

TOP *of* MIND

INFLATION: HERE TODAY, GONE TOMORROW?



Sharp upside inflation surprises that have pushed US inflation to 30+-year highs have fueled concerns that “temporary” pandemic-related inflationary pressures could prove persistent, raising the risk of a damaging wage-price spiral that could force the Fed into a costly tightening cycle. Where inflation goes from here—and what that means for the economy, monetary policy, interest rates and assets—is Top of Mind. We (again) put Jan Hatzius in the hot seat, who maintains that inflationary pressures will gradually subside later next year as commodity prices stabilize and durable goods prices reverse some of their previous run-up, in the context of a seamless transition from Fed tapering to rate hikes in mid-2022. But Allianz’s

Mohamed A. El-Erian is more concerned about an inflationary spiral and warns that the Fed has already fallen behind the curve, raising the risk of an undue hit to growth. We then dig into key inflation drivers with MediaTek’s Rick Tsai and GS analysts, and assess the asset implications of the more inflationary environment ahead.



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

Although [inflationary] pressures are unlikely to subside quickly, I remain confident in the basic view that both headline and core inflation will fall significantly next year.

- Jan Hatzius

My sense is that the [microchip] supply-demand picture will become more balanced by end-2022 as demand continues to settle, and then, by end-2023, supply will be much more adequate, if not necessarily ample, as the investments semiconductor companies are making today start to bear fruit.

- Rick Tsai



Allison Nathan | allison.nathan@gs.com Gabriel Lipton Galbraith | gabe.liptongalbraith@gs.com Jenny Grimberg | jenny.grimberg@gs.com

WHAT’S INSIDE

INTERVIEWS WITH:

Mohamed A. El-Erian, President of Queens’ College, Cambridge University and Chief Economic Advisor at Allianz

Rick Tsai, Vice Chairman and CEO, MediaTek

Jan Hatzius, Head of Global Investment Research and Chief Economist, Goldman Sachs

INFLATION: GETTING WORSE BEFORE BETTER
Spencer Hill and David Mericle, GS US Economics Research

GLOBAL SURGE TURNING LOCAL AND PERSISTENT
Daan Struyven, GS Global Economics Research

THE REVENGE OF THE OLD ECONOMY
Jeff Currie, GS Commodities Research

Q&A ON SHIPPING/LOGISTICS BOTTLENECKS
Jordan Alliger, GS US Transportation Equity Research

UNPACKING US WORKER SHORTAGES
Joseph Briggs, GS US Economics Research

BALANCED PORTFOLIOS: LOSING BALANCE
Christian Mueller-Glissmann, GS Multi-Asset Strategy Research

ASSET IMPLICATIONS OF THE INFLATION OUTLOOK
GS Markets Research

...AND MORE

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

Macro news and views

We provide a brief snapshot on the most important economies for the global markets

US

Latest GS proprietary datapoints/major changes in views

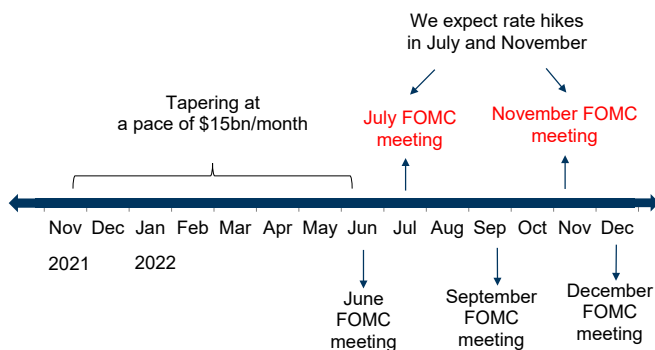
- We recently raised our end-2021 core PCE inflation forecast to 4.4%, and pulled forward our forecast for the Fed's first rate hike to July 2022 given upward revisions to our inflation forecasts, but we see inflation falling to 2.3% by end-2022.
- We now expect the next round of fiscal spending to total \$1.75-2tn over 10 years.

Datapoints/trends we're focused on

- Labor market tightness; we expect maximum employment will be reached by the middle of next year, although labor force participation is likely to remain below its pre-pandemic trend.
- Virus spread, which has risen and remains a key growth risk.

A seamless transition from tapering to rate hikes

Timeline for tapering and rate hikes, GS forecast



Source: Goldman Sachs GIR.

Japan

Latest GS proprietary datapoints/major changes in views

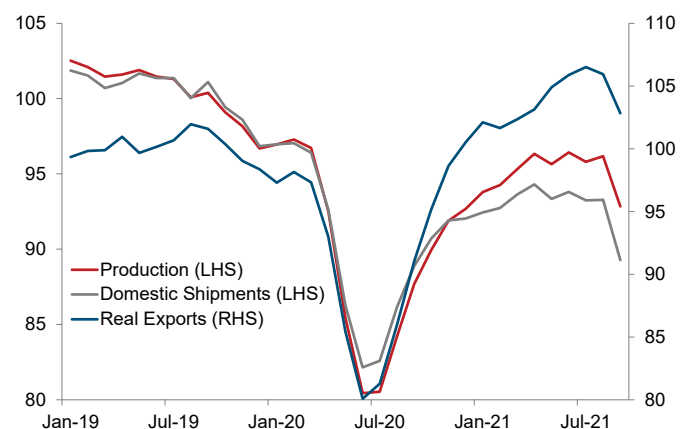
- We lowered our Q4 GDP growth forecast to 6.8% qoq ann. on the back of a sharp Q3 slowdown in exports/production.

Datapoints/trends we're focused on

- Inflation; we expect core CPI inflation to peak at ~1.5% yoy in mid-2022 on rising oil prices and economic reopening.
- Monetary policy; we expect the BOJ to maintain yield curve control and its negative interest rate policy during 2022, but to steadily continue tapering both JGB and risk asset purchases.
- Fiscal policy; we think the boost to GDP from the upcoming ¥30tn+ economic package could be only ¥10tn or less.

Supply bottlenecks weigh on exports and production

3mma; 2019=100



Source: Ministry of Economy, Trade and Industry, BOJ, Goldman Sachs GIR.

Europe

Latest GS proprietary datapoints/major changes in views

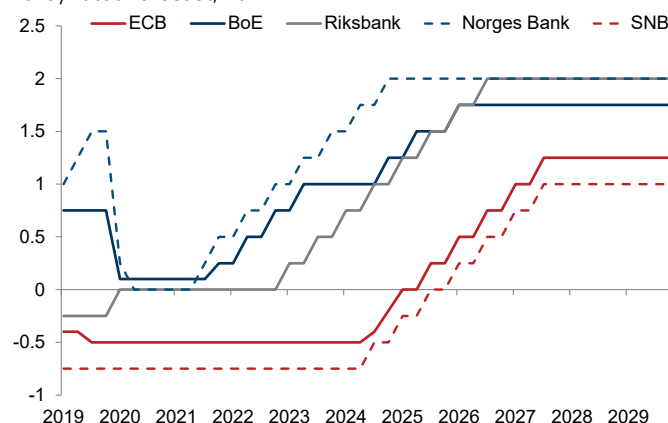
- We now expect Euro area core inflation to peak at 2.5% this month before falling back to 1.2% in December 2022.
- We recently pulled forward our forecast for the ECB's first rate hike to 3Q2024 based on our expectations for a firmer longer-term inflation outlook.
- We pushed back our forecast for the BoE's first rate hike to December following the November MPC meeting.

Datapoints/trends we're focused on

- Monetary policy, which we expect to diverge across Europe.
- Virus pressures, which have increased in parts of Europe.

More divergence in European monetary policy

Policy rates forecast, %



Source: Haver Analytics, Goldman Sachs GIR.

Emerging Markets (EM)

Latest GS proprietary datapoints/major changes in views

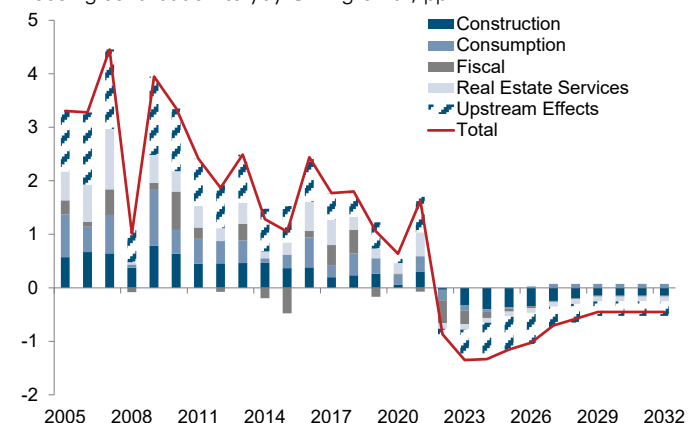
- We recently lowered our 2022 China GDP forecast to 4.8% based on our expectation for a continued structural tightening, especially in the property market.

Datapoints/trends we're focused on

- EM inflation, which remains high, and we don't expect to decline meaningfully year over year until 2Q2022.
- EM monetary policy; we expect the hiking cycle to broaden in 2022 after being mostly focused on CEEMEA/LatAm in 2021, although tightening in EM Asia is likely to be relatively unrushed.

Housing to become a major drag on China growth

Housing contribution to yoy GDP growth, pp



Source: Haver Analytics, Goldman Sachs GIR.

Inflation: here today, gone tomorrow?

Sharp upside inflation surprises that have pushed US inflation to 30+-year highs have fueled concerns that “temporary” pandemic-related inflationary pressures could prove persistent, raising the risk of a damaging wage-price spiral that could force the Fed into a costly tightening cycle. Where inflation goes from here—and what that means for the economy, monetary policy, interest rates and assets—is Top of Mind.

We again put Jan Hatzius, Head of Goldman Sachs Global Investment Research and Chief Economist, in the hot seat on his inflation views. Although inflation surprises have led our economists to substantially increase their inflation forecasts over the past several months, he maintains that inflationary pressures will gradually subside later next year as the primary drivers of the current price surge—sharp increases in the prices of durable goods and commodities—are likely to moderate, if not decline outright. He also expects upward US wage pressures to diminish from their torrid sequential pace as the financial cushion built up by workers during the pandemic dwindles and reduced virus-related concerns motivate people to return to the workforce, even as labor force participation is likely to remain below pre-pandemic levels.

As for what this means for central bank policy, Hatzius notes that higher inflation has begun to change people’s behavior in ways that could prove lasting, but emphasizes that the Fed—and other central banks like the ECB—want this to happen to some extent given their view that inflation in the prior cycle was somewhat too low. And he doesn’t see much evidence of inflation expectations becoming de-anchored in market-based and other measures so far. All told, while the inflation surprises have led our economists to pull forward their Fed tightening timeline—with tapering now expected to conclude in June 2022, seamlessly followed by the first Fed rate hike in July—Hatzius believes that the Fed’s current policy stance remains reasonable for now.

But Mohamed A. El-Erian, President of Queens’ College, Cambridge University, and Chief Economic Advisor at Allianz, is far more concerned about the inflation outlook, arguing that the recent inflation surge has the potential to prove more persistent than many—including the Fed—expect, and could change behavior in ways that risk triggering an inflationary spiral. This risk, he cautions, may not be well reflected in market-based measures of inflation expectations given that fixed income markets are heavily distorted by the Fed’s massive bond buying program. He therefore believes that the Fed has already fallen behind inflationary pressures on the ground by not easing off the monetary stimulus accelerator months ago, which increases the risk that it will be forced to slam on the brakes down the road. This, he says, would result in an undue hit to economic growth, and maybe even in a recession.

Given this spectrum of views, we then dig further into the key inflation drivers: 1) tightness in durable goods owing to supply chain bottlenecks and elevated demand, 2) worker shortages, and 3) housing and commodity scarcity. GS US economists Spencer Hill and David Mericle break down the impact of each on their inflation forecast, and underscore that inflation is set to worsen in the coming months before receding later next year. And Daan Struyven, GS global economist, looks at these drivers in a global context, concluding that while inflation is set to

subside across most G10 economies in 2H22, it will likely remain structurally higher—to the tune of an average 0.5pp above the pre-pandemic level—in the years ahead.

To better understand the supply chain issues in particular, we strike at the heart of the matter—microchip shortages—by speaking with Rick Tsai, Vice Chairman and CEO of MediaTek and former President and CEO of TSMC, the world’s largest manufacturer of microchips. He explains that the current supply-demand imbalance—which remains most severe for mature technology chips used, for example, by the auto industry—will be resolved only gradually as building out new capacity takes years and the industry has learned from past boom/bust cycles to invest cautiously. But he expects subsiding end-demand will leave the market more balanced by end-2022, and that supplies should become more adequate—if not ample—by end-2023 as current investments begin to bear fruit.

We then ask Jordan Alliger, GS US transportation analyst, why severe bottlenecks across the logistics supply chain that have seen, for example, the number of ships in queue to unload at US West Coast ports skyrocket, are so challenging to resolve. His answer: while various factors are at play, worker shortages—and truck driver shortages in particular—are at the center of it, and only so much can be done to overcome them given the highly fragmented nature of the long-haul trucking industry. Joseph Briggs, GS US economist, then explores the broader worker shortage in more detail, arguing that it should ease in the near term as the impact of fiscal transfers and other pandemic-related disruptions diminish, but that labor market tightness, and elevated wages, will likely persist in the years ahead.

Finally, Jeff Currie, GS Global Head of Commodities Research, makes the case that commodity shortages and associated price inflation have little to do with temporary pandemic-related shifts or the race toward net zero, but rather are the result of chronic underinvestment in the “old economy” that’s left insufficient supply to meet rising broad-based demand, fueled by more inclusive growth policies around the world. As a result, while Currie’s baseline views suggest some reprieve from this year’s massive commodity price increases, he believes that price risks are sharply skewed to the upside, and that bouts of commodity-led inflation are likely to be more frequent in coming years.

So what does this all mean for assets? As inflation rises further in the near term and the Fed lifts off, our macro strategists expect higher US front-end nominal yields, reduced scope for sustained Dollar weakness, and outperformance of EUR credit spreads relative to their US peers. And while this backdrop risks denting profit margins and equity valuations, our equity strategists believe that both should hold up reasonably well (for asset-by-asset views, see pgs. 10-11). This view, combined with GS multi-asset strategist Christian Mueller-Glissmann’s assessment that balanced 60/40 portfolios could be facing a “lost decade”, argues for higher equity allocations ahead, and El-Erian agrees that equities are “the cleanest dirty shirt”, for now.

Allison Nathan, Editor

Email: allison.nathan@gs.com
Tel: 212-357-7504
Goldman Sachs and Co. LLC



Interview with Mohamed A. El-Erian

Mohamed A. El-Erian is President of Queens' College, Cambridge University, and Chief Economic Advisor at Allianz, the corporate parent of PIMCO, where he previously served as CEO and co-CIO. He is an advisor to Gramercy and a Professor at Wharton. He served as Deputy Director of the IMF and chair of President Obama's Global Development Council. Below, he argues that the Fed could be heading towards an historic monetary policy mistake by reacting too slowly to rising inflationary pressures.

The views stated herein are those of the interviewee and do not necessarily reflect those of Goldman Sachs.



Allison Nathan: At its latest meeting, the Fed watered down concerns about inflation, citing its transitory nature. Are you concerned Fed officials are too relaxed about the inflation outlook?

Mohamed El-Erian: Yes. While the data has forced the Fed to take a small step away from its narrative of

transitory inflation, it continues to downplay the risk to the economy and the need for monetary policy changes. It seems to wish to hold on to a narrative of—take your pick—“extended transitory”, “persistently transitory” or “rolling transitory” inflation. I take issue with these characterizations because the whole point of transitory inflation is that it wouldn't last long enough to change behaviors on the ground. Yet wage-setting and price-setting behavior is already changing.

Allison Nathan: But aren't most of the underlying inflationary pressures, such as supply chain bottlenecks due to pandemic disruptions and labor shortages owing to extended unemployment benefits, likely to recede soon?

Mohamed El-Erian: The underlying cause of the current surge in inflationary pressure is deficient aggregate supply relative to aggregate demand. Part of that will likely prove transitory as the pandemic continues to recede and factories in Asia ramp up production. But part of it will likely prove more persistent due to longer-term structural changes in the economy. Company after company is rewiring their supply chain to prioritize resilience over efficiency. US labor force participation is stuck at a low 61.6% even as unemployment benefits have expired, suggesting that people's propensity to work may have changed. So, there are longer-term structural and secular elements to the rise in inflation. And I'm concerned that if the Fed doesn't do enough to respond to these secular inflation trends, it risks de-anchoring inflation expectations and causing unnecessary economic and social damage that would hit the most vulnerable segments of our society particularly hard.

Allison Nathan: Inflation expectations so far seem to be fairly well anchored, so how much of a risk is that really?

Mohamed El-Erian: Survey-based inflation expectations are not well anchored; both short and long-term expectations compiled by the New York Federal Reserve have already risen above 4%. Companies are warning about inflationary pressures well into next year and potentially beyond. Market-based expectations remain better anchored for now, but the information content of fixed income markets has become highly distorted by the presence of a large non-commercial buyer—the Fed—that has

incredible willingness to buy regardless of valuation. I think of this in the same way that I think about one of my favorite board games—Risk. When everybody on the board is playing according to the rules of the game, you can assess the probabilities of other players' actions under certain conditions and fairly accurately predict their behavior. But when one very big player plays according to different rules, you'd adapt your behavior or you'd lose. That's what's happening in fixed income markets; market participants understand and respect that they will be steamrolled—as they have been time and time again—by taking the other side of massive Fed asset purchases, even when they're convinced of a fundamental mispricing. So, I would be careful in relying on the usual market measures to gauge inflation expectations, as we don't know how much to adjust for the distortions that the Fed has introduced.

Allison Nathan: Given the above, you believe that the Fed could be heading for an historic policy mistake. What should the Fed be doing versus what they are most likely to do?

Mohamed El-Erian: Simply put, the Fed faces a choice between easing off the accelerator now or slamming on the brakes down the road. It should've starting easing its foot off the monetary stimulus accelerator months ago. I've argued for some time that it had a big window of opportunity to start tapering asset purchases in the spring, when growth was very strong and the collateral damage from maintaining emergency levels of liquidity in a non-emergency world was becoming apparent. But, inertia, inflation miscalculations and a new policy framework that was designed for a world of deficient aggregate demand rather than today's world of deficient aggregate supply led them to wait until earlier this month to announce the start of tapering. In doing so, the Fed has fallen behind the reality of inflationary pressures on the ground that are being picked up by the regional Feds. While it is now starting to act, it's moving too slowly, as evidenced by the growing gap between its policy action and the rise in inflation expectations. So 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 had started to tighten policy earlier. Such a scenario would constitute an historic policy mistake because, after a bout of inflation that most hurts the poor, the economy would risk an undue blow to growth from a sharper tightening relative to what the economy can absorb.

Allison Nathan: But isn't the Fed right to wait to act given that demand is expected to slow significantly next year as fiscal stimulus winds down? Wouldn't it be harmful to put

contractionary monetary policy in place at the same time as contractionary fiscal policy?

Mohamed El-Erian: That's exactly the wrong policy framing, especially given that we're starting from emergency-level loose monetary policy. By waiting to act, the Fed will end up tightening at the same time as fiscal policy is tightening and household savings are drawing down. Financial conditions could also tighten and business investment decline simultaneously too. That's precisely why the Fed should have moved earlier, so that relatively tighter monetary policy doesn't run headlong into multiple other sources of tightening, which risks pushing the economy into a recession. While I don't expect a recession in my baseline scenario, the Fed's slow pace of policy normalization could mean that growth will be lower than it would've otherwise been had the Fed started tightening earlier.

Allison Nathan: But won't the significant contraction in fiscal policy slow inflation even without monetary policy normalization?

Mohamed El-Erian: If initial conditions were near an equilibrium, I would say yes. But they're not—monetary policy is still being run in emergency mode even as the emergency has passed. Even though the Fed is beginning to taper, it's still buying tens of billions of dollars of securities every month, about a third of which are mortgage-backed securities. I don't know a single person who believes the US housing market needs such broad-based policy stimulus. On the contrary, the housing market is so hot that an increasing number of Americans are being priced out of it. And the longer the emergency policy stance continues without an actual emergency, the greater the risk that the Fed does end up having to slam on the brakes and, in doing so, create unnecessary damage—i.e., a new recession.

Allison Nathan: How effective would rate hikes even be in dampening the current inflationary pressures, which stem in part from supply shortages?

Mohamed El-Erian: I am sorry, but the framing of the question is misleading. Instead, we should be asking, "is the current mix of large monthly asset purchases, floored at zero interest rates, and monetary policy in emergency mode going to resolve the supply-side issues?" The answer is, no. We should then ask, "so why should the Fed still be running policy in emergency mode?" The answer is, it shouldn't be. And, finally, we should ask "what's the cost of continuing to do so?" The answer is: one, there's very little evidence that the current stance of monetary policy is helping on the demand side, and even if it were, demand is not the problem. So, by trying to help, the Fed is actually hurting, while also worsening wealth inequality. Two, the significant amount of liquidity the Fed has pumped into the system is increasing the probability of a market accident by forcing investors to take more risk in search of returns. Near accidents have occurred already this year—think of GameStop/hedge funds and Archegos—which we're lucky didn't have systemic effects. And three, the Fed's unnecessarily accommodative policy is encouraging massive resource misallocation. Just think of all the zombie companies that are surviving only because they've been able to refinance themselves at very low rates. The longer this continues, the

greater the drag on longer-term productivity and the more damage there will be when rates eventually rise.

