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GLOBAL MACRO RESEARCH

TOP *of* MIND

2022: 3 THEMES IN CHARTS

In this very special year-end edition of Top of Mind, Our most-loved content from this year you'll find. This report, which may inspire some memes, Charts the story of three major 2022 themes.

We entered the year dealing with **old and new exogenous shocks**,
A pandemic becoming endemic, and a conflict in the former Soviet bloc.
But the year quickly became about **inflation and its impacts**,
On central banks that were behind the curve and forced to firmly react,
On growth, which put recession in question,
And on risky assets, which struggled to overcome their low-rate obsession.

This also led to worries about systemic risk and what could break,
With crypto clearly taking the cake.
Amid all that, we examined **larger trends sure to shape the years ahead**,
China's continued evolution under Xi, and globalization that arguably hangs by a thread.

We hope these themes and their corresponding charts inspire you,
To complete our annual crossword; in our 2022 pieces you'll find answers to the clues.
Thank you for your readership, and wishing you holidays filled with glee,
We look forward to engaging with you again in 2023.

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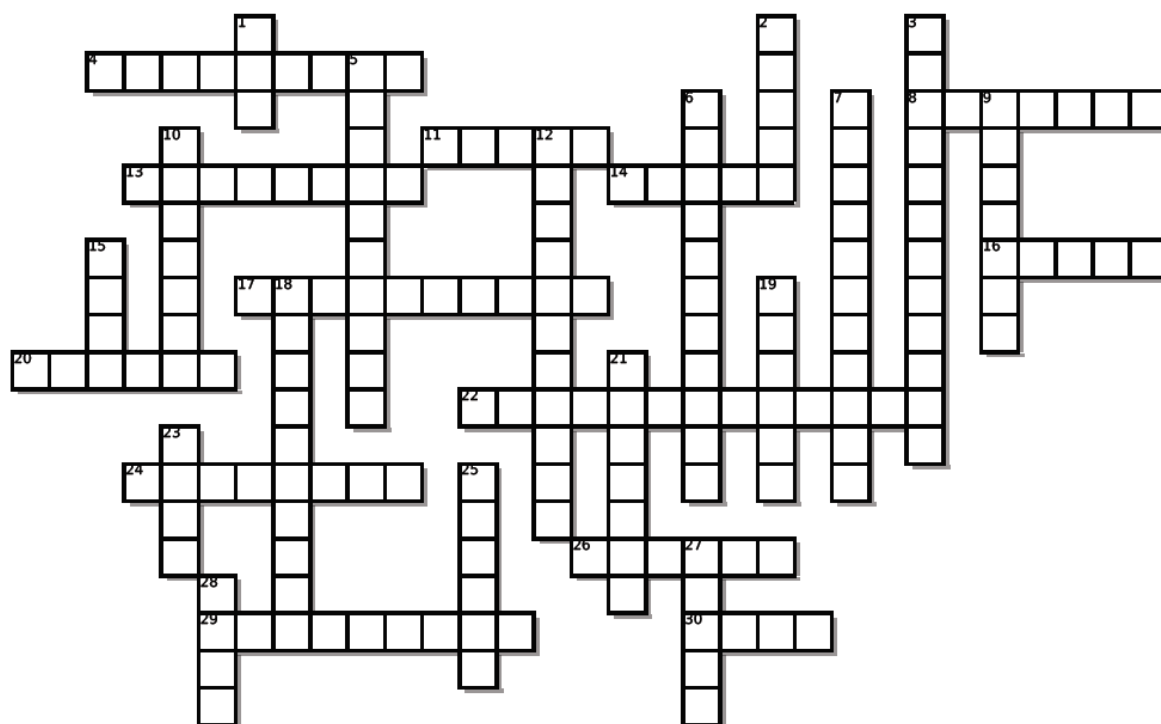
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Investors should consider this report as only a single factor in making their investment decision. For Reg AC certification, see the end of the text. Other important disclosures follow the Reg AC certification, or go to www.gs.com/research/hedge.html.

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Revisiting 2022 themes, crossword-style



Across:

4. Economist and investor Gary Shilling argues that commodity _____ are almost always short-lived due to supply and demand responses to higher prices and human ingenuity (Issue 110).
8. The frequency of outbreaks, their severity, and the burden that they impose on society is a disease's _____ pattern (Issue 105).
11. The _____ Protocol was signed in September 2014 in an attempt to end the War in Donbas. The Protocol failed to stop the fighting, leading to a new package of measures known as _____ II (Issue 106).
13. _____ is a drug developed to fight Covid-19 that doesn't rely on an immune response to work (Issue 105).
14. Global _____ chains are incredibly important for a subset of highly globalized sectors (Issue 108).
16. President Xi Jinping has secured a _____ term as the leader of China, a feat no Chinese leader has achieved since Mao Zedong (Issue 112).
17. Jeff Currie, GS Global Head of Commodities Research, has long argued that we're only at the start of a new commodity _____ (Issue 110).
20. Hui Shan, GS Chief China Economist, believes China's _____ challenges could persist well beyond 2023 as the leadership increasingly embraces a new economic development model that prioritizes goals other than economic _____ (Issue 112).
22. Adam Posen, President of the Peterson Institute for International Economics, believes that rather than spelling the end of _____, the pandemic and War in Ukraine will hasten its corrosion as the world becomes increasingly bifurcated (Issue 108).
24. Vítor Constâncio, former Vice President of the ECB, has long argued that _____ policy shouldn't respond to financial stability concerns (Issue 113).
26. Jan Hatzius, GS Head of Global Investment Research and Chief Economist, has long argued that the path to a soft landing in the US is _____ (Issue 111).
29. The _____ Standing Committee is the most powerful decision-making body of the Chinese Communist Party (Issue 112).
30. The Fed has a somewhat mixed track record of delivering perfect _____ landings, which are no quarters of economic contraction (Issue 107).

Down:

1. Cryptocurrency exchange _____, once considered one of the most reputable exchanges in the business, recently collapsed (Issue 114).
2. Cliff Asness, Founder and CIO of AQR Capital Management, argues that the long era of Growth dominance in equity markets has likely given way to a period of sustained _____ outperformance (Issue 109).
3. Historically, a substantial decline in job vacancies has never occurred without a sharp increase in _____ (Issue 111).
5. Match _____ is the process through which unemployed workers match with open positions (Issue 111).
6. Jeremy Stein, former member of the Federal Reserve Board of Governors, is concerned about _____ in the US Treasury market, which he thinks the Fed could at least partially address with some relatively simple fixes (Issue 113).
7. _____ is the term for a combination of slow growth and high inflation (Issue 107).
9. _____ and Luhansk are separatist regions in Eastern Ukraine that Russian President Putin recognized the independence of in Feb 2022, which proved to be the prelude to a broader conflict (Issue 106).
10. A _____ is a genome with one or more mutations (Issue 105).
12. Gary Gorton, Professor at Yale University, is concerned that _____ could be the cause of a future financial crisis (Issue 114).
15. Michael Mandelbaum, Professor Emeritus of American foreign policy at Johns Hopkins' School of Advanced International Studies, has long referred to _____'s eastward expansion as one of the US' worst foreign policy blunders (Issue 106).
18. FX interventions may be _____ or coordinated with foreign authorities (Issue 113).
19. Eric Rosengren, former President of the Boston Fed, argues that while raising interest rates does nothing to increase supply, it will reduce _____, bringing _____ more in line with supply (Issue 107).
21. Jim O'Neill, former Chairman of GSAM, argues that while global _____ flows have slowed dramatically over the past decade, that doesn't equate to strong evidence of a decline in underlying flows (Issue 108).
23. Global _____ prices have risen over the past two years due to rising demands on _____ production and severe weather (Issue 110).
25. Peter Oppenheimer, GS Chief Global Equity Strategist, says that equity markets are entering a new post _____ cycle characterized by higher inflation and interest rates (Issue 109).
27. Valuations have fallen significantly this year, especially for _____ assets (Issue 109).
28. Timothy Massad, former Chairman of the Commodity Futures Trading Commission, argues that the US regulatory framework has left crypto _____ trading, one of the most common types of crypto trading, unregulated at the federal level (Issue 114).

Puzzle made at <http://www.puzzle-maker.com>.

Solutions on pg. 38.

In the words of our 2022 interviewees

"Financial stability concerns should weigh more on decision-making when the Fed is reasonably close to achieving its mandates. But the Fed is far from its inflation target today, so making progress towards that target must be the priority."

– Jeremy Stein, former Governor, Federal Reserve Board

(Issue 113, November 11)

"The world is arguably becoming increasingly bifurcated into two economic blocs—one aligned with the US and the other with China."

– Adam Posen, President, Peterson Institute for International Economics

(Issue 108, April 28)

"I'm confident that Value can continue to outperform over a medium-term horizon."

– Cliff Asness, Founder and CIO, AQR Capital Management

(Issue 109, June 14)

"Under Xi, ideology is now driving policy—not the other way around."

– Asia Society Policy Institute's Center for China Analysis, led by the Honorable Dr. Kevin Rudd

(Issue 112, October 11)

"I'm not necessarily confident that the Fed will pull off a soft landing, but I am a little more confident than I was."

– Jan Hatzius, GS Head of Global Investment Research and Chief Economist

(Issue 111, September 13)

"The historical relationship between job openings, or vacancies, and unemployment... is crystal clear: the job vacancy rate has never substantially declined without a significant increase in unemployment."

– Olivier Blanchard, former Chief Economist, IMF

(Issue 111, September 13)

"I firmly believed then [in 2018], and still do now, that interest rates cannot be used to serve several different objectives around the economy, like labor market and price stability, as well as financial stability objectives."

– Vítor Constâncio, former Vice President, European Central Bank

(Issue 113, November 11)

"The collapse of [cryptocurrency exchange] FTX is firstly an age-old lesson that unregulated markets are dangerous."

– Jay Clayton, former Chairman, Securities and Exchange Commission

(Issue 114, December 9)

"We should have the highest regard for what future variants [of SARS-CoV-2] may be able to do, because this virus has already thrown us one of the most extraordinary curveballs in the history of virology, and there's no reason to think it couldn't do so again."

– Dr. Eric Topol, Founder and Director, Scripps Translational Science Institute

(Issue 105, January 24)

"What we're seeing is a natural and desirable retrenchment from the hyperglobalization that characterized the last few decades as the world tries to find a happy medium between the excesses of hyperglobalization and the dangers of autarky."

– Dani Rodrik, Professor, Harvard Kennedy School of Government

(Issue 108, April 28)

"Saying that US crypto entities are well-regulated by state laws is akin to saying that the stock market was well-regulated prior to the 1929 crash under state blue sky laws."

– Timothy Massad, former Chairman, Commodity Futures Trading Commission

(Issue 114, December 9)

"I'm very dubious of the view that the era of globalization has peaked."

– Jim O'Neill, former Chairman, Goldman Sachs Asset Management

(Issue 108, April 28)

"The last two recessions were induced by factors other than monetary policy, but the risk of monetary policy being the cause of the next recession has grown."

– Eric Rosengren, former President, Federal Reserve Bank of Boston

(Issue 107, March 14)

"Disruptive innovations...will cut across every sector, every industry, and almost every company. That means that the traditional world order will be disintermediated, disturbed, disrupted, or destroyed...the growth from these [innovation] platforms will shock people."

– Cathie Wood, Founder, CEO, and CIO, ARK Invest

(Issue 109, June 14)

"The emerging new energy order will have significant geopolitical implications... the historically close connection between energy and geopolitics is in for a new—and tumultuous—chapter."

– Meghan O'Sullivan, Deputy National Security Advisor for Iraq and Afghanistan under President George W. Bush

(Issue 110, July 28)

"We should expect Russian occupation of a large part of Ukraine, even if that means a war that could end in tens of thousands of casualties and lead to a refugee crisis as Ukrainians pour into Eastern Europe."

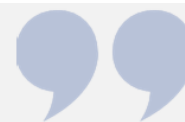
– Andrea Kendall-Taylor, former Deputy National Intelligence Officer for Russia and Eurasia at the National Intelligence Council

(Issue 106, February 24)

"While the US is not blameless, and US actions have been costly to China, the overreach of China's leadership presents the biggest risk to China as we know it today."

– Susan Shirk, Chair of the 21st Century China Center, UC San Diego

(Issue 112, October 11)



"We are looking at a supply shock layered on top of a supply shock. And the nature of the new supply shock—centered on energy—suggests not only that inflation will move even higher and likely prove more persistent moving forward, but also that growth will take a hit."

– Philipp Hildebrand, Vice Chairman, BlackRock

(Issue 107, March 14)

Note: All quotes came from interviews that appeared in GS Top of Mind reports in 2022.

Source: Goldman Sachs GIR.

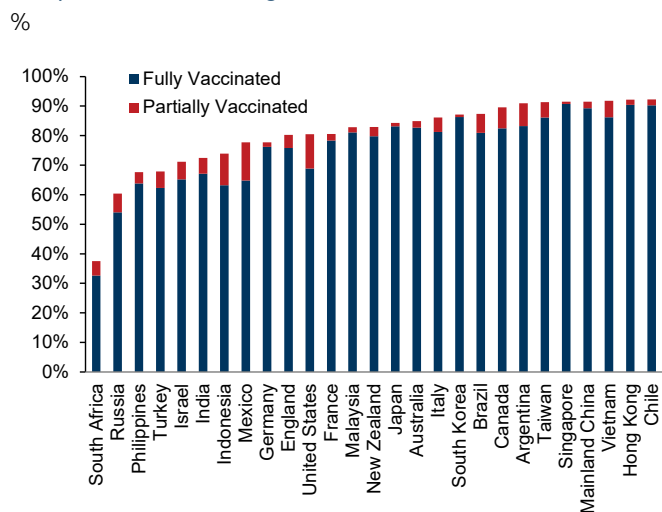


Theme I: Old and new exogenous shocks

*"We entered the year dealing with **old and new exogenous shocks**,
A pandemic becoming endemic, and a conflict in the former Soviet bloc."*

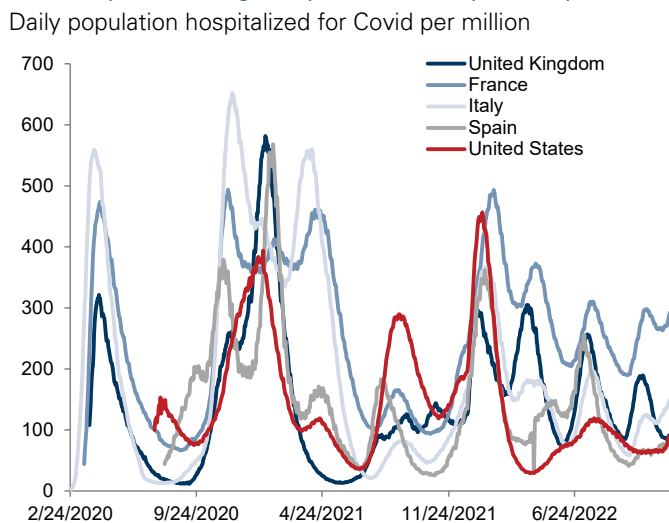
Pandemic now endemic, China in focus

Many economies have high vaccination rates...



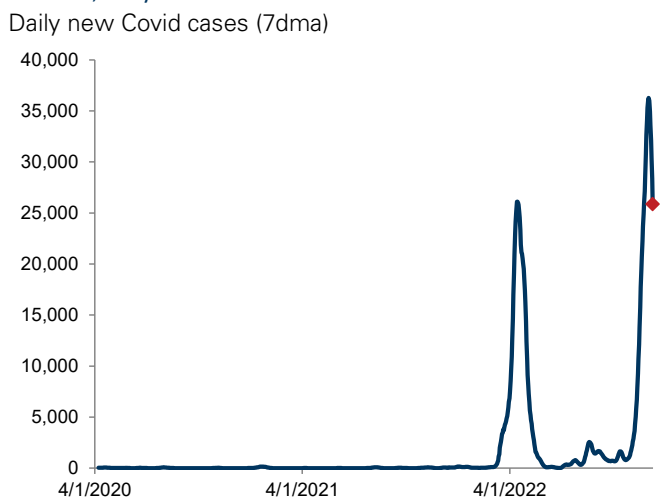
Note: For Mainland China, fully vaccinated is three doses of Chinese vaccine.
Source: Our World in Data, Goldman Sachs GIR.

...and hospitalizations globally remain below previous peaks



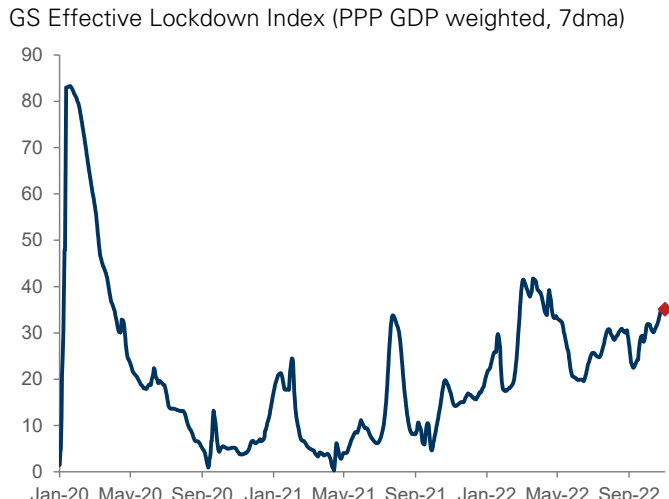
Source: CDC, European Centre for Disease Prevention and Control, Sante Publique France, Presidenza del Consiglio dei Ministri Dipartimento Della Protezione Civile, United Kingdom National Health Services, Goldman Sachs GIR.

In China, daily Covid cases have declined but remain elevated



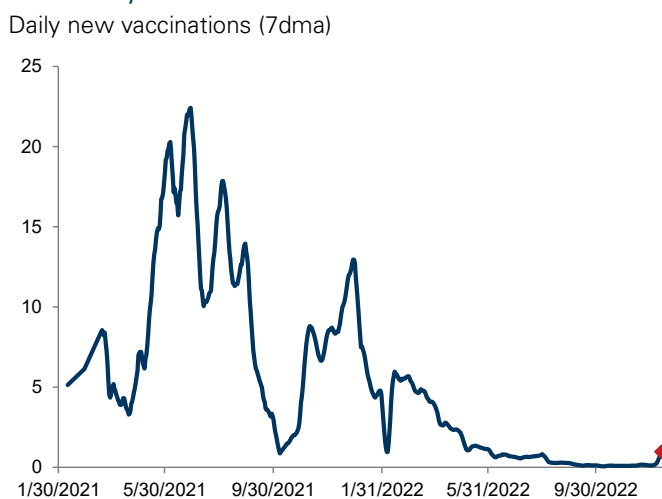
Source: CEIC, Goldman Sachs GIR.

China embarking on reopening, but the road is likely to be bumpy



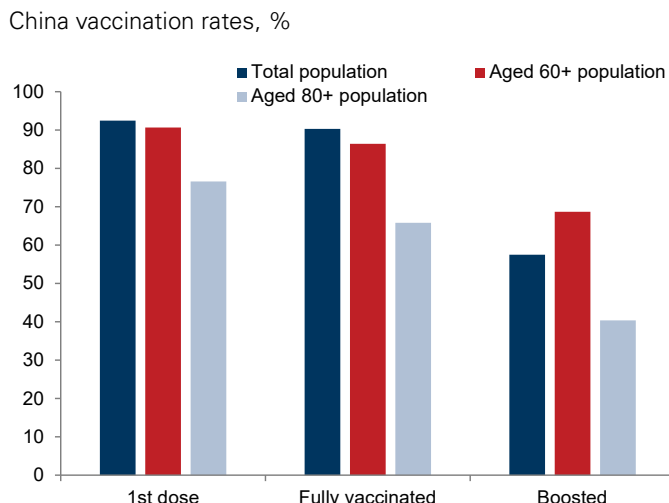
Source: Google LLC "Google COVID-19 Community Mobility Reports"; <https://www.google.com/covid19/mobility/>; Accessed: 12/7/22, Wind, GS GIR.

China's daily new vaccination rate remains low...



Source: CEIC, Goldman Sachs GIR.

...and China has lower elderly vaccination rates than many other economies



Source: NHC, Goldman Sachs GIR.

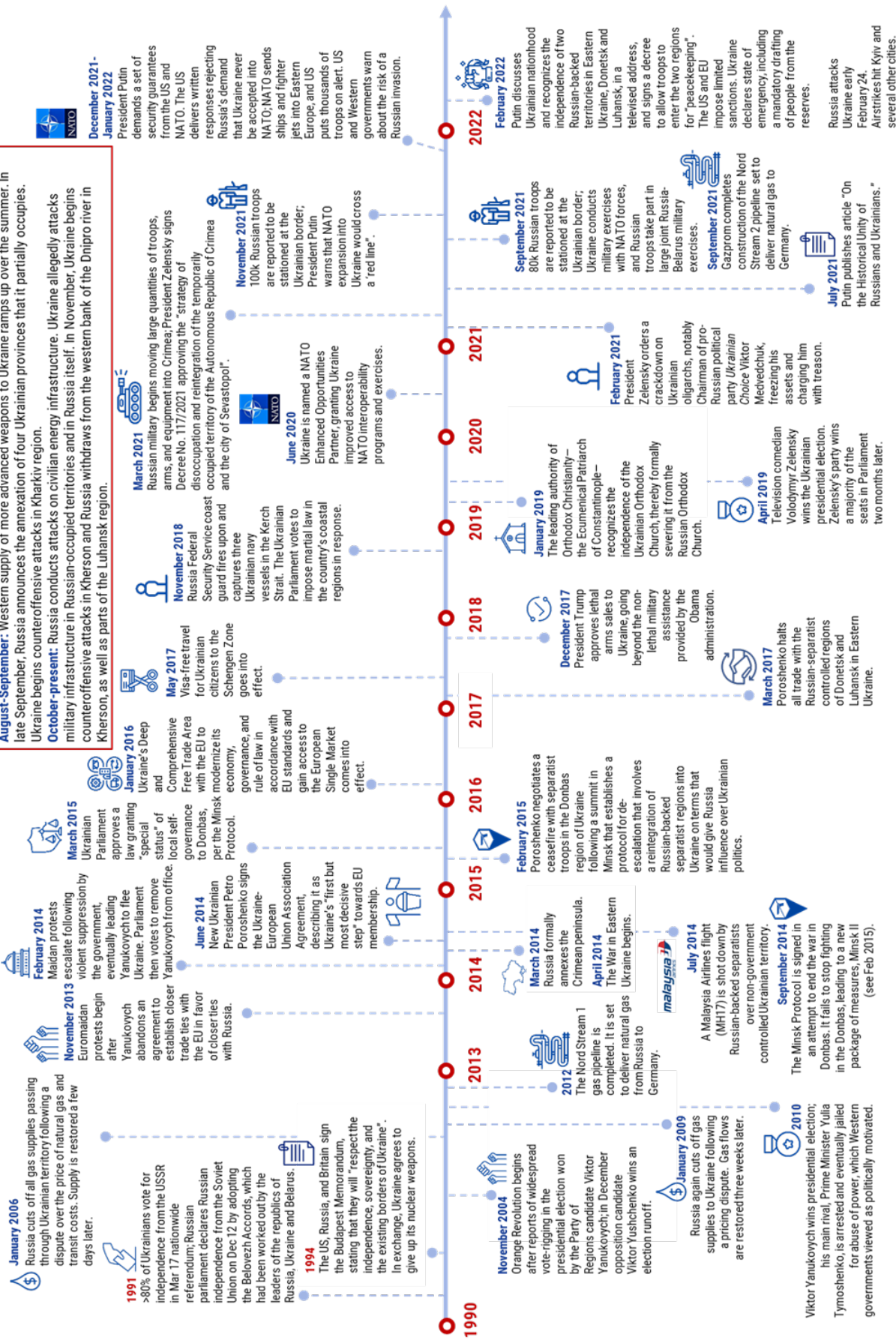
The new shock: Russia-Ukraine War

Chronology of Russia-Ukraine Tensions

February-July: After the initial invasion, Russian forces focus on encircling and capturing Kyiv. Ukrainian resistance leads to a Russian retreat. Russian forces partially occupy several Ukrainian provinces including Kherson, Luhansk, Donetsk, and Zaporizhzhia. Russia makes incremental territorial gains in Donetsk/Luhansk regions over May and June. In May, Mariupol falls to Russian forces, effectively completing a land bridge to Crimea.

