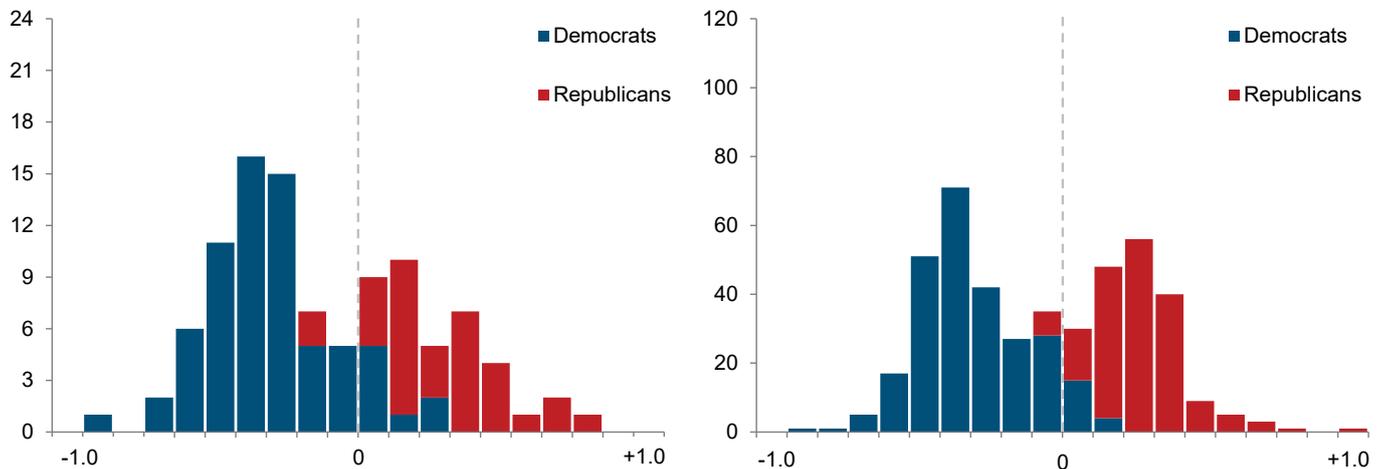
...but by the New Deal Era, both parties had become more moderate and Congress was less polarized...

Ideological scores of Senate (left) and House (right) members of the 74th Congress (1935-1937)



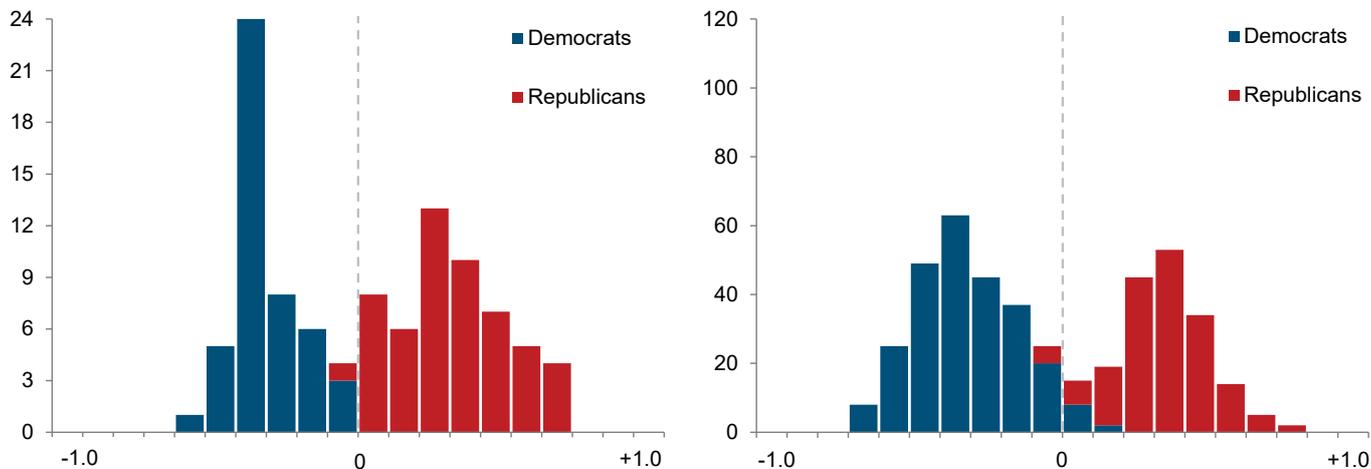
...while Democrats moved slightly left during Johnson's Great Society, the decline in polarization continued...

Ideological scores of Senate (left) and House (right) members of the 88th Congress (1963-1965)



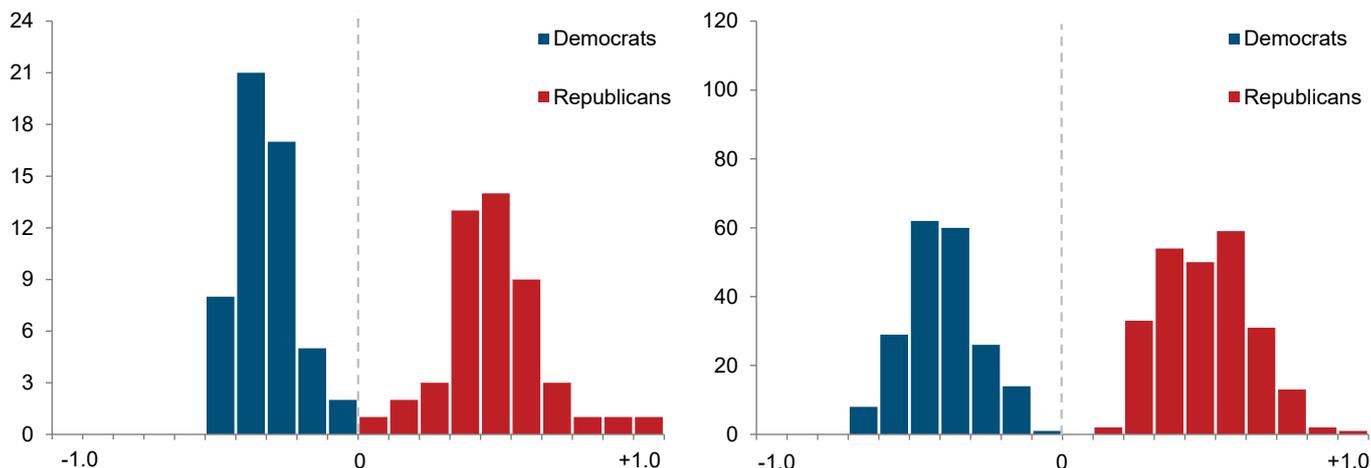
...but by the Reagan years, polarization increased again as Republicans became more ideological...

Ideological scores of Senate (left) and House (right) members of the 99th Congress (1985-1987)



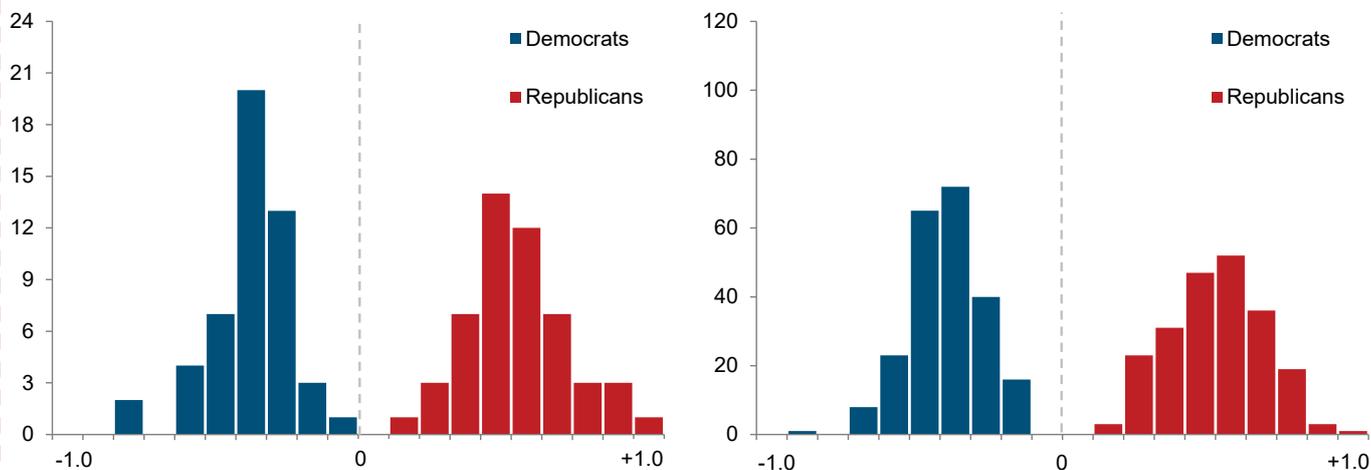
...and both parties became more ideological during the Obama years, increasing polarization further...