Allison Nathan: What do you make of the recent sharp moves in G10 front-end rates, and how would you advise fixed income investors to navigate these moves?

Mohamed El-Erian: I'm really glad I'm no longer managing fixed income bond funds because technicals rather than macro fundamentals are ruling the fixed income markets right now, leading to these outsized moves. And, unless you are a trader that actually sees these flows, the environment is extremely difficult to navigate. I will say that the violent repricing following the Bank of England's (BoE) recent decision to keep rates on hold was an instance of the market getting ahead of itself on pricing in rate hikes. It's true that the BoE had signaled an intention to raise rates in coming months. But in the context of hawkish commentary and moves from central banks in Canada, Australia, and New Zealand, markets mistakenly lumped the UK together with these small, open economies that have no choice but to move ahead of the much larger, less open economies of the US and EU in raising rates. And, in fact, the UK has some very peculiar characteristics that have to be taken into account, like the furlough scheme and Brexit-related labor issues, which clearly distinguish it from these other cases.

Allison Nathan: In the midst of the current inflationary pressures and associated policy actions, equity markets, especially in the US, have been hitting new highs. What's behind that, and do you see a risk of a correction given your concerns about the economic outlook?

Mohamed El-Erian: What's happening in the equity market was recently captured perfectly by the legendary investor Leon Cooperman, who, when asked how he was positioned, responded that he's a "fully invested bear". He's bearish on the fundamentals—with the view that valuations are too high—but he's fully invested in terms of technicals, and liquidity technicals in particular.

The equity market is in a rational bubble; investors are fully aware asset prices are quite high, but they're in a relative valuation paradigm in which it makes sense to be invested in equities rather than in other assets. The fixed income market is distorted and one-sided in terms of risk-return, dominated by technicals, and an unreliable diversifier in the current environment where its long-standing correlation with other financial assets has broken down. Many investors can't invest in private credit, venture capital, or private equity, and are hesitant to delve into crypto. That leaves the equity market as the "cleanest dirty shirt" for investors. That works very well as long as the paradigm is a relative valuation one rather than an absolute valuation one, and markets will likely remain in this paradigm for a while. But investors need to respect that they're riding a huge liquidity wave thanks to the Fed, and that wave will eventually break as monetary stimulus winds down. So investors should keep an eye on the risk of an abrupt shift from a relative valuation market mindset to an absolute valuation one, or an environment in which you stop worrying about the return on your capital and start worrying about the return of your capital. That's a risk to watch because not only would it mean higher volatility, but also, and most critically, an undue hit to the real economy.

Interview with Jan Hatzius

Jan Hatzius is Head of Global Investment Research and Chief Economist at Goldman Sachs. Below, he argues that inflation should subside in 2022, but likely suggests Fed liftoff mid year.



Allison Nathan: US inflation has surged to 30+-year highs with few signs of letting up. You have maintained that inflationary pressures will subside, and still expect inflation to decline sharply next year. Is your confidence in that view wavering at all?

Jan Hatzius: Although the pressure is unlikely to subside quickly, I remain confident in the basic view that both headline and core inflation will fall significantly next year. Much of the current inflationary surge has been driven by an enormous rise in the prices of commodities and supply-constrained goods such as autos, sporting equipment, furniture and other durable goods, due to the pandemic. While we can debate how long it will take for those prices to normalize, I would be astonished if they continue to rise at anywhere near the recent rate, and assuming they don't already remove a large part of the inflationary impulse next year. Right now, these goods are contributing around 130bp to core PCE, which we expect will swing to a 55bp drag by end-2022. The contribution to headline inflation from commodity prices, which have also surged this year as Europe and China have faced energy shortages, is also likely to moderate significantly next year. Even if commodity prices remain at current high levels, or continue to rise somewhat as our commodity strategists expect, the rate of change in these prices will be lower, resulting in a more modest impact on consumer prices. So, the direction of travel in terms of lower inflation is generally clear. That said, I'm much less certain about the precise destination of core PCE. The prospect of 3% core PCE inflation by the end of 2022 seems unlikely, but whether it settles at 2%, 2.5% or even marginally higher depends not only on what happens with goods prices, but also with wages and rents. And, of course, the destination is critical because it will determine the outlook for monetary policy.

Allison Nathan: How can you be confident about the timing of the decline in goods inflation when expectations of when supply chain bottlenecks will be resolved keep getting pushed out?

Jan Hatzius: A decline in inflation only requires stability rather than a material improvement in the goods market, though we have built some improvement into our forecast. Recent signs suggest reasons for cautious optimism on the supply side. Some indices of shipping costs are starting to come down. Semiconductor production has improved on the back of a better virus situation in Asia, which has reduced the scope of COVID-related shutdowns, though it will take time for inventories to rebuild and production capacity to ramp up. It's also important to acknowledge that demand factors have played a role in the inflation surge. US goods consumption has increased nearly 10% above the pre-pandemic trend, driven by elevated disposable income on the back of strong fiscal support as well as a rotation from services to goods spending throughout the pandemic. But that should ease as fiscal policy becomes more

contractionary and services spending rebounds next year. I do think strong personal income and savings numbers suggest the US consumer should hold up reasonably well as fiscal support diminishes next year, but not with the same degree of strength as they have up to now.

Allison Nathan: Even if goods inflation subsides, isn't the strong pace of wage growth a reason to be concerned that inflationary pressures could become persistent?

Jan Hatzius: We're somewhat more concerned about wage pressures than a few months ago given the strength of recent data. Our composition-adjusted wage tracker is currently running at 4% yoy, which isn't particularly worrisome because that's consistent with roughly 2% inflation after factoring in productivity growth. But recent sequential increases in wages have been running higher than that, in the 5-6% range, which is more concerning because if that pace were sustained through 2022, inflation would likely remain materially above target. And there's no doubt that workers have quite a lot of bargaining power right now. The number of unemployed workers per job opening is at its lowest level on record going back to 1980. The quits rate, which measures workers voluntarily leaving their jobs, is also at record highs, although that may owe more to workers switching jobs rather than leaving the workforce entirely. But much of this labor scarcity should be resolved as people who did leave the workforce return on the back of reduced virus-related concerns, fewer challenges around childcare, and rising financial motivations as the financial cushions built up during the pandemic diminish. To that point, while the evidence so far is admittedly mixed, we expect the expiration of enhanced unemployment benefits to increase the labor supply and reduce wage pressures, especially at the bottom end of the pay scale, where they've been particularly severe. The bottom line is that there's still slack in the labor market—four million fewer people are employed in the US today than pre-pandemic—and as this slack is absorbed, wage pressures should moderate from the recent torrid pace.

Allison Nathan: But are you concerned that people just won't return to the labor force, sustaining wage pressures?

Jan Hatzius: We don't expect labor force participation to recover to pre-pandemic levels, in large part due to early retirements, which will only exacerbate the structural downward trend in labor force participation from population aging. So it's true that the labor market is likely tighter than suggested by the four million jobs that are still missing. For this reason, we expect wage growth will remain higher than in the last cycle, on the order of 4% next year and slightly higher in the following years, but, again, slower than the recent 5-6% sequential pace.

Allison Nathan: Whether or not inflationary pressures are sustained seems to depend on the extent to which they impact expectations. What are you watching to assess this risk, and are you at all concerned about the prospect of inflation expectations becoming de-anchored?

Jan Hatzius: There's little evidence of inflation expectations becoming de-anchored so far. We follow a broad range of measures to assess this risk, including forecaster, market and consumer expectations, but admittedly none of these measures is perfect because none captures what really matters: the expectations of people on the ground who are actually making hiring, job search and price decisions in the real economy. That said, we find that forward expectations convey more information than short-term expectations, which are substantially influenced by changes in headline inflation and particularly in oil and gas prices, and therefore don't say much about the extent to which inflation expectations are leading to permanent shifts in behavior. At this point, I'm reassured by the only modest rise in forward expectations such as 5y5y breakevens. That could change, and if it does, it would be a significant development, but so far longer-term inflation expectations look relatively well-anchored.

Allison Nathan: But aren't market-based inflation expectations even less reliable than usual given the Fed's current outsized role in the Treasury market?

Jan Hatzius: Despite its bond buying program, the Fed doesn't purchase nominal bonds or TIPS to achieve particular breakeven inflation rates. They're also only one participant in the most liquid bond market in the world. If market participants had a strong view that inflation is heading significantly higher than the breakeven rate suggested, there would be a large profit opportunity in taking the other side of the Fed's bond purchases. Again, that's not to say market-based inflation expectations are perfect; they're affected by risk and liquidity premia, for example. But, in the absence of perfect measures of inflation expectations, they are still a high-frequency, real-time input that deserves some weight.

Allison Nathan: If the key bellwether of inflation expectations is the extent to which people who are making price and wage decisions are changing their behavior, aren't we already seeing that?

Jan Hatzius: We are seeing some changes in behavior. But the Fed and other central banks like the ECB want these changes to a degree because they viewed inflation as somewhat too low heading into the current period. Now, are we seeing changes in behavior that are larger and going to be more persistent than what's needed to achieve 0.5pp more inflation in the next 10 years than in the last 20 years? It's certainly possible, especially given recent wage numbers. But the economy is still emerging from an incredibly unusual period, so you have to be careful not to put too much weight on indicators like high-frequency wage changes, because it may be that this is a sufficiently weird period that they just don't convey much information about where we'll be a year from now.

Allison Nathan: Some observers argue that the Fed's very easy stance is no longer appropriate, is inflicting collateral damage via inflation, excessive risk taking and resource misallocation, and increases the likelihood that the Fed will need to tighten more aggressively—and slow the economy more sharply—than otherwise would have been the case if they'd acted earlier. What's your response to that?

Jan Hatzius: My response is that the Fed is moving away from its very accommodative stance by committing to end QE and tapering twice as fast as in 2013. The communication around full employment has also evolved to acknowledge potential structural shifts in labor force participation that could influence rate-hiking decisions. This policy stance seems reasonable to me given that we're still some way away from full unemployment and uncertainty around the overall outlook remains high. The economy could look significantly different in the middle of next year. And so it makes sense to take another 6-8 months to consider whether a hike is necessary and the appropriate path for rate normalization. Unlike other central banks that have already started to normalize policy, when the Fed moves it's a momentous step for the global financial cycle and the global economy, and therefore any policy change needs to be well-considered.

As to whether the Fed's current stance is inflicting damage in the ways that you described, it all comes down to whether the funds rate—or the whole structure of interest rates, for that matter—is out of whack, or simply reflects an equilibrium decline in real interest rates that's appropriate given underlying structural changes in the economy. And it's hard to be very confident on that. I agree that market pricing is awfully low, and, over the longer term, the funds rate will likely be at least 100bp higher than current market pricing, with most of this reflecting a rise in real rates rather than breakeven inflation. If that's the case, equity markets wouldn't appear to be too overvalued today. But if real rates turn out to be 200bp too low rather than 50-100bp, it would be a different story, and would signal that valuations were more seriously out of whack and do need adjustment.

Allison Nathan: So what do you expect from the Fed, and how would further inflation surprises impact your view?

Jan Hatzius: Our baseline forecast is for a seamless transition from taper to liftoff in July 2022 and a gradual pace of tightening thereafter with one hike about every six months. That's predicated on the view that core PCE falls back to the 2-2.5% range. If inflation ends up being closer to 2.75%, which seems possible, the Fed would likely embrace a faster tightening path. And while 3% inflation is quite a bit less likely, that would prompt a significantly more aggressive policy response, including quarterly or even more rapid hikes. That said, these scenarios wouldn't necessarily lead to a faster taper timeline or a much earlier liftoff. It's possible that the Fed tapers until the middle of June and then hike rates a month earlier than our current baseline. But anything faster than that seems very unlikely.

Allison Nathan: That said, what impact would the start of rate hikes even have on inflation given that many of the inflationary pressures stem from the supply side?

Jan Hatzius: Higher rates wouldn't do much to address the supply-side constraints, but part of the inflation overshoot is also due to extraordinarily strong demand for durable goods, and monetary policy does influence demand directly and via financial conditions. That said, is a 25 or 50bp move in the funds rate going to have a large impact on inflation? The answer to that has always been, and will continue to be, no.

Inflation: getting worse before better

Spencer Hill and David Mericle answer key questions about their 2022 US inflation outlook, arguing that the inflation overshoot is likely to get worse, but then recede

Inflation surprised sharply to the upside this year and now stands at a 30+-year high, driven mainly by a surge in durable goods prices. Resolving the supply-demand imbalances underlying this surge in inflation will depend on the answers to three key questions: 1) whether supply-demand imbalances in the goods sector will moderate enough for prices to begin to normalize, 2) whether wage growth will cool down now that enhanced unemployment benefits have expired, and 3) how hot shelter inflation will get in the tightest national housing market since the 1970s.

We expect this resolution to take some time, and, as a result, the inflation overshoot is likely to get worse before it gets better, with core PCE on track to rise above 4% yoy and core CPI above 5% in coming months. Our core view remains that the current imbalances will largely work themselves out, as Fed Chair Powell said recently, as businesses and consumers respond to price signals, bringing inflation down to levels moderately above 2% by the end of 2022.

Q: Will supply-demand imbalances for durable goods resolve sufficiently for prices to start normalizing?

A: Yes, durable goods should swing from a sizable boost to a moderate drag on core PCE inflation

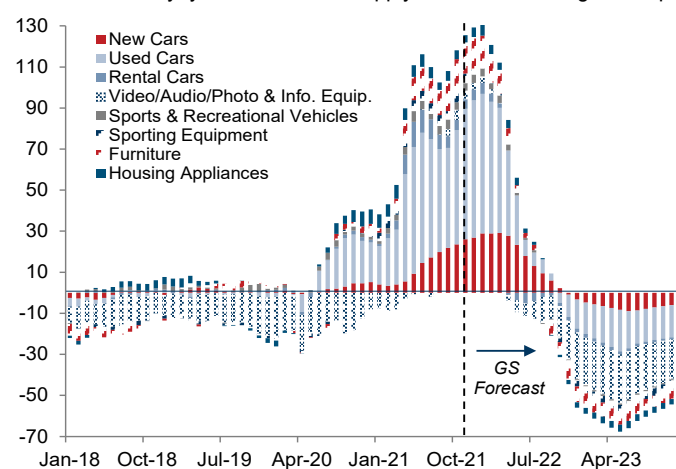
On the demand side, durable goods consumption has been elevated due to pandemic preference shifts and generous fiscal support that pushed disposable income far above trend. We expect demand to moderate slightly next year as services spending rebounds and peak fiscal and stay-at-home boosts fade. But we expect only a modest drop-off in demand for durables, as shortages and high prices this year have likely deferred some demand, and households can partly offset their decline in income by drawing on excess savings.

On the supply side, a variety of problems, including COVID-driven factory shutdowns, disruptions to semiconductor production, port closures and congestion, and widespread labor shortages, have led to supply chain disruptions that are historic in scope and severity. The good news is that US producers report that the main obstacles to meeting demand are not insufficient plant and equipment but rather shortages of critical inputs and labor, which should meaningfully resolve in 2022.

Semiconductors have been the most important input in short supply because of their many downstream uses, especially in autos. We expect semiconductor supply will recover in three stages. The first stage should begin in 4Q21 as imports of semiconductors from Asia rebound from a Q3 dip caused by COVID-related factory shutdowns, which should restore US auto production to normal levels. The second stage should come in 2H22 as new capital investment in existing semiconductor plants begins to yield more output. But a third stage of expanding capacity further using entirely new plants is needed to keep up with rapidly rising semiconductor demand, which we don't expect until well into 2023.

For the goods sector more broadly, we expect higher production and somewhat lower demand should lead to enough of a surplus to start rebuilding inventories in many sectors in 2022, although the dramatic depletion of inventories during the pandemic means that this will likely be a multiyear process. That said, we expect some inventory rebuilding will allow prices of most supply-constrained goods to moderate next year, swinging from providing a 130bp boost to core PCE inflation at end-2021 to a 55bp drag at end-2022 and a 50bp drag at end-2023. This turnaround is the main reason that we expect core PCE inflation to fall from the low 4s at end-2021 to the low 2s at end-2022.

We expect moderate price level normalization to push supply-constrained categories from a PCE boost to a drag
Contributions to yoy core PCE from supply-constrained categories, bp



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

Paralleling this shift and overlapping with it a bit, [the boost from higher commodity prices](#) to consumer price inflation is likely peaking now and should decline by roughly 0.5pp over the course of 2022, as the magnitude of commodity price changes is expected to lessen, even as our commodity strategists generally expect further commodity price gains.

Q: Will hot wage growth cool down now that enhanced unemployment benefits have expired?

A: Yes; wage growth should remain higher than in the last cycle, but subside from the recent pace

Our composition-adjusted wage tracker rose 4% over the last year, above last cycle's 3% peak but still consistent with unit labor costs and prices growing at roughly 2% after netting out productivity growth. Over the last two quarters, however, with labor demand surging and enhanced unemployment benefits still in place, some wage measures accelerated to a 5-6% annualized pace, which is likely incompatible with 2% inflation. Wage growth at the low end of the pay scale has been even stronger. Our [low-wage wage tracker](#)—which covers the bottom half of the wage distribution—has risen nearly 7% over the last year, and wages for the lowest-paid workers are up nearly 13%.

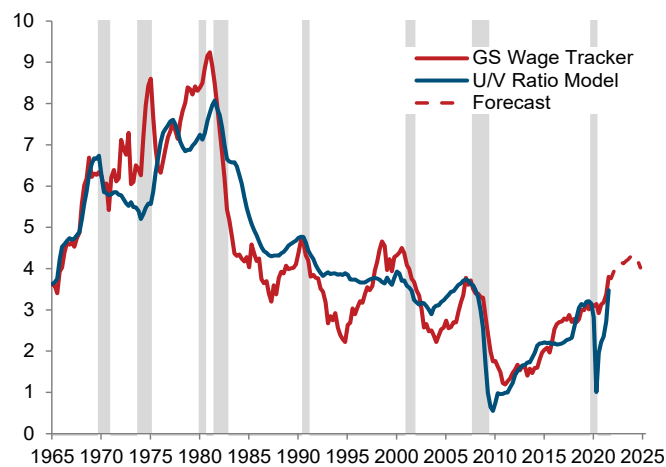
[Labor shortages](#) appear to have eased somewhat now that enhanced unemployment benefits have expired, and the exhaustion of pent-up savings, the reopening of schools, and reduced health risks should bring more workers back over time. But we expect many of the roughly 1mn early retirees and some of the 2mn younger workers who have left the labor force to remain out, as surveys indicate that some workers remain out of the workforce for non-economic reasons. This means that the

labor market will remain even tighter than implied by the unemployment rate, which we expect to return to its pre-pandemic 50-year low of 3.5% next year.

Diminished labor supply, coupled with very strong labor demand, means that the ratio of unemployed workers to job openings is likely to remain historically low, a recipe for strong wage growth. We estimate that underlying wage growth will average 4.0% in 2022 and 4.25% in 2023 and 2024. While this would be meaningfully stronger than last cycle, it would be softer than over the last two quarters and still compatible with inflation eventually settling moderately above 2%.

High demand for workers and limited labor supply are set to keep wage growth at or above 4%

Wage growth, percent change, year ago



Note: Composition-adjusted wage tracker shown post-2000; shading indicates recessions. Source: US Department of Labor, Goldman Sachs GIR.

Q: How hot will housing inflation get in the tightest national housing market since the 1970s?

A: Very hot, to the highest rate in three decades

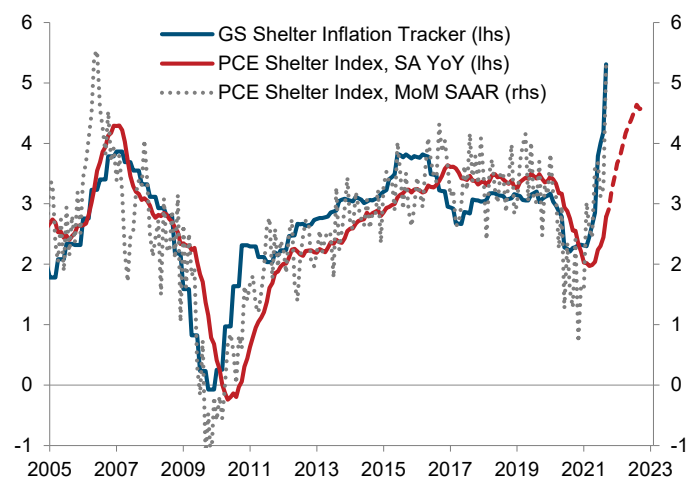
Vacancy rates for both owner-occupied and rental units have fallen to extremely low levels, and house prices have risen 20% over the last year. Strong demand driven by pandemic preference shifts, low mortgage rates, and demographic tailwinds looks sustainable, and the constraints on supply—especially shortages of construction workers and buildable plots of land—pre-date the pandemic and are likely to largely persist, meaning that the national housing shortage is likely here to stay. We estimate that the further labor market recovery we expect, combined with spillover effects from the ongoing boom in house prices, will push shelter inflation above 4.5% to its highest rate in three decades by end-2022. Our shelter inflation tracker has already reached 5.3% yoy, suggesting that the risks around even our aggressive forecast are two-sided.