August-September: Western supply of more advanced weapons to Ukraine ramps up over the summer. In late September, Russia announces the annexation of four Ukrainian provinces that it partially occupies. Ukraine begins counteroffensive attacks in Kharkiv region.

October-present: Russia conducts attacks on civilian energy infrastructure. Ukraine allegedly attacks military infrastructure in Russian-occupied territories and in Russia itself. In November, Ukraine begins counteroffensive attacks in Kherson and Russia withdraws from the western bank of the Dnipro river in Kherson, as well as parts of the Luhansk region.



Source: Council on Foreign Relations, NY Times, various news sources, Goldman Sachs GIR.

Vladimir Putin... in his own words

“Russia was and will remain a great power. It is preconditioned by the inseparable characteristics of its geopolitical, economic and cultural existence. They determined the mentality of Russians and the policy of the government throughout the history of Russia and they cannot but do so at present.”

*"Russia at the Turn of the Millennium",
December 1999*

"I think it is obvious that NATO expansion does not have any relation with the modernization of the Alliance itself or with ensuring security in Europe. On the contrary, it represents a serious provocation that reduces the level of mutual trust. And we have the right to ask: against whom is this expansion intended?"

"Speech to the Munich Security Conference on Security Policy", February 2007

"We are seeing a greater and greater disdain for the basic principles of international law. And independent legal norms are, as a matter of fact, coming increasingly closer to one state's legal system.... First and foremost, the United States, has overstepped its national borders in every way. This is visible in the economic, political, cultural and educational policies it imposes on other nations."

"Speech to the Munich Security Conference on Security Policy", February 2007

"We view the appearance of a powerful military bloc on our borders, a bloc whose members are subject in part to Article 5 of the Washington Treaty, as a direct threat to the security of our country. The claim that this process is not directed against Russia will not suffice. National security is not based on promises."

"Statement at the NATO Summit in Bucharest", April 2008

"The so-called civilized world, of which our Western colleagues have self-appointed themselves the only representatives, prefers not to notice [the situation in the Donbas] as if there isn't a genocide through which nearly four million people are being put through, all simply because these people did not agree to the Western coup of Ukraine in 2014."

"Address by the President of the Russian Federation", February 2022

Source: Collected speeches of the President of Russia, Kremlin.Ru.

"With Ukraine, our Western partners have crossed the line, playing the bear and acting irresponsibly and unprofessionally.... If you compress the spring all the way to its limit, it will snap back hard. You must always remember this."

"Address by the President of the Russian Federation", March 2014

"The allegations and statements that Russia is trying to establish some sort of empire, encroaching on the sovereignty of its neighbors, are groundless. Russia does not need any kind of special, exclusive place in the world...While respecting the interests

"We call on the Kyiv regime to immediately end hostilities, end the war that they unleashed back in 2014 and return to the negotiating table... We will defend our land with all the powers and means at our disposal. And we will do everything to ensure the safe life of our people. This is the great liberation mission of our people."

"Speech by the President of the Russian Federation at Annexation Ceremony", September 2022

of others, we simply want for our own interests to be taken into account and for our position to be respected."

"Speech to the Valdai International Discussion Club", October 2014

"I am confident that true sovereignty of Ukraine is possible only in partnership with Russia. Our spiritual, human and civilizational ties formed for centuries and have their origins in the same sources, they have been hardened by common trials, achievements and victories. Our kinship has been transmitted from generation to generation. It is in the hearts and the memory of people living in modern Russia and Ukraine, in the blood ties that unite millions of our families. Together we have always been and will be many times stronger and more successful. For we are one people."

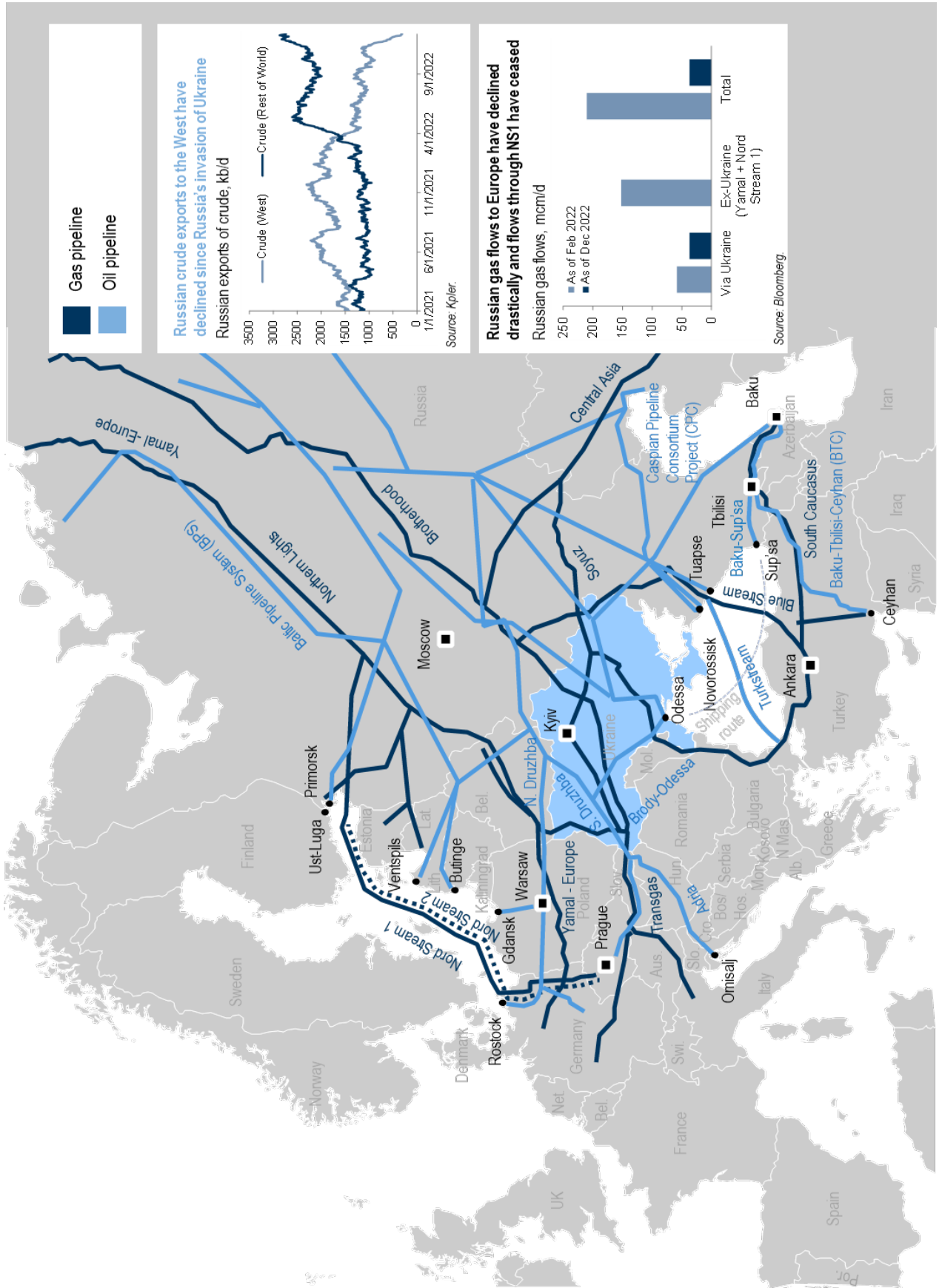
"On the Historical Unity of Russians and Ukrainians", July 2021

"The new inter-State relations between Russia and China are superior to political and military alliances of the Cold War era. Friendship between the two States has no limits, there are no 'forbidden' areas of cooperation, strengthening of bilateral strategic cooperation is neither aimed against third countries nor affected by the changing international environment and circumstantial changes in third countries."

"Joint Statement of the Russian Federation and the People's Republic of China", February 2022

The looming risk: energy shortages

Russian energy flows into Europe



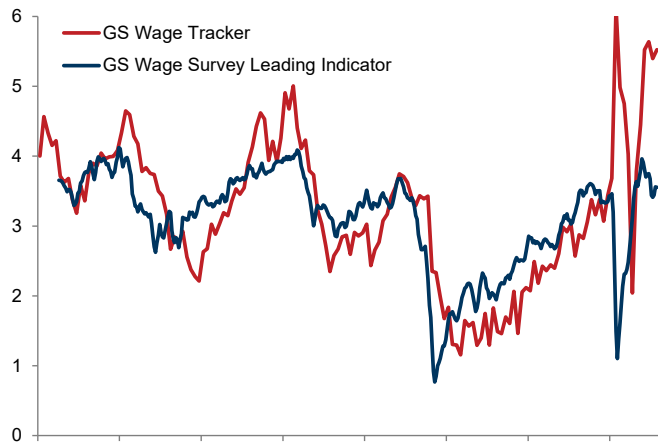


Theme II: Inflation and its impacts

*“But the year quickly became about **inflation and its impacts**,
On central banks that were behind the curve and forced to firmly react,
On growth, which put recession in question,
And on risky assets, which struggled to overcome their low-rate obsession.
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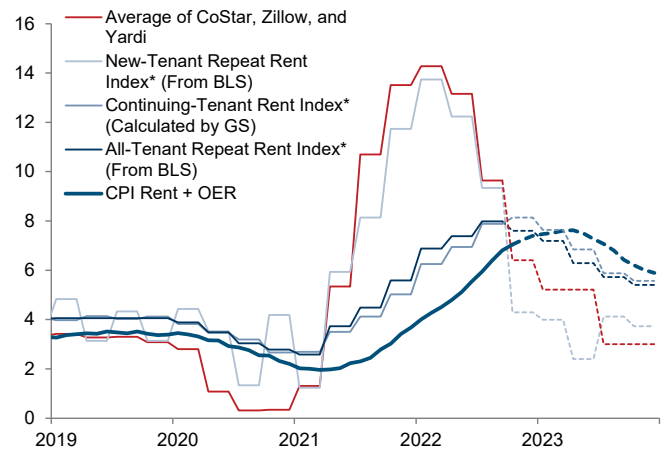
US (& global) inflation has likely peaked

US wage growth is high, but looks set to slow somewhat
Percent change, year ago



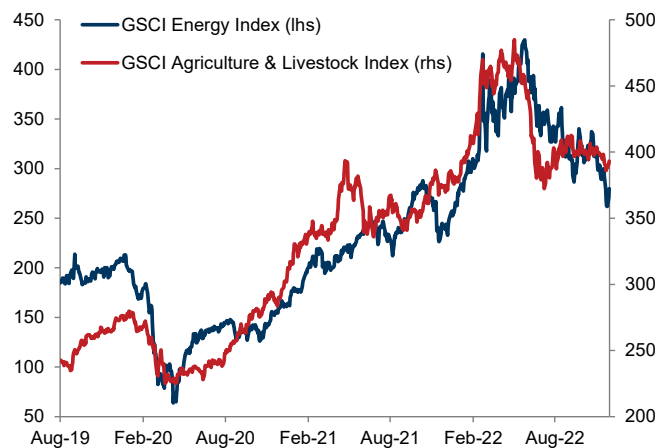
The GS Wage Tracker extracts a common signal from ECI, avg hourly earnings, comp/hour, median weekly wages, and the Atlanta Fed's Wage Tracker. The Wage Survey Leading Indicator extracts a common signal from surveys of consumers & businesses that ask qs about expected income & wage growth.

US rent inflation has recently declined
Percent change, year ago

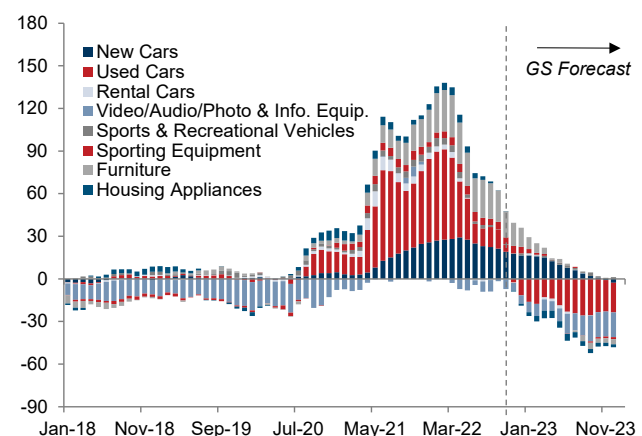


Adjusted for the historical gap of the ATRR vs. CPI rent.

Commodity prices have declined from recent highs
Dec 31, 1982 = 100 (lhs), Jan 2, 1970 = 100 (rhs)



US inflation from supply-constrained categories has fallen sharply
Contributions to year-on-year core PCE inflation, bp



We expect the disinflationary impulse from core goods to help reduce US core PCE to 4.5% by Dec-22 and 2.9% by Dec-23

GS US core PCE inflation forecast

| | Weight | Oct. 2022 YoY | Dec. 2022 YoY | Dec. 2022 Contribution to Change | Dec. 2023 YoY | Dec. 2023 Contribution to Change |
|--------------------------------|--------------|---------------|---------------|----------------------------------|---------------|----------------------------------|
| Core PCE | 100.0 | 5.0 | 4.5 | -0.5 | 2.9 | -2.0 |
| Core Goods | 27.4 | 4.6 | 3.5 | -0.3 | -1.5 | -1.5 |
| New Vehicles | 2.5 | 8.3 | 7.0 | 0.0 | -1.2 | -0.2 |
| Used Vehicles | 1.6 | 2.1 | -7.3 | -0.2 | -15.4 | -0.2 |
| Household Appliances | 0.5 | 0.3 | -3.1 | 0.0 | -4.5 | 0.0 |
| Video, Audio, Computers | 2.5 | -2.8 | -2.4 | 0.0 | -8.2 | -0.1 |
| Recreational Vehicles | 0.7 | 0.4 | 1.5 | 0.0 | 2.1 | 0.0 |
| Jewelry, Watches | 0.7 | 2.1 | 1.4 | 0.0 | 0.2 | 0.0 |
| Clothing & Footwear | 3.2 | 4.4 | 3.5 | 0.0 | 2.3 | -0.1 |
| Pharma & Medical | 4.1 | 2.6 | 2.8 | 0.0 | 0.5 | -0.1 |
| Pets Products | 0.6 | 12.5 | 13.2 | 0.0 | 2.3 | -0.1 |
| Expenditures Abroad | 0.1 | -2.3 | -3.3 | 0.0 | -1.6 | 0.0 |
| Residual Core Goods | 10.8 | 7.0 | 6.3 | -0.1 | -0.6 | -0.7 |
| Core Services | 72.6 | 5.1 | 4.9 | -0.2 | 4.5 | -0.5 |
| Housing | 16.8 | 7.0 | 7.4 | 0.1 | 5.6 | -0.2 |
| Ground Transportation | 0.4 | 4.1 | 3.0 | 0.0 | 2.3 | 0.0 |
| Air Transportation | 1.1 | 33.7 | 17.6 | -0.2 | 0.6 | -0.3 |
| Food Services & Accommodation | 8.4 | 7.7 | 7.0 | -0.1 | 5.2 | -0.2 |
| Financial Services & Insurance | 8.2 | -0.2 | -1.0 | -0.1 | 3.0 | 0.3 |
| Medical Services | 17.7 | 2.8 | 2.9 | 0.0 | 4.0 | 0.2 |
| Foreign Travel | 1.5 | 10.0 | 10.1 | 0.0 | 4.4 | -0.1 |
| Residual Core Services | 18.4 | 5.5 | 5.5 | 0.0 | 4.5 | -0.2 |

We expect declines in both US core and headline CPI by the end of the year and into 2023

GS US core and headline CPI inflation forecasts

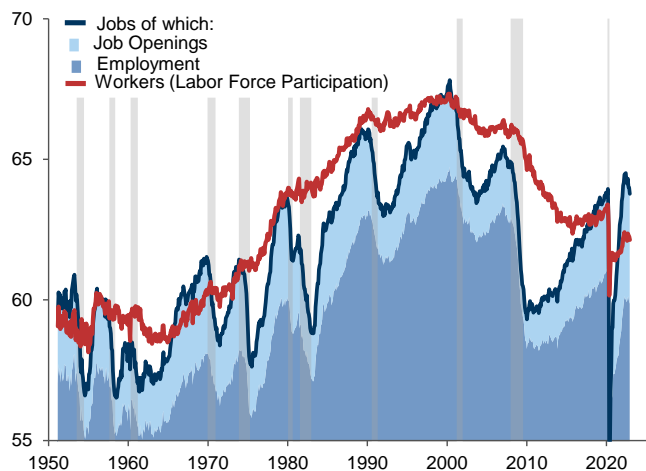
| | Weight | Oct. 2022 YoY | Dec. 2022 YoY | Dec. 2022 Contribution to Change | Dec. 2023 YoY | Dec. 2023 Contribution to Change |
|----------------------------------|--------------|---------------|---------------|----------------------------------|---------------|----------------------------------|
| Core CPI | 100.0 | 6.3 | 5.9 | -0.4 | 3.2 | -3.2 |
| Apparel | 3.1 | 4.2 | 3.2 | 0.0 | 2.2 | -0.1 |
| New Cars | 5.2 | 8.3 | 6.9 | -0.1 | -1.2 | -0.5 |
| Used Cars | 4.8 | 2.6 | -6.4 | -0.4 | -13.3 | -0.8 |
| Medical Care Commodities | 1.9 | 3.0 | 3.2 | 0.0 | 0.5 | 0.0 |
| Health Insurance | 1.1 | 20.6 | 7.5 | -0.1 | -29.7 | -0.6 |
| Medical Services ex Insurance | 7.6 | 3.3 | 4.0 | 0.0 | 6.4 | 0.2 |
| Pets | 1.4 | 11.9 | 11.9 | 0.0 | 2.3 | -0.1 |
| Household Furnishings + Ops. | 6.1 | 8.7 | 7.4 | -0.1 | 2.8 | -0.4 |
| Personal Care | 2.8 | 6.5 | 6.9 | 0.0 | 4.4 | -0.1 |
| Rent + OER | 40.2 | 7.0 | 7.4 | 0.1 | 5.6 | -0.6 |
| Public Transportation | 1.2 | 25.6 | 23.9 | 0.0 | 5.2 | -0.2 |
| Private Transportation Services | 6.5 | 12.6 | 14.3 | 0.1 | 6.7 | -0.4 |
| Miscellaneous goods and services | 18.1 | 5.7 | 6.1 | 0.1 | 5.1 | -0.1 |
| Headline CPI | 100.0 | 7.8 | 6.7 | -1.1 | 3.2 | -4.6 |
| Core CPI | 78.2 | 6.3 | 5.9 | -0.3 | 3.2 | -2.5 |
| Food | 13.7 | 10.9 | 11.0 | 0.0 | 6.9 | -0.6 |
| Energy | 8.1 | 17.6 | 6.6 | -0.9 | -3.3 | -1.7 |

Source for exhibits: Bureau of Labor Statistics, Department of Commerce, Census Bureau, CoStar, Zillow, REIS, S&P, University of Michigan, Federal Reserve, GS GIR. Special thanks to Manuel Abecasis for charts.

The tight US labor market is rebalancing

The labor market adjustment in the US is underway...

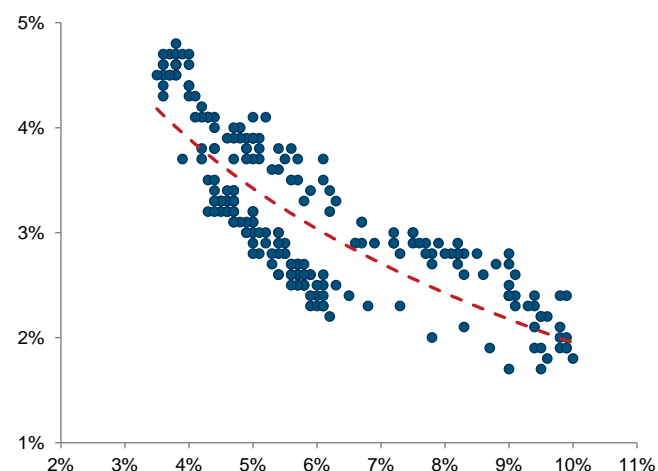
US jobs-workers gap, percent of population



Extrapolated before Dec 2000 using the newspaper help-wanted index based on methodology by Regis Barnichon, San Francisco Fed.

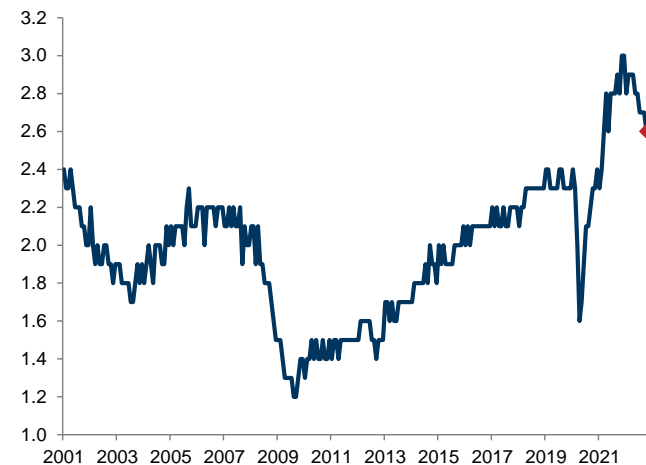
A decline in job openings has historically been associated with a rise in the unemployment rate...