Ideological scores of Senate (left) and House (right) members of the 112th Congress (2011-2013)



...a trend which has continued and even grown today

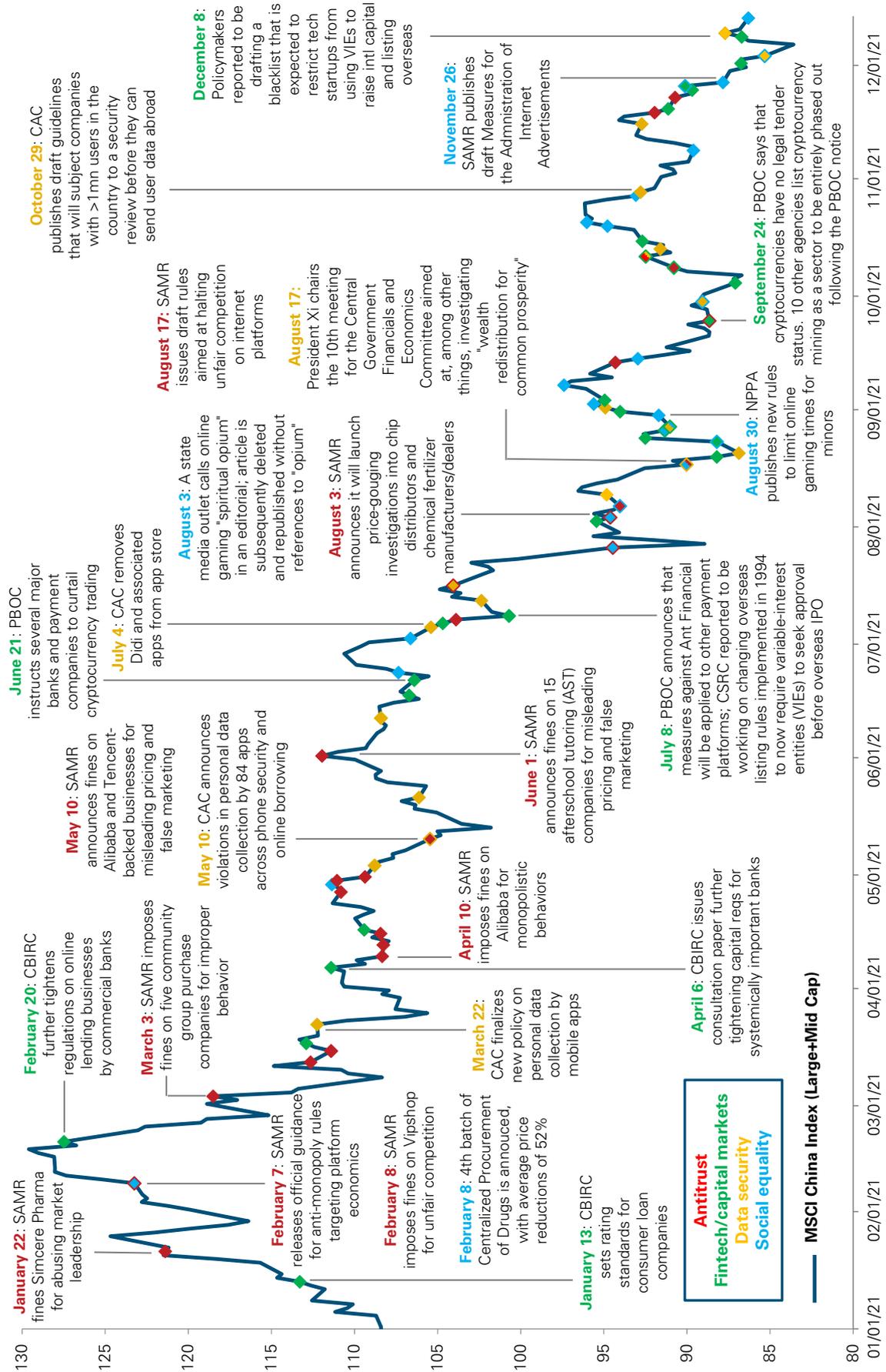
Ideological scores of Senate (left) and House (right) members of the current Congress



Note: Ideological scores are calculated using [methodology](#) developed by Keith T. Poole and Howard Rosenthal, which aggregates all roll call votes cast in each legislative session; vote scores of each member of Congress range from most liberal (-1 to 0) to most conservative (0 to +1); y-axis is a frequency measure for each score range; analysis excludes votes by independents and any third parties.

Source for all charts: [Jeffrey B. Lewis, Keith Poole, Howard Rosenthal, Adam Boche, Aaron Rudkin, Luke Sonnet \(2021\), Voteview: Congressional Roll-Call Votes Database](#), Pew Research Center, Goldman Sachs GIR.

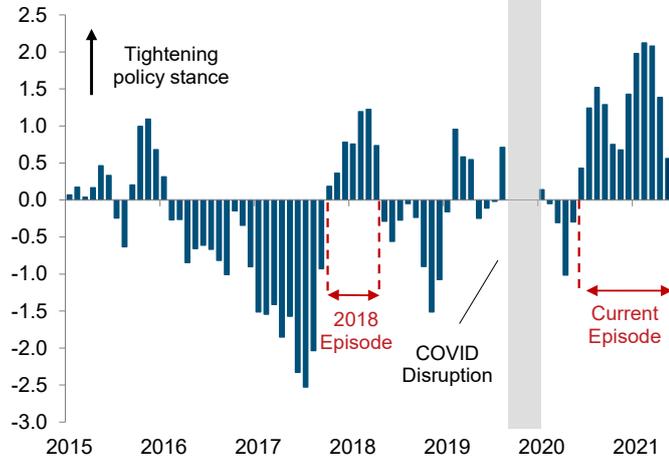
China: all about the regulatory surprises...



Source: MSCI, Goldman Sachs G/I.R.
 Special thanks to the GS Asia Strategy team for their help with this exhibit.

...that caught China tech in the crosshairs

China has seen an unprecedented regulatory tightening
POE (privately owned enterprise) regulatory proxy, z-score



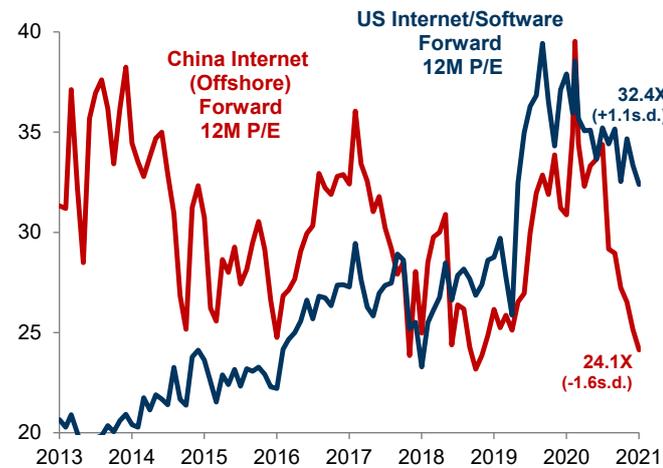
Note: POE regulation proxy reflects the text-mining results of news among POE heavy sectors. Data points during Mar-Jun 2020 have been removed due to COVID disruptions.
Source: Factiva, MSCI, FactSet, Goldman Sachs GIR (Asia Strategy team).

China tech has lost ~\$1.5tn in market cap since February
Total listed market cap of Chinese internet/tech stocks, \$tn



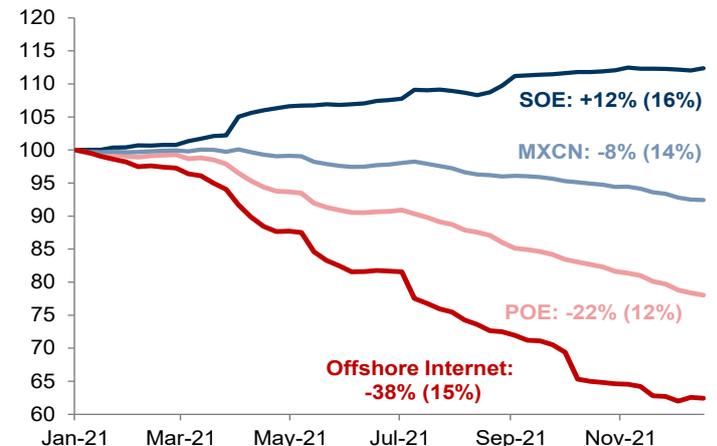
Note: *Includes all stocks, *excluding stocks listed after Feb 17.
Source: FactSet, MSCI, Bloomberg, Goldman Sachs GIR.

China's Internet stocks trade at a sizable discount to US peers
Forward P/E, multiple



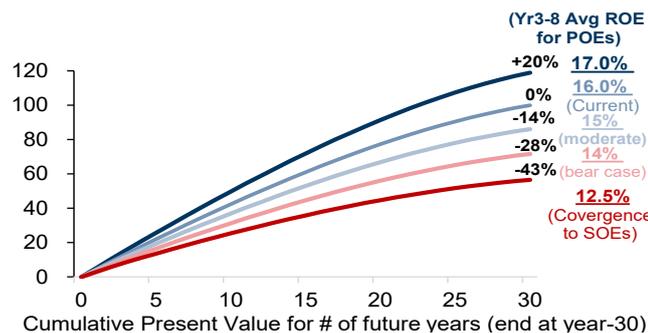
Source: FactSet, MSCI, Goldman Sachs GIR.