Worse, and then better, but risks are tilted to the upside

Prolonged supply-demand imbalances, strong wage growth, and accelerating rents are set to keep core PCE, and especially core CPI, quite high for much of next year. But as supply-constrained categories shift from a transitory inflationary boost to a transitory deflationary drag, we expect core PCE inflation to fall from 4.4% at end-2021 to 2.3% at end-2022 and 2.1% at end-2023 even as faster growth of wages and rents provides more persistent inflationary pressures in coming years.

We expect shelter inflation to rise at the fastest rate in 30 years in 2022

Percent change, year ago (lhs), percent change, annual rate (rhs)

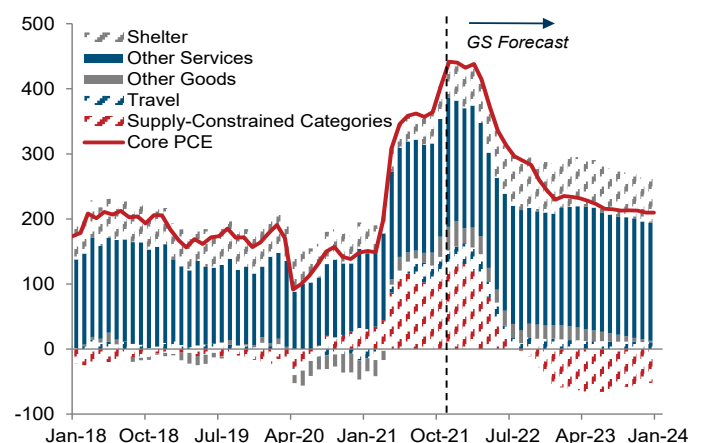


Note: Dashed line denotes GS forecasts. Source: Department of Commerce, Census Bureau, CoStar, Zillow, REIS, GS GIR.

However, substantial uncertainty remains around the outlook for prices of supply-constrained goods and wage growth. A scenario analysis to evaluate the risks around our 2022 inflation forecast reveals that the evolution of supply-constrained categories is by far the biggest contributor to inflation uncertainty in 2022, and that risks to our forecast are probably tilted to the upside. Moderately more price level reversion in durables categories, coupled with slightly softer wage growth, would subtract 0.25pp from our baseline forecast. But no price level reversion, coupled with stronger wage growth, would add 0.5pp, and further increases in durables prices at even half the rate so far during the pandemic would add nearly 1pp.

We expect core inflation to fall as supply-constrained categories shift from a transitory boost to a transitory drag

Contributions to yoy core PCE inflation, bp



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

Spencer Hill, Senior US Economist

Email: spencer.hill@gs.com
Tel: 212-357-7621

Goldman Sachs and Co. LLC

David Mericle, Chief US Economist

Email: david.mericle@gs.com
Tel: 212-357-2619

Goldman Sachs and Co. LLC

Snapshot of our mainline asset views

What is the impact of the inflation outlook and associated central bank shifts on your asset class?

Rates

Praveen Korapaty and George Cole

US:

- Our economists' expectations of elevated inflation and earlier central bank tightening in economies including the US, Canada and New Zealand should translate into upward pressure in front-end nominal yields. Overall, we expect the combination of rising 5y yields and a somewhat sticky 5y5y yield will mean 10y UST yields rise to levels modestly above forwards. Our YE22 5y and 10y UST yield targets are 1.8% and 2%, which are about 55bp and 40bp above spot levels respectively.
- Yield curve behavior partly depends on the perceived central bank response to inflation—if the response is viewed as adequate as we expect, curves should trade with a flattening bias through next year, but if the central bank is perceived as being behind the curve on inflation, we could instead see some steepening.
- Our higher inflation outlook is one reason we expect a materially higher nominal terminal rate than markets are currently pricing, i.e., intermediate and long end yields look too low.
- Although markets are incorporating some degree of tightening in nominal terms, real yields are still close to historic lows, and should reprice substantially in the future, though the exact timing of this at longer maturities is unclear. We expect 10bp of the 40bp selloff in 10y UST yields by YE22 to come from breakeven widening and 30bp from an increase in real yields.
- Higher inflation, with risks skewed to the upside, means that nominal bonds may have less value as a portfolio hedge.

Europe:

- Although our economists believe inflation will ultimately prove benign in the Euro area, we expect belly (5y) risk premium to remain elevated given the uncertainty around inflation forecasts.
- An eventual decline in underlying inflation should allow the ECB to anchor the very front-end of the EUR curve. Together with a strong and durable growth recovery on the back of a back-loaded fiscal impulse, this should lead to a steepening of the EUR curve, both at 2s5s and 2s10s. By contrast, we expect elevated levels of inflation in the UK and relatively early hikes by the BoE—even if the pace of hikes is slightly slower than current pricing—will keep the UK curve relatively flat in comparison.

FX

Zach Pandl and Kamakshya Trivedi

- Under our economists' baseline inflation forecasts, we see reduced scope for sustained USD weakness.
- All else equal, higher inflation in an economy is negative for its currency, according to the theories of the "law of one price" and purchasing power parity (PPP), as well as the empirical observation that real exchange rates tend to mean revert. Our GSDEER model—the primary tool we use for estimating FX "fair value"—is based on the same principle. If, for example, US inflation runs 1% above Euro area inflation for five years, GSDEER would imply that EUR/USD "fair value" should rise by 5%.
- In practice, however, news of higher inflation may actually result in FX appreciation over the short run, depending on the central bank's reaction function. If a central bank credibly targets inflation, a currency may appreciate given expectations of tighter policy; however, if a central bank accommodates a rise in inflation, the currency may depreciate. In countries where the central bank may have low inflation-fighting credibility (e.g. certain high-yielding EMs), the currency tends to depreciate in response to news of higher inflation. However, in countries where the central bank has a long track record of maintaining stable inflation and/or follows a clear policy rule, the currency tends to appreciate in response to higher inflation.
- Similarly, G10 currencies with larger increases in inflation expectations tend to outperform over the short-run, while those smaller increases or declines tend to underperform—likely because of the expected impact on monetary policy.
- Investors thus shouldn't be too wary of markets with rising inflation, as long as the central bank is responding in a credible way.

CREDIT

Lotfi Karoui, Amanda Lynam, Marty Young

Corporate credit:

- We believe EUR spreads will perform better than their USD peers, given the Fed will likely start hiking rates in July 2022 while the ECB will remain on hold until 2024, in our view, in response to relative inflationary pressures.
- As investors continue to reprice future rate hikes in response to incoming inflation data and associated Fed actions, we also see scope for continued underperformance of front-end USD IG spreads relative to longer-dated bonds (i.e. curve flattening), given the emergence of competing alternatives in short-term rates markets.
- The return of "cash" as an investable asset class with this inflation backdrop will continue to undermine the value proposition of short-duration and high-quality corporate bonds while also easing the "urgency" of buying the dip and staying invested.
- Although not in our economists' base case, we believe a stagflationary macro environment would be quite damaging for corporate credit; history suggests that spreads tend to widen across both IG and HY when stagflation rears its head, as fear of tighter monetary policy weakens risk appetite. Damage would likely be especially severe in the USD IG market, given negative real yields, ultra-low nominal yields, tight spreads, and two-decade highs in duration.

US securitized credit:

- Inflation risks will tend to have relatively small, if not positive, impacts on US securitized credit exposures. The supply chain challenges that have limited auto manufacturer and homebuilder profits, for example, have pushed up used vehicle and home prices, which in turn has led to declines in loss rates across auto ABS and residential MBS. Similarly, while wage inflation is a risk to corporate profits, it would be credit positive for residential MBS and consumer ABS.
- Single-family housing and commercial real estate can potentially act as hedges for inflation risks, as, historically, property owners have been able to pass rising input costs through to rents.
- Higher inflation would likely contribute to growing performance dispersion in the commercial real estate market, as generalized price growth would likely lead to higher expenses but smaller revenue growth in the weakest properties and sectors.

EQUITIES

Ben Snider, Lilia Peytavin, Caesar Maasry

US:

- Inflation generally boosts nominal revenues but compresses profit margins as companies struggle to raise prices to keep up with rising input costs. However, we expect S&P profit margins to rise modestly and look for continued real earnings growth next year even in the current inflationary environment, as large-cap US stocks will likely continue to avoid margin squeezes due to strong pricing power and continued efficiency gains. We expect the S&P 500 to climb to 5100 by end-2022 driven primarily by strong profit growth, and think rising real rates will solidify the ceiling on valuation multiples.
- High inflation can raise the equity risk premium, as well as lead to monetary policy tightening that raises the risk-free rate, both of which are detrimental for equity valuations. However, our economists' forecast for a decelerating rate of inflation next year and a pace of Fed tightening roughly in line with market pricing suggests a benign environment for equity valuations in 2022. We expect valuations to remain roughly flat as a modest rise in interest rates is roughly offset by a reduction in the equity risk premium as uncertainty declines. As a result, US equities should appreciate roughly in line with earnings growth.
- Below the index level, history suggests that the best-performing equities in inflationary environments are those of companies with revenues that benefit most directly from inflation, such as Energy firms, and companies with the pricing power to pass through rising input costs and protect profit margins, such as Health Care. Stocks with low pricing power and "long duration" companies with elevated multiples founded on low interest rates should face the greatest risk.

Europe:

- Our economists' expectations of accelerating inflation should benefit European equities relative to bonds, as inflation favors real assets. A modestly higher inflationary environment is also supportive for European equities in absolute terms given a) it reduces the tail risk of deflation, which is something that has been a greater threat in Europe and b) Europe has more sectors than the US which, all else equal, tend to do well in environments of higher inflation.
- Below the market surface, rising input prices create significant dispersion within sectors: winners are stocks which have pricing power and lower shares of private labels as they are able to pass on higher costs. By contrast, weak operating margin businesses and those with higher electricity costs as a percentage of revenues are penalized. Inflation also creates dispersion across sectors. We have an OW recommendation on Banks, which tend to be the greatest beneficiaries in an environment of higher inflation expectations and interest rates. We have an UW recommendation on most defensive consumer-facing sectors, such as Consumer Products & Svcs., Personal Care, Drug and Grocery Stores, as well as Food, Bev and Tob. Construction and Mats. as they are vulnerable to both higher input costs and wage growth.
- If inflationary pressures were to become more structural than our economists expect, in the event of a wage-price spiral for example, this could trigger a sharp repricing in the bond market, which equities tend not to digest well. In a taper tantrum type of reaction, equities would likely de-rate, and growth/defensive sectors would outperform along higher bond yields.

EM:

- EM equities tend to display similar sensitivities to higher inflation as DM equities given shared transmission mechanisms, particularly the potential pass-through of tighter monetary policy into higher real rates. However, food and energy costs generally account for a larger portion of the inflation basket in emerging economies, which can cause EM equities to be more sensitive to headline, rather than core, inflation.
- In the current environment, we take solace that EM central banks have managed to "lift off" ahead of most of their DM counterparts (central banks in 10 of the largest 18 EM economies have tightened policy this year). Our research suggests that EM hiking cycles that are well priced in the rates market tend to be benign for equities. That said, recent global inflationary impulses have coincided with USD strength, a key impediment to EM equity outperformance.
- Near-term inflationary and rates pressures keep us long on "defensive" EMs such as Mexico and Russia.

COMMODITIES

Damien Courvalin, Sabine Schels, Mikhail Sprogis

Energy and base metals:

- We expect commodity prices to benefit in an inflationary environment, especially when accompanied by interest rate hikes.
- We also maintain that commodities remain one of the best hedges against inflation; commodities are spot assets whose prices don't depend on forward growth expectations but rather on the current level of demand relative to the current level of supply, and as a result, they can act as a hedge against short-term unanticipated inflation.
- Commodities also remain one of the few hedges against stagflation, precisely because increases in oil, natural gas or base metals prices are required to rebalance demand with insufficient supply, the situation we're facing in these markets today.

Precious metals:

- Gold acts as a hedge against tail risk of a large growth deceleration or inflation becoming more persistent or de-anchored. Should inflationary pressures on the energy, housing or labor front become more entrenched, that could trigger increased concerns about stagflation, which would lead to more investor demand for gold.
- Gold will do particularly well in an environment of rising inflation where the Fed remains more dovish than expected. A more hawkish-than-expected Fed could initially hurt gold, but resulting fears of a growth slowdown and recession could also eventually support gold prices. We therefore expect gold to perform well until inflation cools down.

Global surge turning local and persistent

Daan Struyven answers key questions about the surge in global inflation this year and his expectation that it will gradually abate in 2022

The inflation debate this year has centered on many dichotomies: persistent vs. transitory, supply vs. demand, and global vs. local. Although these dichotomies oversimplify the discussion, they provide a helpful framework for summarizing the current state of inflation and our inflation forecasts to levels moderately above 2% by the end of 2022.

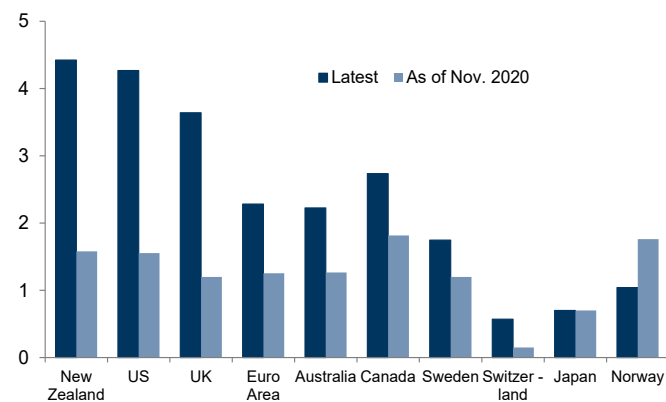
Q: How global has the surge in inflation been in 2021?

A: Fairly global, although cross-country differences are large

The biggest surprise of 2021 has been the global nature of the inflation surge, which has been visible not only in EM economies that have a long history of these inflationary bouts, but also in most G10 economies. Core inflation in 4Q21 is on track to significantly exceed our (and most forecasters') expectations as of a year ago in eight of the ten G10 economies, especially in the US and New Zealand. The two exceptions are Japan and Norway, where a prolonged low inflation trend and the appreciation of the Krone, respectively, have kept inflation subdued.

An upward inflation surprise across most of G10

4Q21 GS core inflation forecasts: G10, % change vs. year ago



Source: Goldman Sachs GIR.

Inflation has also risen sharply in most of the EM world excluding Asia. The regional average for headline inflation is on track to surge this quarter to 7½% yoy in Central and Eastern Europe, and to 8¼% in Latin America, but remain soft at just 2% in EM Asia.

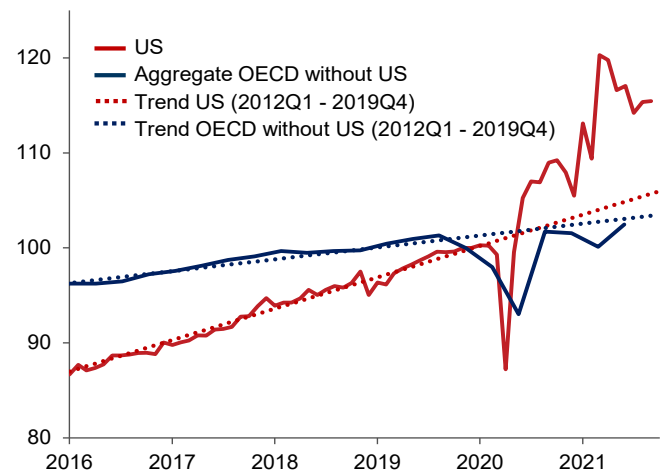
Q: Does the surge in goods inflation mostly reflect weak supply or strong demand?

A: Both play a major role, but the contribution from exceptionally strong US goods demand is underappreciated

To be sure, [supply bottlenecks](#) in the semiconductor, auto, and other sectors have played a large role in price spikes in several durable goods categories. But exceptionally strong goods demand is an underappreciated driver of the surge in global goods inflation, especially in the US. Although US real goods consumption has already declined by 5% since peaking in March when households received stimulus checks, it remains 10% above trend. Across many economies, there's been a strong cross-country [relationship](#) between real goods spending and the rise in goods prices since the start of the pandemic. Excess goods demand explains 90% of cross-country differences in goods inflation and 60% of the overall rise in US goods prices.¹ Similarly, [we estimate](#) that strong goods demand has accounted for about two-thirds of the lengthening in global manufacturing delays, based on an analysis of manufacturing PMI output and supplier delivery times.

US goods demand is exceptionally elevated

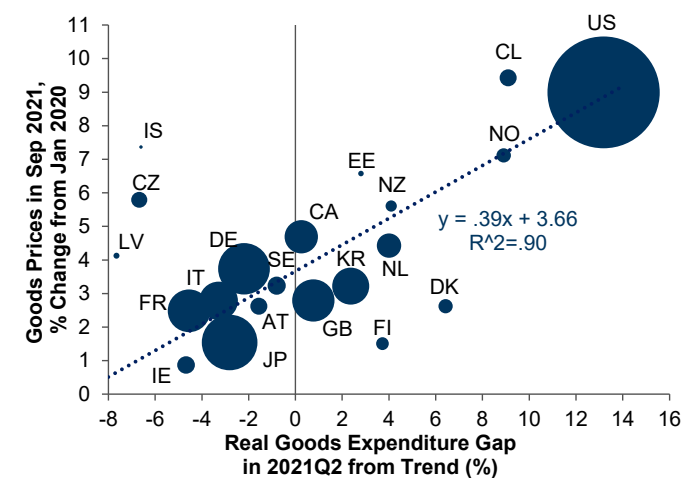
Real goods expenditure, index (Dec 2019=100)



Source: OECD, Goldman Sachs GIR.

Excess goods demand is closely linked to inflation

Change in goods prices versus goods expenditure gap, %



Note: Trend for charts above is estimated using observations from 2012Q1-2019Q4. Both bubble sizes and regression weights are proportional to GDP.

Source: OECD, Goldman Sachs GIR.

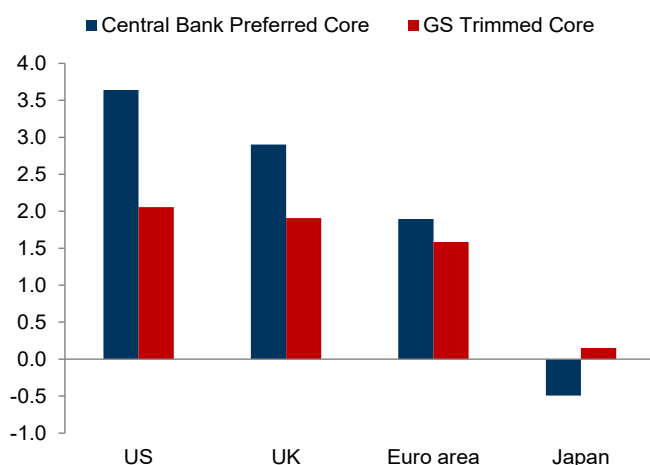
¹ This simple calculation is based on the intercept, and US trend goods inflation of 0% likely understates the demand contribution to inflation because a large share of goods is imported from abroad.

Q: Will the 2021 inflation surge prove transitory or persistent?

A: Our central scenario is that much of the 2021 inflation surge will gradually abate in late 2022. That being said, more persistent pressures are building in the US and the UK, and we ultimately expect G10 inflation to settle ½pp above the pre-pandemic level, on average

The US core inflation overshoot is so far entirely attributable to a surge in a limited number of durable goods categories. Although inflationary pressures will likely get worse before they get better in late 2022, we still expect this surge to gradually abate as goods demand should slow while goods supply rises next year. Our GS trimmed core inflation measure—which systematically trims a weighted one-third of outlier categories—shows how concentrated the recent inflation surge has been in most large G10 economies so far. Our September trimmed core measure is essentially on the central bank target in the US (2.06% yoy), and the UK (1.91%), but below target in the Euro Area (1.58%) and especially in Japan (0.15%).²

GS trimmed core measure shows a more modest inflation rise CB preferred core inflation vs. GS trimmed core, % change vs. year ago



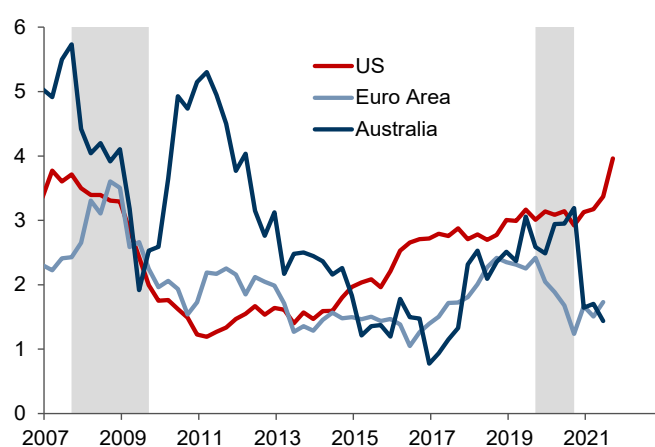
Note: Central bank preferred core measure is PCE ex. food and energy in the US, HICP ex. food, energy, alcohol and tobacco in the Euro Area and UK, CPI ex. fresh food and energy in Japan, and the average of trimmed, median, and common CPI in Canada. Central bank preferred core inflation is equal to realized print. Source: Goldman Sachs GIR.