Unemployment (x-axis), job openings (y-axis), rate, 2000-2019



The quits rate has declined, confirming that the labor market is loosening at the margin

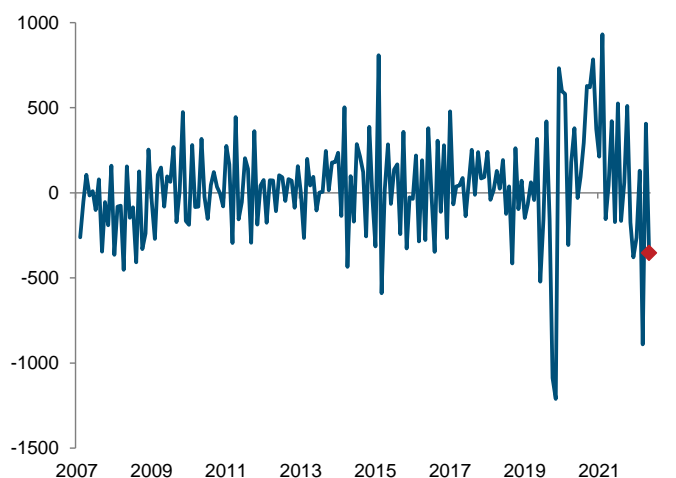
Quits as a percent of total employment



Source for all exhibits: Bureau of Labor Statistics, Goldman Sachs GIR. Special thanks to US economics team for charts.

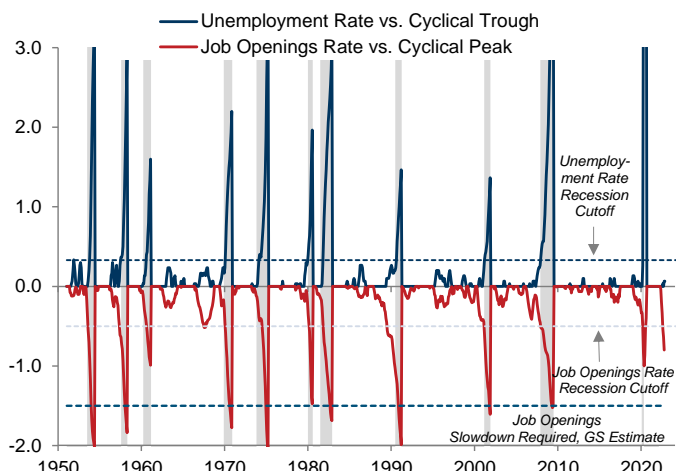
...as the number of open positions has fallen from its March peak

Monthly change in total nonfarm job openings, thousands



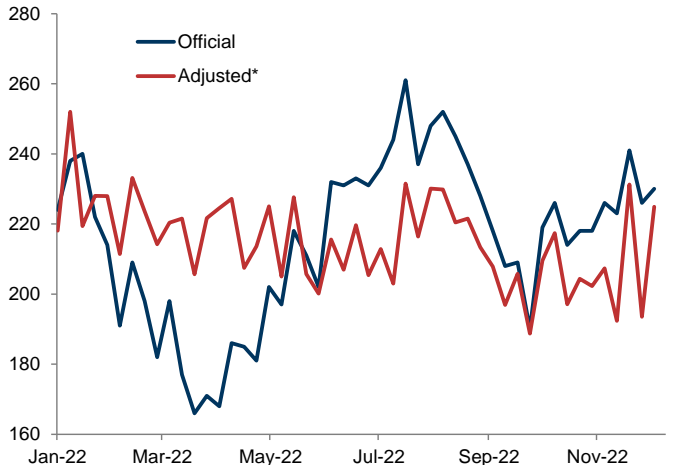
...but job openings have so far declined without unemployment rising much

Percentage points



Initial claims have increased, but look much more stable on an adjusted basis

Initial jobless claims, thousands

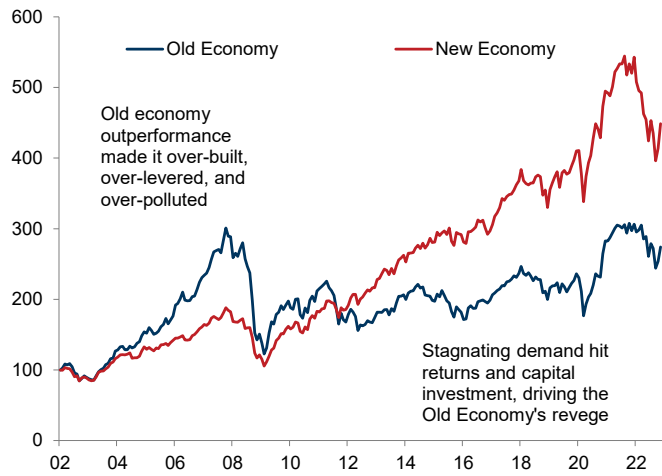


Note: Uses an average of 2017-2019 seasonal factors (as of 3/31) and removes July/August distortions in MA and CT.

Commodity underinvestment still an issue...

Commodities have delivered relatively poor returns...

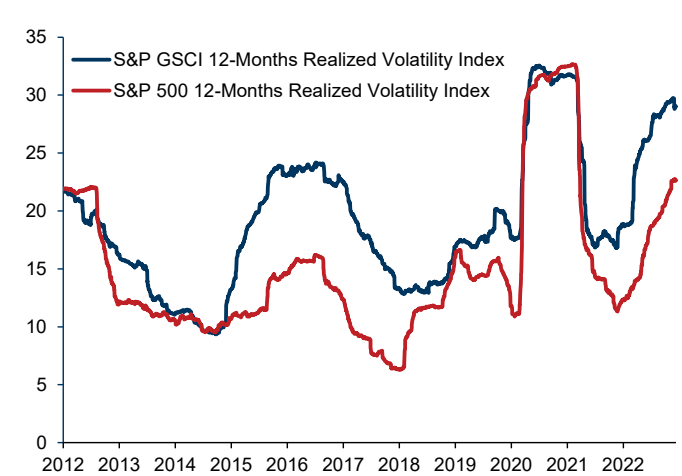
Cumulative equity returns by sector, 2002 = 100



Note: Old economy includes energy and metals; new economy includes tech. Source: Reuters, Goldman Sachs GIR.

...and have been relatively volatile over the past decade

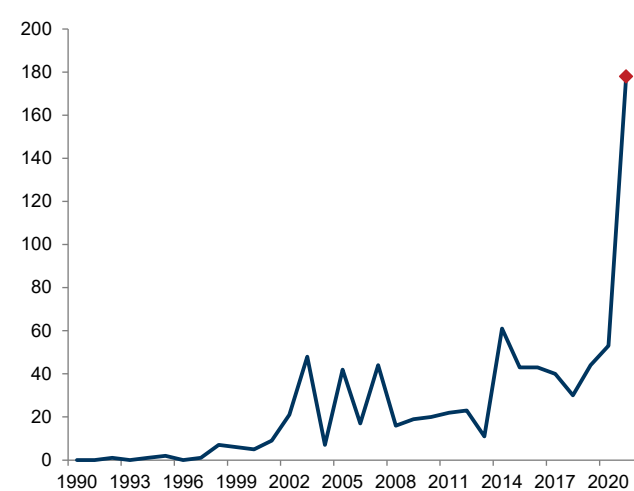
Annualized standard deviation of daily price returns by index



Source: S&P Global, Goldman Sachs GIR.

Global ESG regulations have grown significantly...

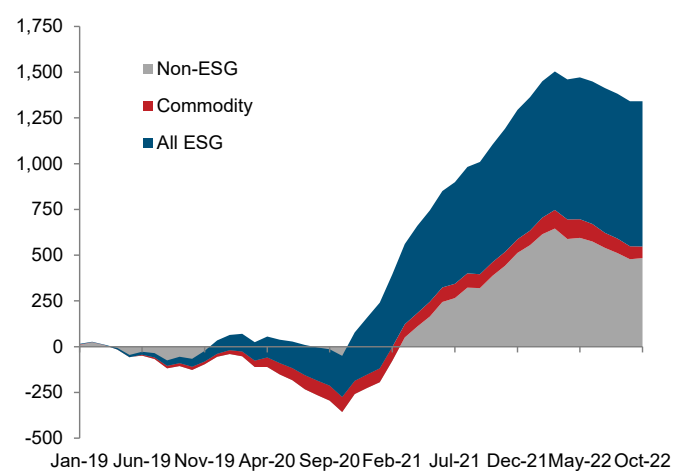
Global sustainable finance regulations, issued or in progress



Source: PRI, Goldman Sachs GIR.

...and ESG has cannibalized flows into commodities

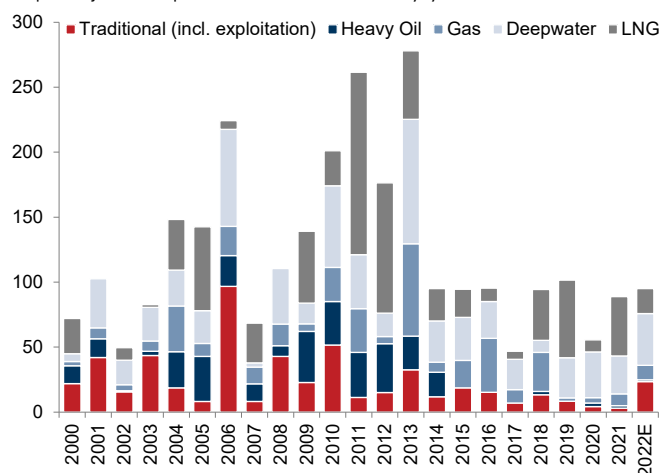
Cumulative change in Morningstar equity fund flows, \$bn



Source: Morningstar, Goldman Sachs GIR.

The result: nearly a decade of capex underinvestment...

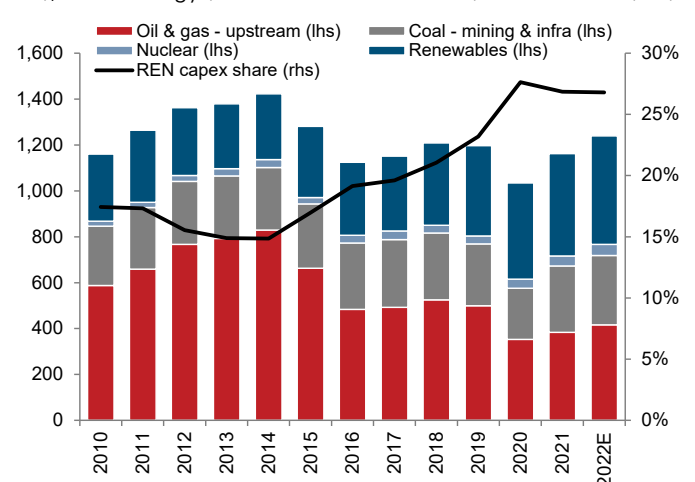
Top Projects capex sanctioned in oil by year, \$bn



Source: Company data, Goldman Sachs GIR.

...with an increased share of renewables in capex spending

Energy supply capex by fuel and power supply source (\$bn, lhs), clean energy (renewables and biofuels) as % of total (rhs)



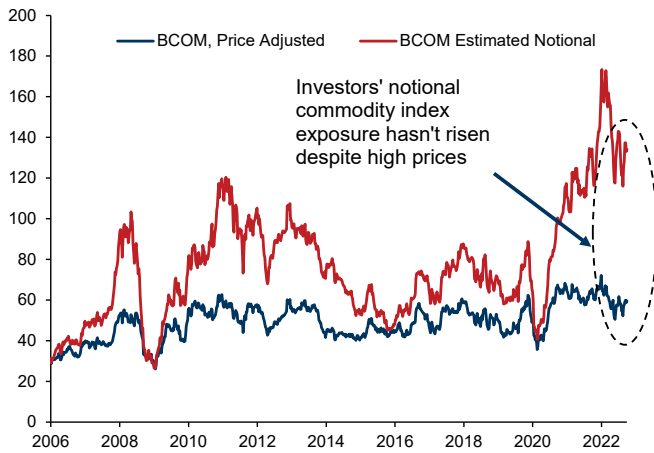
Source: IEA WEI, Goldman Sachs GIR.

Special thanks to Commodities Research team for charts.

...as investors remain hesitant

Commodity index investors have reduced exposure even as commodities have outperformed

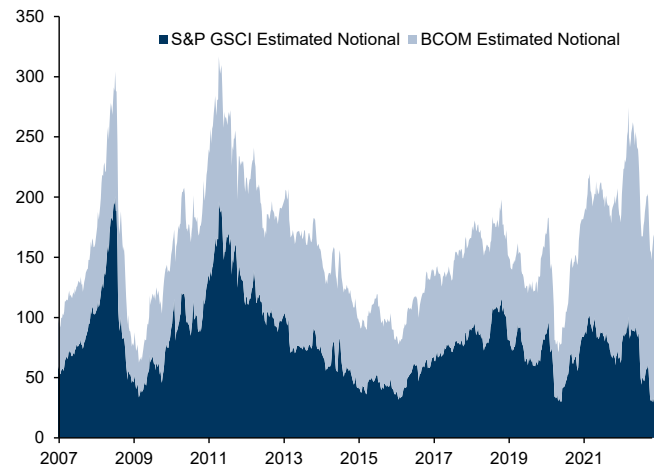
GSe, BCOM notional AUM and price-adjusted AUM, \$bn



Source: Bloomberg, Goldman Sachs GIR.

Total commodity index exposure is less than \$200bn vs. ~127tn and ~\$124tn for global fixed income and equity markets

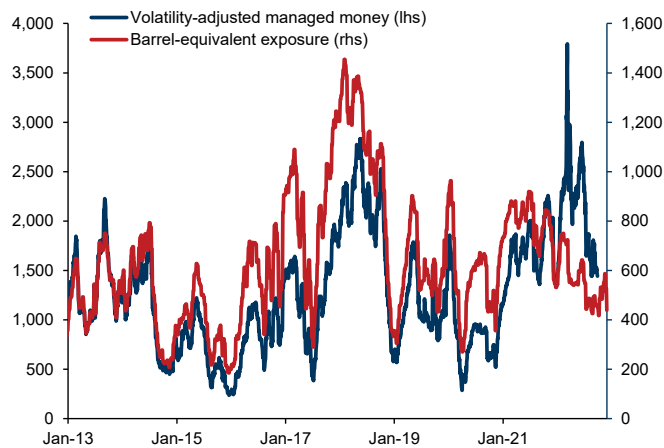
S&P GSCI and BCOM notional AUM, \$bn



Note: Global capital markets capitalization data as of 2021. Source: SIFMA, Bloomberg, Goldman Sachs GIR.

High volatility gave investors more exposure than desired, leading them to reduce positioning

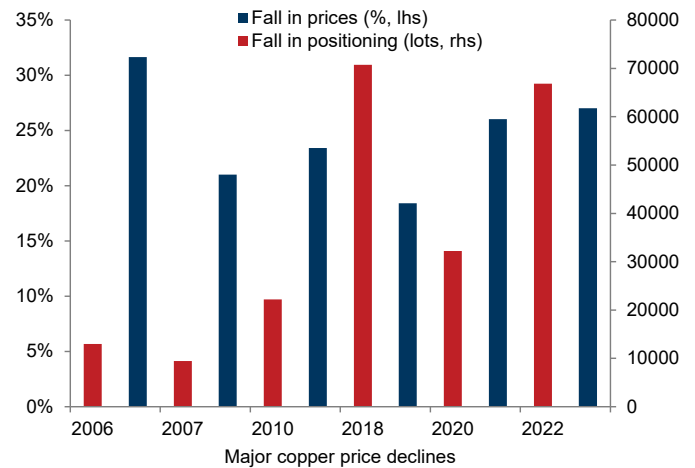
Volatility-adjusted notional exposure (\$mn, lhs), barrel-equivalent exposure (million barrels, rhs)



Source: ICE, Bloomberg, CME, Goldman Sachs GIR.

The positioning adjustment in copper remains close to a record

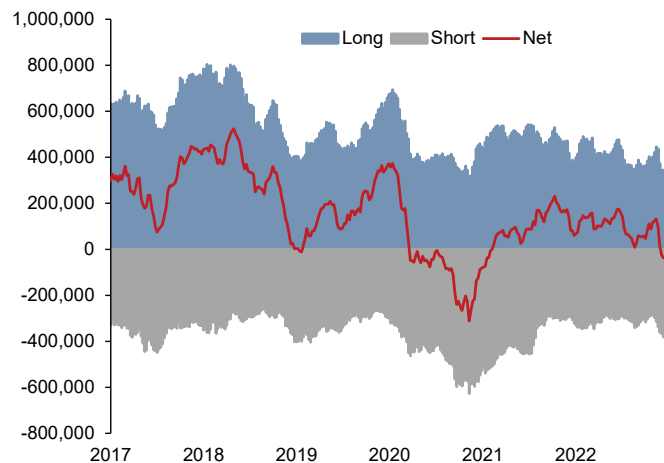
Price decline (%), fall in positioning (lots, rhs)



Source: Bloomberg, Wind, Goldman Sachs GIR.

Positioning in oil is below its 3-year moving average

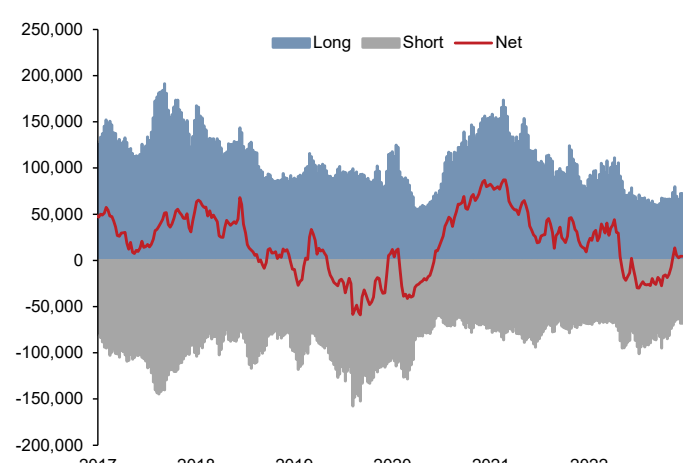
Net investor positioning in Brent crude oil, lots



Source: CFTC, Goldman Sachs GIR.

And investors are net flat copper

Net investor positioning in copper, lots

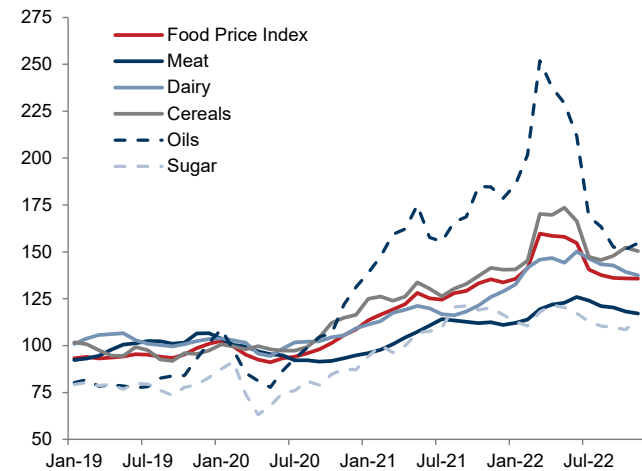


Source: CFTC, Goldman Sachs GIR.

Special thanks to Commodities Research team for charts.

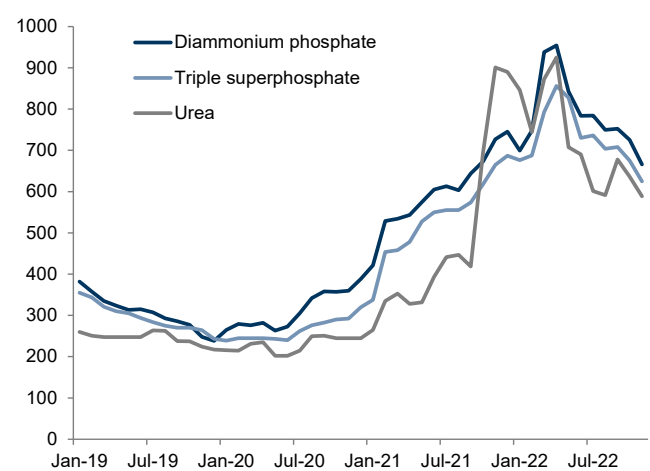
Food prices ebbing, food crisis remains

Food prices have declined sharply from recent peaks...
UN FAO Price Indices, 2014-2016 average = 100



Source: Food and Agriculture Organization of the UN, Goldman Sachs GIR.

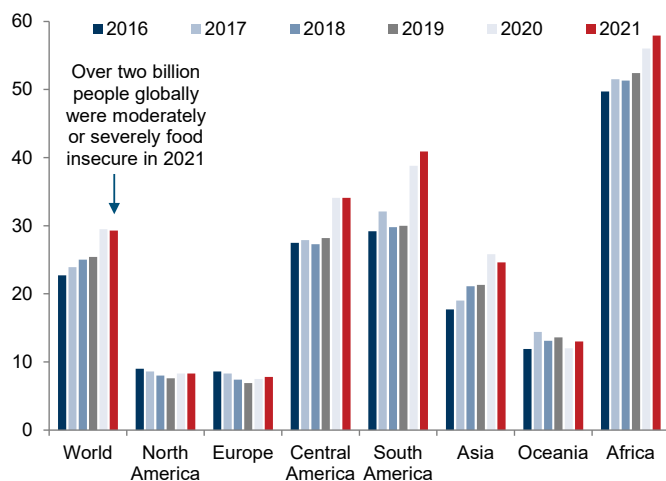
...as have fertilizer prices
\$/mt



Source: World Bank, Bloomberg, Goldman Sachs GIR.

But the structural crisis in food persists...

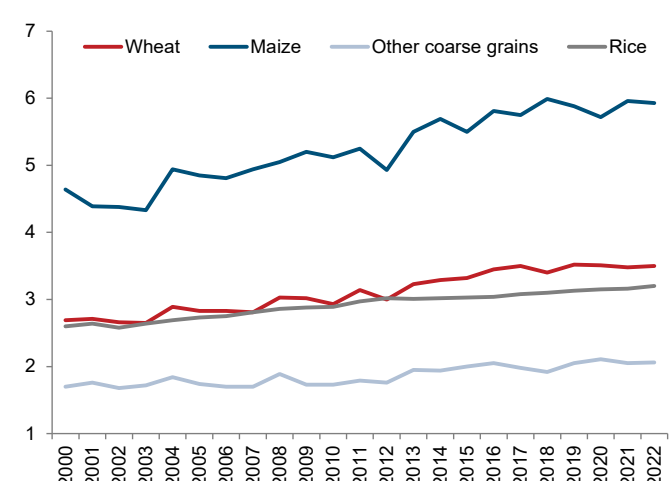
Prevalence of moderate or severe food insecurity, % of pop.