Consensus EPS for offshore Internet has fallen ~38% YTD
MXCN EPS revision (Average of 2021/22 EPS, CNY) %



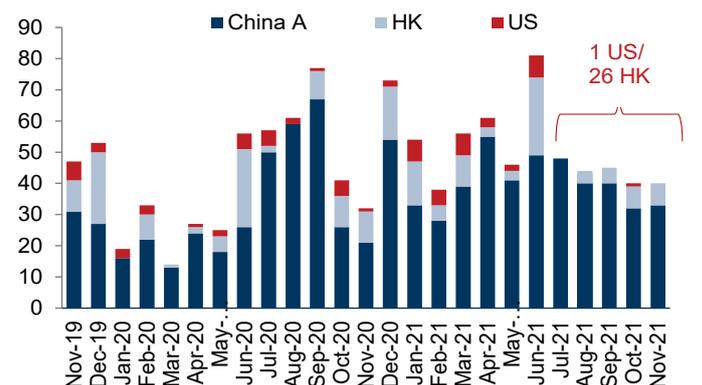
Note: POEs are privately-owned enterprises and SOEs are state-owned enterprises; bracketed numbers represent 2020-22E EPS CAGR on consensus estimates.
Source: FactSet, Goldman Sachs GIR.

Fair value of China POEs depends on profit profile
MSCI China fair value (current=100) based on ROE assumption



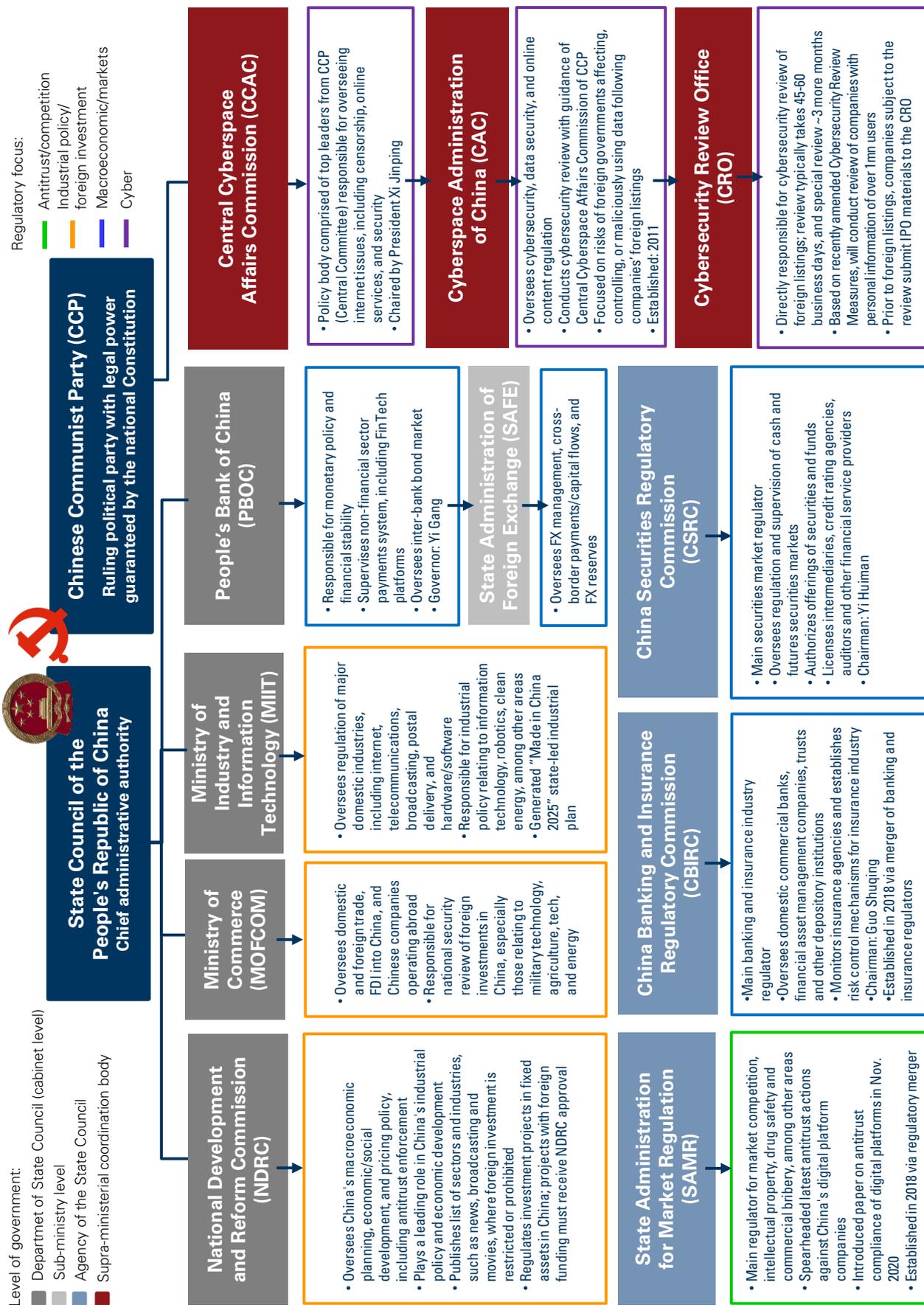
Note: Under a DCF model, with fixed ERP (= current market implied), near-term growth (consensus) and other model assumptions.
Source: FactSet, Goldman Sachs GIR.

Offshore Chinese IPO volumes have fallen since June
Number of IPOs of mainland Chinese companies by venue



Source: Wind, Bloomberg, Goldman Sachs GIR.

For those of us who need a refresher on how China regulates...



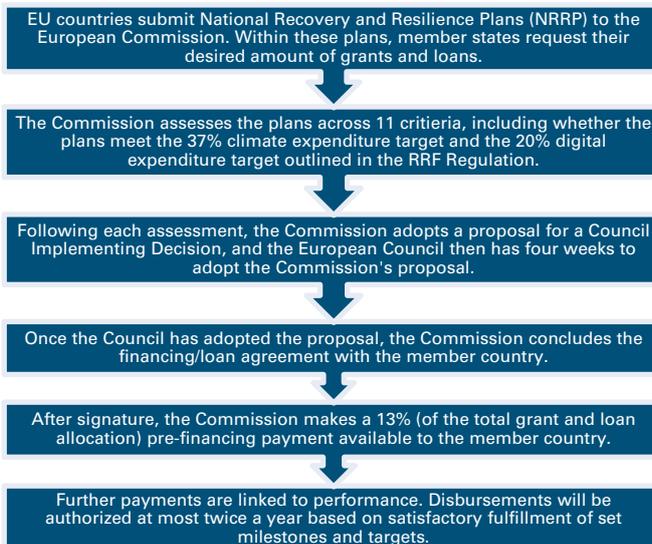
Note: After-school tutoring (AST) restrictions were initiated by the Ministry of Education (not shown here); State Council manages the day-to-day work of the CCAC; other ministries and government agencies not shown here but that are involved in various regulators include the Ministry of Public Security and the Ministry of State Security. Source: IMF, US-China Business Council, Reuters, China Briefing, iStockPhoto, Goldman Sachs GIR.

EU: the Recovery Fund that bolstered fiscal support was a positive development...

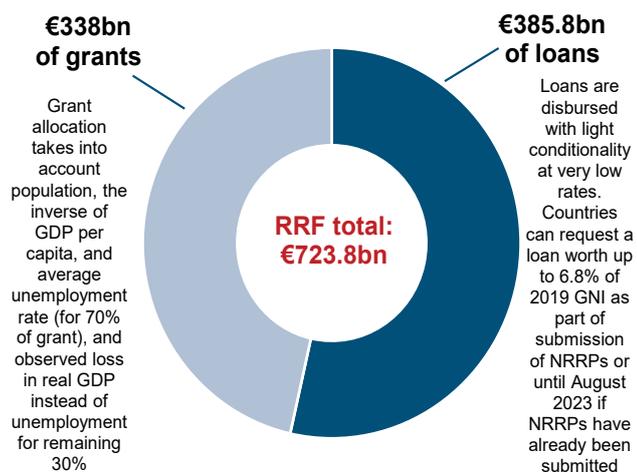
What is it?

The Recovery and Resilience Facility (RRF) is the centerpiece of the Next Generation EU (NGEU) fund, a €807bn (in current prices) temporary recovery instrument aimed to help repair the economic and social damage to the EU from the COVID-19 pandemic. Beyond repairing the immediate damage from the pandemic, the RRF is designed to make EU economies more sustainable, resilient, and better prepared for the green and digital transitions underway around the world. As a part of this, each country that is approved to receive funds from the RRF must commit to spending a minimum of 37% of expenditures on climate investments and reforms, and a minimum of 20% to support their digital transitions.

How are funds disbursed to member countries?



Funding mix

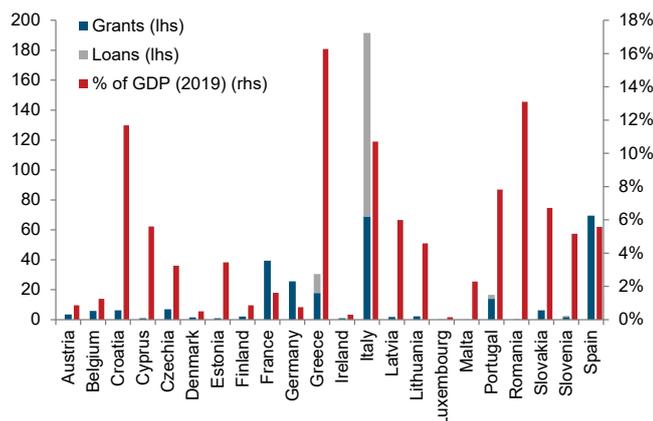


How will this be paid for?