That said, the recent acceleration in our US trimmed measure to 3.3% on a 3-month annualized basis and the broad-based US October CPI acceleration illustrate that more persistent inflationary forces are building. Tightness in labor and housing markets, wages pressures, and the underlying inflation trend will drive the timing of inflation normalization and the level at which inflation ultimately settles. Within the G10, these persistent forces should be more pronounced in the US, the

UK, New Zealand, and Canada than in the Euro area, Australia, and Japan.

On the labor market side, our GS wage trackers are firmer in the US and the UK at around 4% and 4½% year-over-year, respectively, than in the Euro Area and Australia, where they have fallen below 2%. Similarly, housing supply is very tight in the US, the UK, Canada, and New Zealand. More broadly, the pre-pandemic starting point for inflation across G10 economies remains a key differentiating factor. In fact, in the Euro Area, a further uptick in inflation expectations—which have been too low—is necessary in our forecasts to sustainably approach the ECB's target.

Wages are firmer in the US, but softer in Euro area/Australia
GS wage trackers, % change versus year ago



Note: Grey bars reflect US recessions. Source: Goldman Sachs GIR.

Taken together, we expect inflation to moderate in the second half of next year across most of the G10. We forecast that central banks' preferred measures of core inflation in 4Q22 will be moderately above the target in the UK (2.5%), US (2.4%), Canada (2.2%), and New Zealand (2.1%), moderately below the target in Australia (2.1% vs. the 2.5% target), and significantly below the target in the Euro area (1.2%).

Beyond the next few years, we expect inflation to settle ½pp above the pre-pandemic level on average, in part because central banks such as the Fed and the ECB have tweaked their goals accordingly. These structurally higher inflation forecasts also incorporate factors that we expect to mostly persist, including housing and energy markets tightness, elevated US wage pressures, and increased long-run inflation expectations.

Daan Struyven, Senior Global Economist

Email: daan.struyven@gs.com
Tel: 212 357-4172

Goldman Sachs and Co. LLC

² Our trimmed core measure is above target in Canada (3.58%).

The revenge of the old economy

Jeff Currie argues that current commodity shortages are the product of chronic underinvestment in the old economy

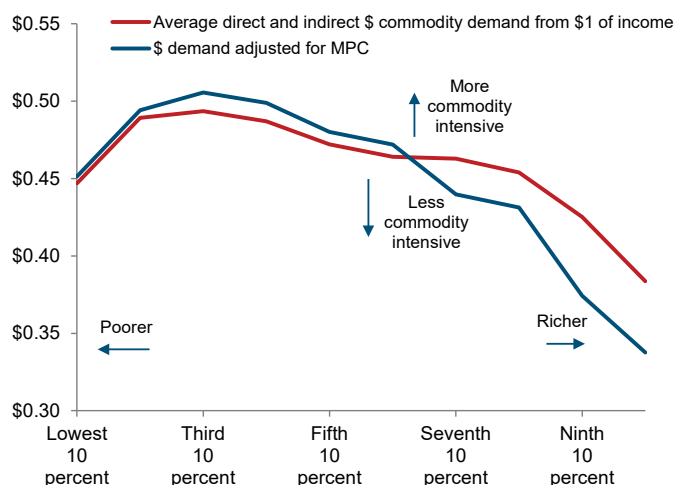
It is tempting to blame today's shortages in the "old economy"—everything from energy, to other basic materials, and even agriculture—on a series of temporary disruptions driven by the COVID-19 pandemic, or the race toward net zero and fossil fuel divestment. Yet these bottlenecks have little to do with COVID-19, and are not solely driven by environmental, social, and governance (ESG) capital restrictions. Instead, the roots of today's commodity crunch can be traced back to the aftermath of the Global Financial Crisis (GFC) and the following decade of falling returns and chronic underinvestment in the old economy. As infrastructure aged and investment waned, so did the old economy's ability to supply and deliver the commodities underpinning many finished goods. After years of neglect, today's rising gas prices, copper supply shortfalls and China's struggles with power generation are the old economy's revenge.

A commodity shortage long in the making

In the years following the GFC, as households struggled to pay down debt and businesses faced tighter lending conditions, the macro recovery stagnated and uncertainty over the future growth rates of traditional activity grew. As policymakers focused on macro-stability via QE rather than social need and redistributive policies, lower-income households suffered. They faced stagnating real wages and economic insecurity, tighter credit limits and increasingly unaffordable assets. High-income households, on the other hand, benefitted from the financial asset inflation caused by QE.

This disparity in outcomes hit the old economy hard. In the old economy, price appreciation occurs when the volume of demand outstrips the volume of supply. Higher-income households may control the dollars, but lower-income households control the volume of commodity demand given their greater number and propensity to consume physical goods over services.

Lower-income households determine commodity demand



Source: US Bureau of Economic Analysis, US Bureau of Labor Statistics, GS GIR.

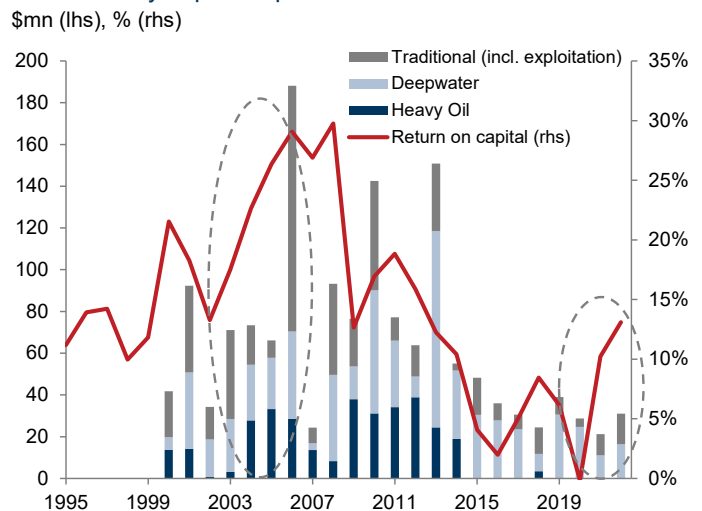
Old economy returns stagnated as commodity demand waned



Source: Reuters, Datastream, Goldman Sachs GIR.

As the volume of demand for commodities waned, so did the returns for old economy sectors. Lower returns led to reduced long-cycle old economy capex—which traditionally requires a 5-to-10-year horizon of sufficient demand—in favor of short-cycle "new economy" investment in areas like technology.

Old economy capital expenditure fell with returns



Source: Company data, Goldman Sachs GIR.

By 2013, this weakness backed up into China. As the world's manufacturing engine slowed and commodities began their historic slide, the old economy's capital flight intensified. Indeed, the old economy was overbuilt, debt-laden and overpolluted. While the old economy represents only about 35% of global GDP, it generated at least two times the corporate losses, had about 90% of the non-financial debt, and created 80% of the emissions. It is no wonder why investors preferred Big Tech to oil and copper.

After oil prices collapsed in 2015, markets were fed up with wealth destruction, nearly halting deal flows across the old economy. China stopped aggressively stimulating lossmaking enterprises like coal mines. And as climate change became top of mind, investors put greater weight on ESG issues, further restricting capital. The resulting decline in investment prevented capacity growth in commodities. This has been particularly the case in hydrocarbons, where investor divestiture

for ESG reasons compounded an already growing underinvestment problem.

As income equality falls, inflation tends to rise

The policy response to COVID-19 created the perfect demand environment to expose the severity of these supply constraints. Lockdowns generated a wave of demand for physical goods given an inability to consume services. But the pandemic also had a deeper effect—it placed social need at the center of policymakers' agendas. This was the case not only in the West, but also beyond—even China has "Common Prosperity" goals. Such inclusive growth has only accentuated the demand for physical commodities and associated goods price inflation.

Indeed, there has long been a relationship between falling inequality and rising commodity demand. It is no coincidence that US income inequality troughed during the 1970s—the last DM-led commodity supercycle. Although oil supply shocks are commonly blamed for the inflationary episodes of the 1960s/70s, the supply shocks actually created recessions, reducing the volume of physical demand and, in turn, price pressures. It's almost forgotten that OPEC's first attempt at an oil embargo in 1967 failed to increase oil prices because of insufficient demand. Oil inflationary pressures only emerged after five years of Lyndon B. Johnson's populist "War on Poverty" that saw oil demand accelerate from 3.9% yoy in 1967 to 8.1% yoy in 1973—more than sufficient to make OPEC's second attempt at an oil embargo successful.

Even China's commodity bull market of the 2000s was a result of redistributive policy on a global scale. Once the US decided to allow China to join the WTO, it unleashed a powerful outsourcing arbitrage that resulted in a redistribution of wealth to a large number of low-income Chinese laborers. With this newfound income, these households bought physical goods in large volumes just as low-income households in the US and Europe did in the late 1960s and 1970s. For commodities and physical goods, only demand can drive multi-year bull markets.

Higher commodity prices, with risks skewed to the upside

So where is commodities inflation headed next? Our baseline view generally sees tightness persisting across the commodities complex in 2022, leaving oil and metals prices at or moderately above current levels. Specifically, we forecast Brent crude oil prices will average \$85/bbl in 2022—a roughly 20% increase from 2021 average prices, although this pales in comparison to an estimated +60% yoy rise in oil prices this year, and is relatively close to current price levels. On the metals side, we also see aluminum and copper market deficits growing in the coming year, which we think will generate price upside of about 10% and slightly more than 20% from current price levels, respectively. However, these represent a 75% and 50% fall, respectively, in the rate of each metal's price inflation, consistent with our economists' view of a diminishing commodity contribution to headline inflation.

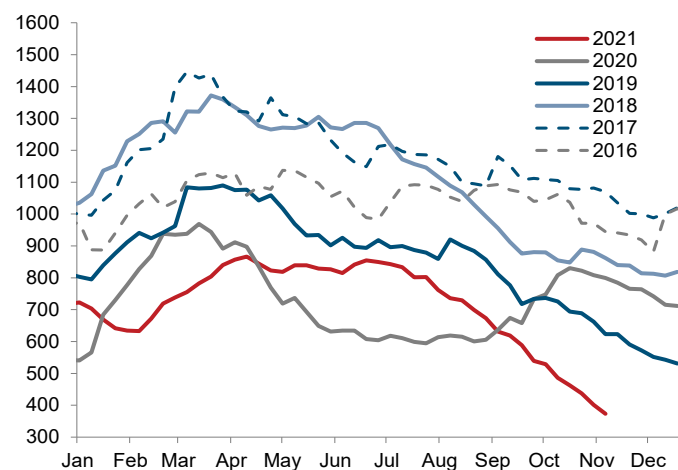
But we view risks to these forecasts as sharply skewed to the upside. It's increasingly apparent that shocks to one part of the system now create ripple effects elsewhere. Reduced coal output in China hit aluminum smelting capacity, creating shortages in aluminum. Reduced gas availability forced gas-to-oil substitution, generating shortages in oil. The rolling impact

of smaller, more frequent shocks on a stretched system generates the emergent phenomenon in which transitory shocks lead to persistent physical price inflation—the beginning of which we are seeing today.

To that end, should winter weather prove colder than normal, gas and power prices in Europe would likely surge further, prompting the need for more gas-to-oil substitution against a continued backdrop of tight oil supplies as OPEC maintains production discipline and shale producers continue to prefer returning cash to shareholders. Should that happen, the current oil deficit will only continue to grow, and the longer it does, the more likely it is that the market will need to induce demand destruction via sharply rising and volatile oil prices. In that scenario, we estimate that Brent crude oil prices could surge to as high as \$110/bbl, which would generate another burst of inflationary pressures. And other commodities—like copper—are facing similar risks of low inventories and large deficits requiring price spikes to balance the market.

Copper inventories have fallen and the market is in deficit

Global visible copper cathode stocks, kmt



Source: Wind, Goldman Sachs GIR.

Bouts of commodity inflation set to continue

This is where the revenge of the old economy will leave its mark. Periods of commodity price pressure will reoccur as broad-based demand meets inadequate infrastructure, leaving markets to draw down until prices are forced to destroy demand to regain market balance. Usually, such periods need to occur only once or twice to stimulate a sufficient supply response to ensure balance in the long run.

Today, however, the higher hurdles for investment owing to growing ESG concerns over commodity supply chains, demand uncertainty during the energy transition, and rising carbon taxes suggest more such periods of volatility will be required to balance markets. If policymakers' goals of broad-based prosperity and a massive buildout of green infrastructure are to be met, commodity prices will need to significantly overshoot to the upside to incentivize the required investment. This is needed to compensate for the growing risks involved in long-cycle capex projects and the inherent complexities surrounding the green energy transition. As we argued a year ago, a new commodity supercycle is upon us.

Jeff Currie, Global Head of Commodities Research

Email: jeffrey.currie@gs.com
Tel: 44-20-7552-7410

Goldman Sachs International

Interview with Rick Tsai

Rick Tsai is Vice Chairman and CEO of MediaTek, a global semiconductor company based in Taiwan. He is the former Chairman and CEO of Chunghwa Telecom and former President and CEO of TSMC. Below, he discusses what's behind the current shortage in microchips, when it might be resolved, and what it could mean for the industry and consumers going forward.

The views stated herein are those of the interviewee and do not necessarily reflect those of Goldman Sachs.



Allison Nathan: Why are microchips such a critical input for so many products?

Rick Tsai: Microchips have been central to the functioning of the products we use in our daily lives for decades, but like electricity or air they largely go unseen, receiving little thought or attention. In recent years,

that's started to change as digital transformation has taken hold of every facet of our lives. Inside every mobile phone, personal computer, and vehicle are microchips processing and storing information. There are roughly 50-60 microchips in your iPhone and hundreds of chips in cars, with that number growing as the amount of electronic components in cars continues to rise. For example, the autonomous driving features that most electric vehicles now have require substantial chip power.

Improvements in chip technology over the last several decades have led to significant increase in computing power that's allowed all of these devices to become more powerful in performance while simultaneously consuming less power. And if the world really is heading towards the "metaverse", the need for computing power will significantly grow over the next several decades, which will only make microchips even more important than they are today.

Allison Nathan: What's behind the current shortage in microchips?

Rick Tsai: Although pandemic-related shifts in supply and demand have been a key culprit, the factors behind the current supply-demand imbalance were already in place before the pandemic. The semiconductor industry has grown at a double-digit pace for the past five decades, mainly because of Moore's Law—Intel co-founder Gordon Moore's prediction that the number of transistors on a chip would double every 18-24 months while the cost would remain the same. In just the last decade, the industry has been growing at a 6-8% CAGR, fueled by the digital transformation of society. And the pandemic just accelerated this transformation as people increasingly worked, transacted and sought entertainment online.

At the same time, the supply of microchips has grown only moderately, as the foundries that manufacture microchips, memory makers that produce memory chips, and integrated device manufacturers (IDM) that both design and manufacture chips have been cautious in ramping up capacity after having been burned during past brutal boom/bust cycles such as the dot-com bubble and the Global Financial Crisis. Investment in mature technology (node sizes ranging from 22 nanometers (nm) to 180nm), which is mostly what automotive chips use for their applications, has been especially low over the last decade compared to leading edge technology (node sizes ranging from

5nm to 12nm). So while the supply of leading edge technology is tight, it isn't strangling, unlike that of mature technology.

Allison Nathan: Why wasn't there more investment in mature technology, given that industry demand from automakers has been growing?

Rick Tsai: It comes down to basic economics. Chip manufacturers have made good money under their current business model of buying used equipment at a low price when they need to resolve bottlenecks and provide incremental capacity. Building a greenfield plant and buying new equipment requires a completely different cost structure—companies have to be able to charge their customers a high enough price to justify these investments. So it didn't make economic sense to invest more.

Allison Nathan: Why has it been so challenging for the semiconductor industry to resolve the shortages, for example, by ramping up existing production capacity or increasing capacity, and what are semiconductor companies actually doing to help ease the shortages?

Rick Tsai: There really isn't much room to ramp up existing capacity—capacity utilization rates for mature technology are above 90%; most of the wafer fabs—which turn thin wafers of a semiconductor material, like silicon, into microchips—that we work with have been running at full capacity for over a year now. And increasing capacity would take a while; building a wafer fab takes at least 2.5-3 years. It's not just building the factory, either—companies need to buy the equipment to manufacture the chips. Equipment lead times have increased to 10-12 months amid a surge in demand, some of which may be due to overbooking by end-customers. The size of the market for wafer front-end equipment—the equipment required to make wafers—has grown from \$47bn in 2019, to \$60bn in 2020, to around \$80bn so far this year. And equipment is only made in the units of thousands, with each unit costing as much as \$5mn, or more. So building a new fab is a capital-intensive process that takes a long time to yield results.

That said, some manufacturers are investing in new capacity. But companies are still being cautious with their expansion plans, and entering into long-term contracts with their customers that include various protections, like pre-payments, to ensure that they can make a return on their investment before they jump in, which take time to negotiate.

Allison Nathan: To what extent have factory shutdowns in Southeast Asia and labor shortages more broadly played a role in why the industry is taking so long to respond?

Rick Tsai: Factory shutdowns in Southeast Asia have certainly contributed to the long response times, but only to a limited extent. Factories in Malaysia, which are critical for chip packaging and, to some degree, equipment manufacturing,

were declared essential manufacturers during the pandemic so they continued manufacturing, albeit at a reduced rate. Productivity is back up to somewhat normal levels now, so factory shutdowns contributed to maybe three months' worth of delays. Labor shortages have also impacted some major US equipment suppliers, which is partly why equipment lead times have increased from about two quarters to four quarters, although shipping delays have also been a factor.

Allison Nathan: Have you observed chip consumers adapting their behavior in response to these shortages?

Rick Tsai: Yes. Many original equipment manufacturers (OEMs) and companies like Google, AWS, and Facebook are now designing their own chips, either with chipmakers or by themselves. And OEMs in the smartphone and PC space are also strengthening their supply chain relationships. Many companies have understood for some time, although it took this crisis for some to realize, that they need to have a strategic relationship with their chip suppliers, not only so suppliers can better design chips to meet their specific application requirements, but also so suppliers can better understand and meet their demand needs. More of our customers are now signing memorandums of understanding (MOU) for one or more years' worth of supply. Whether this focus on strategic relationships will continue after the crisis has passed remains to be seen; in my experience, it will for many companies, but some customers will revert again to more transactional relationships. That's just the nature of business.

Allison Nathan: Ultimately, when/how might the current shortages be resolved?

Rick Tsai: Unfortunately, shortages will still take a while to resolve, although we have already seen some improvement in the demand-supply imbalance on the margin. End-demand for PCs and smartphones has begun to ease from the pandemic peaks. The global PC market grew in Q3, but at a slower rate than it did during the pandemic. While semiconductor demand in the smartphone space is still high as consumers switch from 4G to 5G devices, which have a much higher chip content, global smartphone sales have fallen over the past 6-9 months. Major OEMs currently have about 1.5-2 months' worth of inventory, which is tight for their business requirements, but it's no longer a hand-to-mouth situation.

My sense is that the supply-demand picture will become more balanced by end-2022 as demand continues to settle, and then by end-2023 supply will be much more adequate, if not necessarily ample, as the investments semiconductor companies are making today start to bear fruit. It's a bit more nuanced than that, because there's so many different kinds of chips and being short even a few in a device with hundreds can cause delays, but I expect a gradual move towards balance over the next few years. Beyond that, it's hard to say what the situation will look like, as new sources of demand will emerge over the next several years, from, for example, the hardware needed to build out the metaverse.

Allison Nathan: Consumers have enjoyed cheaper and better tech products over the last several decades, but do the recent developments suggest that will no longer be the case going forward?

Rick Tsai: It's hard to say. The driving force behind tech products becoming cheaper and better was the success of Moore's Law, which led to microchips delivering higher performance at a lower cost. Today's iPhones have 100,000x more computing power than the computer that sent astronauts to the moon. Moore's Law is slowing down, and how that impacts the tech cost structure going forward is a megatrend issue for the industry. But innovation won't stop even when Moore's Law is no longer applicable; there will just be different forms of innovation, for instance, in chip packaging, where chips are now being put on top of or beside each other to enhance the power of the system. Whether that can replace the benefits to end-consumers of Moore's Law, I can't say for certain, but the semiconductor industry has a track record of overcoming numerous technical, business, and now, of course, political challenges, and I believe it will continue to thrive and provide significant value to consumers.