People in moderate food insecurity have reduced the quality/quantity of their food and are uncertain about their ability to obtain food; people in severe food insecurity have run out of food, and, at most extreme, haven't eaten in days.
Source: Food and Agriculture Organization of the UN, Goldman Sachs GIR.

Cereal yields have stagnated in the last several years...

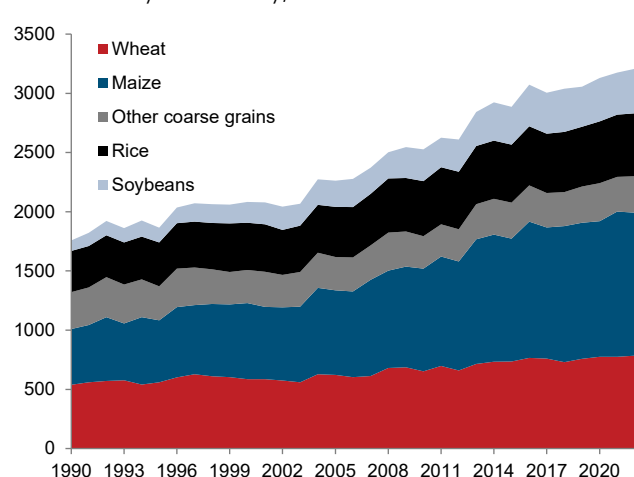
Yields by cereal, tonnes per hectare



Source: OECD, Food and Agriculture Organization of the UN, Goldman Sachs GIR.

...and while global food production has risen significantly...

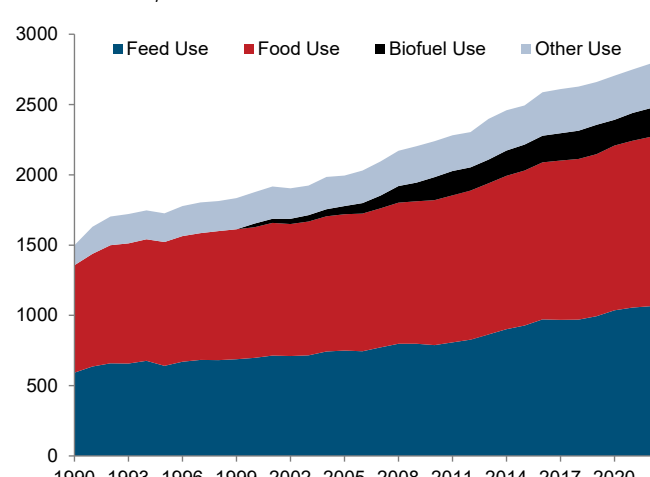
Production by commodity, million tonnes



Source: OECD, Food and Agriculture Organization of the UN, Goldman Sachs GIR.

...demands on global food production have also increased

Use of cereal, million tonnes



Note: Cereal includes maize, wheat, other coarse grains, and rice.
Source: OECD, Food and Agriculture Organization of the UN, Goldman Sachs GIR.

All about central bank tightening

| | Interest Rate Policy | Balance Sheet and Other Policy | Outlook |
|------------|--|--|--|
| FED | <p>Federal funds rate: 4.25%-4.50%</p> <ul style="list-style-type: none"> Federal Reserve has increased the federal funds rate target range by 425 basis points since the start of the year. | <ul style="list-style-type: none"> In September the Fed's runoff caps doubled from their initial levels to their announced peak of \$60bn for Treasuries and \$35bn for MBS per month. If principal payments exceed the stated caps in a given month, the Fed will roll over the excess. | <ul style="list-style-type: none"> We expect the Fed to deliver 25bp hikes in February, March, and May for a peak funds rate of 5.00-5.25%. |
| ECB | <p>Deposit facility rate: 2.00%</p> <ul style="list-style-type: none"> The ECB has increased their deposit rate by 250 bps since July. | <ul style="list-style-type: none"> The ECB announced they will continue fully reinvesting the principal payments from maturing securities purchased under the APP until the end of February 2023, after which principal payments will not be reinvested fully to let the APP portfolio decline at a pace of €15 billion per month on average until 2023. | <ul style="list-style-type: none"> We expect the ECB to hike by 50bp in February and March, and by 25bp in May for a terminal rate of 3.25%. |
| BOE | <p>Bank Rate: 3.50%</p> <ul style="list-style-type: none"> The BoE has increased their deposit rate by 340 bps since December last year. | <ul style="list-style-type: none"> The BoE conducted temporary and targeted purchases of long-dated UK government bonds from September 28 through October 14. The BoE commenced gilt sales on 1 November at an average pace of £10 billion per quarter. Taken together with maturing gilts, for 2022 as a whole, the stock of gilts held by the BoE has been reduced by £44 billion. | <ul style="list-style-type: none"> We expect the BoE to deliver a 50bp hike in February and 25bp hikes in March and May for a terminal rate of 4.50%. |
| BOJ | <p>Deposit Rate: -0.10%</p> <ul style="list-style-type: none"> The BoJ has made no change to the deposit rate since 2016. | <ul style="list-style-type: none"> With the introduction of YCC in September 2016, the BOJ shifted its main target to keeping 10yr JGB yield curve at 0% and as such, the quantity purchase of JGB became a passive instrument. The MOF/BoJ conducted yen-buying interventions in September and October. | <ul style="list-style-type: none"> We expect the BoJ to maintain NIRP and YCC through 2023. |

Source: Federal Reserve, European Central Bank, Bank of England, Bank of Japan, Goldman Sachs G/I.

The big question: hard or soft landing?

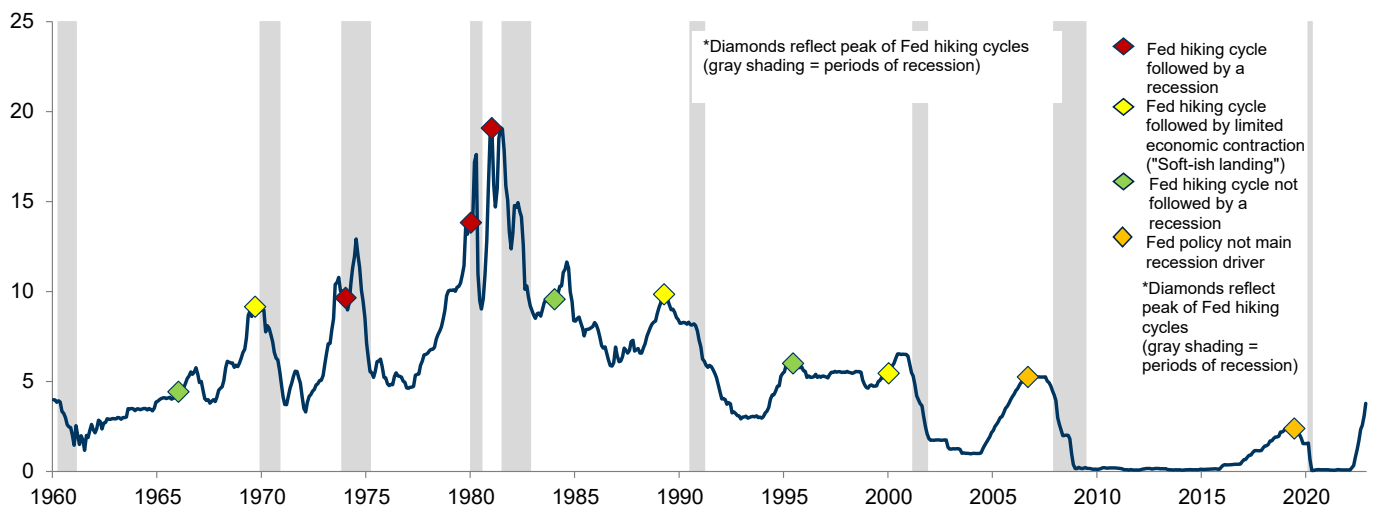
The Fed has a somewhat mixed track record in delivering perfect soft landings (i.e., no quarters of economic contraction)

| Tightening period | Change in RFF (bps) | NBER first recession month | Real GDP drop | Policy-induced recession? |
|-----------------------|---------------------|----------------------------|---------------|----------------------------------|
| Sep. 1965 - Nov. 1966 | 175 | -- | None | No |
| July 1967 - Aug. 1969 | 540 | Jan-70 | -0.6% | Soft-ish landing |
| Feb. 1972 - July 1974 | 960 | Dec-73 | -2.7% | Hard landing |
| Jan. 1977 - Apr. 1980 | 1300 | Feb-80 | -2.2% | Hard landing |
| July 1980 - Jan. 1981 | 1000 | Aug-81 | -2.1% | Hard landing |
| Feb. 1983 - Aug. 1984 | 315 | -- | None | No |
| Mar. 1988 - Apr. 1989 | 325 | Aug-90 | -1.4% | Soft-ish landing |
| Dec. 1993 - Apr. 1995 | 310 | -- | None | No |
| Jan. 1999 - July 2000 | 190 | Apr-01 | -0.1% | Soft-ish landing |
| June 2004 - June 2006 | 425 | Jan-08 | -3.8% | Policy not main recession driver |
| Oct. 2015 - Jan. 2019 | 225 | Mar-20 | -10.1% | Policy not main recession driver |
| Mar. 2022 - ? | ? | -- | -- | ? |

Source: Alan Blinder (2022), Goldman Sachs GIR.

This tightening cycle began with interest rates at historically low levels...

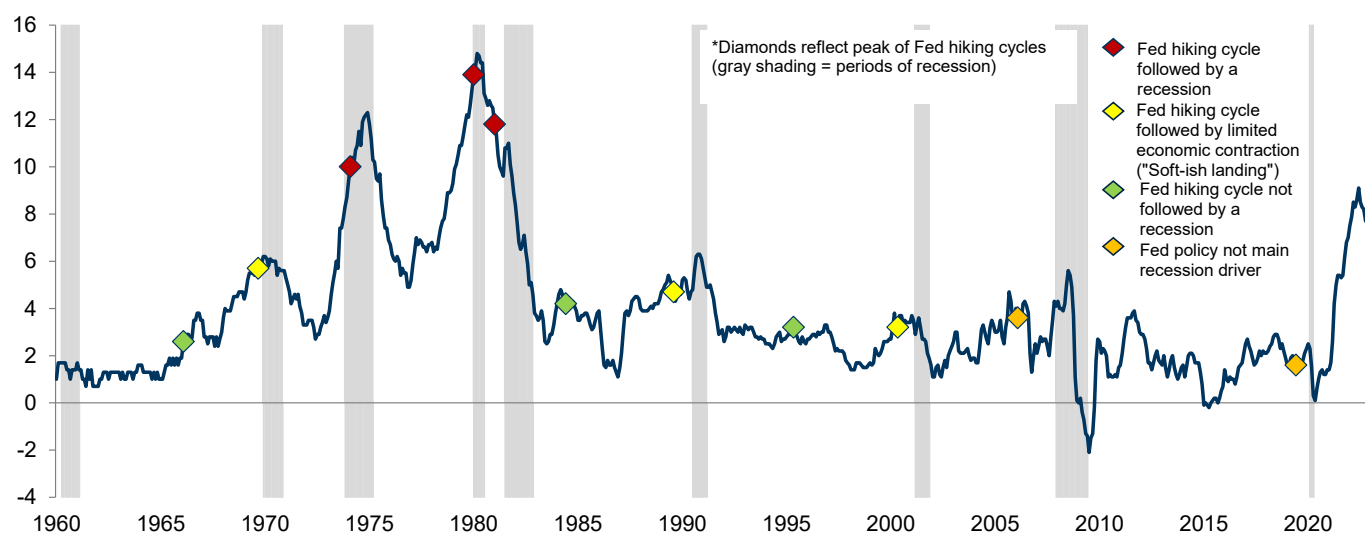
Fed funds effective rate, % pa



Source: Alan Blinder (2022), Goldman Sachs GIR.

...and with inflation more elevated than any time since the 1970s

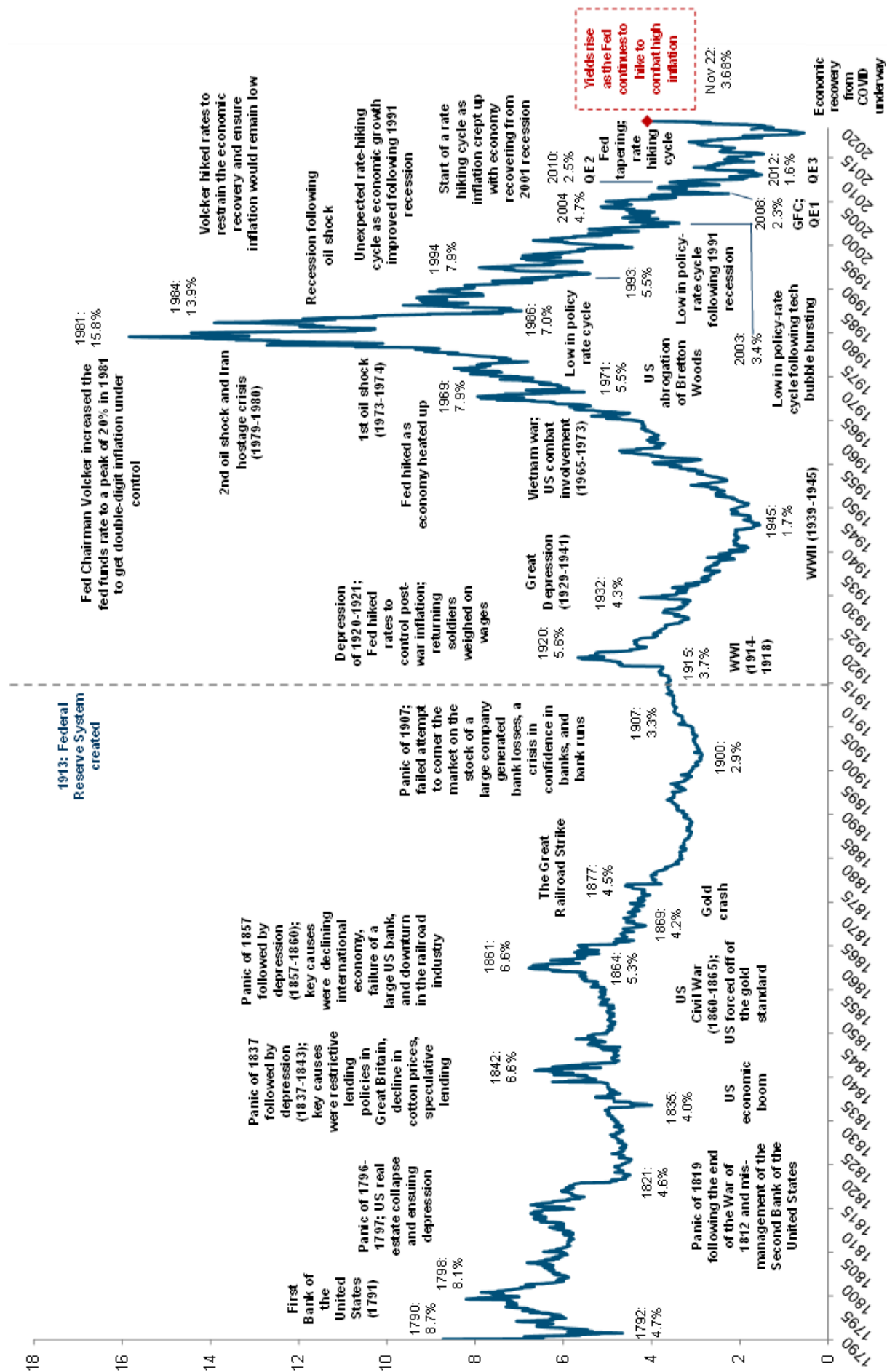
Headline CPI inflation, % yoy



Source: Alan Blinder (2022), Goldman Sachs GIR.

Soaring rates...

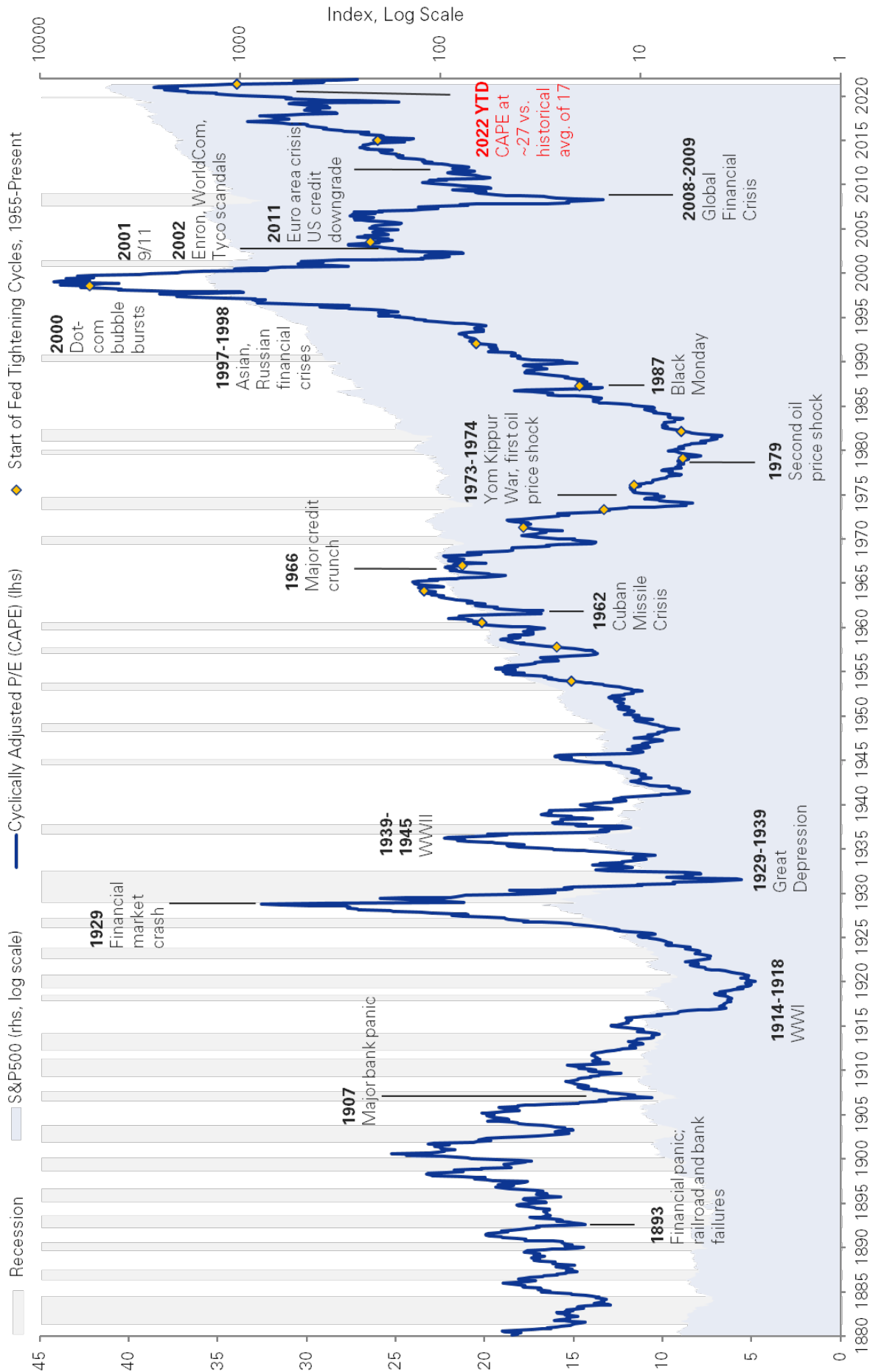
Long history of US 10-year Treasury yields monthly averages



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

...have led to a valuation reset

Long history of US P/E



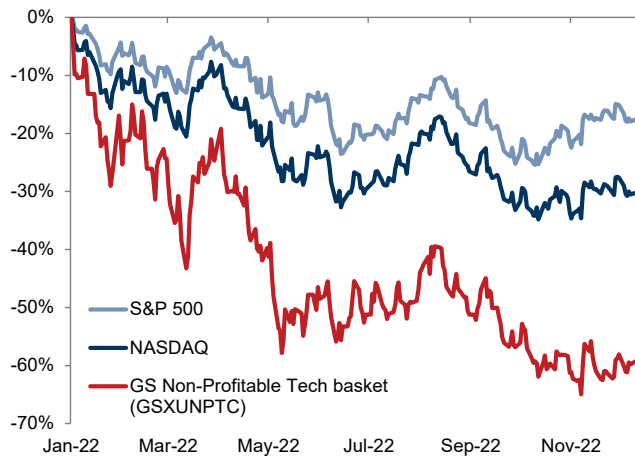
The CAPE uses a 10-year average of real S&P 500 reported earnings per share.

Source: Robert Shiller, BEA, NBER indicators retrieved from FRED, Federal Reserve Board, Goldman Sachs GIR.

...a drawdown in long duration assets

Unprofitable tech is down more than 50% YTD...

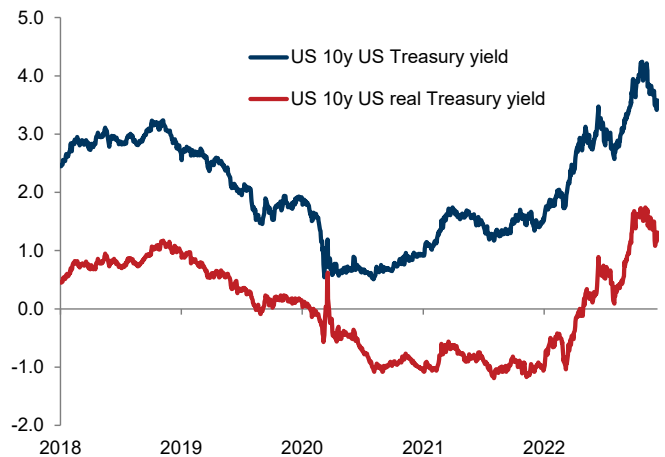
YTD price return, %



Note: GSXUNPTC is a GMD basket; data as of December 12, 2022.
Source: Bloomberg, Goldman Sachs, Goldman Sachs GIR.