To finance NGEU, and the RRF by extension, the European Commission, on behalf of the EU, borrows money on the capital markets at more favorable rates than individual member states. Net borrowing operations are scheduled to end by 2026, and repayment to start in 2028 and continue until 2058. The loans will be repaid, through the Commission, by the borrowing member states, and the grants by the EU budget (any grants requested over the maximum amount allowed per country will be financed by that country). To do so, the Own Resources Decision (ORD), which establishes how the EU budget is financed and was ratified on May 31, 2021 by all member states, raised the maximum level of resources that can be called for from member states from 1.2% to 1.4% of EU GNI. It also provides for a temporary increase in the ORD ceiling by an additional 0.6%, to be used exclusively for servicing the RRF debt. Additional sources of revenue are expected to be linked to a carbon border adjustment mechanism, a digital tax, and the EU Emission Trading System, although these have not yet been approved.

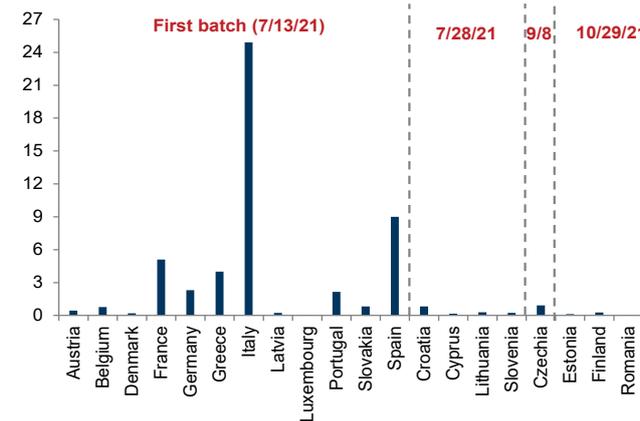
Southern European countries at the forefront

€ billions (lhs), % (rhs)



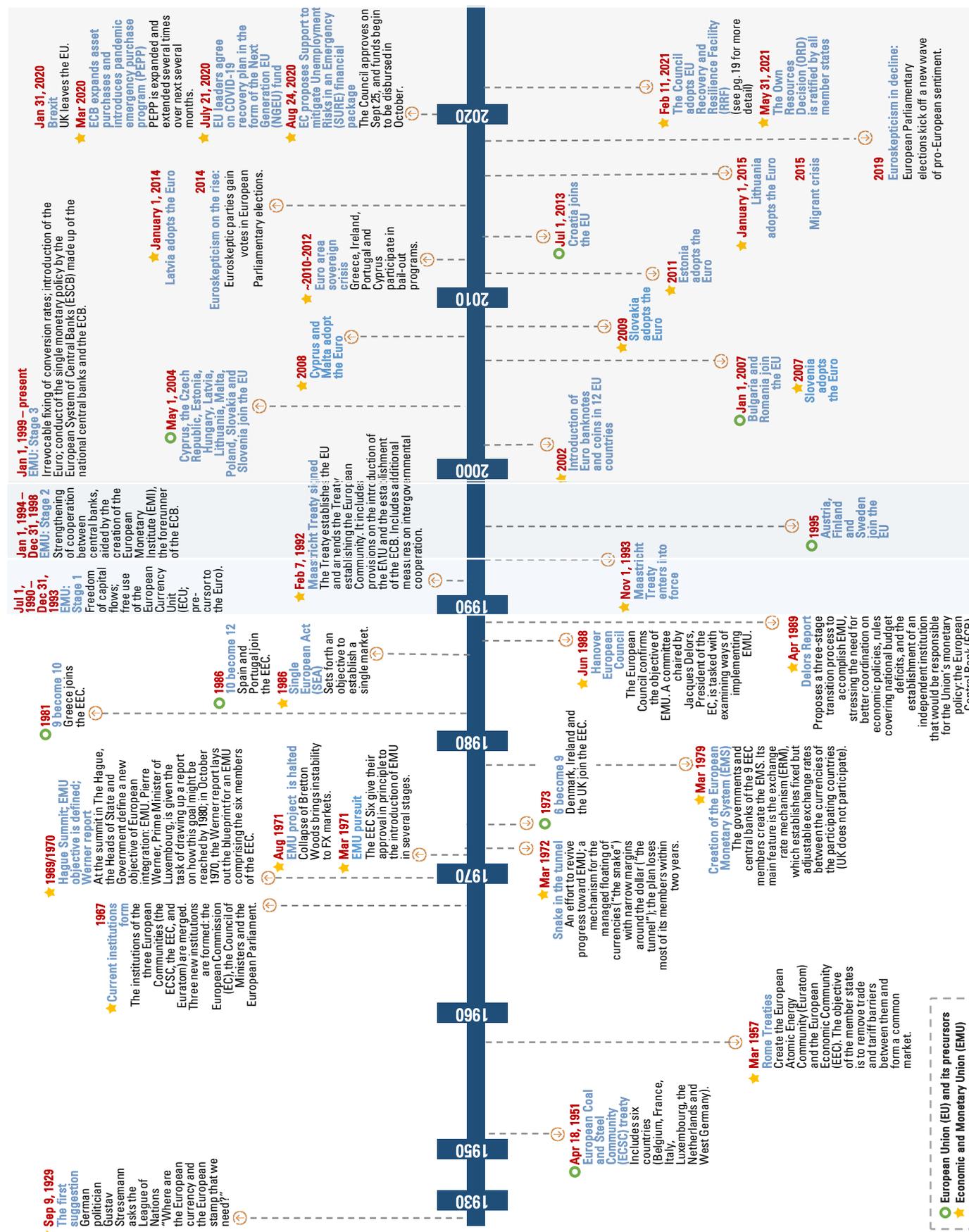
22 countries have been authorized to receive funds so far*

Funds received as advance on total requested, € billions



*Ireland was approved to receive funds at the same time as Czechia and Malta was approved to receive funds on 10/5/2021, but no funds have yet been disbursed. Source for all exhibits: European Commission, European Council, Goldman Sachs GIR.

...but EU integration still lags



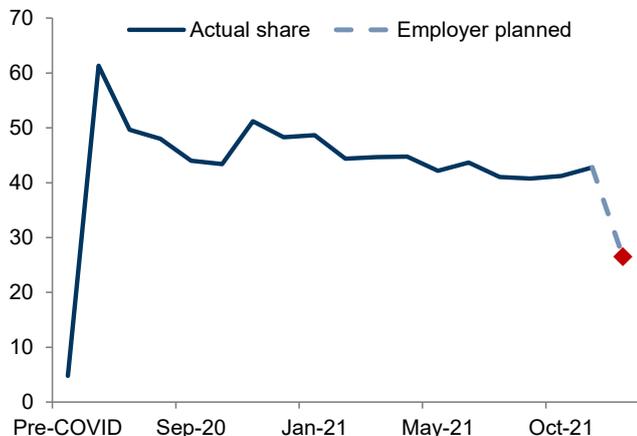
Source: ECB, European Commission, European Council, Europa, Goldman Sachs GfR.

2021: tackling the major crises of our time

The post-pandemic future of work continues to evolve...

The share of remote work has plateaued ~40%

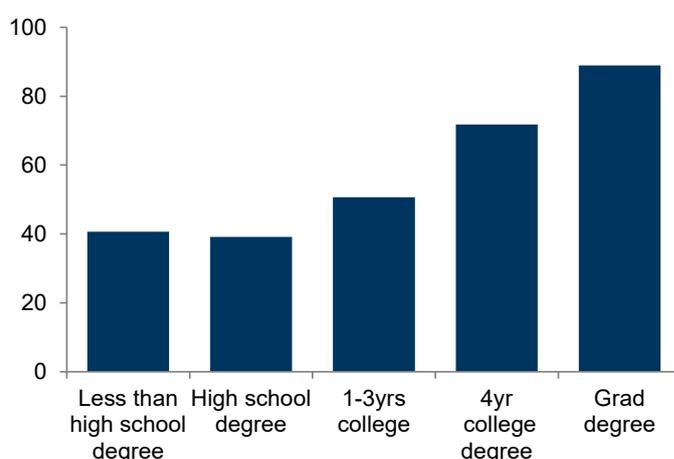
Share of US paid full days worked from home, %



Note: Pre-COVID estimate from 2017-18 American Time Use Survey; post-COVID estimate based on employers' expectations in Nov. survey wave. Source: Survey of Working Arrangements and Attitudes, BLS, Goldman Sachs GIR.