Allison Nathan: Given all this, could the current disruptions lead to a reshaping of semiconductor supply chains? Could we see a de-concentration of production?

Rick Tsai: A large scale de-concentration is probably unlikely. While the US continues to be a key technology and manufacturing base, semiconductor industry concentration has grown over the last 30 years, primarily clustered in Taiwan, South Korea, and to some degree Mainland China. The semiconductor industry has always been capital and technology-intensive; innovation is very expensive, and implementing those innovations into manufacturing is even more costly. Economics dictate that only the top one or two firms consistently make good money, which isn't uncommon in many other industries—Apple captures 75% of the profits in the global smartphone industry, for example. I've worked in Taiwan for over 30 years and worked at TSMC for over 20, and in that time I've seen Taiwanese firms successfully manage their capital investments to generate strong returns, which fed back into R&D and capacity investment. Most companies have decided that they don't want to operate in such a self-reinforcing cycle, because it carries significant risks for shareholders, so they have come to rely on TSMC and a handful of other companies for their technology and capacity.

Going forward, some forces are pushing the industry towards de-concentration, which in some respects makes sense, especially from a risk management standpoint. But it will be very difficult and costly to do so, not just because it would require semiconductor companies to drastically change the way they do business, but also because the existing synergies in the industry would have to be recreated. Taiwan has a huge cluster of wafer fabs as well as all of the industries that support and surround them. This efficiency, together with Moore's Law, is what has allowed tech products to become cheaper and better over the last several decades. Breaking up the cluster will likely elongate the pace of innovation as well as increase costs. It's unclear who would fund that. That's what people are currently looking to governments for. But, remember, the government's money is ultimately people's money, so the burden of de-concentration would ultimately fall on consumers.

Microchips, explained

What is a microchip, and who makes them?

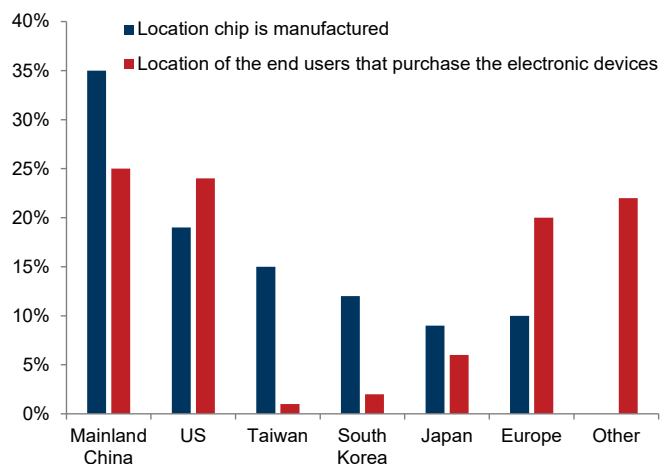
A microchip is a set of electronic circuits layered on a thin wafer of semiconductor material, typically silicon. Transistors located on the chip act as miniature electrical switches that can turn a current on or off. The more transistors that are located on a chip, the more the chip can do. The size of a microchip and the number of transistors on it varies; a microchip the size of a human fingernail can contain billions of transistors.

There are three main types of microchip companies: **Integrated Device Manufacturers** (Intel, Samsung), who design and manufacture chips in-house, **Fabless companies** (Qualcomm, AMD), who design chips in-house but outsource manufacturing, and **Foundries** (TSMC, GlobalFoundries), who manufacture chips for fabless companies, as well as IDMs who don't have sufficient in-house capacity.

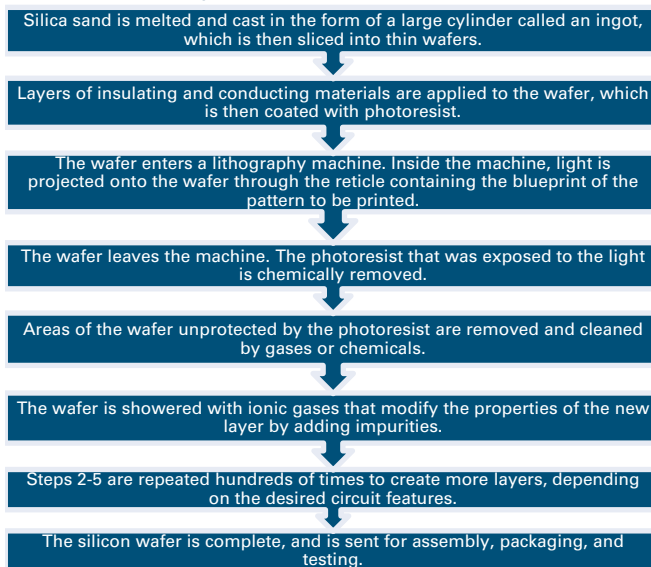
What do microchips do?

Microchips are the building blocks of technology, and are central inputs in many everyday devices, including cars, computers, smartphones, medical devices, and even pets (a lost pet's microchip can be scanned for their owner's contact info). There are three main types of microchips: **logic chips**, **memory chips**, and **Discrete, Analog, and Other (DAO) chips**. Logic chips are the 'brains' of electronics. They process information in order to complete tasks. Central processing units (CPUs) are built for general functionality, graphics processing units (GPUs) are optimized for visual displays, and neural processing units (NPU) are designed for machine learning applications. Memory chips store information. DRAM chips save data when a device is turned on, while NAND chips save data after a device is turned off. DAO chips transmit, receive, and transform information dealing with continuous parameters, like temperature.

Where in the world are chips manufactured and sold?



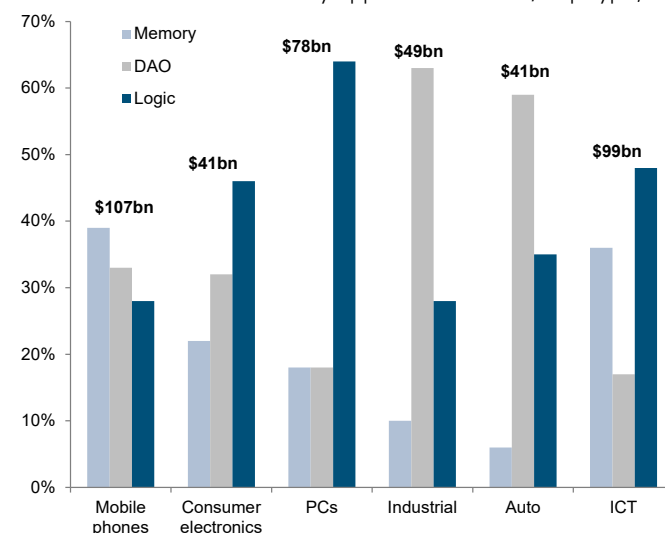
How are microchips manufactured?



Note: A simplified version of the major steps in the manufacturing process.

What types of microchips go into various devices?

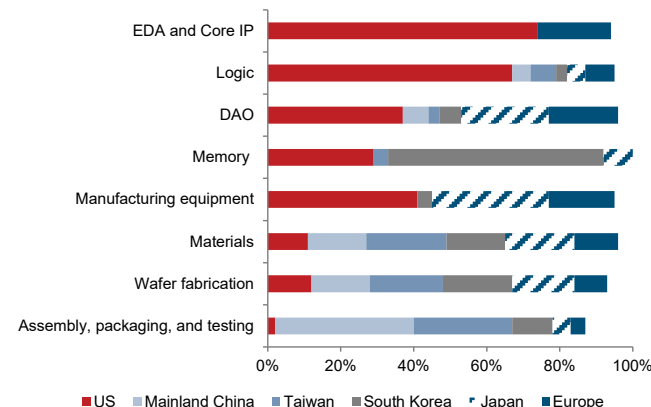
Global semiconductor sales by application market/chip type, %



Note: ICT is information and communications tech infrastructure.

What parts of the value chain does each region specialize in?

Semiconductor industry value added by activity and region, %

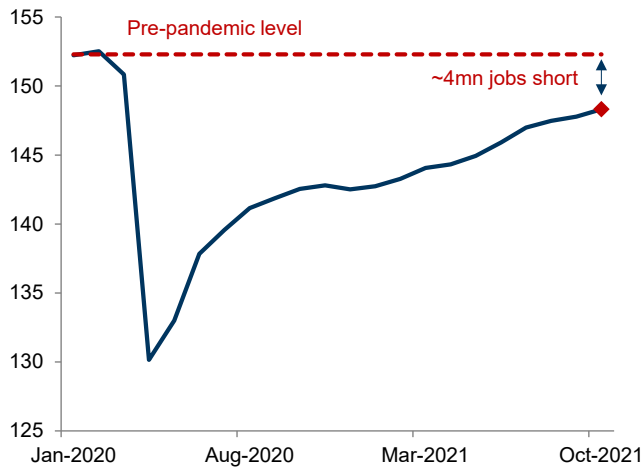


Note: EDA is electronic design automation, software tools used for chip design.

Sources for all exhibits: Semiconductor Industry Association, Goldman Sachs GIR.

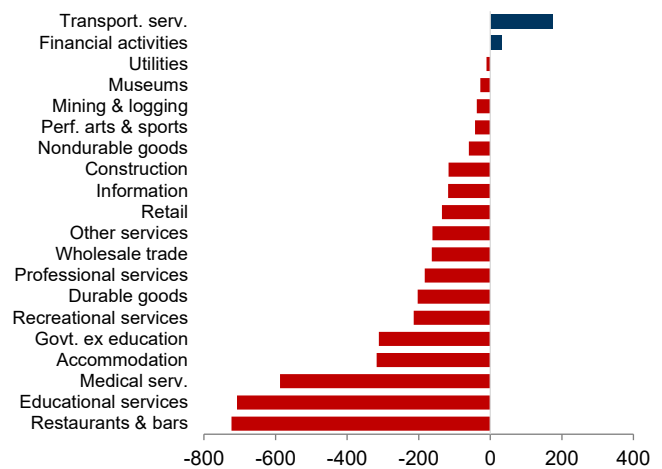
The labor market recovery in pics

Employment is still ~4mn short of pre-pandemic level
Current vs. pre-pandemic employment, millions



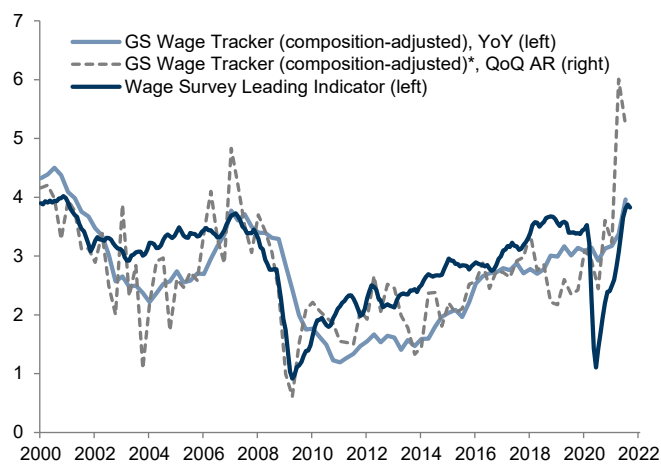
Source: US Bureau of Labor Statistics, Goldman Sachs GIR.

Virus-sensitive sectors have been the slowest to recover
Employment shortfall relative to Jan 2020 (thousands of jobs)



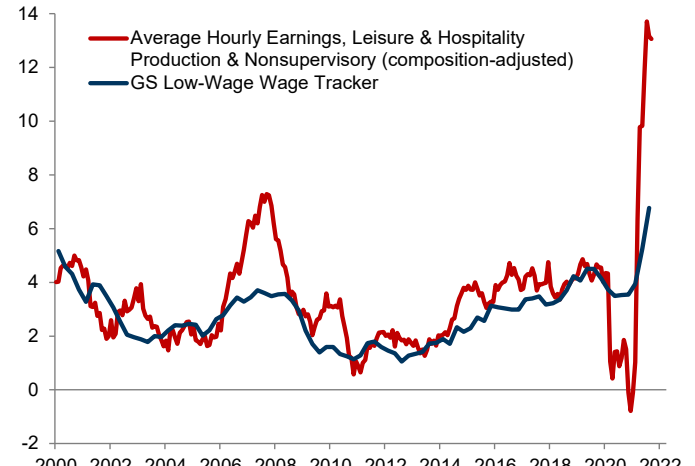
Source: US Bureau of Labor Statistics, Goldman Sachs GIR.

Wage growth accelerated in Q2/Q3 of 2021
Percent change vs. year ago



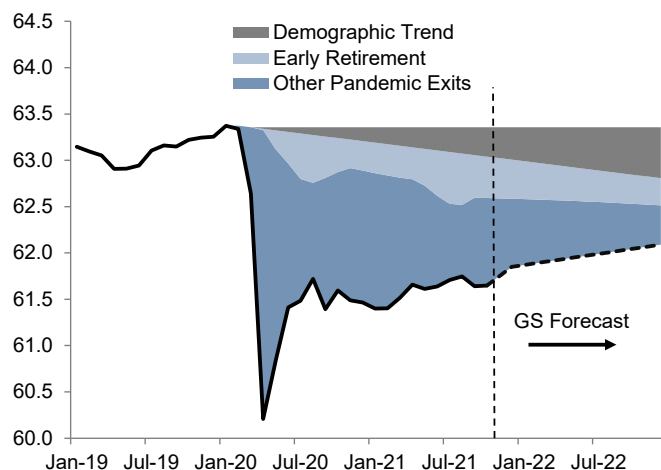
Note: QoQ AR. based on quarterly data for av. hourly earnings and ECI.
Source: US Department of Labor, Goldman Sachs GIR.

Wage growth is especially elevated for low-wage workers
Percent change vs. year ago



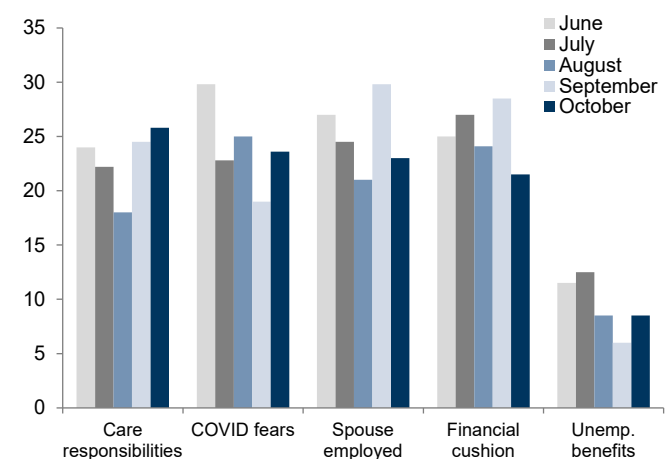
Source: US Department of Labor, Goldman Sachs GIR.

Labor force participation will likely remain depressed
Labor force participation rate decomposition, percent



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

Non-economic reasons are still holding back some workers
Reasons not urgently searching for a job, unemploy. workers, %



Source: Indeed, Goldman Sachs GIR.

Q&A on shipping/logistics bottlenecks



Jordan Alliger, GS analyst for the US Transportation sector, answers key questions on shipping and logistics bottlenecks and what companies are doing to relieve them

Q: Supply chain disruptions are continuing to affect many parts of the US economy, and many of the current bottlenecks seem to center around shipping and logistics issues. Where are the bottlenecks, and how did we end up here?

A: There is no single pain point—bottlenecks exist up and down the entire supply chain. That said, no place are the bottlenecks more evident than at the ports. 83 container ships are currently anchored off the coast of California waiting to offload their freight, principally at the Port of Long Beach and the Port of LA, compared to just nine ships in June and about 50 in September. In a normal year, the maximum number of ships anchored during peak season is about 5. Some of this increased port congestion derives from increased lockdowns in East Asia and forced power outages in China, which led to surges of increased ship volume compared to a steady stream of container ships. But a lot of it owes to labor, warehouse, and equipment shortfalls, with labor shortages really the major culprit. Ships come into port, but there aren't enough local, or drayage, truck drivers to move the containers to warehouses, which are full anyway. The Logistics Managers' Index of Warehousing Utilization suggests that warehouse utilization is at or near all-time highs. Then there aren't enough long-haul, or over-the-road, truckers to move inventory from warehouses to distribution centers and stores. Worker attrition has been especially significant on the truck driver front. Over-the-road trucking employment is currently 2.7% below pre-pandemic levels, and truck productivity as measured by miles per truck per week/month is actually negative, around -14%. On the equipment side, chassis, which hook up to the back of a truck to transport containers, as well as containers themselves, are in short supply, partly due to longer dwell times; chassis dwell times have increased to 9 days from an average of 3-4 days, and container dwell times to around 6 days from an average of 2-3. 30-35% of containers are sitting around doing nothing for more than 5 days, compared to only 5% in 2019.

Q: Given all of that, how effective will President Biden's plan for some West Coast ports to operate 24/7 be in relieving the bottlenecks?

A: It likely won't help ease congestion much. Operating these ports for longer hours certainly makes sense, but we estimate that the 6 major shippers that originally signed on for the plan could help increase port throughput by maybe 3-5%. Ultimately, the labor, warehouse, and equipment shortages will still constrain how quickly ships can be offloaded even if ports are open all night.

Q: Is the situation at East Coast ports similar to what's happening at West Coast ports? How difficult/costly would it be for shippers to source from East Coast ports instead?

A: Moving goods from Asia, particularly Southeast Asia, to the US east coast is much easier today than it was a decade ago given the widening and deepening of the Panama Canal. So when West Coast ports started becoming backlogged, shippers rerouted many goods to East Coast ports. The premium for such rerouting is currently around \$2000-3000/container, which is a rounding error to avoid the west coast congestion. But East Coast ports are now also becoming congested. The Port of Savannah, one of the larger East Coast ports, currently has 25 ships waiting to be offloaded, compared to almost none in a normal year. That's obviously lower than the absolute number of ships in queue at the West Coast ports, but throughput capacity is also much lower at East Coast ports; the Ports of LA, Long Beach, and Oakland together account for nearly a third of US import volumes, while the Ports of New York, New Jersey and Savannah together account for only 20%. The building congestion on the east and west coasts is reflected in rail intermodal volumes across the US rails, which are down 8% yoy on a 4QTD (quarter-to-date) basis at a time when demand is through the roof.

Q: How are constraints on warehouse capacity being addressed, and how much will those efforts move the needle on easing the port bottlenecks and beyond?

A: Some ports have announced various expansion plans to tackle the space shortage at warehouses. However, the high cost of land around ports is a limiting factor in such expansion, and the plans that are underway will take time to execute. In the meantime, railroad operators are trying to help out. The adoption of precision scheduled railroading (PSR), an operational model that requires fewer locomotives and rail cars sitting in terminals, has left underutilized space at some railroads that can be redeployed. For example, CSX Corp. has added 13 container overflow yards at key terminals to create additional storage and capacity. Warehouse capacity as measured by the Logistics Managers' Warehousing Capacity Index is still contracting, but it did improve last month, so some of these initiatives may be helping at the margin.

But beyond the physical space issues, warehouse capacity is also constrained by equipment and labor shortages. Robotic tracking and fulfillment systems in warehouses need semiconductor chips to operate, which are currently on backlog. And even though warehouses today are much more automated than they were in the past, workers are still needed for tasks like moving forklifts

around and placing items on shelves. So space, equipment, and labor issues all need to be tackled in order for the current warehouse issues to ease.

Q: With much of the bottlenecks tracing back to a shortage in truckers, what are you hearing from trucking companies in terms of the steps they're taking to ease this shortage, and why has this proven so challenging?

A: Most of the major over-the-road truckers—including Knight-Swift Transportation, Werner Enterprises, and Schneider National—are offering wage increases as high as 15-20% as well as hiring bonuses, retention bonuses, guaranteed minimums, etc. to attract drivers. Many of them are also opening up more driver schools to recruit new workers into the industry, which has been somewhat successful, but not sufficient to make up for the shortfall given that training takes time. But the extent to which these efforts can resolve the shortages is undermined by the extreme fragmentation of the industry. The largest trucking companies (50+ trucks) account for only about 1% of the total industry. The multitude of truckers are mom-and-pop businesses with only a few truckers and trucks; 85-90% of trucking companies operate with five or fewer trucks. So while the top truckers can offer meaningful wage increases and recruit drivers, that only goes so far in boosting the overall capacity of the system.

Q: What role do railroads play in the logistics supply chain, and how well have freight rail operators tackled the ongoing supply chain issues?

A: Railroads are one of the main ways that goods move from the coasts to inland points. And railroad operators have done a better job than most at improving fluidity in their networks, for two main reasons. One, although the single biggest complaint from rail companies has been that they need more labor, the industry isn't suffering the same severity of labor issues that the trucking industry is because railroad jobs have historically paid well and offered good benefits. And two, railroads are very efficient, partly due to operational models like PSR. They're able to add more rail cars or locomotives as necessary and adjust to changing demand conditions. Some companies are also trying to incentivize customers into different behaviors. Union Pacific Railroad, for example, is offering a \$60/container refund to shippers who use their facilities on the weekends instead of weekdays (incremental to each customer's current weekend average). But, at the end of the day, there's only so much railroads can do when the rest of the supply chain is bottlenecked, and while velocity and dwell measures have improved, they're still behind where they should be.