...as real yields have risen sharply back into positive territory

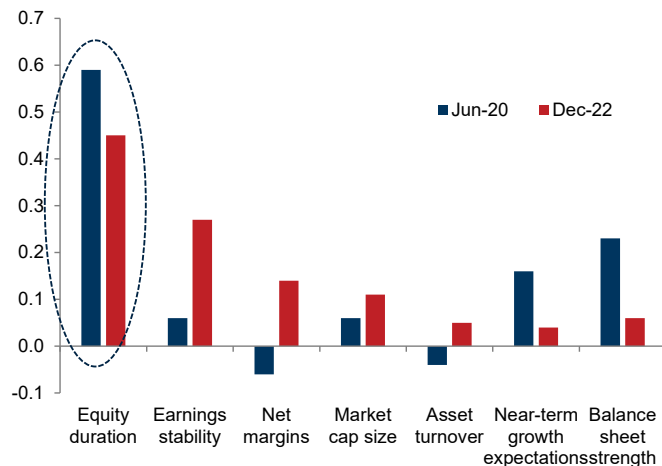
Yield, %



Source: Bloomberg, Goldman Sachs GIR.

Rising rates have weighed on longer duration equities...

Relative importance of variable in explaining S&P 500 stock FY2 P/E, standardized coefficient



Note: Relative importance isolated using cross-sectional regression of S&P 500 company valuations on duration, margins, turnover, leverage, earnings stability, market cap, and near-term growth expectations.
Source: Goldman Sachs GIR.

...and both profitable and unprofitable Growth have de-rated

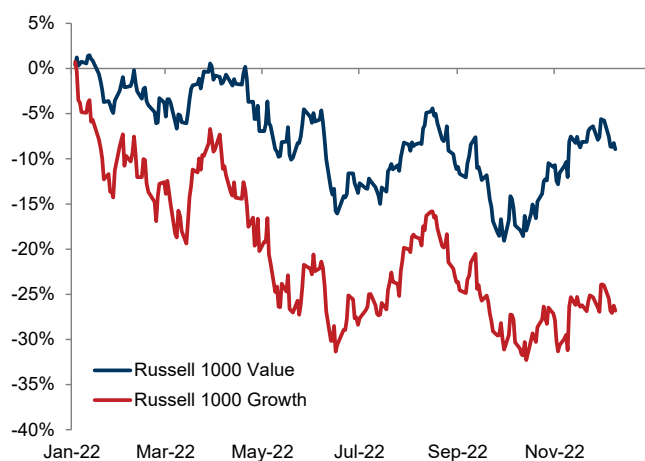
Average FY2 EV/sales based on stocks in Russell 3000, ratio



Source: FactSet, Goldman Sachs GIR.

Value has outperformed Growth amid the selloff...

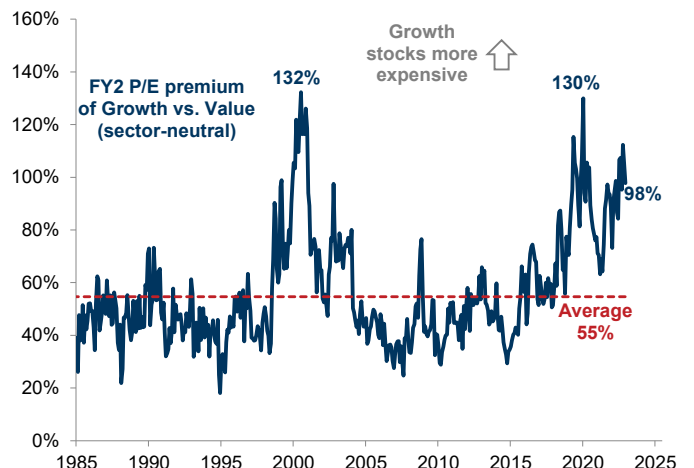
YTD price return, %



Source: Bloomberg, Goldman Sachs GIR.

...but still trades at a sizable discount relative to history

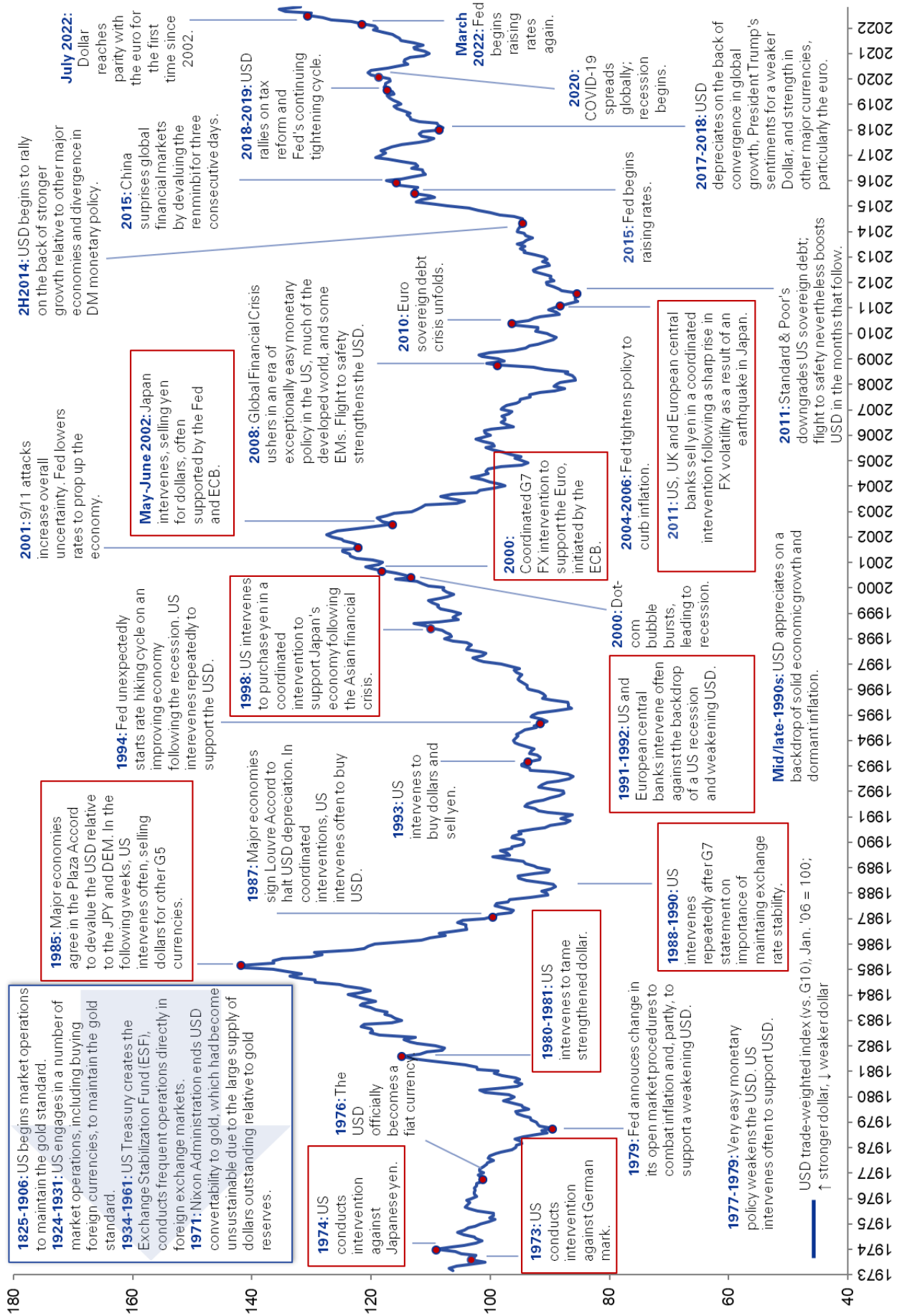
FY P/E premium of Growth vs. Value, %



Source: FactSet, Goldman Sachs GIR.

...as well as a resurgence in the Dollar...

Long history of the US Dollar



Source: Federal Reserve Board, Congressional Research Service, Haver Analytics, various news sources, Goldman Sachs GIR.

...and talk of FX intervention

How FX interventions work

Monetary authorities and/or central governments at times intervene in foreign exchange markets to influence the value of their currencies by buying and selling domestic and foreign currencies. Such interventions may be unilateral or coordinated with foreign authorities. Historical interventions have had various degrees of success in moving exchange rates consistent with the desired direction of the intervention.

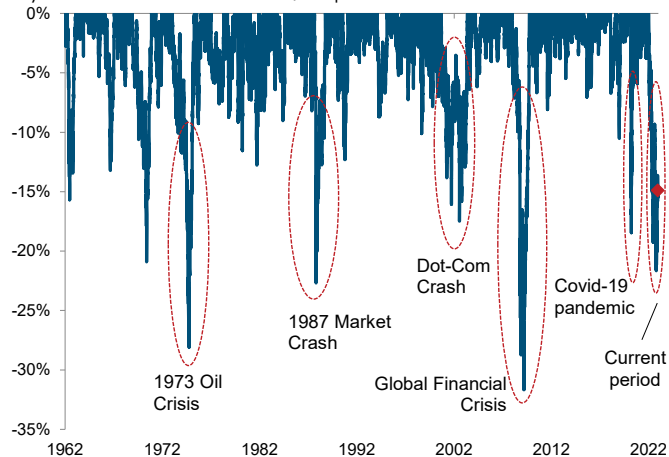
| | Who has the authority to intervene? | How is the intervention conducted? | When did authorities last intervene? | What is the size and composition of FX reserves? |
|--|---|--|--|---|
|  United States | The US Treasury has primary responsibility for intervening in the FX market. | FX interventions are executed by the New York Fed. When a decision is made to intervene, the New York Fed's Open Market Trading Desk buys/sells dollars/foreign currency. The foreign currencies used to intervene have historically come equally from FX reserves held in the Fed's System Open Market Account (SOMA) or the Treasury's Exchange Stabilization Fund (ESF). | Since 1996, the US has only intervened in FX markets on three occasions: (1) June 1998, purchasing yen in the context of Japan's plans to strengthen its economy, (2) Sept 2000, buying euros in a coordinated intervention initiated by the ECB out of concern about the potential implications of euro exchange rate movements on the global economy, and (3) March 2011, selling yen following a sharp rise in FX volatility as a result of an earthquake in Japan. | As of September 30, the ESF and SOMA together held around \$34bn in foreign currency reserves, split between euro- and yen-denominated assets. A significant portion of reserves are invested on an outright basis in government-backed securities, and some may be held on deposit at the BIS and foreign central banks. |
|  Euro area | The Eurosystem conducts FX operations in accordance with Articles 127 and 219 of the Treaty on the Functioning of the EU. | Interventions may be carried out either directly by the ECB (i.e., in a centralized manner) or by National Central Banks (NCBs) acting on behalf of the ECB on a "disclosed agency" basis (i.e., in a decentralized manner). Any intervention relating to another EU currency is carried out in close cooperation with the relevant non-Euro area NCB. | The Eurosystem has only intervened in the FX market in 2000—engaging in both coordinated and unilateral interventions to strengthen the euro—and in 2011—the coordinated intervention to sell yen after the earthquake in Japan. | As of end-Sept, the Eurosystem held around \$300bn and the ECB around \$55bn in foreign currency reserves, split between dollars, yen, and CNY. |
|  United Kingdom | The UK government and the BoE may both intervene in the FX market, authority granted to them by the May 1997 Letter from the Chancellor to the Governor of the BoE. | Interventions are carried out by the BoE, which acts as either an agent of the government or at its own discretion. When acting as an agent, the BoE buys/sells currency using the government's holdings of FX reserves, which are held in the Exchange Equalisation Account (EEA). The BoE has a separate pool of FX reserves that it uses when intervening on its own account. | The UK last intervened in the FX market in 2011, as part of the coordinated intervention to sell yen with other G7 central banks. Prior to that, the UK had not intervened in at least a decade. | As of end-Sept, the UK government held around \$97.6bn and the BoE around \$9.2bn in foreign currency reserves, split between dollars, euro, yen, and CNY. |
|  Japan | FX intervention is carried out under the authority of the Ministry of Finance (MOF). | The BoJ conducts FX interventions on behalf of and at the instruction of the MOF. The Foreign Exchange Fund Special Account (FEFSA), which falls under the jurisdiction of the MOF, is used for interventions. The MOF gives the BoJ specific instructions for FX intervention based on relevant market information provided by the BoJ. | Japan bought ¥2.8tn in September and ¥6.4tn in October. | As of end-Sept, Japan held around \$1.1tn in foreign currency reserves. |

Source: New York Fed, US Treasury, European Central Bank, Bank of England, Bank of Japan, IMF, Haver Analytics, Goldman Sachs GIR.

A bad year for balanced portfolios...

Balanced portfolios have experienced large drawdowns...

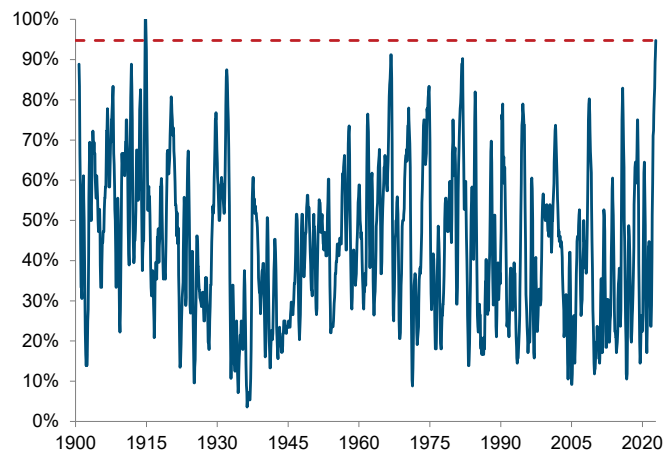
1-year drawdowns for a 60/40 portfolio



Daily returns, monthly rebalancing; data as of Dec 12, 2022.
Source: Haver Analytics, Datastream, Goldman Sachs GIR.

Cash continues to outperform most assets...

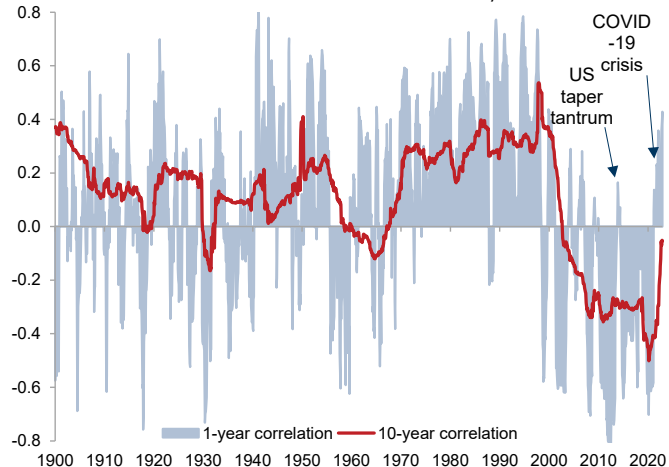
% of assets with 6m returns lower than T-Bills, 2m MA



Assets: S&P 500, SXXP, DAX, FTSE, TOPIX, MSCI EM, US 2y/10y/30y, Germany 10y, Japan 10y, UK 10y, gold, oil, copper, S&P GSCI, DJ Corp, USD IG, USD HY.
Source: Haver Analytics, Datastream, Goldman Sachs GIR (data as of 12/12/22).

Equity/bond correlations have turned more positive, meaning bonds are providing less of a hedge to equities

Correlation between S&P 500 returns and 10y UST returns

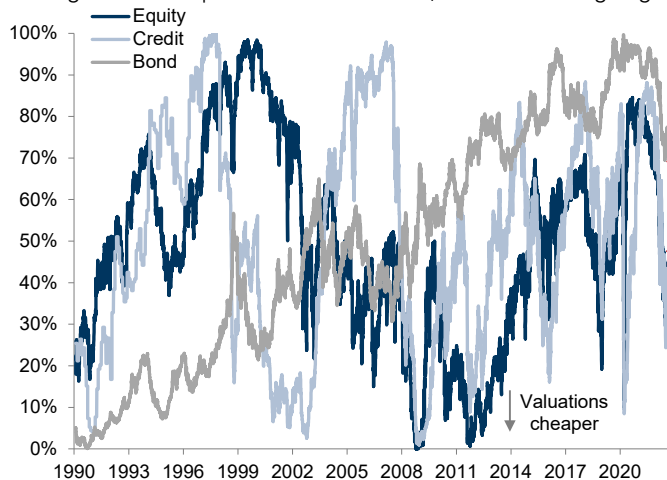


Source: Datastream, Goldman Sachs GIR (data as of Dec 12, 2022).

Special thanks to GS portfolio strategist Andrea Ferrario for charts.

...and valuations have fallen, especially for risky assets

Average valuation percentile since 1990, 4-week moving avg



Equity: NTM P/E of S&P 500, MSCI Europe, MSCI EM, Credit: spread of US HY, IG, EUR HY, IG, EMBI, Bond: 10y yield of US, Germany, Japan; data as of 12/12.
Source: Datastream, I/B/E/S, Goldman Sachs GIR.

...and real assets are still outperforming balanced portfolios

Total return performance

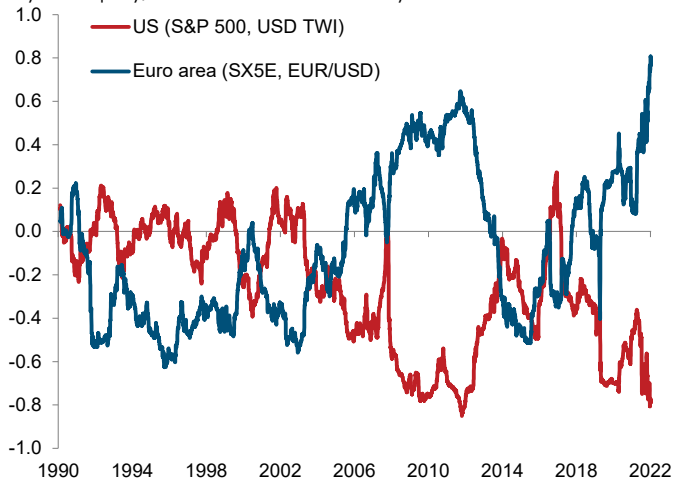


Data as of Dec 12, 2022.

Source: Bloomberg, Goldman Sachs GIR.

Equity/FX correlations have remained more positive

1-year equity/FX correlation of weekly returns



Source: Datastream, Stoxs, Goldman Sachs GIR (data as of Dec 12, 2022).

...and a brutal year for crypto

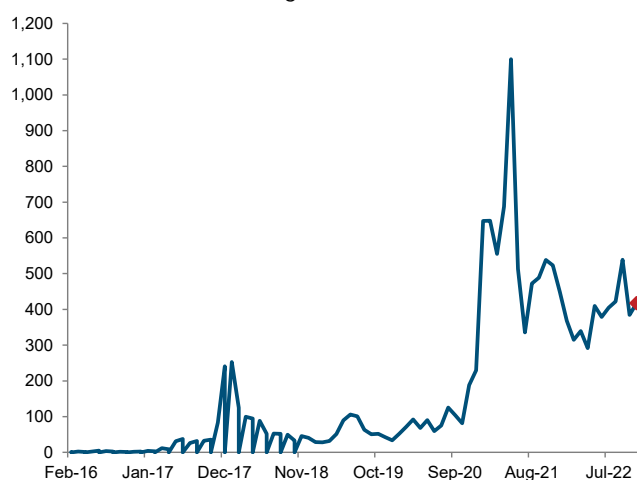
Crypto's total market cap has fallen by around 70% since its peak in May 2021, to levels below \$900bn, a correction roughly in line with that of the first 'crypto winter' in 2018

Total crypto market cap, \$bn



Note: Includes all crypto coins.
Source: Coin Dance, Goldman Sachs GIR.

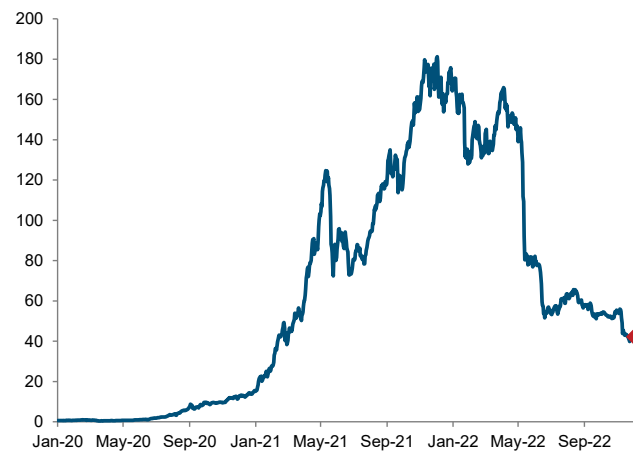
Bitcoin and ether volumes have fallen by roughly 65% since mid-2021, compared with around 95% during the first winter Trusted BTC & ETH trading volumes, \$bn



Note: Trusted volumes represents the sum of all volume from the spot markets of a set of trusted exchanges, in units of US dollars.
Source: Coin Metrics, Goldman Sachs GIR.

Leverage within the crypto ecosystem, as proxied by total value locked (TVL) in decentralized finance, is nearly 80% off its 2021 highs, at around \$42bn

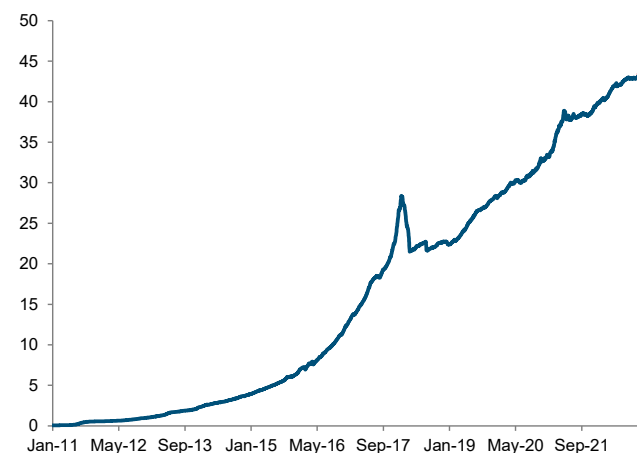
Decentralized finance TVL, \$bn



Note: TVL measures the overall value of crypto assets deposited in decentralized finance protocols.
Source: DeFiLlama, Goldman Sachs GIR.