Remote work is more common among the highly educated

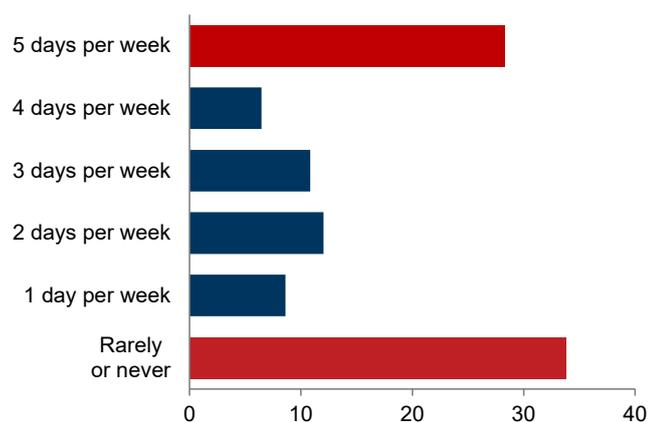
Share of workers who worked remotely at all during pandemic, %



Note: Based on all survey waves since May 2020. Source: Survey of Working Arrangements and Attitudes, Goldman Sachs GIR.

Most workers still prefer fully remote or fully in-office work

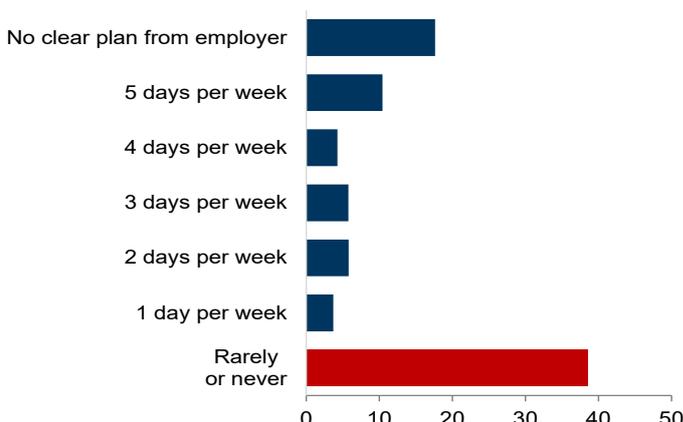
Preferred employee WFH days after COVID (2022+), %



Note: Based on all survey waves since May 2020, reflects all respondents. Source: Survey of Working Arrangements and Attitudes, Goldman Sachs GIR.

While employers favor a return to office

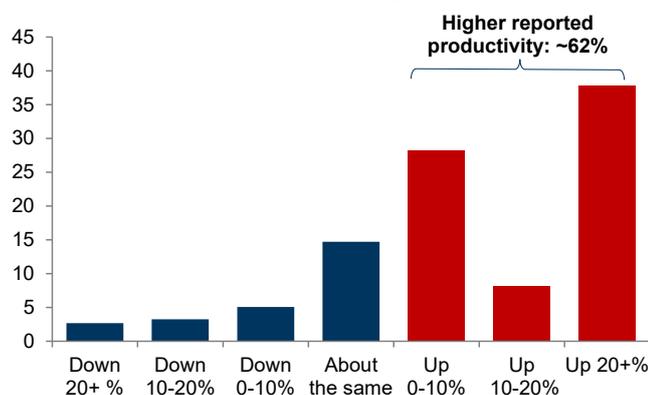
Preferred employer WFH days after COVID (2022+), %



Note: Based on all survey waves since May 2020, excludes respondents with no employer. Source: Survey of Working Arrangements and Attitudes, Goldman Sachs GIR.

Workers continue to report being more productive from home

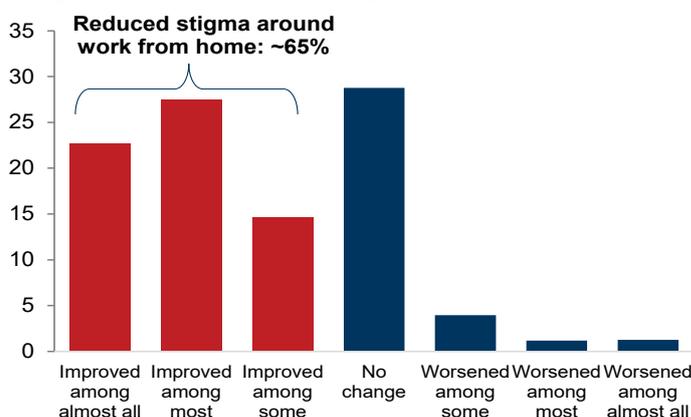
Workers' self-stated productivity during WFH vs in office, %



Note: Based on all survey waves since July 2020. Source: Survey of Working Arrangements and Attitudes, Goldman Sachs GIR.

And the perceived stigma around WFH has further improved

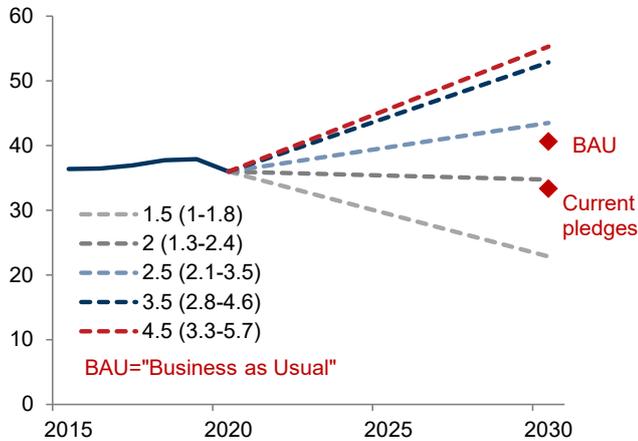
Change in perception of WFH among people you know, %



Note: Based on all survey waves since July 2020. Source: Survey of Working Arrangements and Attitudes, Goldman Sachs GIR.

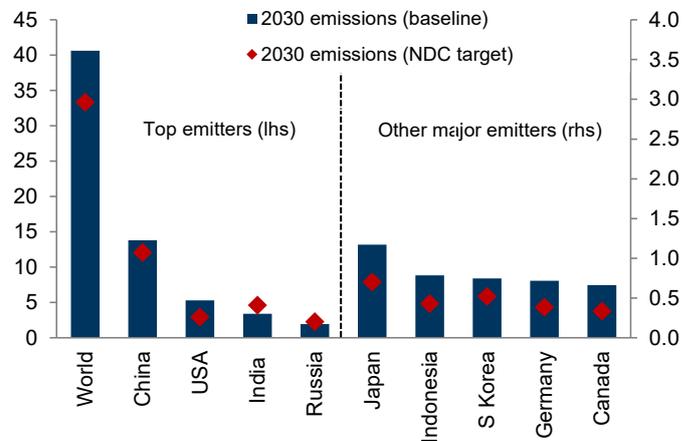
...and we still have a long way to go to solve climate change

A big gap exists between emissions goals vs current policy...
IPCC emissions scenarios vs current policy/pledges, Gt CO2



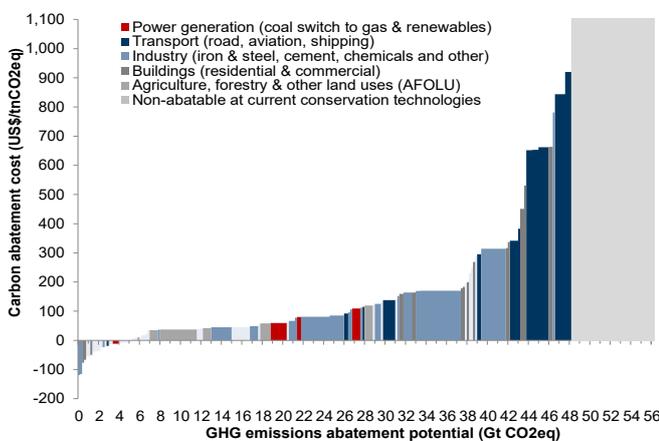
Note: Scenarios based on IPCC Shared Socio-economic pathways; temperature ranges reflect long-term estimate based on emissions path; BAU refers to baseline without new mitigation policies; current pledges based on country-level NDC commitments as of October 2021.
Source: IPCC, IMF, Goldman Sachs GIR.

...requiring large emissions reductions in most economies
Emissions baseline under BAU vs 2030 targets, Gt CO2



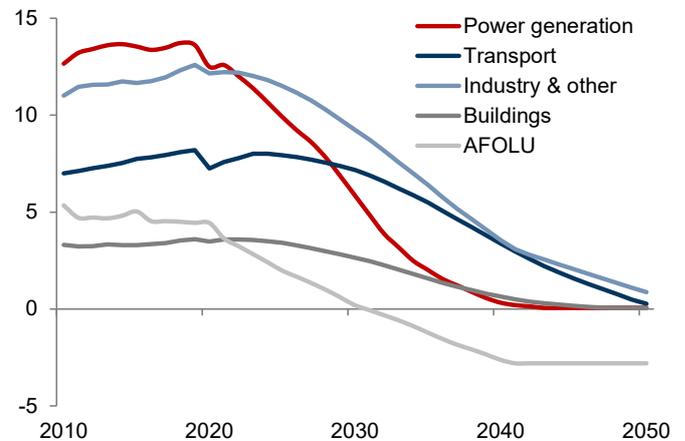
Note: Baseline reflects estimate of total CO2 emissions in BAU scenario, doesn't include all GHG emissions; NDC targets are the unconditional target or, where available, the average of the conditional and unconditional target; two listed countries' pledges (India and Russia) remain higher than BAU scenario.
Source: IPCC, IMF, Goldman Sachs GIR.

Low cost de-carbonization is concentrated in power today...
2021 carbon abatement cost curve, \$/ton CO2 eq.