Q: To what extent has the current congestion translated into higher shipping costs, and who's ultimately bearing the brunt of those costs?

A: Nowhere has the current congestion manifested itself more than in air and ocean cargo rates, the two areas that relate directly to international trade. Airfreight from Hong Kong to North America is up 50% yoy, and in oceanfreight prices are 4x higher yoy. But amid this increase in shipping costs, transport companies have largely beat expectations this earnings season because they've been able to pass these costs onto the shipping public in the form of higher prices, which has more than offset the weakness in volumes. In the parcel sector, FedEx and UPS have been able to increase and retain surcharges both internationally and domestically. Trucking rates have also risen in line with increased wages so trucking companies have been able to produce increased earnings and push up earnings guidance even in an environment in which truck productivity is negative. This could come back to haunt them, as once companies commit to a higher wage structure, it's here to stay, even when business ultimately slows. But, for now, earnings and profit margins are very healthy. And railroad operators are currently reporting some of the best yields we've ever seen. All along the transport supply chain, companies have substantial pricing power because end consumers are so desperate for capacity that they'll pay whatever is necessary. Case in point: the Ports of LA and Long Beach have recently begun to charge shipping companies a \$100/day fee on truck-bound containers that are left in terminals for more than eight days and rail-bound containers left for more than two days (\$100/day incremental fee applied/container), but consumers will ultimately bear this cost.

Q: What are you hearing from companies as to when/how this all ultimately gets resolved?

A: Some combination of more labor and demand normalization will likely be necessary to ultimately resolve these bottlenecks, but the challenge is knowing when that will occur. Companies initially thought congestion would ease in September 2021 as the expiration of unemployment benefits would bring people back into the labor force, but September came and went and, at least in the transportation sector, workers didn't return. A month ago consensus was that the situation would ease in 1Q22 as demand normalized after Chinese New Year, but that has now shifted to mid-2022. That seems conceivable as demand is likely to slow after Christmas and the Chinese New Year, allowing supply chains to catch up and shelves to be restocked. And at least on the ocean side, some slight easing is likely over the next several weeks as peak Christmas season shipping passes ahead of the holidays, given that it normally takes about 20 days for ships to travel from Asia to the US. It's not clear if that will be sustainable because Chinese New Year will likely back things up again shortly after, but some near-term relief on the ocean side is possible.

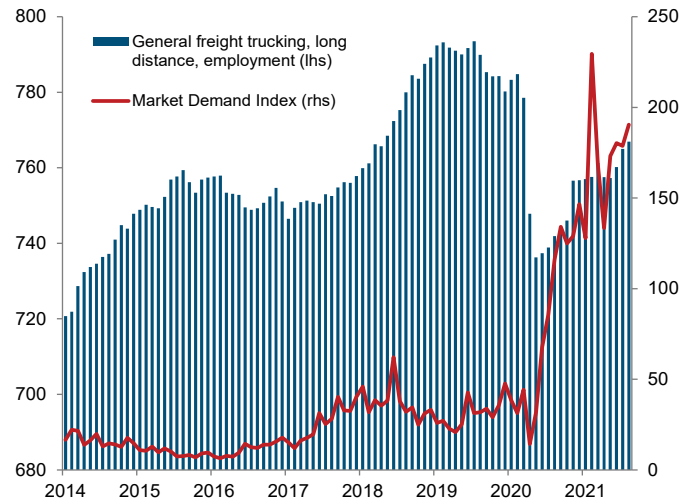
Congestion up and down the supply chain...

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



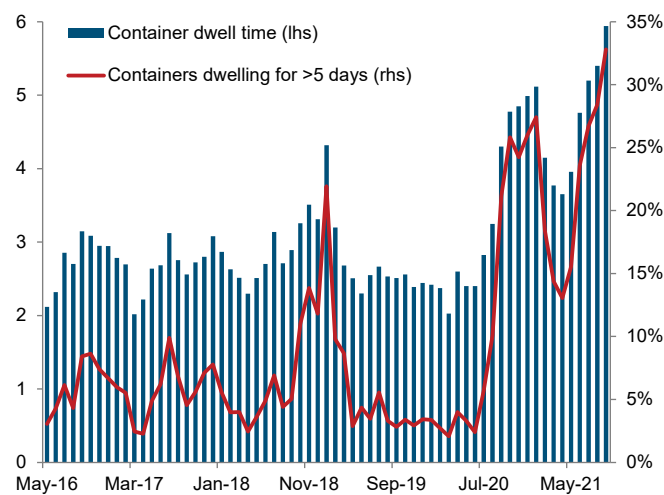
Source: Marine Exchange of Southern California, Goldman Sachs GIR.

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



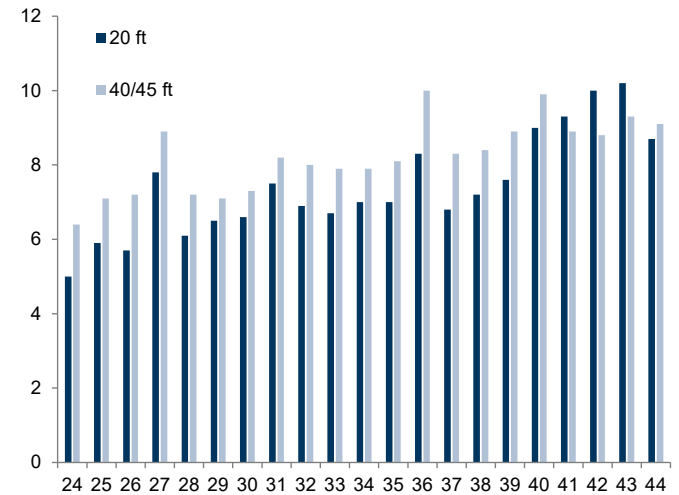
Source: Truckstop, US Bureau of Labor Statistics, Goldman Sachs GIR.

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



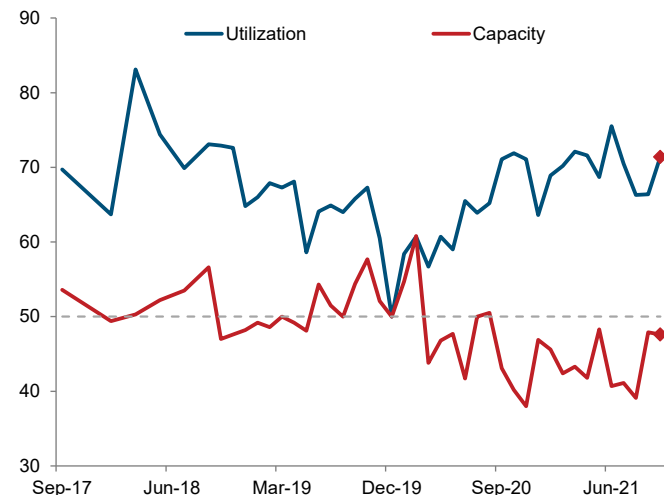
Source: Pacific Merchant Shipping Association, Goldman Sachs GIR.

Chassis dwell times are also at record highs
 Chassis street dwell times by size, week # (x-axis), days (y-axis)



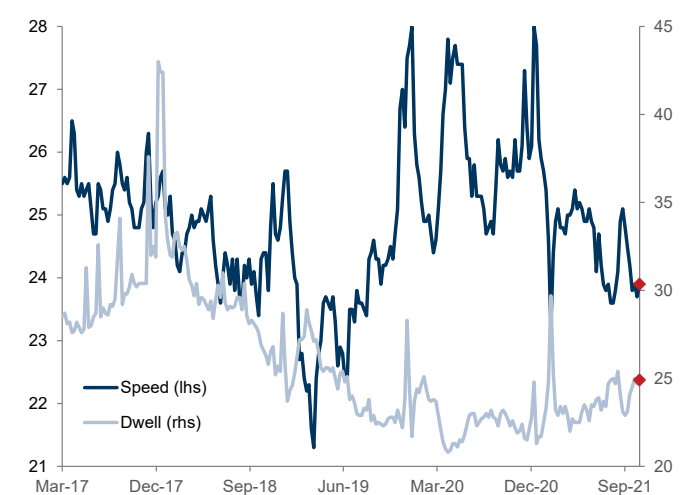
Source: Pool of Pools, Goldman Sachs GIR.

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)

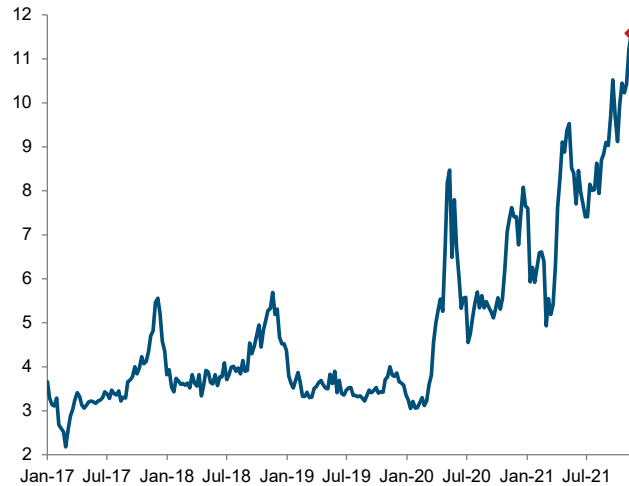


Source: STB, Goldman Sachs GIR.

...has led to increased prices/delivery times

Airfreight rates have significantly increased

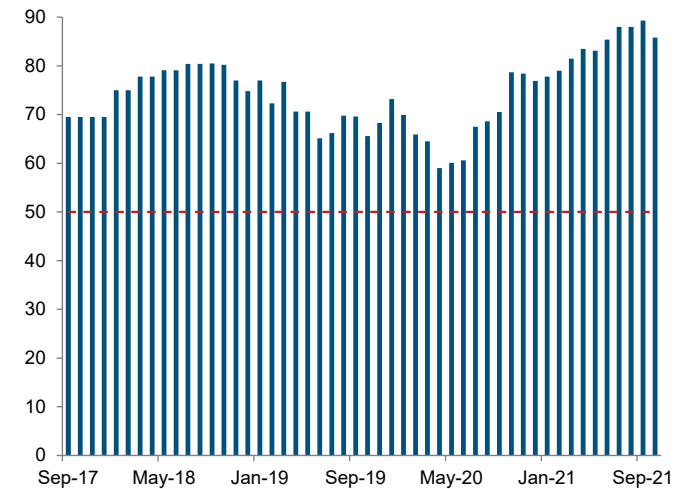
Hong Kong to North America (NA) airfreight rate, \$/kg



Source: TAC Index, Goldman Sachs GIR.

Warehouse space has become more expensive

LMI Warehousing Pricing Index

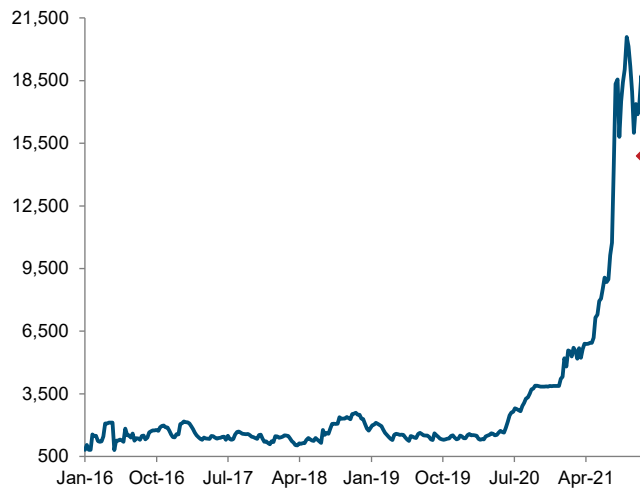


Note: Pricing above 50 indicates an increase in prices.

Source: Logistics Managers' Index, Goldman Sachs GIR.

Oceanfreight rates to the West Coast remain very high...

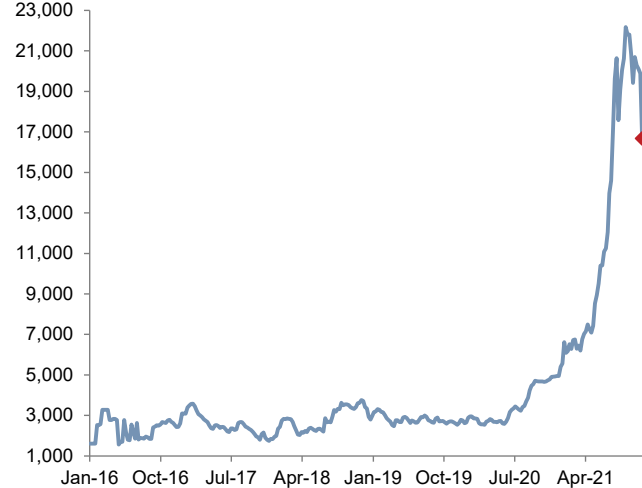
China/East Asia to NA WC oceanfreight rate, \$/container



Source: Freightos, Goldman Sachs GIR.

... as do East Coast oceanfreight rates

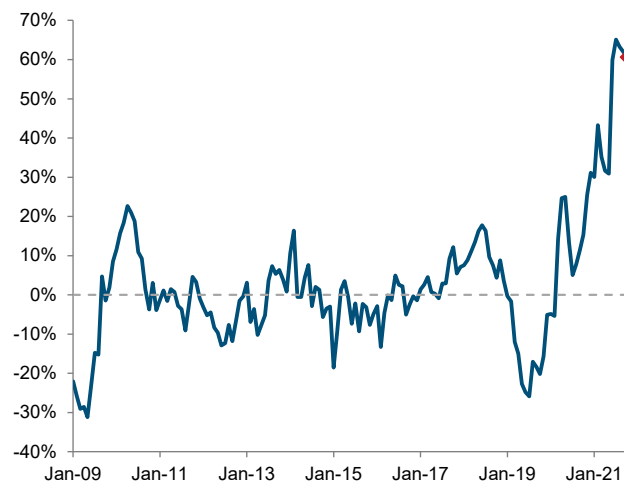
China/East Asia to NA EC oceanfreight rate, \$/container



Source: Freightos, Goldman Sachs GIR.

Delivery times for manufacturers have risen 60% YoY

PMI: Manufacturing Suppliers' delivery times, YoY, SA



Source: IHS Markit, Goldman Sachs GIR.

Special thanks to GS US Transp. analyst Paul Stoddard for charts.

Door-to-door shipping times have increased to >70 days

China to US door-to-door ocean shipping time, days



Source: Freightos, Goldman Sachs GIR.

Unpacking US worker shortages

Joseph Briggs argues that acute labor shortages should ease in the near term, as the impact of fiscal transfers and other pandemic-related disruptions diminish, but labor market tightness will likely persist in the years ahead

Widespread worker shortages have significantly slowed the US labor market recovery this year and contributed to strong wage growth, fueling concerns about a lasting period of sustained higher inflation ahead. The shortages are particularly challenging for businesses, which are struggling to hire workers amid rising labor costs. In a recent GS survey, 80% of small businesses reported that hiring difficulties are currently impacting their bottom line. While the economy is still a long way from full employment, wage growth according to our wage tracker stood at 3.9% yoy in Q3—well above last cycle's peak growth rate—and quarterly growth rates point toward an even sharper acceleration to a 5-6% annualized pace in Q2 and Q3.

If sustained, these growth rates would likely be inconsistent with the Fed's inflation goal, and Fed Chair Powell acknowledged as much at the November FOMC meeting's press conference, noting it would be concerning if wage growth increased "persistently and materially" above inflation and productivity gains. The timeline for resolving worker shortages is therefore important not only for the labor market and business profit margin outlooks, but for the inflation, Fed and interest rate outlook as well.

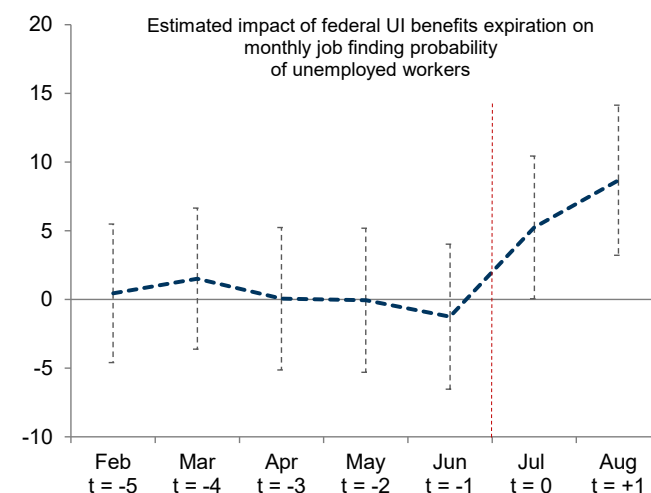
Lower supply, higher demand

The worker shortages reflect a perfect storm of factors that have significantly reduced the supply of workers who are currently looking for jobs at the same time that labor demand—as measured by job openings—has surged to all-time highs. As a result, there are currently a record-high 1.4 job openings per unemployed persons, suggesting that jobs are quite abundant relative to the number of people who want to fill them.

The exceptionally generous fiscal policy response to the pandemic, which lowered the incentives for some workers to find jobs, is likely one reason why labor supply was tighter than usual last spring and summer. Indeed, labor force participation rates among lower-income households trended lower than those of higher-income households after stimulus checks were distributed and UI benefits expanded earlier this year, and many unemployed workers cite a larger-than-usual financial cushion as one reason why they aren't urgently searching for a job.

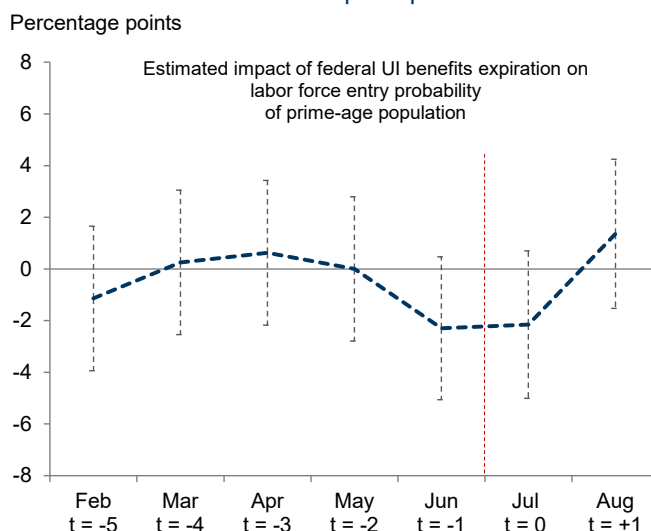
Individual-level employment data from July and August—when 25 states opted out of federal unemployment insurance (UI) benefit programs that increased the size of benefits, extended their duration, and expanded eligibility to include gig workers—also shows that UI-benefit expiration significantly boosted the job-finding rate for unemployed workers, although the expiration was not associated with an increase in the probability of labor force re-entry for workers who had left the workforce.

UI benefit expiration boosts job finding for unemployed workers



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

But it did not affect labor force participation



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

But generous fiscal policy isn't the only driver of shortages in labor supply. The pandemic has also prompted early retirements, which have removed 1.5mn workers from the labor force. A collapse in immigration (~700k drag on labor supply) and an increase in self-employment (~800k drag) during the pandemic have also reduced the pool of prospective employees. And other drags on the labor force—for example, population aging—are entirely unrelated to the pandemic.

Short-term improvement, longer-term tightness

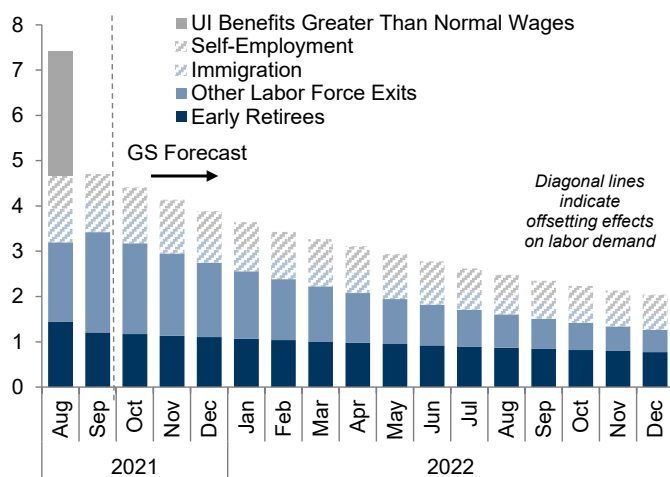
Looking ahead, we expect that labor shortages will ease considerably in the near term. The impact of fiscal transfers should diminish going forward, as the bulk of transfer payments are now behind us, and most households have accumulated only enough excess savings to postpone labor force re-entry for a few months. The impact of childcare disruptions—which limited parental labor supply earlier in the pandemic—also appear much smaller now that schools have fully reopened, while an improving virus situation, widespread vaccination at workplaces, and new antiviral drugs should alleviate the health-risk concerns that many people report as their main reason for not working. And nearly all workers that have left the labor

force since the start of the pandemic report that they still intend to start searching for work within the next twelve months, which should help fill jobs and allow job vacancies to normalize back towards their pre-pandemic trend. The collapse in immigration and increase in self-employment also primarily reflect near-term imbalances, as both reduce the need for employed labor and should therefore lower labor demand.