The recent FTX turmoil triggered a temporary surge in users moving their assets off exchange wallets

Unique BTC wallet addresses, number, millions

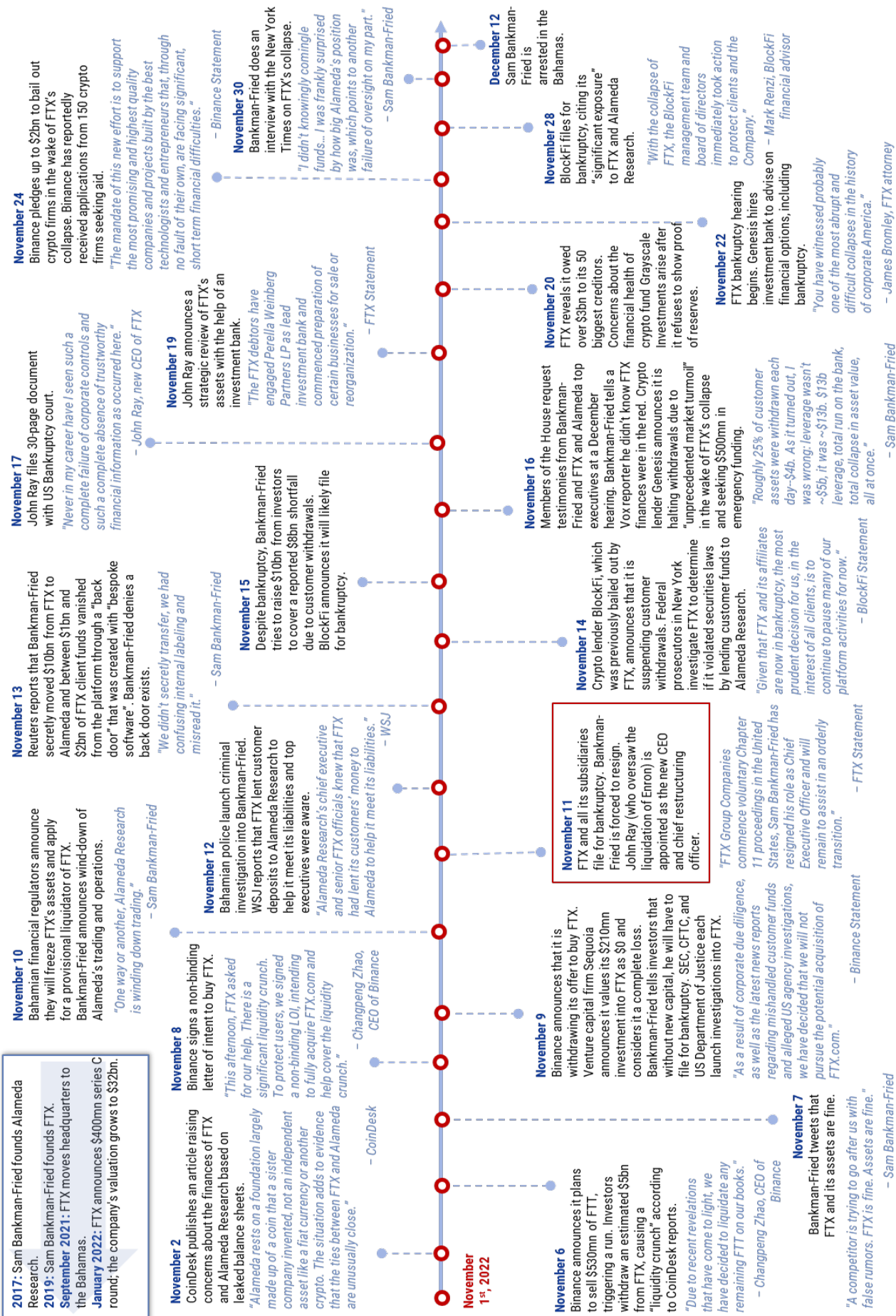


Note: Unique BTC wallet addresses are those that have >0 native currencies; in general, the higher the number of unique addresses, the higher the user count.
Source: Coin Metrics, Goldman Sachs GIR.

Special thanks to Will Nance, GS Equity Research, for charts.

...made worse by FTX's collapse

Chronology of a crypto crisis



Source: CoinDesk, Reuters, Twitter, WSJ, various news sources, Goldman Sachs GIR.

...which put crypto regulation in focus

A snapshot of global crypto regulation

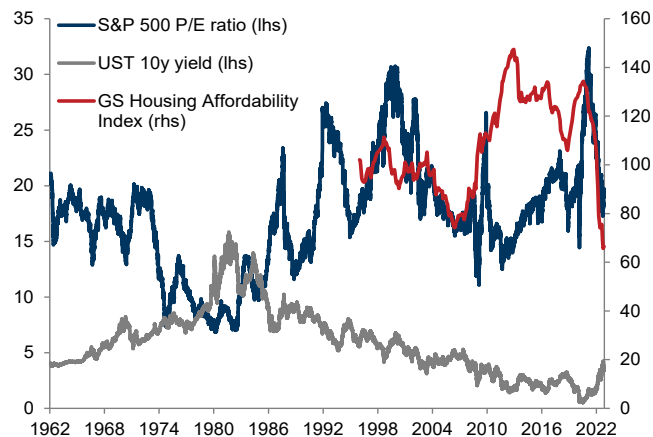
| | Legal status and regulation of digital assets | Regulation of cryptocurrency exchanges |
|--------------|---|---|
| Americas | The Bahamas | <ul style="list-style-type: none"> Exchanges, classified as "digital asset businesses", are also regulated under DARE. DARE stipulates who may participate in the digital assets space. Exchanges must have appropriate internal controls and a risk framework in place, meet a minimum level of capital, strictly adhere to anti-money laundering and counter-terrorist financing (AML/CFT) laws, and maintain appropriate record-keeping measures of clients' information and digital asset holdings. |
| | Canada | <ul style="list-style-type: none"> All cryptocurrency exchanges are required to register with the Financial Transactions and Reports Analysis Centre of Canada (FinTRAC). Crypto exchanges are regulated in the same way as money services businesses. Pursuant to a 2019 amendment to the Proceeds of Crime (Money Laundering) and Terrorist Financing Act (PCMLTFA), they are subject to the same due diligence and reporting requirements. All financial institutions and money services businesses are required to keep a record of all cross-border crypto transactions under the Virtual Currency Travel Rule. |
| | LatAm | <ul style="list-style-type: none"> Cryptocurrency exchanges have yet to formally regulate crypto exchanges. Mexico regulates exchanges through the Law to Regulate Financial Technology Institutions (LRITF), which imposes registration and reporting requirements. |
| Europe | United States | <ul style="list-style-type: none"> Cryptocurrency exchanges (which FinCEN considers "money transmitters") are legal and fall under the regulatory scope of the Bank Secrecy Act (BSA), which means that cryptocurrency exchange service providers must register with FinCEN, implement an AML/CFT program, maintain appropriate records, and submit reports to the authorities. FinCEN also requires that exchanges comply with the Travel Rule, gathering and sharing information about the originators and beneficiaries of all cryptocurrency transactions over a certain monetary threshold. |
| | EU | <ul style="list-style-type: none"> Cryptocurrency exchanges are currently not regulated at the EU level, although exchanges must comply with EU AML laws under 5AMLD and 6AMLD. In certain member states, exchanges must register with the respective national authorities (the Financial Supervisory Authority in Germany, the Ministry of Finance in Italy, etc.) If and when MiCA is passed into law, it will subject crypto exchanges to consumer protection, transparency, and governance standards, and hold exchanges responsible for the loss of customer assets due to fraud, cyberattack, or negligence. |
| | Switzerland | <ul style="list-style-type: none"> Cryptocurrency exchanges must obtain a license from FINMA to operate. To obtain the license, firms must be authorized to conduct business in the country, set internal regulations in accordance and fully comply with the Anti-Money Laundering Act (AMLA), and establish an appropriate organizational structure. |
| | United Kingdom | <ul style="list-style-type: none"> Cryptocurrency exchanges must register with the FCA and comply with AML/CFT reporting obligations. |
| Asia-Pacific | Australia | <ul style="list-style-type: none"> Crypto exchanges operating in the country are required by the Australian Transaction Reports and Analysis Centre (AUSTRAC) to register, identify and verify users, maintain records, and comply with AML/CFT reporting mandates. An Oct 2021 report from the Senate Select Committee has proposed a new licensing regime for crypto exchanges in an effort to better regulate the purchase and sale of crypto assets by consumers (the bill has not yet been adopted into law). |
| | China | <ul style="list-style-type: none"> Cryptocurrency exchanges and the purchase and sale of virtual currencies are currently illegal. |
| | India | <ul style="list-style-type: none"> In 2018, the RBI banned financial institutions from "dealing with or settling virtual currencies", but in 2020 the Supreme Court lifted the ban after declaring it unconstitutional. |
| | Japan | <ul style="list-style-type: none"> Pursuant to the PSA, exchange service providers must be registered with the Financial Services Agency (FSA), with a minimum capital requirement, satisfactory organizational structure and operational systems, and comply with AML/CFT laws and cybersecurity requirements. Crypto exchanges must ensure the safe management of information, provide sufficient information to and protect customers, and properly segregate customer funds. |

Note: Table does not constitute an exhaustive list of all countries/regions that regulate crypto.

Source: ComplyAdvantage, Government of the Bahamas, Canadian Securities Administrators, CFTC, FinCEN, IRS, SEC, European Council, Dow Jones, London School of Economics, UK Financial Conduct Authority, Australian Securities and Investments Commission, Australian Taxation Office, Dezan Shira & Associates, PBoC, CoinDesk, Cointelegraph, World Economic Forum, Global Legal Insights, Thomson Reuters, GS GIR.

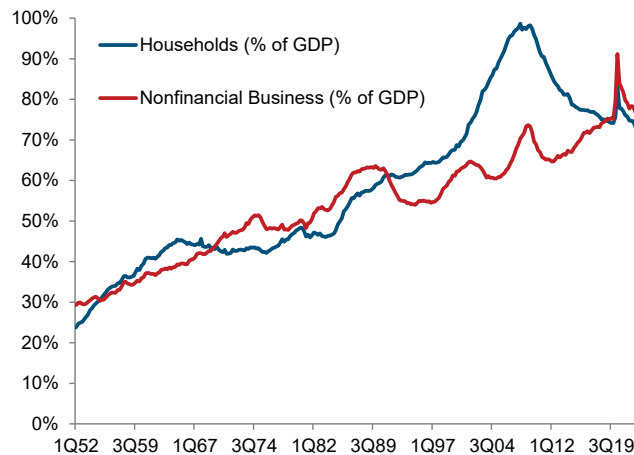
The overarching worry: financial stability

In the US, asset prices have generally fallen amid macro challenges, but housing affordability has declined sharply
Ratio and yield (lhs), index (rhs)



Note: Higher levels for Housing Index represent increasing affordability.
Source: Bloomberg, S&P Dow Jones Indices, FRED, Goldman Sachs GIR.

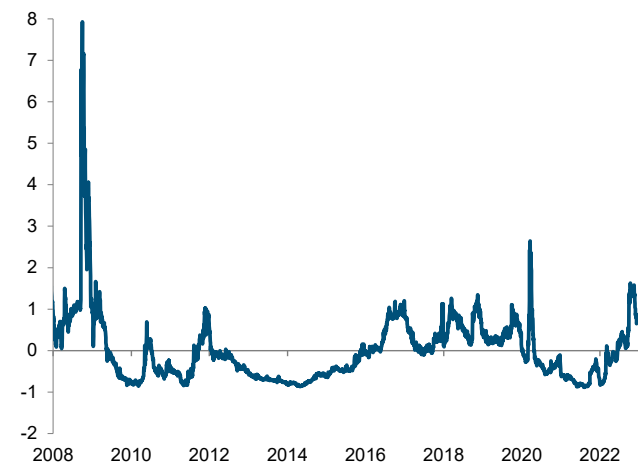
US households' debt-to-GDP ratio has declined, while businesses' debt-to-GDP ratio has generally increased
Debt of select nonfinancial sectors as a share of GDP



Note: Households includes nonprofits.
Source: FRB's Financial Accounts of the United States, Goldman Sachs GIR.

Stresses in the funding market have continued to ease from their recent peak

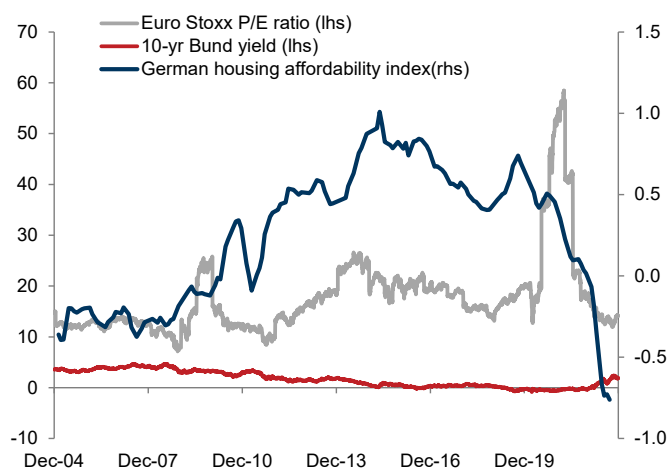
GS Funding Market Subindex, Z-score



Source: Goldman Sachs GIR.

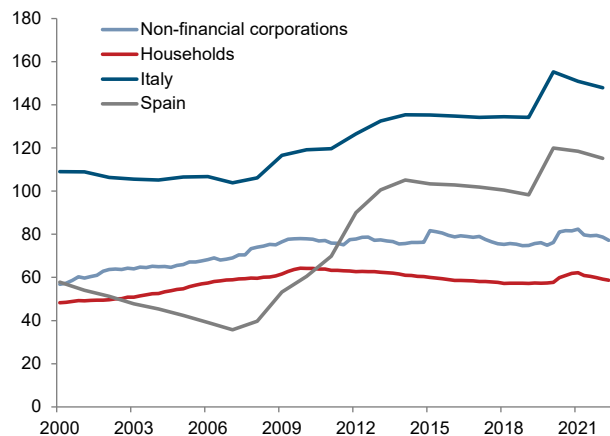
In the Euro area, bund yields have increased and housing affordability has decreased significantly

Ratio and yield (lhs), Index (rhs)



Source: ECB, Goldman Sachs GIR.

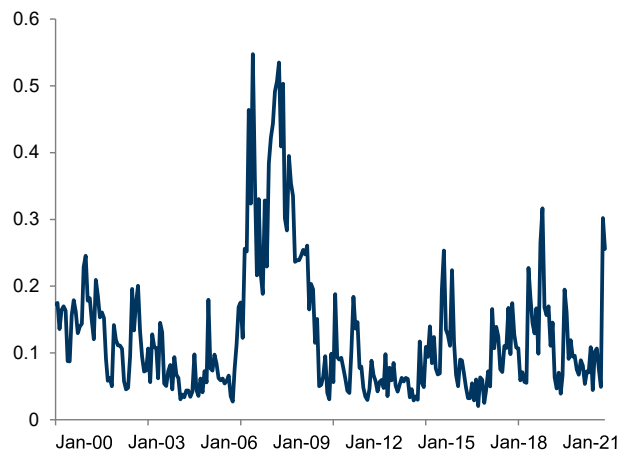
Euro area household and corporation debt-to-GDP ratios have decreased; high debt-to-GDP ratios make some Euro area sovereigns more vulnerable
Debt-to-GDP ratio, % of GDP



Source: ECB, Haver, Goldman Sachs GIR.

In the UK, financial stresses have increased recently, nearing levels seen around COVID-19

Country level index of financial stress UK, index



Note: index includes six financial stress measures that capture three financial market segments: equity markets, bond markets and foreign exchange markets.
Source: ECB Europa, Goldman Sachs GIR.



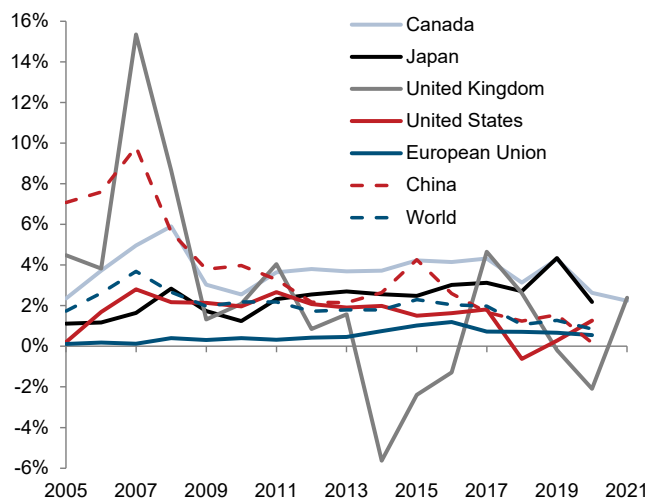
Theme III:
Larger trends sure to shape the
years ahead

*"Amid all that, we examined **larger trends sure to shape the years ahead**, China's continued evolution under Xi, and globalization that arguably hangs by a thread."*

Deglobalization underway?

FDI out of major economies has declined or stagnated...

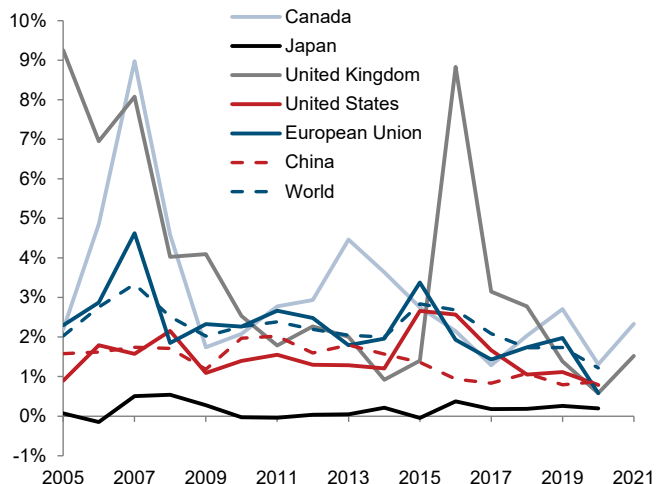
Foreign direct investment outward flows, % of GDP



Source: OECD Foreign Direct Investment Statistics, Goldman Sachs GIR.

...as has FDI into major economies since 2005

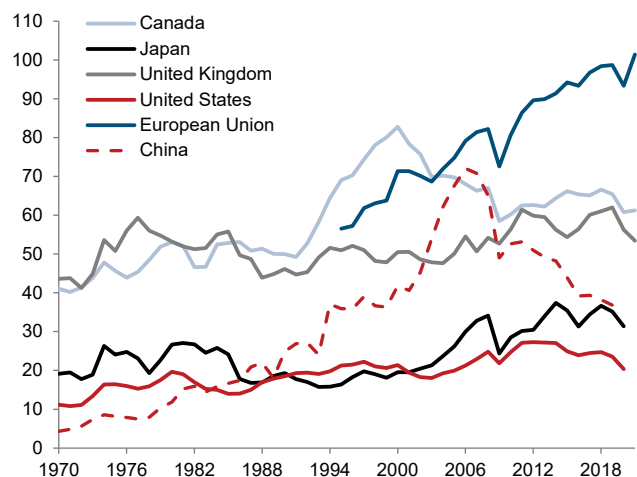
Foreign direct investment inward flows, % of GDP



Source: OECD Foreign Direct Investment Statistics, Goldman Sachs GIR.

Trade has risen in some economies, and fallen in others...

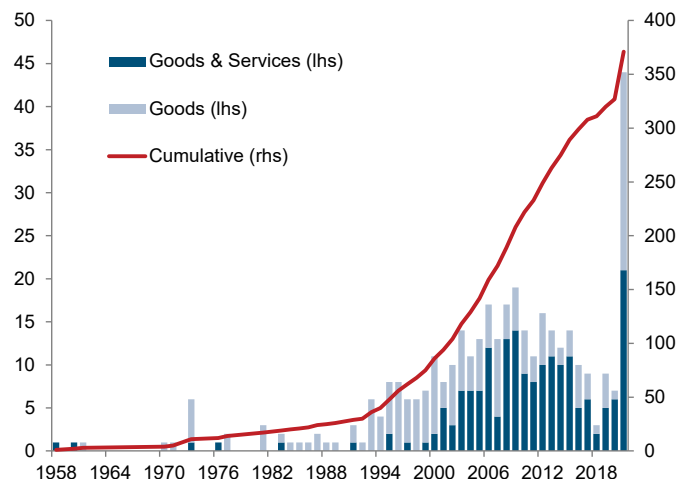
Trade in goods and services, % of GDP



Source: OECD, Goldman Sachs GIR.

...as global trade agreements have grown to >350

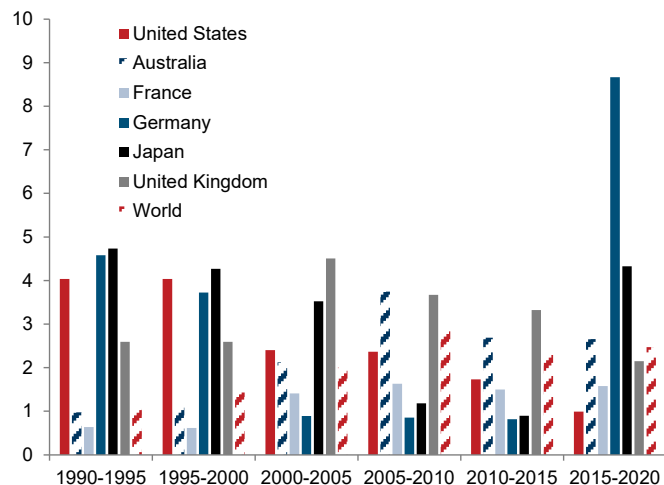
of Regional Trade Agreements in force, by year of entry



Source: WTO Regional Trade Agreements Database, Goldman Sachs GIR.

Immigrant flows have remained low across many DMs

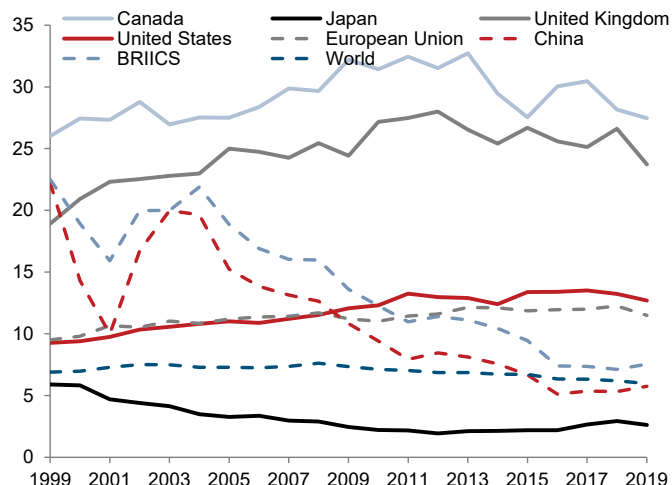
Annual rate of change of the migrant stock by destination, %



Source: UN Department of Economic and Social Affairs, Goldman Sachs GIR.