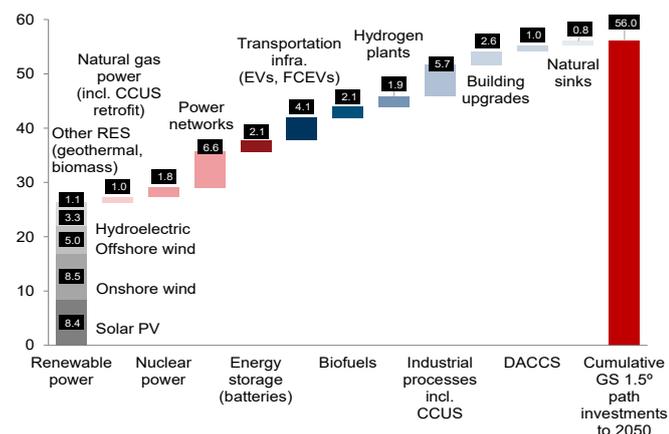
Source: Goldman Sachs GIR.

...requiring steep CO2 cuts in power in <1.5 °C scenario
CO2 emissions in GS 1.5 °C scenario by sector, GtCO2



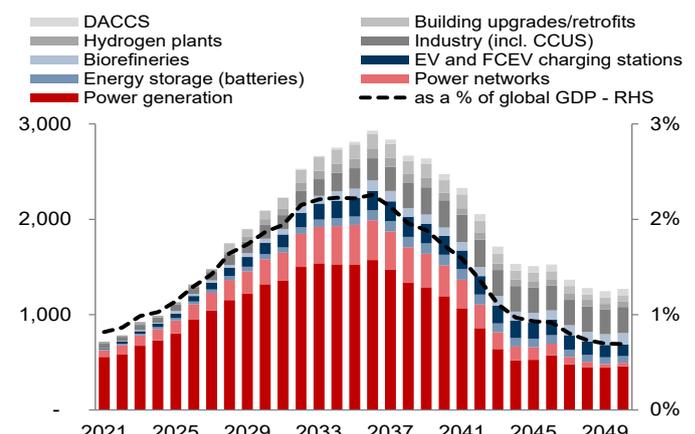
Source: Goldman Sachs GIR.

~\$56tn of investment needed for global Net Zero carbon
Cumulative infra. investment in GS 1.5 °C net zero model, \$tn



Note: Represents cumulative total figure for global investment by 2050.
Source: Goldman Sachs GIR.

Investment to reach >2% of GDP by 2032 in 1.5°C scenario
Ann. infra. investment for net zero by 2050, \$tn; as % GDP (rhs)

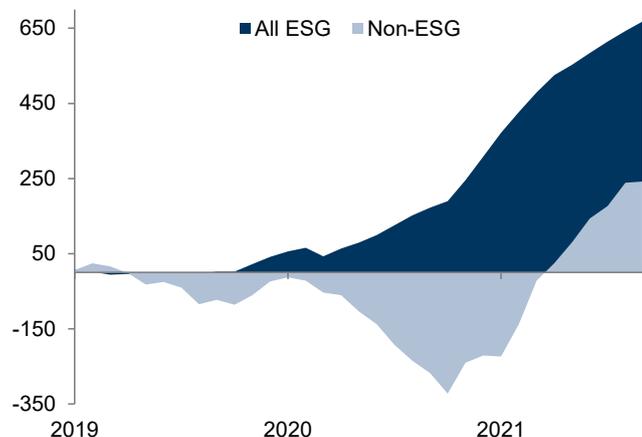


Note: This only reflects incremental investment; doesn't include maint/capex.
Source: Goldman Sachs GIR.

The private sector is stepping up to tackle the climate problem...

ESG equity inflows have outpaced non-ESG inflows...

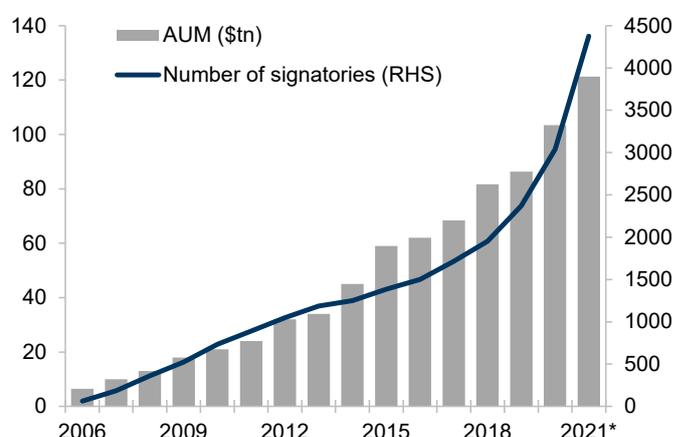
Cumulative mon. global flows for ESG/non-ESG equity funds, \$bn



Source: Morningstar, Goldman Sachs GIR.

...alongside investors' growing commitment to the PRI

PRI signatory growth (rhs) and AUM (lhs, \$tn)

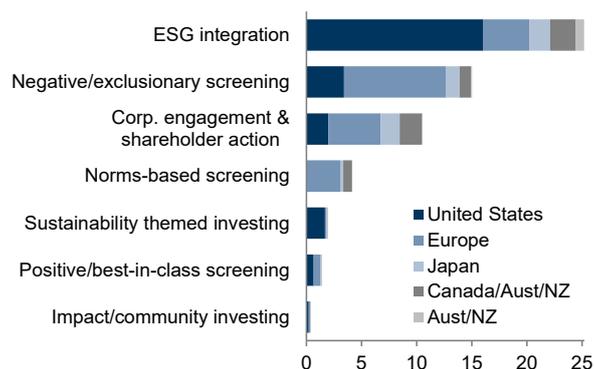


Note: The Principles of Responsible Investment (PRI) have required signatories to incorporate ESG considerations into at least 50% of their AUM since 2020, AUM as of March 30, 2021.

Source: PRI, Goldman Sachs GIR.

ESG integration and screening are the top fund strategies...

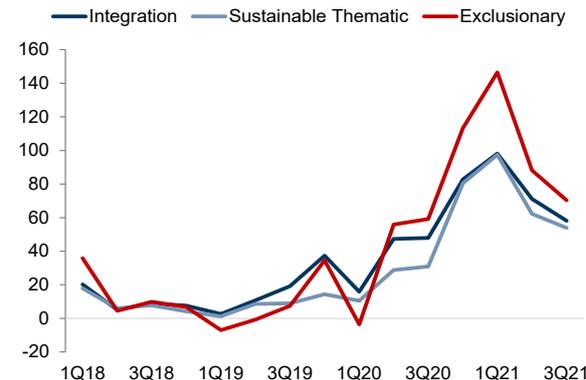
Sustainable investing assets by strategy (2020), \$tn



Source: GSIA, Goldman Sachs GIR.

...but exclusionary strategies have seen larger inflows recently

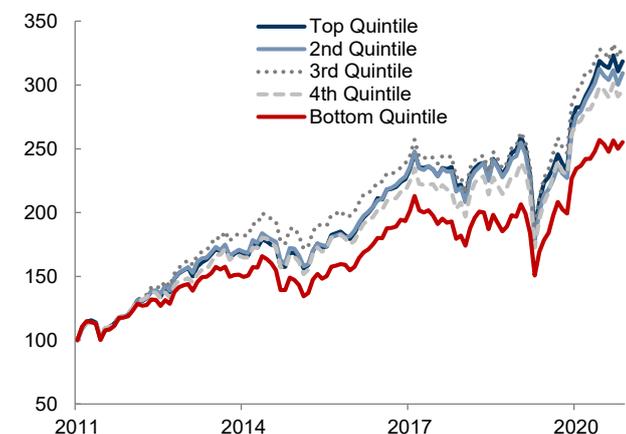
Global ESG equity fund flows by category, \$bn



Note: Strategies are not mutually exclusive, see [here](#) for more on designations. Source: Morningstar, Goldman Sachs GIR.

Companies with low E&S scores have underperformed

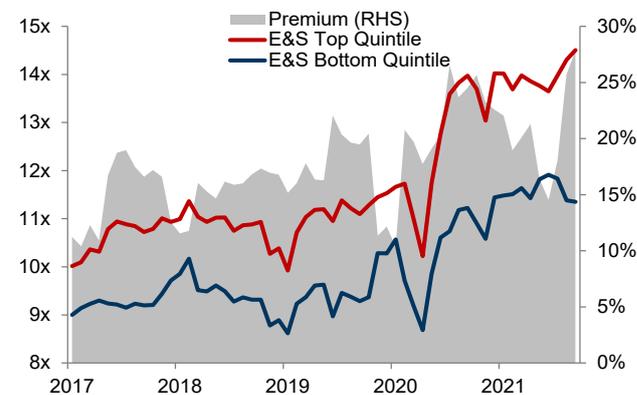
Cumulative performance by SUSTAIN E&S headline percentiles, %



Note: E&S refers to environment and sustainability. Source: Bloomberg, Refinitiv Eikon, FactSet, MSCI, Goldman Sachs GIR.