But the medium- and long-term labor supply outlook is more mixed. Most of the early retirements and some of the other labor force exits will not reverse. The participation shortfall from early retirees will therefore unwind only relatively slowly through fewer new retirements. Significant wealth gains—including appreciation in house prices, stock wealth, and retirement portfolios during the pandemic—and changes in lifestyle and work preferences may also prompt some workers to voluntarily remain out of the labor force, provided they can afford to do so. As a result, we expect that labor supply will remain depressed by over a million workers at the end of 2022 relative to its pre-pandemic trend.

Labor shortages to ease, but remain an employment drag

Total drag on labor force relative to trend, millions of workers



Source: Department of Labor, Census Bureau, Goldman Sachs GIR.

Rethinking maximum employment

A labor force shortfall of more than one million workers is not what Fed officials had in mind when they specified a maximum employment goal for raising their policy rate. But at the November FOMC meeting’s press conference, Chair Powell made clear that the FOMC realizes that maximum employment might look different post-pandemic, and that labor force participation is, and could remain, depressed in part for non-economic reasons. Because jobs are so abundant and any residual weakness in labor supply in mid-2022 will likely owe to changes in fiscal policy, wealth, and worker preferences, we expect the FOMC to judge any participation shortfall at that point as structural or voluntary, and update their maximum employment goal accordingly. We therefore don’t expect the forecasted shortfall to be an impediment to rate hikes.

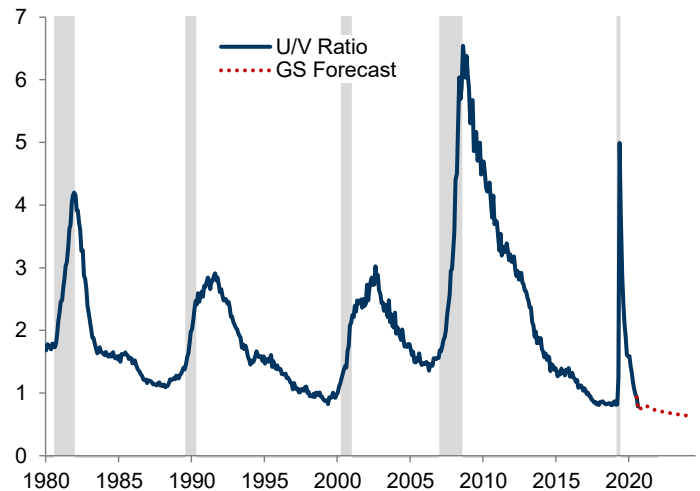
A tight labor market (and firmer wage growth) ahead

That said, we do expect the longer-term drags on labor supply, combined with still-solid labor demand, to keep the labor market tight in the coming cycle, with the ratio of unemployed

persons to job vacancies likely remaining historically low. As a result, we expect that a 3.5% unemployment rate—our forecast for end-2022—will imply a tighter labor market than it did in 2019.

Job searchers to remain low relative to job vacancies

Unemployed workers (U) vs. job vacancies (V), ratio

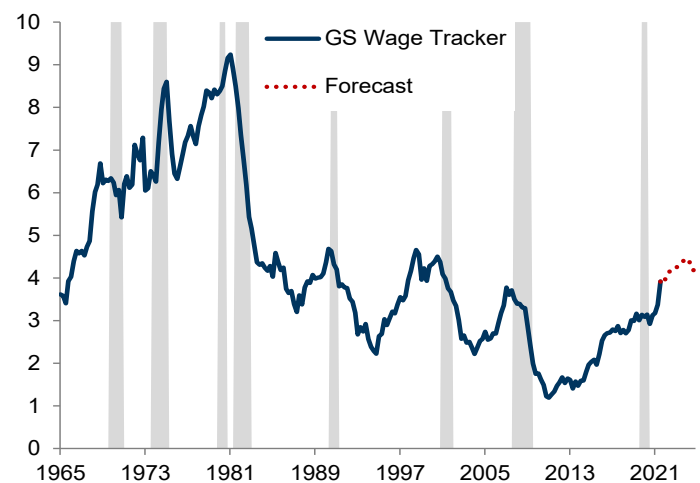


Note: Shading indicates NBER recessions. Source: Department of Labor, Goldman Sachs GIR.

This suggests that while the acute wage pressures observed in Q2 and Q3 should lessen, wage growth will likely remain strong in coming years, especially because wage growth tends to rise quickly when the unemployed-workers-to-job-vacancy ratio falls to very low levels, as is the case today. We estimate that underlying wage growth will average 4.0% in 2022 and 4.25% in 2023 and 2024. This would be meaningfully stronger than last cycle, but softer than seen over the last two quarters, and still compatible with inflation eventually settling moderately above 2%.

Wage growth expected to remain strong in the coming cycle

Wage growth, percent change vs. year ago



Note: Composition-adjusted wage tracker shown post-2000, shading indicates NBER recession. Source: Goldman Sachs GIR.

Joseph Briggs, Senior US Economist

Email: joseph.briggs@gs.com
Tel: 212-902-2163

Goldman Sachs and Co. LLC

Balanced portfolios: losing balance

Christian Mueller-Glissmann argues that 60/40 portfolios might face a "lost decade" given a more challenging growth/inflation mix and stretched valuations, which suggests greater equity and cash allocations in the next cycle

Balanced 60/40 portfolios (60% equities, 40% bonds) have recovered strongly from the COVID-19 bear market, recouping losses in record time and posting sizable gains. The rebound comes after a period of unusually strong real returns and relatively low risk for US 60/40 portfolios following the Global Financial Crisis (GFC), as the combination of low inflation and robust profit growth boosted both bonds and equities.

But while 60/40 portfolios have been one of the best performing strategies for the current generation of investors, that's unlikely to remain the case in the post-pandemic cycle. The prospect of a "lost decade" looms large for balanced portfolios given the likelihood of a less favorable growth/inflation mix—primarily owing to higher and more persistent inflation—as well as elevated starting valuations. In coming years, real returns for balanced portfolios are likely to be lower and riskier, especially in event of a more stagflationary environment, which argues against balanced portfolios ahead.

Goldilocks meets inflation

The long period of strong performance for 60/40 portfolios since the GFC was supported by a structural "Goldilocks" macro environment in which both US growth and inflation were neither too high nor too low, holding steady between 2% and 4%. In particular, well-anchored inflation was a key tailwind for asset markets and helped reduce macro volatility. A steady decline in real interest rates supported valuations across both bonds and equities, helping to fuel a "bull market in everything". And US corporate profit growth was boosted by a dramatic increase in profit margins—extending a trend that started in the early 1980s—as well as a fast-growing Tech sector, tax cuts and share buybacks.

But the macro backdrop for balanced portfolios looks set to become less favorable in the post-pandemic cycle. Uncertainty around the medium-term growth and inflation outlook has increased significantly, as have concerns about stagflation. The fast recovery from the pandemic recession, which was aided by unprecedented monetary and fiscal stimulus, coupled with supply-side shocks in goods, commodities and labor markets, has resulted in a sharp increase in inflationary pressures.

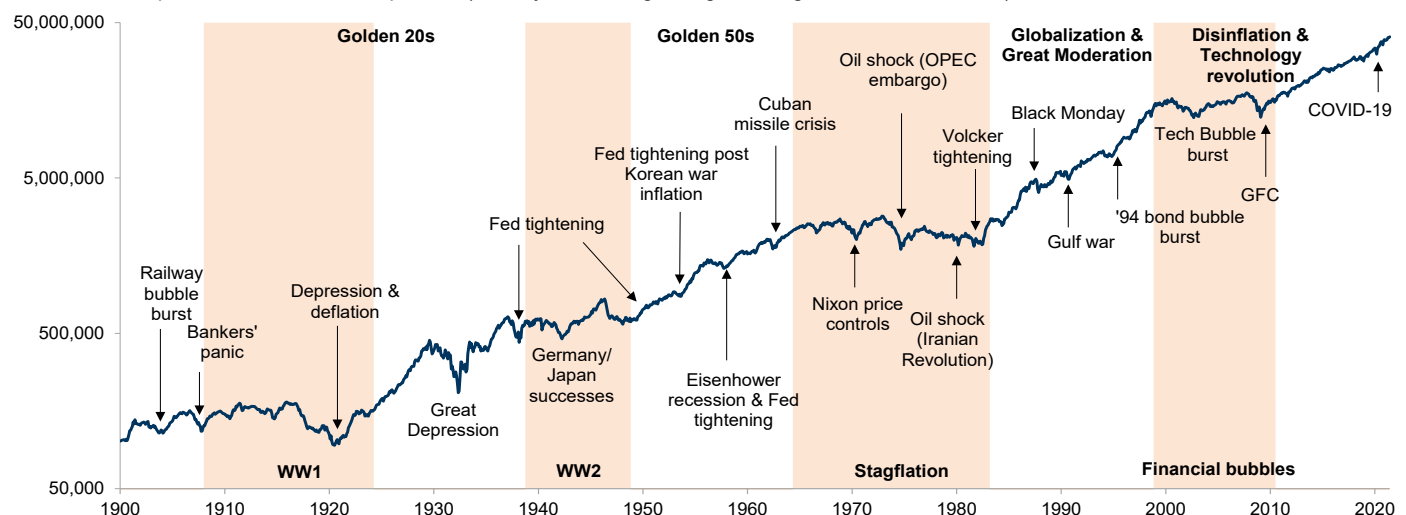
Despite recent high inflation prints, bond markets haven't sold off much and long-dated real yields remain near all-time lows owing to several factors, including substantial excess savings in the private sector, dovish central bank policy, market expectations that inflation will prove transitory and investor scepticism about how much central banks will be able to hike rates this cycle. But that may soon change if markets become more concerned about persistent inflation and central banks turn more hawkish, and long-dated real yields might also rise as green investment increases and fiscal deficits continue to expand. A period of higher inflation and/or weak growth that sees real yields rise would weigh heavily on 60/40 portfolios, denting profit margins and valuations across assets.

Valuation frustration

Balanced portfolios are especially vulnerable given the elevated starting point for valuations. Equity valuations are nearing Tech Bubble levels and global bond yields remain near multi-decade lows. Equities and bonds are rarely expensive at the same time and so early in the cycle. Only the end of the "Golden" 1920s and 1950s, which were followed by the Great Depression and 1970s stagflation, respectively, are comparable in terms of valuation levels. In contrast to the post-GFC period, valuations are already quite high given the stage of recovery and could become a speed limit for balanced portfolios. That said, equities have continued to perform well in recent years despite high valuations, helped by low inflation and strong profit growth, especially in the US tech sector, and valuations have a poor track record of forecasting returns, even over longer horizons. But more persistent inflation might become a key headwind for valuations over time.

"Lost decades" for US 60/40 portfolios have been relatively frequent and often followed strong bull markets

Real total return performance of US 60/40 portfolio (monthly rebalancing, orange shading denotes "lost decade")



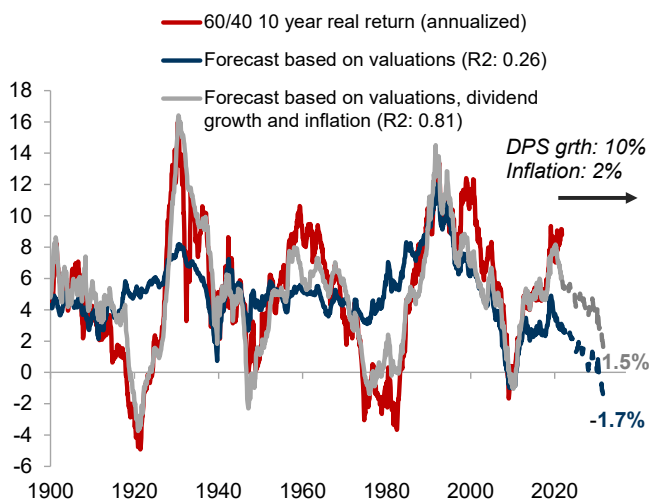
Source: Goldman Sachs GIR.

A 60/40 lost decade looms

Amid elevated valuations and a potentially less supportive growth/inflation mix, the risk of a "lost decade" for 60/40 portfolios, i.e., a prolonged period of poor buy-and-hold real returns, has increased. Despite recent experience, "lost decades" for 60/40 strategies are actually more common than investors might think and have frequently followed strong bull markets. In the case of a mean reversion in valuations, we would forecast much lower 60/40 returns in coming years, even assuming dividend growth similar to the last cycle and anchored inflation. But even if valuations remain at current elevated levels, we would still expect real 60/40 returns to be less than half those during the last cycle and likely below the long-run average of 5%.

We expect much lower 60/40 returns in the next decade

Real returns, %



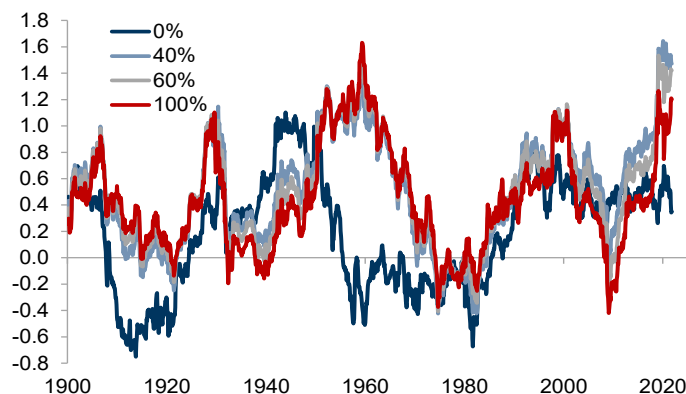
Source: Robert Shiller, Datastream, Goldman Sachs GIR.

Balanced strategies lose balance

Since the GFC, the 10-year rolling Sharpe ratio of a 60/40 portfolio was nearly three times the long-run average and well above the S&P 500. But with lower expected returns ahead, the pressure for investors to move up the risk curve is high. In this environment, investors face two challenges: assessing how much risk to take for an acceptable real return and identifying the optimal asset mix for the post-pandemic cycle.

Last cycle, 40/60 not 60/40 was highest Sharpe ratio portfolio

10-year rolling Sharpe ratio with different equity allocations in a balanced portfolio (S&P 500 and US 10-year bond)

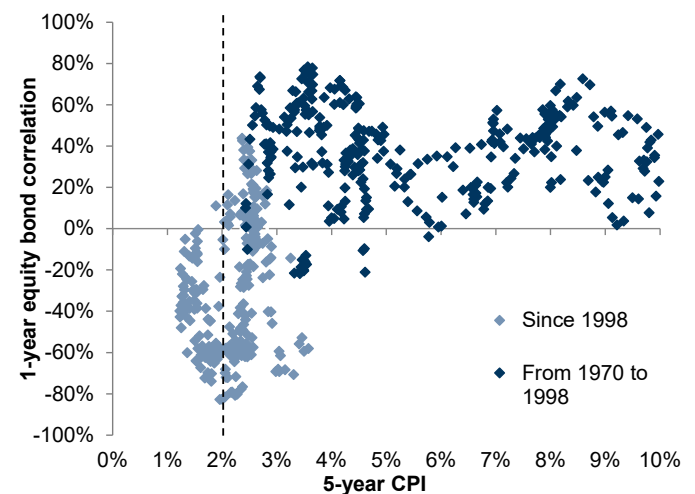


Source: Haver Analytics, Goldman Sachs GIR.

In the last cycle, the optimal portfolio was closer to a risk parity strategy, i.e., 30-40% equities, which meant that investors bore relatively little risk to achieve attractive real returns. In the coming cycle, balanced portfolios could lose their balance as bonds are unlikely to buffer equities during drawdowns. As a result, pressure for higher equity allocations will increase as equities and bonds become more correlated, equity risk premia remain positive, the risk of investing in bonds relative to equities increases with greater inflation volatility, and cash becomes more attractive relative to bonds from a return perspective.

Equity/bond correlation tends to turn positive with high inflation

Equity/bond correlation vs. realized US CPI



Source: Haver Analytics, Goldman Sachs GIR.

Why not 100% equities?

The need for attractive real returns and less of a benefit from bonds point to a shift toward higher equity allocations. While this is a big change from the last 35 years, it's not that unusual from a historical perspective. Several periods in the past, including during the stagflation of the 1970s, yielded no benefits from bond allocations. The current environment also suggests a higher allocation to cash. While in the last cycle "cash was trash", the reward for moving up the duration curve is much lower today given yield curves are less steep early in the cycle and rate risk has increased with inflation.

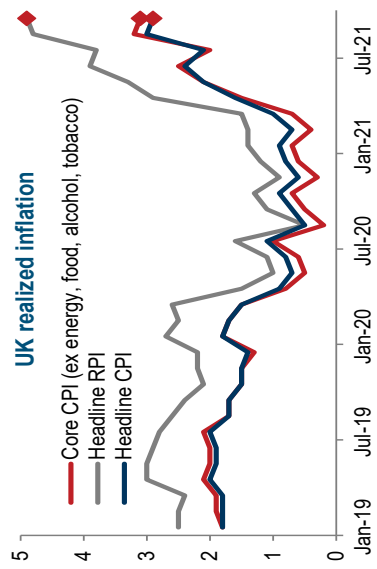
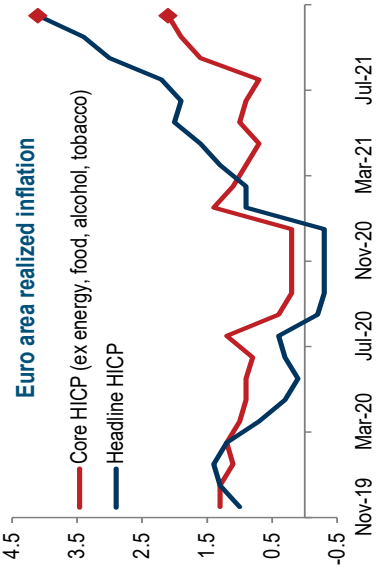
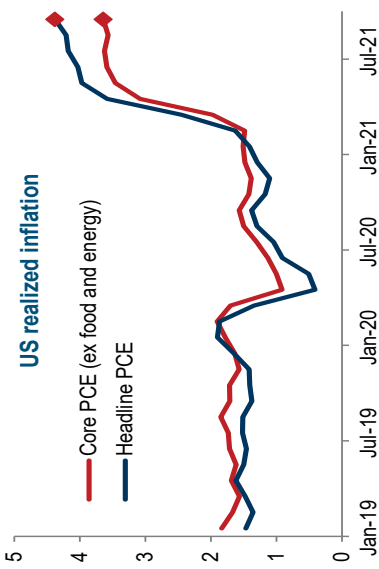
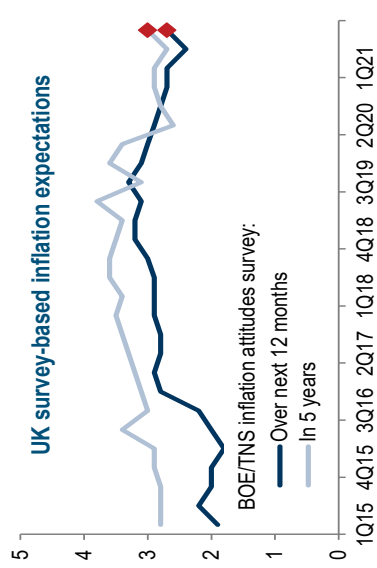
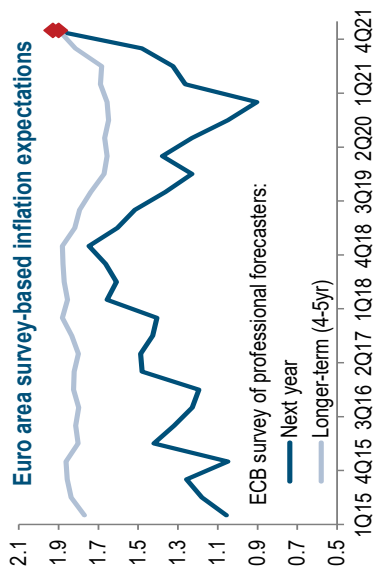
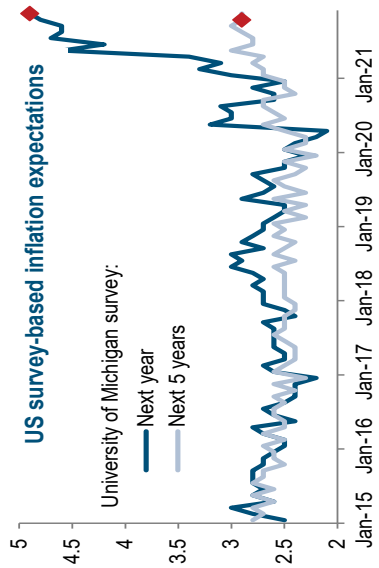
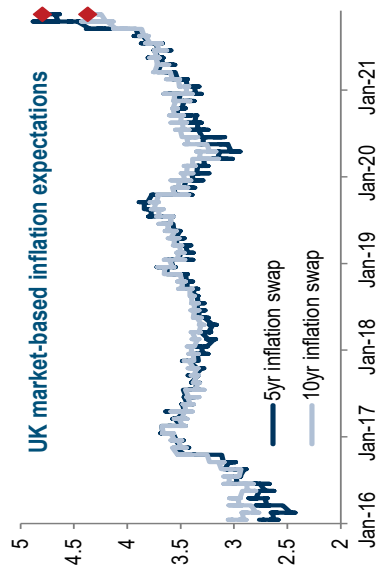
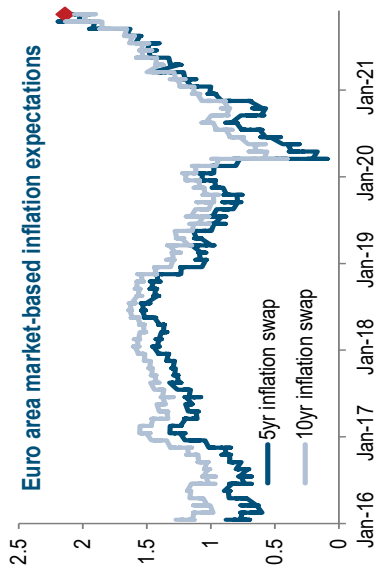
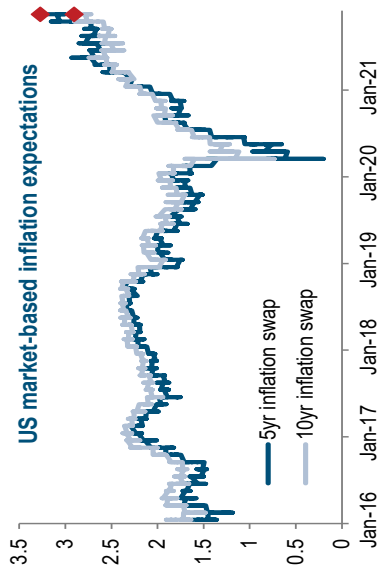
Of course, large cash allocations don't help in terms of real returns, which argues for even higher strategic equity allocations, possibly even as high as 100%. The key risk of that is the prospect of an equity bubble, which can weigh materially even on long-term returns. We think the risk of an equity bubble is low as long as longer-dated real rates remain low. But in any scenario higher equity allocations increase portfolio risk, which argues that investors should also pursue multi-asset strategies, such as exposure to real assets and commodities, as well as option overlays, in the coming cycle to achieve acceptable real returns without unacceptable risk.