Global cooperation in science/tech has stagnated or waned

% of patent apps filed under the PCT with foreign co-inventors

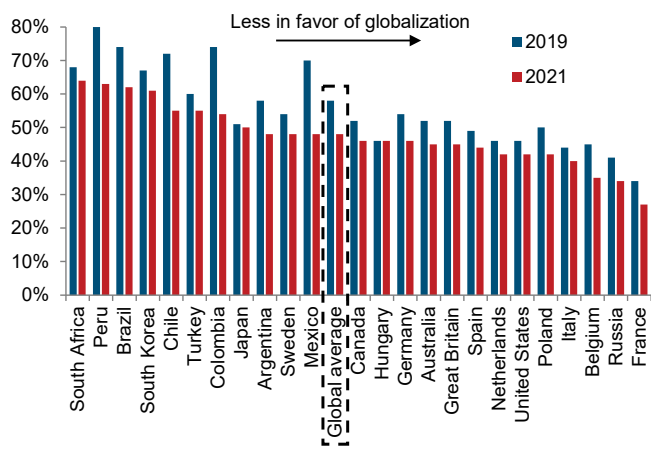


Source: OECD Patent Database, Goldman Sachs GIR.

Shifting attitudes towards globalization

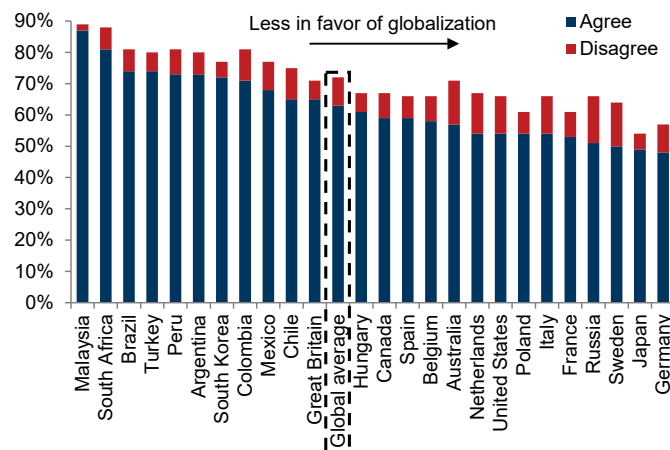
Positive sentiment about globalization has declined...

% of respondents that agree with the statement "overall, globalization is a good thing for my country"



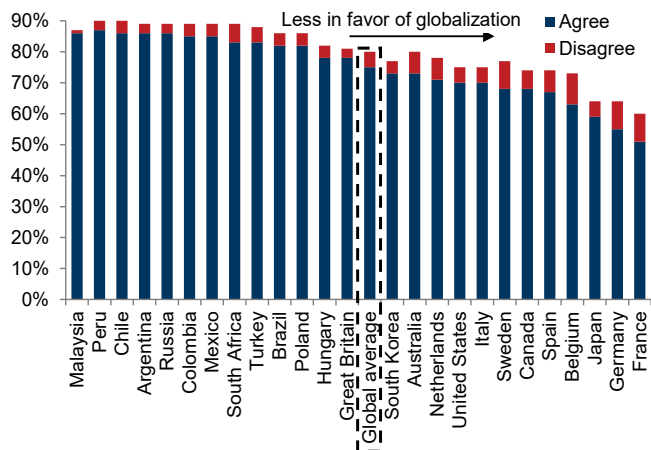
...but majorities in many countries support foreign investment

% of respondents that agree/disagree with the statement "investment by global companies in my country is essential for our growth and expansion"



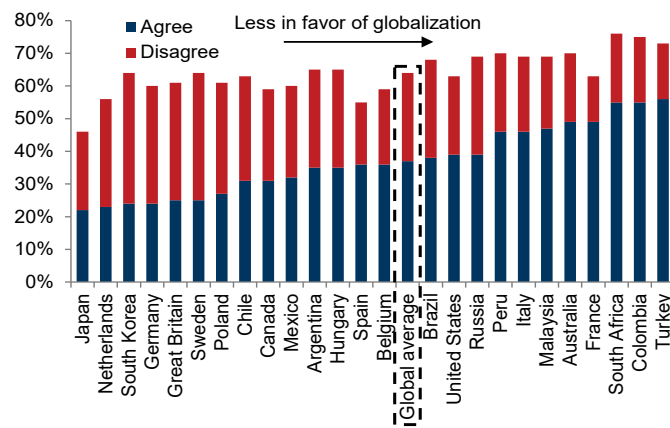
Trade expansion is viewed as a positive by most...

% of respondents that agree/disagree with the statement "expanding trade is a good thing"



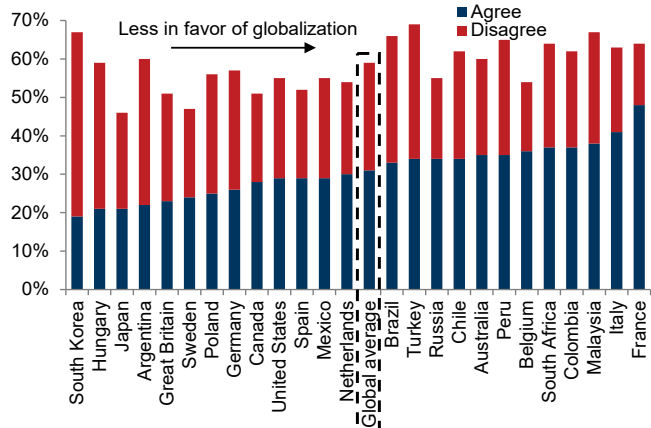
...but more favor more barriers to trade than oppose them

% of respondents that agree/disagree with the statement "there should be more trade barriers to limit imports of foreign goods and services in my country"



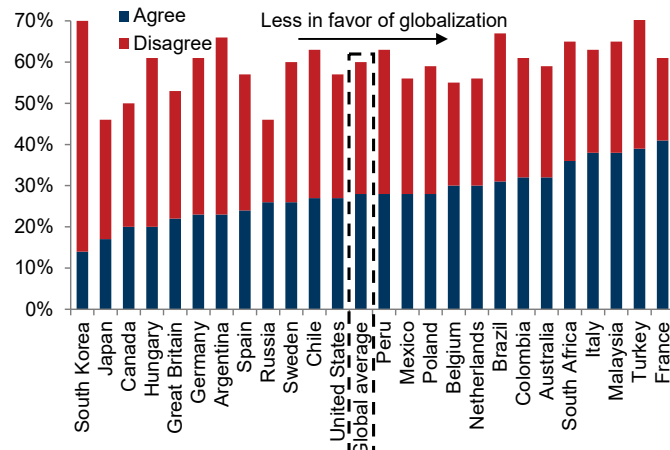
Public opinion is divided as to globalization's impact on the implementation of effective economic policies...

% of respondents that agree/disagree with the statement "globalization prevents my country's government from implementing effective economic policies"



...as well as to its impact on the functioning of democracy

% of respondents that agree/disagree with the statement "globalization prevents democracy in my country from functioning well"

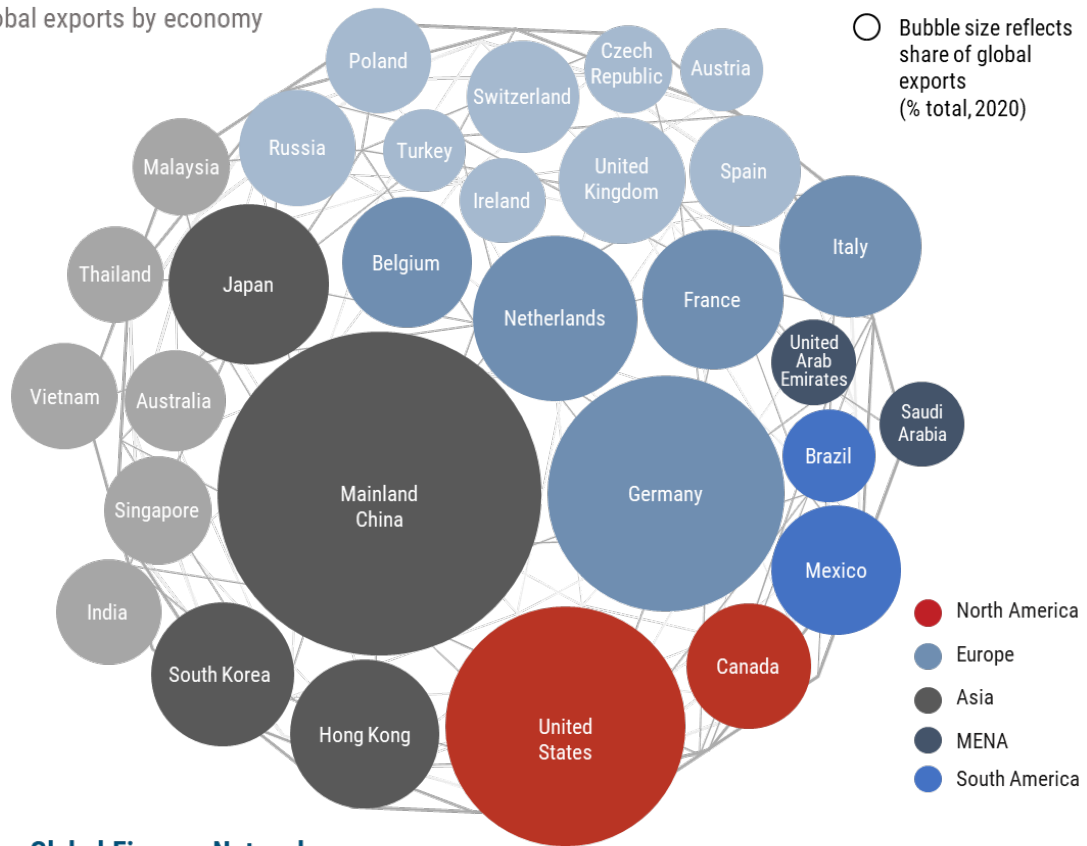


Source for all exhibits: Ipsos World Opinion on Globalization and International Trade in 2021 (25-country survey for the WEF), Goldman Sachs GIR.

Networks of global trade and finance

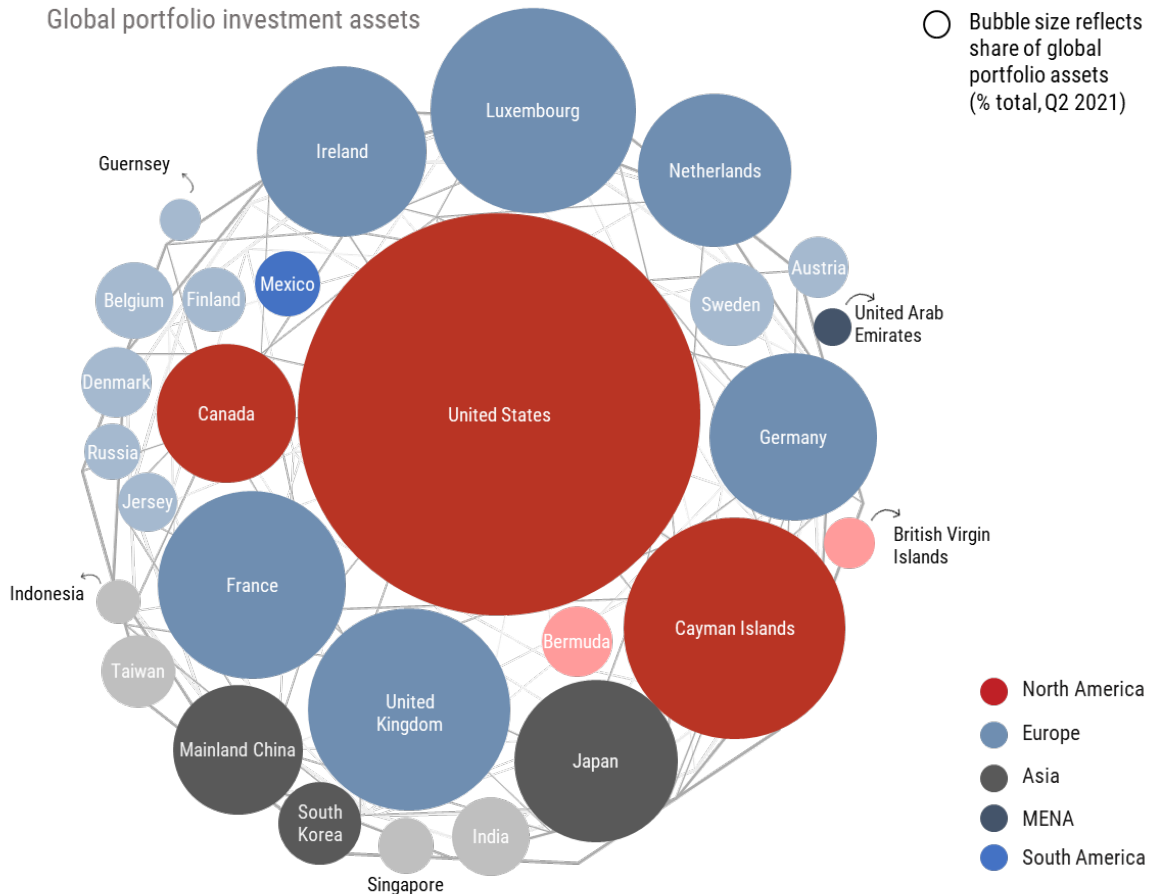
The Global Trade Network

Global exports by economy



The Global Finance Network

Global portfolio investment assets



Note: Global portfolio investment assets here reflect all financial claims (debt/equity and excluding FDI) of the world on the economy in question and provide a rough proxy for an economy's weight in the global financial system. Gray lines aren't a reflection of the level of bilateral trade or portfolio investment.
Source: Methodology derived from "The Global Financial Cycle", Rey and Miranda-Agrippino (2021), IMF, Goldman Sachs GIR.

China's new Politburo and PSC

Politburo Standing Committee (PSC)

The PSC includes the highest ranking officials in the Chinese Communist Party (CCP). There are currently seven members, with four of them being newly appointed at the 20th Party Congress. However, **the committee size has fluctuated over time.**

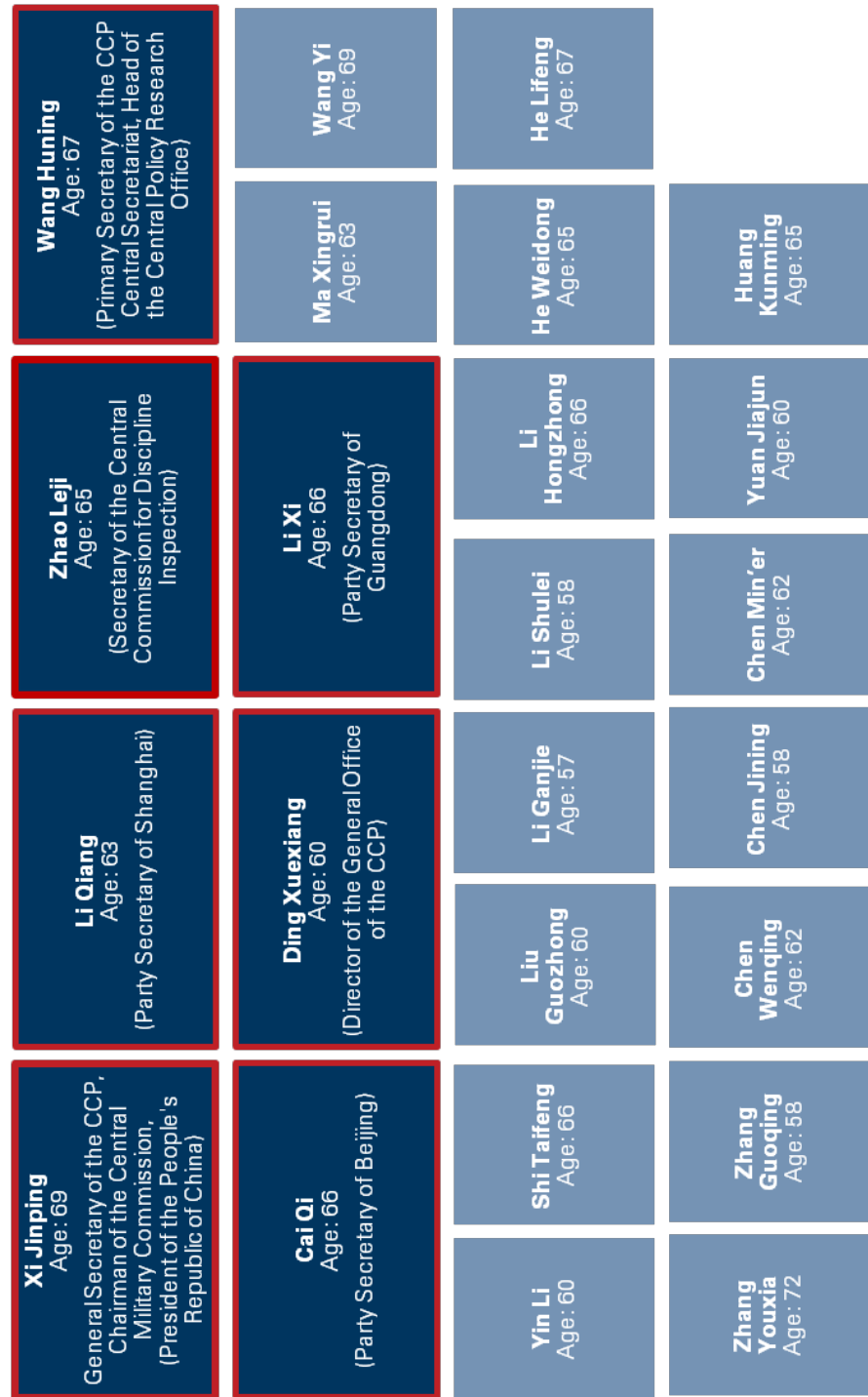
General Secretary

The head of the Communist Party and highest ranking official in China. Historically, presidents have served a maximum of two five-year terms, but the term limit was abolished in 2018. **Xi was granted a third term at the 20th Party Congress, in a break with historical norms.**



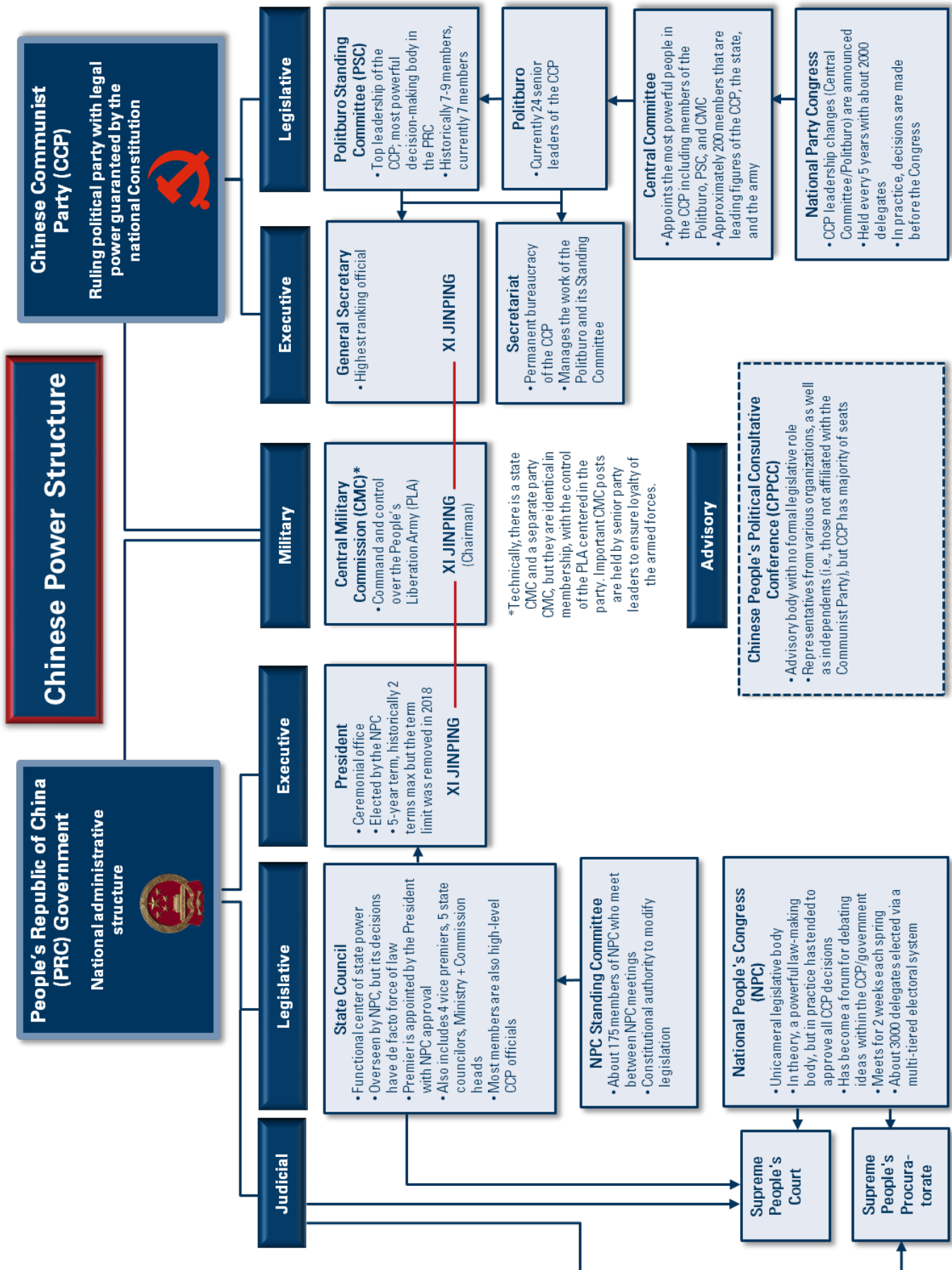
Politburo

Composed of 24 members, the Politburo is the chief political decision-making body in China. The number of the Politburo members declined marginally from 25 to 24 after the 20th Party Congress. Under traditional rule, officials over the age of 67 are expected to retire, though there were a few exceptions at the 20th Party congress.