The multiple spread between ESG leaders/laggards is growing

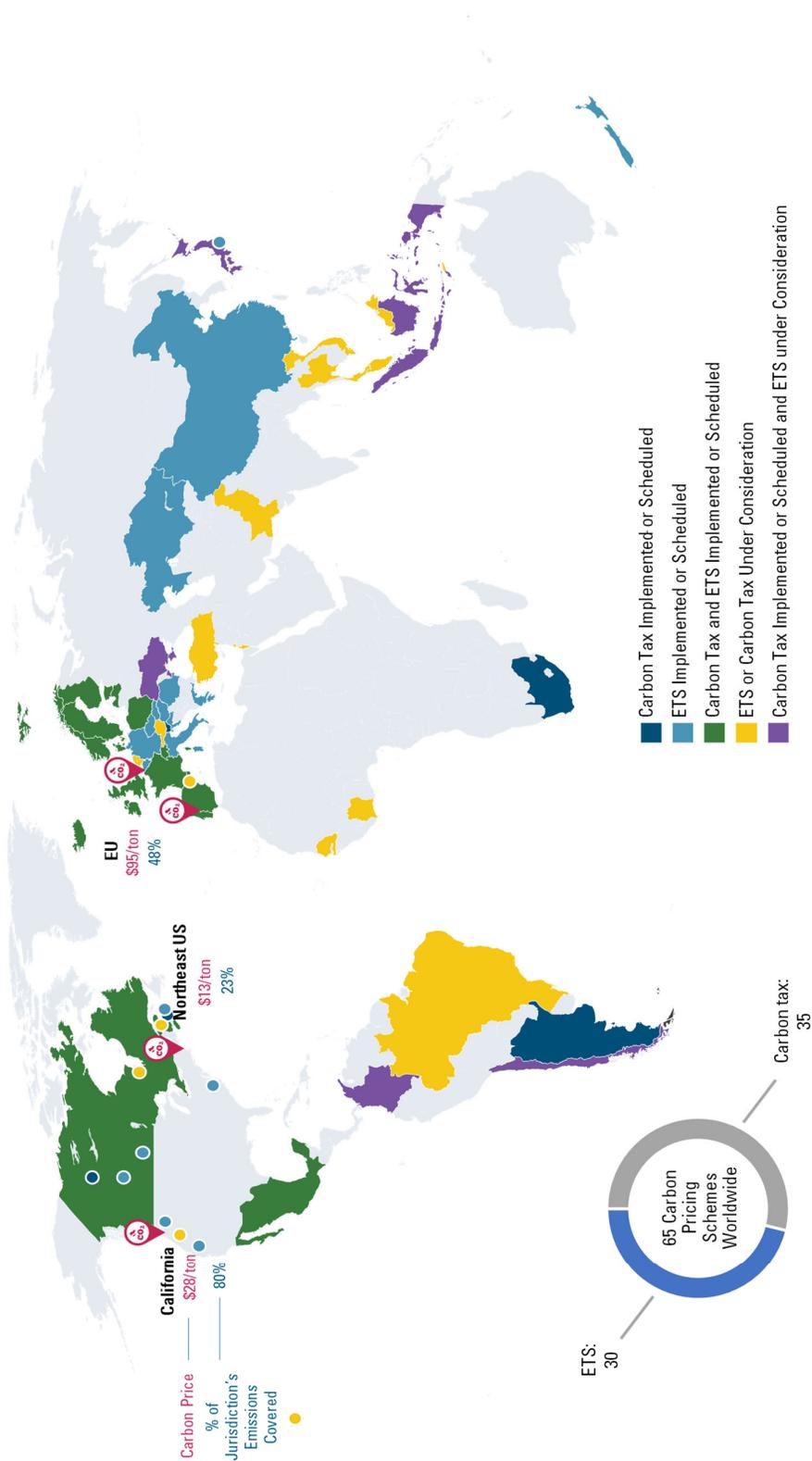
12m fwd EV/EBITDA & relative premium (trimmed mean) (lhs), Q1 vs. Q5 SUSTAIN Operational E&S (rhs); E&S disclosure >50%



Note: Reflects 12m forward multiple of top quintile of companies in the GS SUSTAIN E&S headline rank vs that of the bottom quintile; Q5 is 5th quintile. Source: FactSet, Goldman Sachs GIR.

...but carbon prices are still the most efficient solution for solving climate change

65 carbon pricing initiatives cover ~12Gt of emissions, representing nearly a quarter of annual GHG emissions



Note: Carbon prices may not be comparable among countries, due to differences in sectors covered, allowances distributed, and exemptions applied; schemes and emissions data as of April 1, 2021; pricing data current, sourced from California Air Resources Board (California), ICE (EU), RGGI (Northeast).

Source: California Air Resources Board, ICE, RGGI, World Bank, Goldman Sachs GIR.

Top of Mind archive



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Investing in climate change 2.0
December 13, 2021



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Oil's Seismic Shock
March 31, 2020



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November 17, 2021



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Europe at a Crossroads
October 18, 2021



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2020's Black swan: COVID-19
February 28, 2020



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Is China Investable?
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Reopening the Economy
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Making Sense of Midterms
October 29, 2018

Summary of our key forecasts

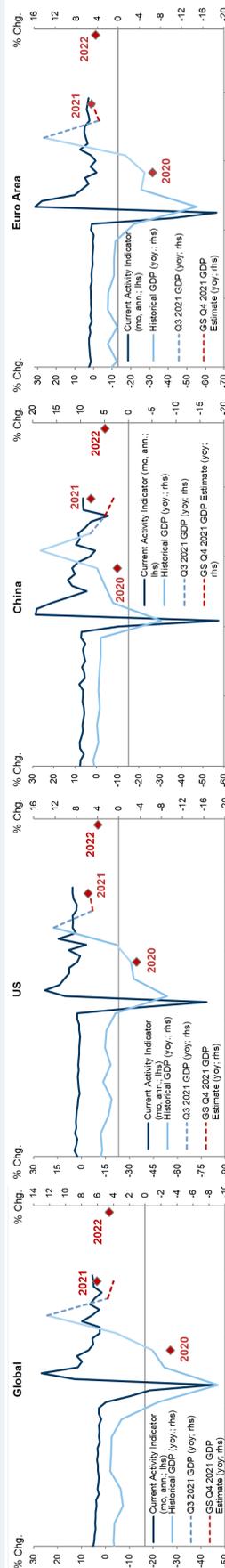
GS GIR: Macro at a glance

Watching

- **Globally**, we expect full-year growth of 6.0% in 2021 and 4.5% in 2022, more than 1pp above potential, thanks to continued medical improvements, a consumption boost from pent-up savings, and inventory rebuilding, but the prospect of a winter COVID wave and a drag from the Omicron variant pose downside risk.
- **In the US**, we expect full-year growth of 5.7% in 2021 and 3.9% in 2022. We expect a modest drag on growth from the Omicron variant in 1Q22 and see a gradual slowdown next year as the positive impulses from continued reopening, pent-up saving and inventory restocking contend with a steady headwind from diminishing fiscal support. We expect core PCE inflation will continue to rise to 4.5% by end-2021 before falling to 2.4% by end-2022. We expect the unemployment rate to fall to 4.1% and 3.5% by the end of 2021 and 2022, respectively.
- **The Fed** has announced that it will double the pace of the tapering of asset purchases to \$30bn per month in January. We expect the first rate hike in March, followed by additional hikes in June and September. We expect balance sheet runoff will begin in 4Q22. On the fiscal policy front, we expect the passage of additional spending of around \$1.75-\$2tn focused on infrastructure, social benefits, and long-term investment, though we see growing downside risk to the final bill becoming law.
- **In the Euro area**, we expect full-year growth of 5.1% in 2021 and see risks skewed toward the downside amid the recent sharp rise in COVID case growth and the emergence of the Omicron variant. But we remain constructive on the outlook for the latter part of next year and expect growth of 4.3% in 2022 given a likely easing of industrial bottlenecks, significant catch-up room for services spending, and persistent fiscal support. We expect core inflation to fall sharply in January 2022 as base effects wash out, and reach 1.4% by December 2022.
- **The ECB** recently announced that it will end net PEPP purchases in March while providing an "APP bridge" to September 2021, though we expect it will maintain flexibility against downside risks via EPP through flexible reinvestments and the option to reactivate net purchases. We expect the first rate hike in 2024, but risks are skewed toward an earlier lift-off.
- **In China**, we expect below-consensus real GDP growth of 7.8% in 2021 and 4.8% in 2022. While recent dovish/pro-growth policy actions have reduced the left-tail risk to our 2022 growth forecast, property market developments remain a key downside risk to watch in the coming months.
- **WATCH CORONAVIRUS**. The Omicron variant poses near-term risks to the global medical and economic outlook. Although the range of possible outcomes remains wide given remaining uncertainty about the transmissibility, degree of protection from vaccines and prior infections, and disease severity of the new variant, medical evidence so far suggests that Omicron is transmitting more quickly than Delta, but is evading immunity against hospitalizations only slightly more.

Goldman Sachs GIR.

Growth



Source: Haver Analytics and Goldman Sachs Global Investment Research. Note: GS CAI is a measure of current growth. We have recently revised our methodology for calculating this measure. For more information on the methodology of the CAI please see "Lessons Learned: Re-engineering Our CAIs in Light of the Pandemic Recession," Global Economics Analyst, Sep. 29, 2020.