Christian Mueller-Glissmann, Sr. Multi-Asset Strategist

Email: christian.mueller-glissmann@gs.com
Tel: 44-20-7774-1714

Goldman Sachs International

The inflation surge in pics



Note: HICP is the Harmonized Index of Consumer Prices, a measure of inflation that is comparable across EU countries; UK RPI is the Retail Prices Index, which differs from the CPI in that it includes housing costs. Source: Federal Reserve Bank of St. Louis, University of Michigan, Haver Analytics, Eurostat, European Central Bank, UK Office for National Statistics, Bank of England, Goldman Sachs GIR.

Summary of our key forecasts

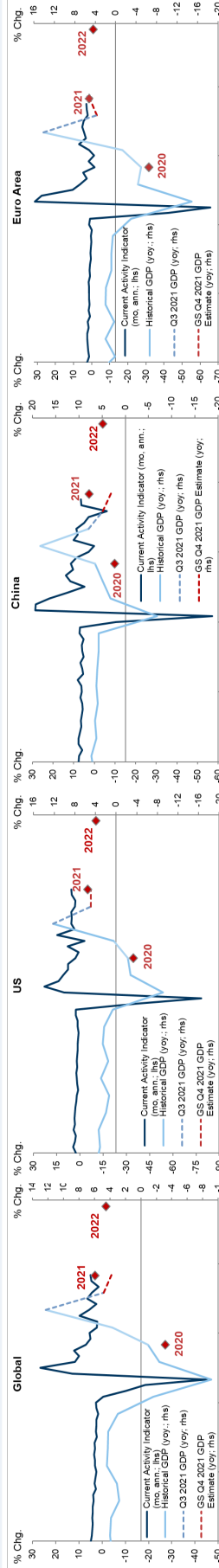
GS GIR: Macro at a glance

Watching

- **Globally**, we expect full-year growth of 5.9% in 2021 and see a significant near-term acceleration especially in most advanced economies ahead. Although the fastest pace of recovery is now behind us, we expect global growth of 4.5% in 2022, more than 1pp above potential, thanks to continued medical improvements, a consumption boost from pent-up savings, and inventory rebuilding.
- **In the US**, we expect full-year growth of 5.5% in 2021 and 3.9% in 2022. We see a gradual slowdown next year as the positive impulses from continued reopening following Delta improvement, pent-up saving and inventories struggle to offset the drag from fiscal policy. We expect core PCE inflation will continue to rise to 4.4% by end-2021 before falling to 2.3% by end-2022. We expect the unemployment rate to fall to 4.2% and 3.5% by the end of 2021 and 2022, respectively.
- **The Fed** has announced the start of tapering at a pace of \$15/bn per month, and we expect the first rate hike in July 2022. On the fiscal policy front, we expect the passage of additional spending of around \$1.75-\$2trn focused on infrastructure, social benefits, and long-term investment.
- **In the Euro area**, we expect full-year growth of 5.2% in 2021 and see risks towards slower momentum over the winter in the event of another COVID wave or energy supply shortages. But we remain constructive on the outlook for next year and expect growth of 4.4% 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 peak this month before falling back to 1.2% by December 2022.
- **The ECB** recently reiterated that it continues to view current inflationary pressures as transitory, and we think officials will keep rates unchanged until 3Q24. But we expect rising confidence in the inflation outlook will result in a more conservative QE decision in December, and look for only a temporary QE bridge to end-2022.
- **In China**, we expect below-consensus real GDP growth of 7.8% in 2021 and 4.8% in 2022. Although we think the odds of a housing-driven financial crisis are low, we believe the Chinese property sector is in a multi-year slowdown, which suggests lower growth in coming years.
- **WATCH CORONAVIRUS**. While the virus will continue to ebb and flow, we expect increasing global access to vaccinations, booster shots, and other medical improvements should result in lower hospitalizations and deaths. From now until the end of 2022, we expect a 15pp increase in the GDP-weighted global protection rate against infection and hospitalization to 70% and 85%, respectively. Moreover, we think the new antiviral drugs from Pfizer and Merck—if approved and broadly distributed—should further cut the risk of severe outcomes.

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	Interest rates 10Yr (%)				Markets				Equities													
	2021	2022	Last	E2021	E2022	FX	Last	3m	12m	S&P 500	E2021	E2022	Returns (%)	12m	YTD	E2021 P/E						
GDP growth (%)	GS	Cons.	GS	Cons.	GS	Cons.	GS	Cons.	GS	Cons.	GS	Cons.	S&P500	MXAPJ	Topix	STOXX 600						
Global	5.9	5.8	4.5	4.4	1.63	1.70	2.00	EUR/\$	1.13	1.16	1.18	Price	4,700	5,100	5,100	9.0	25.0	23.4x				
US	5.5	5.5	3.9	3.9	-0.25	-0.10	0.30	GBP/\$	1.34	1.35	1.37	EPS	\$209	\$226	\$226	9.0	-1.0	15.7x				
China	7.8	8.0	4.8	5.4	0.07	0.10	0.20	\$/JPY	115	115	111	Growth	47%	45%	8%	10.0	13.0	21.4x				
Euro area	5.2	5.1	4.4	4.2	0.89	1.10	1.35	\$/CNY	6.4	6.4	6.2					8.0	23.0	17.3x				
Policy rates (%)	Commodities				Credit (bp)				Wage Tracker 2021 (%)													
	GS	Mkt.	GS	Mkt.	Last <td>E2021 <td>E2022 <td>Consumer</td> <td>E2021 <td>E2022 <td>CPI</td> <td>Unemp. Rate</td> <td>CPI</td> <td>Unemp. Rate</td> <td>Q1</td> <td>Q2</td> <td>Q3</td> <td>Q4</td> </td></td></td></td>	E2021 <td>E2022 <td>Consumer</td> <td>E2021 <td>E2022 <td>CPI</td> <td>Unemp. Rate</td> <td>CPI</td> <td>Unemp. Rate</td> <td>Q1</td> <td>Q2</td> <td>Q3</td> <td>Q4</td> </td></td></td>	E2022 <td>Consumer</td> <td>E2021 <td>E2022 <td>CPI</td> <td>Unemp. Rate</td> <td>CPI</td> <td>Unemp. Rate</td> <td>Q1</td> <td>Q2</td> <td>Q3</td> <td>Q4</td> </td></td>	Consumer	E2021 <td>E2022 <td>CPI</td> <td>Unemp. Rate</td> <td>CPI</td> <td>Unemp. Rate</td> <td>Q1</td> <td>Q2</td> <td>Q3</td> <td>Q4</td> </td>	E2022 <td>CPI</td> <td>Unemp. Rate</td> <td>CPI</td> <td>Unemp. Rate</td> <td>Q1</td> <td>Q2</td> <td>Q3</td> <td>Q4</td>	CPI	Unemp. Rate	CPI	Unemp. Rate	Q1	Q2	Q3	Q4				
US	0.13	0.45	0.63	1.04	82	90	85	USD	IG	90	89	97	US	6.4	4.2	2.9	3.5	4.4	1.9	3.6	--	
Euro area	-0.50	-0.43	-0.50	-0.26	5.18	3.65	3.45	HY	291	290	360	Euro area	2.5	7.5	2.5	7.1	--	--	--	--	--	--
China	2.20	2.34	2.20	2.48	9,577	10,500	11,500	EUR	IG	110	99	103	China	0.7	--	2.7	--	12.1	12.6	7.7	--	
Japan	-0.10	-0.04	-0.10	-0.03	1,859	2,000	2,000	HY	330	297	330											

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 November 16, 2021.

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.

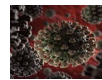
Macro-Data Assessment Platform (MAP)

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.

Top of Mind archive – click to access



Issue 102
Europe at a Crossroads
October 18, 2021



Issue 86
2020's Black swan: COVID-19
February 28, 2020



Issue 101
Is China Investable?
September 13, 2021



Issue 85
Investing in Climate Change
January 30, 2020



Issue 100
The Post-Pandemic Future of Work
July 29, 2021



Special Issue
2019 Update, and a Peek at 2020
December 17, 2019



Issue 99
Bidenomics: evolution or revolution?
June 29, 2021



Issue 84
Fiscal Focus
November 26, 2019



Issue 98
Crypto: A New Asset Class?
May 21, 2021



Issue 83
Growth and Geopolitical Risk
October 10, 2019



Issue 97
Reflation Risk
April 1, 2021



Issue 82
Currency Wars
September 12, 2019



Issue 96
The Short and Long of Recent Volatility
February 25, 2021



Issue 81
Central Bank Independence
August 8, 2019



Issue 95
The IPO SPAC-tacle
January 28, 2021



Issue 80
Dissecting the Market Disconnect
July 11, 2019



Special Issue
2020 Update, and a Peek at 2021
December 17, 2020



Issue 79
Trade Wars 3.0
June 6, 2019



Issue 94
What's In Store For the Dollar
October 29, 2020



Issue 78
EU Elections: What's at Stake?
May 9, 2019



Issue 93
Beyond 2020: Post-Election Policies
October 1, 2020



Issue 77
Buyback Realities
April 11, 2019



Issue 92
COVID-19: Where We Go From Here
August 13, 2020



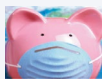
Issue 76
The Fed's Dovish Pivot
March 5, 2019



Issue 91
Investing in Racial Economic Equality
July 16, 2020



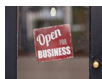
Issue 75
Where Are We in the Market Cycle?
February 4, 2019



Issue 90
Daunting Debt Dynamics
May 28, 2020



Issue 74
What's Next for China?
December 7, 2018



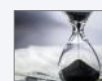
Issue 89
Reopening the Economy
April 28, 2020



Issue 73
Making Sense of Midterms
October 29, 2018



Issue 88
Oil's Seismic Shock
March 31, 2020



Issue 72
Recession Risk
October 16, 2018



Issue 87
Roaring into Recession
March 24, 2020



Issue 71
Fiscal Folly
September 13, 2018

Source of photos: www.istockphoto.com

Disclosure Appendix

Reg AC

We, Allison Nathan, Gabe Lipton Galbraith, Jenny Grimberg, Joseph Briggs, Jeff Currie, Jan Hatzius, Spencer Hill, David Mericle, Christian Mueller-Glissmann and Daan Struyven hereby certify that all of the views expressed in this report accurately reflect our personal views, which have not been influenced by considerations of the firm's business or client relationships.

I, Jordan Alliger hereby certify that all of the views expressed in this report accurately reflect my personal views about the subject company or companies and its or their securities. I also certify that no part of my compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

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

Regulatory disclosures

Disclosures required by United States laws and regulations

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

The following are additional required disclosures: **Ownership and material conflicts of interest:** Goldman Sachs policy prohibits its analysts, professionals reporting to analysts and members of their households from owning securities of any company in the analyst's area of coverage.

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

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

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. **Australia:** Goldman Sachs Australia Pty Ltd and its affiliates are not authorised deposit-taking institutions (as that term is defined in the Banking Act 1959 (Cth)) in Australia and do not provide banking services, nor carry on a banking business, in Australia. This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act, unless otherwise agreed by Goldman Sachs. In producing research reports, members of the Global Investment Research Division of Goldman Sachs Australia may attend site visits and other meetings hosted by the companies and other entities which are the subject of its research reports. In some instances the costs of such site visits or meetings may be met in part or in whole by the issuers concerned if Goldman Sachs Australia considers it is appropriate and reasonable in the specific circumstances relating to the site visit or meeting. To the extent that the contents of this document contains any financial product advice, it is general advice only and has been prepared by Goldman Sachs without taking into account a client's objectives, financial situation or needs. A client should, before acting on any such advice, consider the appropriateness of the advice having regard to the client's own objectives, financial situation and needs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests and a copy of Goldman Sachs' Australian Sell-Side Research Independence Policy Statement are available at: <https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html>. **Brazil:** Disclosure information in relation to CVM Resolution n. 20 is available at <https://www.gs.com/worldwide/brazil/area/gir/index.html>. Where applicable, the Brazil-registered analyst primarily responsible for the content of this research report, as defined in Article 20 of CVM Resolution n. 20, is the first author named at the beginning of this report, unless indicated otherwise at the end of the text. **Canada:** Goldman Sachs Canada Inc. is an affiliate of The Goldman Sachs Group Inc. and therefore is included in the company specific disclosures relating to Goldman Sachs (as defined above). Goldman Sachs Canada Inc. has approved of, and agreed to take responsibility for, this research report in Canada if and to the extent that Goldman Sachs Canada Inc. disseminates this research report to its clients. **Hong Kong:** Further information on the securities of covered companies referred to in this research may be obtained on request from Goldman Sachs (Asia) L.L.C. **India:** Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (India) Securities Private Limited, Research Analyst - SEBI Registration Number INH000001493, 951-A, Rational House, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400 025, India, Corporate Identity Number U74140MH2006FTC160634, Phone +91 22 6616 9000, Fax +91 22 6616 9001. Goldman Sachs may beneficially own 1% or more of the securities (as such term is defined in clause 2 (h) the Indian Securities Contracts (Regulation) Act, 1956) of the subject company or companies referred to in this research report. **Japan:** See below. **Korea:** This research, and any access to it, is intended only for "professional investors" within the meaning of the Financial Services and Capital Markets Act, unless otherwise agreed by Goldman Sachs. Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (Asia) L.L.C., Seoul Branch. **New Zealand:** Goldman Sachs New Zealand Limited and its affiliates are neither "registered banks" nor "deposit takers" (as defined in the Reserve Bank of New Zealand Act 1989) in New Zealand. This research, and any access to it, is intended for "wholesale clients" (as defined in the Financial Advisers Act 2008) unless otherwise agreed by Goldman Sachs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests is available at: <https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html>. **Russia:** Research reports distributed in the Russian Federation are not advertising as defined in the Russian legislation, but are information and analysis not having product promotion as their main purpose and do not provide appraisal within the meaning of the Russian legislation on appraisal activity. Research reports do not constitute a personalized investment recommendation as defined in Russian laws and regulations, are not addressed to a specific client, and are prepared without analyzing the financial circumstances, investment profiles or risk profiles of clients. Goldman Sachs assumes no responsibility for any investment decisions that may be taken by a client or any other person based on this research report. **Singapore:** Goldman Sachs (Singapore) Pte. (Company Number: 198602165W), which is regulated by the Monetary Authority of Singapore, accepts legal responsibility for this research, and should be contacted with respect to any matters arising from, or in connection with, this research. **Taiwan:** This material is for reference only and must not be reprinted without permission. Investors should carefully consider their own investment risk. Investment results are the responsibility of the individual investor. **United Kingdom:** Persons who would be categorized as retail clients in the United Kingdom, as such term is defined in the rules of the Financial Conduct Authority, should read this research in conjunction with prior Goldman Sachs research on the covered companies referred to herein and should refer to the risk warnings that have been sent to them by Goldman Sachs International. A copy of these risks warnings, and a glossary of certain financial terms used in this report, are available from Goldman Sachs International on request.

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

Japan: Goldman Sachs Japan Co., Ltd. is a Financial Instrument Dealer registered with the Kanto Financial Bureau under registration number Kinsho 69, and a member of Japan Securities Dealers Association, Financial Futures Association of Japan and Type II Financial Instruments Firms Association. Sales and purchase of equities are subject to commission pre-determined with clients plus consumption tax. See company-specific disclosures as to any applicable disclosures required by Japanese stock exchanges, the Japanese Securities Dealers Association or the Japanese Securities Finance Company.

Global product; distributing entities

The Global Investment Research Division of Goldman Sachs produces and distributes research products for clients of Goldman Sachs on a global basis. Analysts based in Goldman Sachs offices around the world produce research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy. This research is disseminated in Australia by Goldman Sachs Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs do Brasil Corretora de Títulos e Valores Mobiliários S.A.; Public Communication Channel Goldman Sachs Brazil: 0800 727 5764 and / or contatogoldmanbrasil@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Canal de Comunicação com o Público Goldman Sachs Brasil: 0800 727 5764 e/ou contatogoldmanbrasil@gs.com. Horário de funcionamento: segunda-feira à sexta-feira (exceto feriados), das 9h às 18h; in Canada by either Goldman Sachs Canada Inc. or Goldman Sachs & Co. LLC; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs New Zealand Limited; in Russia by OOO Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman Sachs & Co. LLC. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom.

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

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

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

General disclosures

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

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by our Global Investment Research Division. Goldman Sachs & Co. LLC, the United States broker dealer, is a member of SIPC (<https://www.sipc.org>).

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

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

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

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

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

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

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

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options and futures disclosure documents which are available from Goldman Sachs sales representatives or at <https://www.theocc.com/about/publications/character-risks.jsp> and https://www.fiadocumentation.org/fia/regulatory-disclosures_1/fia-uniform-futures-and-options-on-futures-risk-disclosures-booklet-pdf-version-2018. Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

Differing Levels of Service provided by Global Investment Research: The level and types of services provided to you by the Global Investment Research division of GS may vary as compared to that provided to internal and other external clients of GS, depending on various factors including your individual preferences as to the frequency and manner of receiving communication, your risk profile and investment focus and perspective (e.g., marketwide, sector specific, long term, short term), the size and scope of your overall client relationship with GS, and legal and regulatory constraints. As an example, certain clients may request to receive notifications when research on specific securities is published, and certain clients may request that specific data underlying analysts' fundamental analysis available on our internal client websites be delivered to them electronically through data feeds or otherwise. No change to an analyst's fundamental research views (e.g., ratings, price targets, or material changes to earnings estimates for equity securities), will be communicated to any client prior to inclusion of such information in a research report broadly disseminated through electronic publication to our internal client websites or through other means, as necessary, to all clients who are entitled to receive such reports.

All research reports are disseminated and available to all clients simultaneously through electronic publication to our internal client websites. Not all research content is redistributed to our clients or available to third-party aggregators, nor is Goldman Sachs responsible for the redistribution of our research by third party aggregators. For research, models or other data related to one or more securities, markets or asset classes (including related services) that may be available to you, please contact your GS representative or go to <https://research.gs.com>.

Disclosure information is also available at <https://www.gs.com/research/hedge.html> or from Research Compliance, 200 West Street, New York, NY 10282.

© 2021 Goldman Sachs.

No part of this material may be (i) copied, photocopied or duplicated in any form by any means or (ii) redistributed without the prior written consent of The Goldman Sachs Group, Inc.