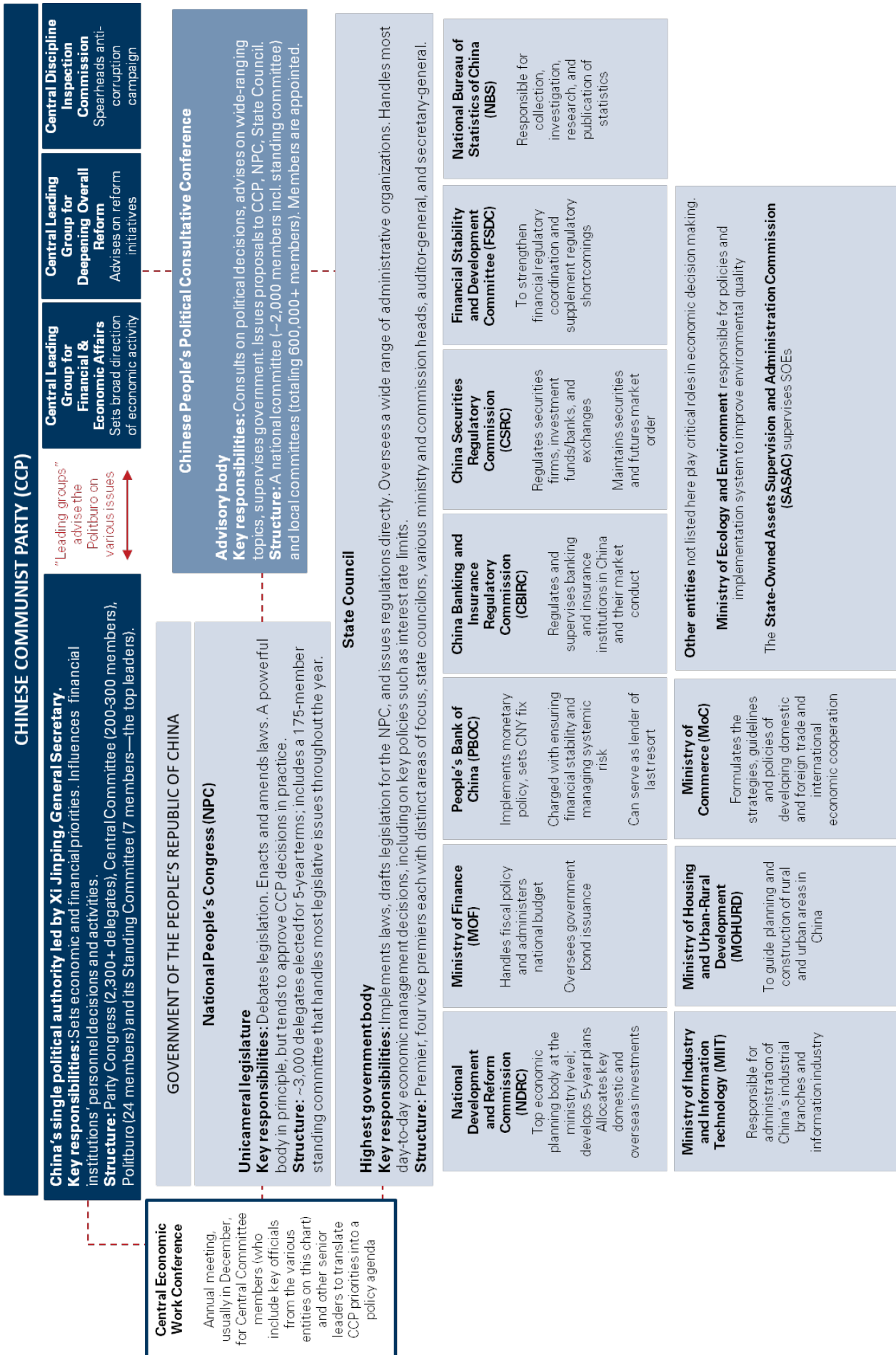
Note: (1) refers to roles before the 20th Party Congress. Source: Asia Society Policy Institute, Jamestown Foundation, www.gov.cn, Goldman Sachs GIR.

The Chinese power structure



Source: Congressional Research Service, US-China Business Council, Congressional Executive Commission on China, iStockPhoto, Goldman Sachs GIR.

Who calls the economic shots in China?



Source: China State Council, Goldman Sachs GIR.

China's longer-term woes: property sector...

What's going on?

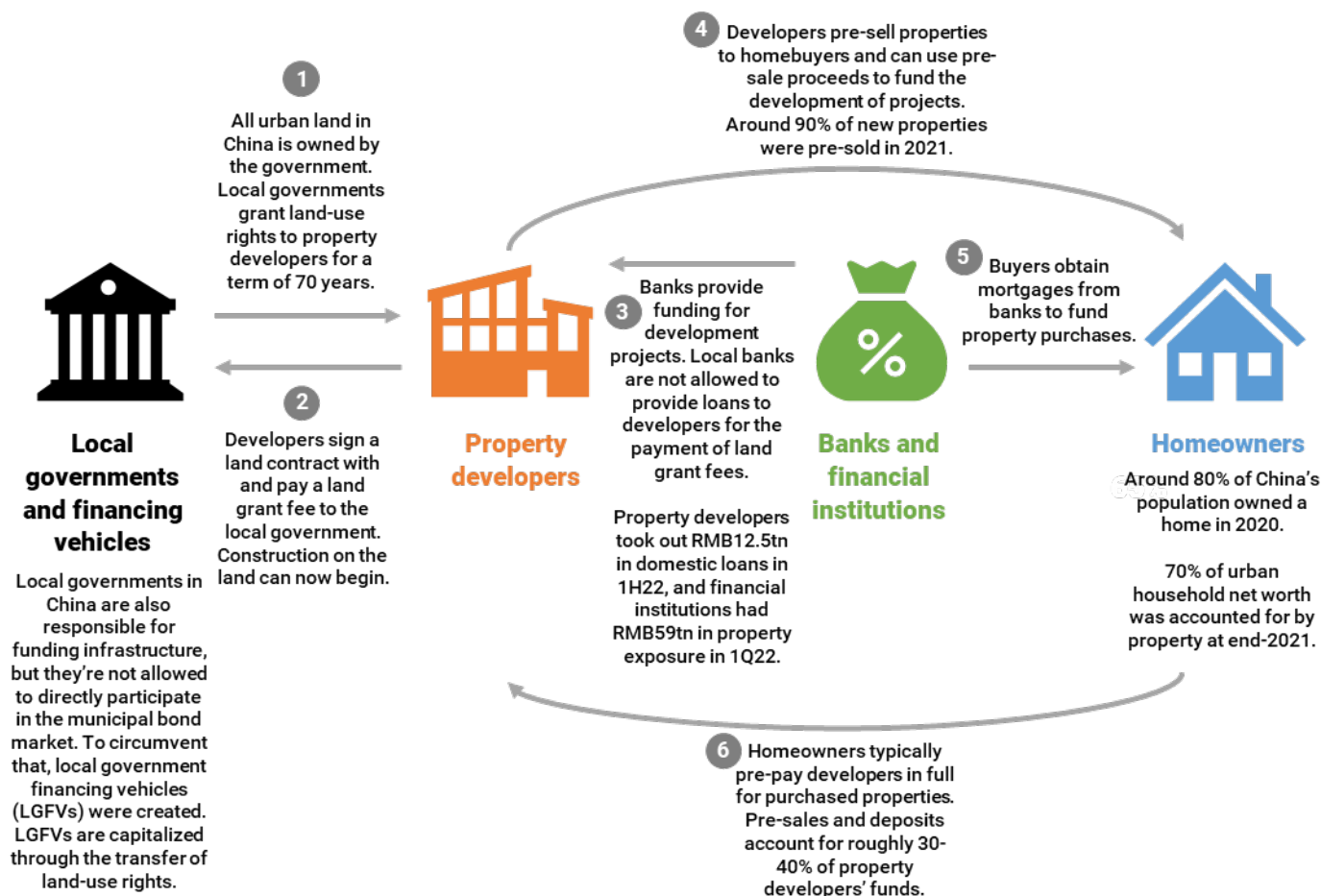


China's property sector has long served as an important engine of growth for the economy. As the country urbanized over the past few decades and household incomes grew, housing construction increased at a double-digit annual pace in the 2000s and even faster after the Global Financial Crisis, when policymakers eased policy to counter downside pressures from abroad.

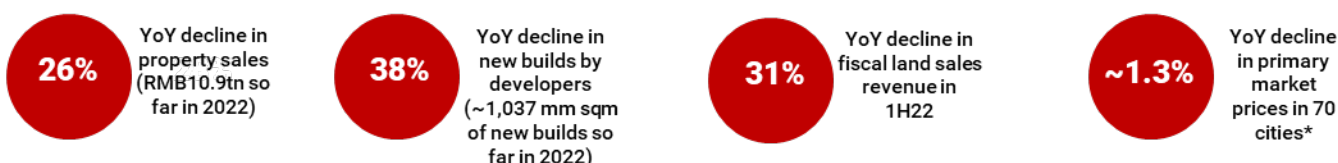
This growth, however, came at the cost of higher leverage. To stem that and prevent it from negatively affecting the economy, in 2020, Chinese regulators imposed "three red lines" on developers—criteria they must meet to apply for financing: (1) a total liability to asset ratio below 70%, (2) a net gearing ratio below 100%, and (3) a cash to short-term debt ratio >100%. Constraints were also imposed on individual banks' property lending.

Credit conditions tightened sharply as a result, leading to a large slowdown in activity levels in the property sector. Completions fell as developers struggled to obtain financing, and homebuyers—who typically fully pre-pay developers for homes—started refusing to pay mortgages on homes that had yet to be delivered, putting further pressure on developers, and on the banks and local governments with exposure to them.

How does China's property market work?



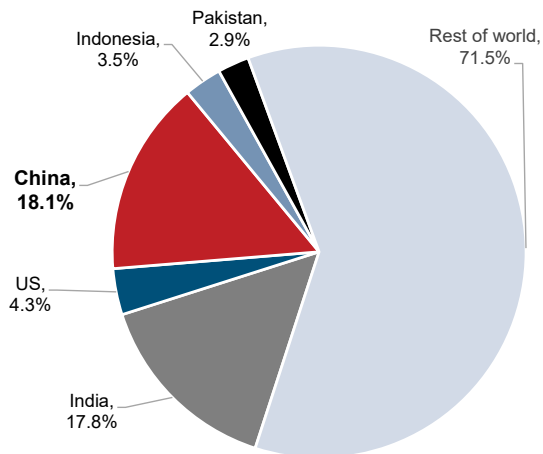
The crisis in numbers



*NBS 70-city primary-market weighted average property price change in November. Source: Baker McKenzie, Dezan Shira & Associates, NBS, PBOC, CREIS, CRIC, Goldman Sachs GIR. Special thanks to the GS real estate and banks analysts who provided the data.

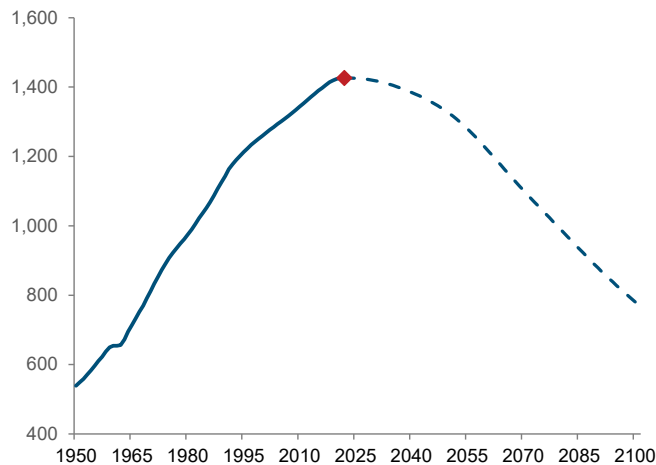
...and demographics

China accounts for over one-sixth of the world's population...
Five most populous countries, % of total world population



Note: Total population as of January 1, 2021 (latest data available).

...but China's population is projected to decline after this year
Population, millions of people



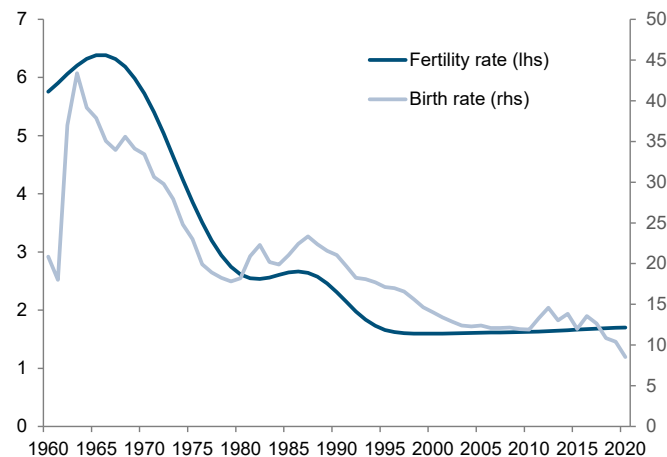
Note: Dashed line represents UN medium-variant projections, which assume a decline of fertility for countries where large families are still prevalent, a slight increase of fertility in several countries where women have fewer than two live births on avg over a lifetime, and continued reductions in mortality at all ages.

A history of population planning policies in China...

| Policy | Announced/Implemented | Abolished | Background/Description |
|--------------------------------|-----------------------|-----------|--|
| Later, Longer, Fewer | Early 1970s | -- | Promoted later marriage, longer gaps between children, and fewer children to control the country's population |
| One-child policy | 1979 | 2015 | Designed to put a brake on population growth amid severe shortages of natural resources, capital, and goods |
| Two-child policy | 2016 | 2021 | Enacted in the face of slowing population growth, an ageing population, and a shrinking workforce |
| Three-child policy | May 2021 | July 2021 | Designed to boost the country's birth rate and slow population decline after the two-child limit failed to do so |
| All family size limits removed | July 2021 | | All family size limits and corresponding penalties removed |

...has resulted in a sharp decline in fertility and birth rates...

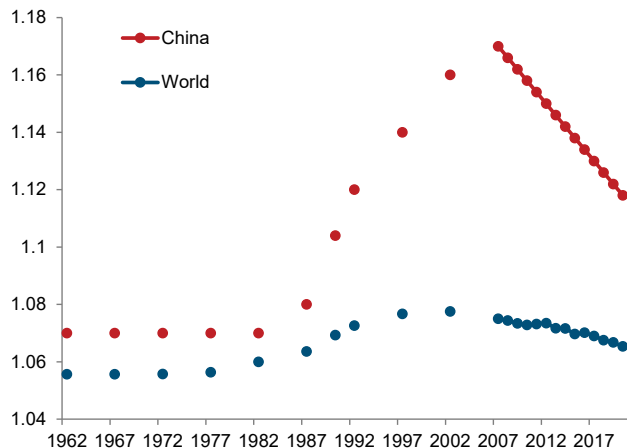
Fertility rate (lhs), live births per 1,000 population (rhs)



Note: Fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with age-specific fertility rates of the specified year.

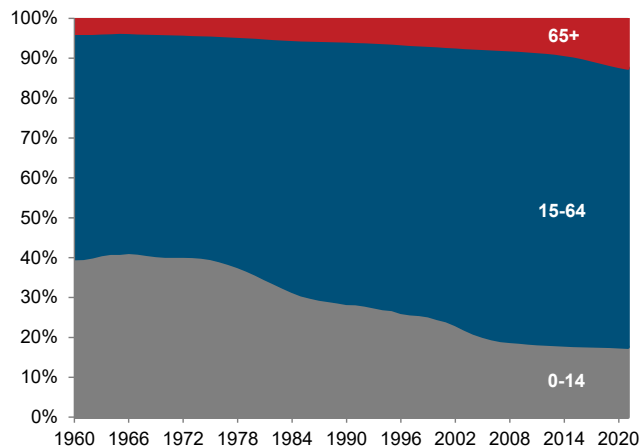
...a more distorted sex ratio than the rest of the world...

Sex ratio at birth (male births to female births)



...and a shrinking share of the population under 14 years old

Share of total population by age group, %



Source for all exhibits: United Nations, Department of Economic and Social Affairs, Population Division (2022), various news sources, Goldman Sachs GIR.

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December 9, 2022



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May 21, 2021



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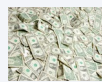
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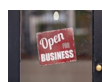
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Summary of our key forecasts

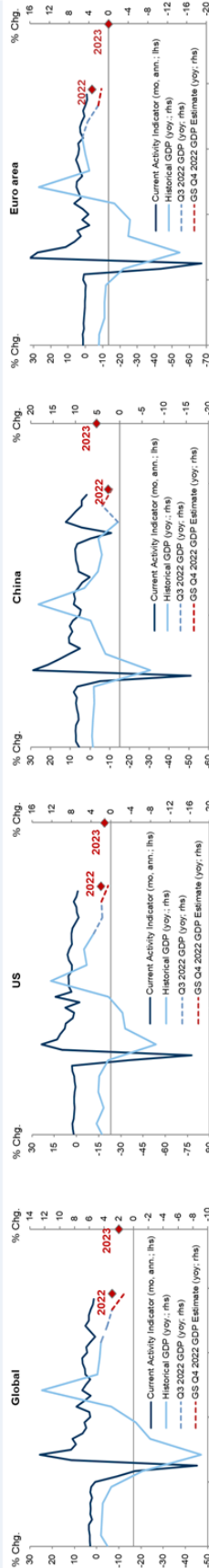
GS GIR: Macro at a glance

Watching

- **Globally**, we expect annual average GDP growth to slow to a sluggish 2.0% in 2023, reflecting sizable drags from tighter financial conditions, the protracted energy crisis in Europe, a bumpy reopening in China, and the housing downturn in China and elsewhere. We expect the global inflation surge to peak this quarter, and think the combination of a moderation in demand growth, improvements in goods supply, and tighter monetary policy will be sufficient to bring inflation back toward DM central banks' targets over the next two years.
- **In the US**, we expect GDP growth to slow to 2.0% in 2022 and 1.3% in 2023, reflecting a negative impulse from tighter financial conditions. We see a (below-consensus) 35% probability of entering a recession over the next year, although we think any recession would likely be mild. We expect core PCE inflation to decline significantly to 2.9% by end-2023, reflecting easing in supply chain constraints, a peak in shelter inflation next spring, and slower wage growth, although we expect progress on wage growth to be more gradual than disinflation from core goods and shelter. We expect the unemployment rate to stand at 3.7% by end-2022 before rising to 4.1% by end-2023 and 4.2% by end-2024.
- **We expect the Fed** to deliver 25bp hikes in February, March, and May for a peak funds rate of 5.00-5.25%, though recent easing in financial conditions could push the Fed to a higher peak rate. On the fiscal policy front, the midterm elections produced a divided government, which we expect will reduce the size and probability of fiscal support in the event of a recession.
- **In the Euro area**, we expect a mild recession in 4Q22-2Q23 and GDP to contract by 0.1% in 2023, driven by continued significant gas supply disruptions owing to the war in Ukraine and slowing growth momentum. We expect headline inflation to peak at around 10.7%yoy in December before falling back to around 4.3% in December 2023.
- **We expect the ECB** to hike by 50bp in February and March, and by 25bps in May for a terminal rate of 3.25%.
- **In China**, we expect full-year real GDP growth of 2.6% in 2022 before accelerating to 5.2% in 2023. On a sequential basis, we expect -4.0% qoq ann. growth in 4Q22 after a very strong rebound of 16.5% in 3Q22 due to the weaker-than-expected October activity data and the latest Covid resurgence in major cities.
- **WATCH INFLATION AND EUROPEAN ENERGY**. On the inflation front, more persistent inflationary pressures could lead to extended central bank hiking cycles, which could raise the risk of recession in several major economies. Tensions in the European energy market also continue to loom large, with Russia suspending natural gas flows through the Nord Stream gas pipeline indefinitely and the European import ban/G7 price cap on Russian oil recently implemented. But recent rebalancing of the gas market driven by an exceptionally mild start to the European winter has reduced the risk of energy rationing this winter.

Goldman Sachs Global Investment Research.

Growth



Source: Haver Analytics and Goldman Sachs Global Investment Research. Note: GS CAI is a measure of current growth. 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 | Markets | | | | | | | | | | Equities | | | | | | | | | | | | | |
|------------------|---------|------|-------|------|---------------------------|---------|--------|--------|-------------|---------|----------|------|-----------|--------|-------------|-------|-----------------------|------|------------|-------|-----|------------|--|--|
| | 2022 | | 2023 | | Interest rates 10Yr (%) | | E 2022 | | E 2023 | | E 2022 | | E 2023 | | Returns (%) | | YTD | | E 2022 P/E | | | | | |
| | GS | Mkt | GS | Mkt | US | Germany | Japan | UK | Commodities | 3m | 12m | Last | FX | E 2022 | E 2023 | GS | Cons. | GS | Cons. | 12m | YTD | E 2022 P/E | | |
| GDP growth (%) | 1.3 | 2.9 | 3.0 | 2.0 | 2.2 | US | 3.49 | 4.10 | 4.30 | EUR/USD | 1.07 | 0.94 | 1.05 | Price | 3,600 | - | S&P500 | - | -16.0 | 18.3x | | | | |
| | 0.6 | 2.0 | 1.8 | 1.3 | 0.4 | Germany | 1.93 | 2.50 | 2.75 | GBP/USD | 1.24 | 1.07 | 1.22 | EPS | \$224 | \$223 | IXAPJ | 6.0 | -17.0 | 13.7x | | | | |
| | 1.7 | 2.6 | 3.2 | 5.2 | 4.8 | Japan | 0.25 | 0.25 | 0.25 | USD/JPY | 135 | 155 | 140 | Growth | 7% | 6% | Topix | 11.0 | -1.0 | 14.2x | | | | |
| | 1.4 | 3.3 | 3.2 | -0.1 | -0.1 | UK | 3.33 | 3.75 | 4.00 | \$/CNY | 6.9 | 7.20 | 6.90 | | | | STOXX 600 | 3.0 | -11.0 | 12.8x | | | | |
| Policy rates (%) | GS | Mkt | GS | Mkt | Commodities | Last | 3m | 12m | Credit (bp) | Last | 4Q22 | 2023 | Consumer | 2022 | 2023 | 2023 | Wage Tracker 2022 (%) | Q1 | Q2 | Q3 | Q4 | | | |
| | 4.38 | 5.21 | 5.13 | 4.27 | Crude Oil, Brent (\$/bbl) | 83 | 95 | 105 | USD | IG | 130 | 150 | 170 | US | 8.0 | 3.7 | 3.8 | 4.1 | 5.5 | 5.6 | 5.5 | 5.4 | | |
| | 2.00 | 2.87 | 3.25 | 2.66 | LtL Gas (\$/mmBtu) | 6.43 | 6.20 | 4.15 | HY | 431 | 490 | 575 | Euro area | 8.5 | 6.9 | 7.4 | 7.1 | - | - | - | - | | | |
| | 2.00 | 2.51 | 2.00 | 2.87 | Copper (\$/mt) | 8,478 | 9,500 | 11,000 | EUR | IG | 183 | 215 | 225 | China | 2.0 | - | 2.2 | - | - | - | - | - | | |
| | -0.10 | 0.11 | -0.10 | 0.21 | Gold (\$/troy oz) | 1,808 | 1,850 | 1,950 | HY | 509 | 555 | 615 | | | | | | | | | | | | |

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 14, 2022.

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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