Forecasts

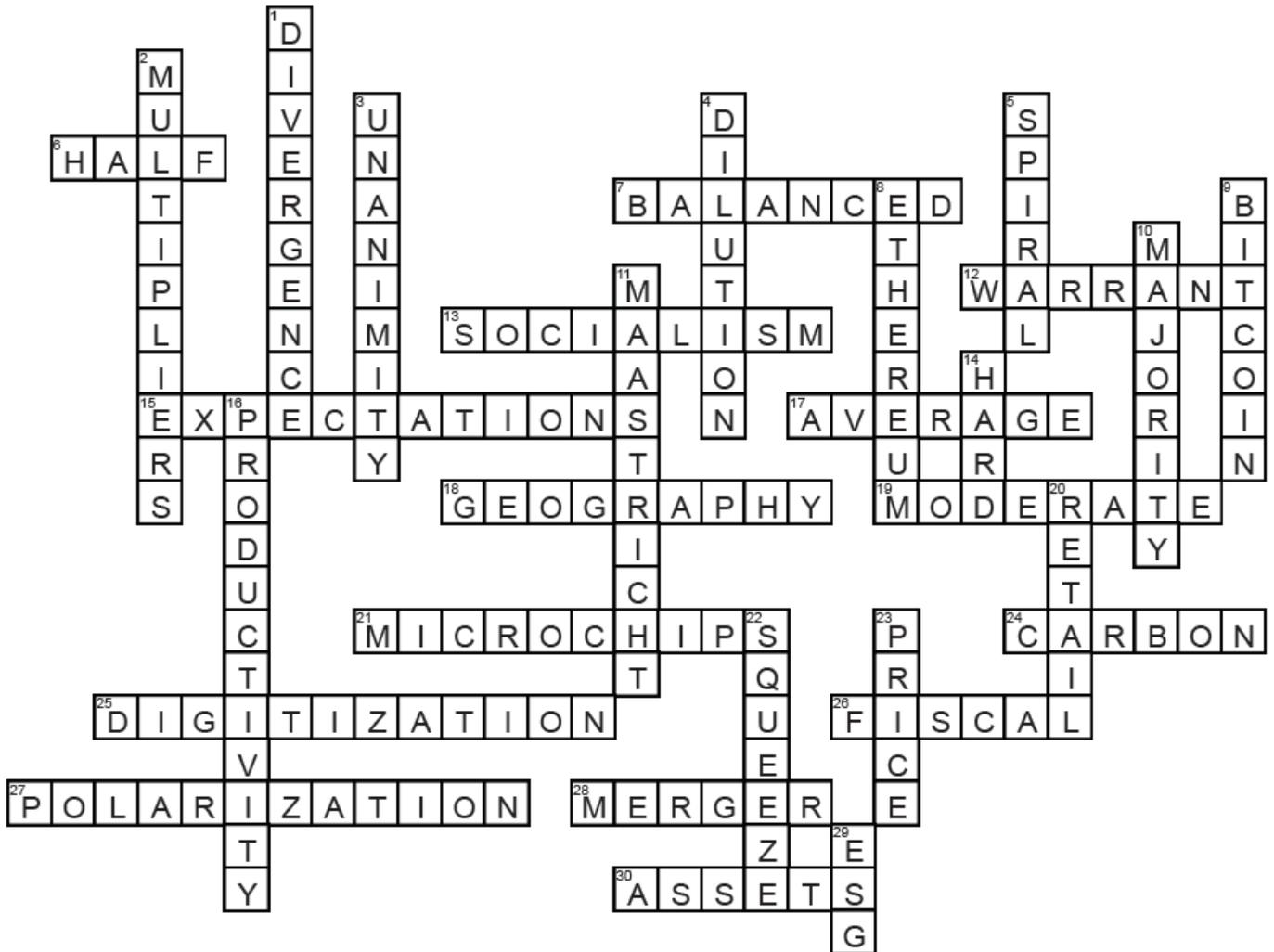
Economics	GDP growth (%)				Interest rates 10Yr (%)				Markets										
	2021	2022	GS	Cons.	Last	E2021	E2022	FX	Last	3m	12m	S&P 500	E2021	E2022	Cons.				
Global	6.0	5.8	4.5	4.4	US	1.44	1.70	2.00	EUR\$	1.13	1.15	Price	4,700	--	5,100				
US	5.7	5.6	3.9	3.9	Germany	-0.35	-0.10	0.30	GBP/\$	1.33	1.31	EPS	\$209	\$207	\$226				
China	7.8	8.0	4.8	5.2	Japan	0.04	0.10	0.20	\$/JPY	114	115	Growth	47%	45%	8%				
Euro area	5.1	5.1	4.3	4.2	UK	0.67	1.10	1.35	\$/CNY	6.4	6.35	6.2	STOXX 600	11.0	19.0	16.7x			
Policy rates (%)	2022				Commodities				Wage Tracker 2021 (%)										
	GS	Mkt.	GS	Mkt.	Last	3m	12m	Credit (bp)	Last	E2021	E2022	Q1	Q2	Q3	Q4				
US	0.13	0.70	0.88	1.04	Crude Oil, Brent (\$/bbl)	75	90	85	USD	IG	98	97	US	3.0	3.5	4.4			
Euro area	-0.50	-0.44	-0.50	-0.30	Nat Gas (\$/mmBtu)	3.77	3.65	3.55	HY	305	290	360	Euro area	2.5	7.5	7.1	--		
China	2.20	2.24	2.20	2.44	Copper (\$/mt)	9,525	10,500	11,500	EUR	IG	114	99	103	China	0.9	--	12.1	12.6	7.7
Japan	-0.10	-0.04	-0.10	-0.04	Gold (\$/roy oz)	1,796	2,000	2,000	HY	340	297	330	China	2.7	--	--	--	--	

Source: Bloomberg, Goldman Sachs Global Investment Research. For important disclosures, see the Disclosure Appendix or go to www.gs.com/research/hedge.html.

Market pricing as of December 16, 2021.

Puzzle solutions

Crossword from pg. 2 of this report:



Glossary of GS proprietary indices

Current Activity Indicator (CAI)

GS CAIs measure the growth signal in a broad range of weekly and monthly indicators, offering an alternative to Gross Domestic Product (GDP). GDP is an imperfect guide to current activity: In most countries, it is only available quarterly and is released with a substantial delay, and its initial estimates are often heavily revised. GDP also ignores important measures of real activity, such as employment and the purchasing managers' indexes (PMIs). All of these problems reduce the effectiveness of GDP for investment and policy decisions. Our CAIs aim to address GDP's shortcomings and provide a timelier read on the pace of growth.

For more, see our [CAI page](#) and [Global Economics Analyst: Trackin' All Over the World – Our New Global CAI, 25 February 2017](#).

Dynamic Equilibrium Exchange Rates (DEER)

The GSDEER framework establishes an equilibrium (or "fair") value of the real exchange rate based on relative productivity and terms-of-trade differentials.

For more, see our [GSDEER page](#), [Global Economics Paper No. 227: Finding Fair Value in EM FX, 26 January 2016](#), and [Global Markets Analyst: A Look at Valuation Across G10 FX, 29 June 2017](#).

Financial Conditions Index (FCI)

GS FCIs gauge the "looseness" or "tightness" of financial conditions across the world's major economies, incorporating variables that directly affect spending on domestically produced goods and services. FCIs can provide valuable information about the economic growth outlook and the direct and indirect effects of monetary policy on real economic activity.

FCIs for the G10 economies are calculated as a weighted average of a policy rate, a long-term risk-free bond yield, a corporate credit spread, an equity price variable, and a trade-weighted exchange rate; the Euro area FCI also includes a sovereign credit spread. The weights mirror the effects of the financial variables on real GDP growth in our models over a one-year horizon. FCIs for emerging markets are calculated as a weighted average of a short-term interest rate, a long-term swap rate, a CDS spread, an equity price variable, a trade-weighted exchange rate, and—in economies with large foreign-currency-denominated debt stocks—a debt-weighted exchange rate index.

For more, see our [FCI page](#), [Global Economics Analyst: Our New G10 Financial Conditions Indices, 20 April 2017](#), and [Global Economics Analyst: Tracking EM Financial Conditions – Our New FCIs, 6 October 2017](#).

Goldman Sachs Analyst Index (GSAI)

The US GSAI is based on a monthly survey of GS equity analysts to obtain their assessments of business conditions in the industries they follow. The results provide timely "bottom-up" information about US economic activity to supplement and cross-check our analysis of "top-down" data. Based on analysts' responses, we create a diffusion index for economic activity comparable to the ISM's indexes for activity in the manufacturing and nonmanufacturing sectors.

Macro-Data Assessment Platform (MAP)

GS MAP scores facilitate rapid interpretation of new data releases for economic indicators worldwide. MAP summarizes the importance of a specific data release (i.e., its historical correlation with GDP) and the degree of surprise relative to the consensus forecast. The sign on the degree of surprise characterizes underperformance with a negative number and outperformance with a positive number. Each of these two components is ranked on a scale from 0 to 5, with the MAP score being the product of the two, i.e., from -25 to +25. For example, a MAP score of +20 (5;+4) would indicate that the data has a very high correlation to GDP (5) and that it came out well above consensus expectations (+4), for a total MAP value of +20.

Disclosure Appendix

Reg AC

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