The recent rapid collapse of cryptocurrency exchange FTX on the heels of the crash of Terra’s Luna and the failure of Celsius has sent shockwaves through the crypto ecosystem. In the wake of these events, questions about regulatory oversight of digital assets, where the ecosystem goes from here, and potential spillover risks to the financial system and the real economy are Top of Mind. For answers, we turn to former SEC Chairman Jay Clayton, former CFTC Chairman Timothy Massad, Yale’s Gary Gorton, One River’s Marcel Kasumovich, and GS traders, strategists, and economists. Given their varying perspectives, it’s perhaps no surprise that their views differ on the role that the US regulatory landscape for digital assets has played in the turmoil, why it has (so far) remained contained within the crypto ecosystem, and whether that’s likely to remain the case. But they generally agree on one point: that the innovative potential of blockchain technology remains significant and remarkable.

“

The collapse of FTX is firstly an age-old lesson that unregulated markets are dangerous.

- Jay Clayton

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

- Timothy Massad

The problem is not the absence of regulation, but the absence of regulatory clarity.

- Marcel Kasumovich

The recent crises didn’t have spillover effects, not because regulators have effectively ringfenced crypto from the traditional financial system, but because blockchain technology isn’t currently interoperable with the real world... But that lack of interoperability will eventually change.

- Gary Gorton

WHAT'S INSIDE

INTERVIEWS WITH:

Jay Clayton, Former Chairman, Securities and Exchange Commission, Senior Policy Advisor and Of Counsel, Sullivan & Cromwell

Timothy Massad, Former Chairman, Commodity Futures Trading Commission, Research Fellow and Director of the Digital Assets Policy Project, Harvard University

Marcel Kasumovich, Head of Research, One River Asset Management

Gary Gorton, Professor, Yale School of Management

CRYPTO'S LATEST WINTER IN PICS

Will Nance, GS Equity Research

Q&A ON THE CRYPTO ECOSYSTEM

Oliver Harris and Andrei Kazantsev, GS Global Markets Division

CRYPTO: LIMITED US ECONOMIC IMPACTS

Joseph Briggs, GS US Economics Research

REGULATING AT THE “POINT OF TRUST”

Jeff Currie and Daniel Sharp, GS Commodities 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 expect more Fed tightening in 2023 added a 25bp hike in May, for a peak funds rate of 5.5-2.25%) on our expectation that more hikes may be necessary to keep growth on a below-potential path.

Datapoints/trends we’re focused on

- Recession risk; we continue to ascribe below-consensus 35% odds to a recession over the next 12m and think the economy remains on a narrow path to a soft landing.
- Jobs-workers gap; we expect further declines in job openings alongside a 0.5bp rise in unemployment in 2023 to shrink the gap to the level needed to dampen labor market overheating.
- Core PCE inflation, which we expect to fall to 2.9% in Dec 2023.

We see below-consensus odds of a US recession

Estimated US recession probability (next 12m), %

Source: WSJ October 2022 Forecaster Survey, Goldman Sachs GIR.

**Japan**

Latest GS proprietary datapoints/major changes in views

- No major changes in views.

Datapoints/trends we’re focused on

- BoJ policy; we continue to expect no rate hikes in 2023, although we see adjustments to forward guidance and/or a widening of the 10y yield band as a possibility.
- Japan GDP growth, which we expect to slow to 1.3% in 2023 but remain above potential on the back of reopening boosts to consumption and capex.
- Core CPI inflation, which we expect to decelerate after peaking at around 3.5% at YE22, due in part to new energy subsidies, but remain above 2% throughout most of 2023.

Consumption and capex driving the economy in 2023

Real GDP growth, %, yoy

Source: Cabinet Office, Goldman Sachs GIR.

**Europe**

Latest GS proprietary datapoints/major changes in views

- We expect a shallower Euro area recession (contraction of 0.7% over 4Q22-2Q23 vs. 1.1% previously) due to more resilient hard data, lower risk of energy rationing, and significant fiscal support, but also a more muted recovery as the region’s gas supply situation remains fragile.
- We expect more ECB tightening in 2023 (25bp hike in May vs. none previously, for a terminal rate of 3%) given ongoing inflation pressures and the shallower recession we expect.

Datapoints/trends we’re focused on

- Euro area inflation, which we expect to peak in Dec before gradually easing over 2023 as goods price inflation cools.
- UK growth: we expect a deeper recession than in the EA.

**Emerging Markets (EM)**

Latest GS proprietary datapoints/major changes in views

- We raised our 2022/23 Russia GDP growth forecasts to -3.3%/-1.3% due to a smaller reduction in Russian export volumes and better domestic demand performance due to a large fiscal loosening that is likely to be extended into 2024.

Datapoints/trends we’re focused on

- China growth, which we expect to accelerate to 4.5% in 2023 as China exits its zero-Covid policy, which we continue to expect in 2Q23, but risk is tilted towards an earlier reopening.
- EM monetary policy; we expect many EM central banks to tighten further in early ’23, particularly in CEE/MEA and Asia, but think LatAm central banks could begin easing in late ’23.
- EM growth: we expect it to weaken further in coming months.

**Higher ECB terminal rate**

ECB rate hikes, %

Source: ECB, Haver Analytics, Goldman Sachs GIR.

**Majority of EM central banks to tighten further in 2023**

Number of EM central banks (includes 24 EMs in GS coverage)

Source: Haver Analytics, Goldman Sachs GIR.
The winter of crypto’s discontents

The recent rapid collapse of cryptocurrency exchange FTX—once considered one of the most reputable exchanges in the business—on the heels of the crash of Terra’s Luna algorithmic stablecoin and the failure of the Celsius crypto lending platform has sent shockwaves through the crypto ecosystem, which has lost roughly 70% of its market cap since its all-time peak last year. In the wake of these events, questions about regulatory oversight of digital assets, where the ecosystem goes from here, and potential risks to the financial system and the real economy are Top of Mind.

For a range of perspectives, we speak to crypto investors, former regulators, and academics. We first ask them about what caused FTX’s collapse. Marcel Kasumovich, Head of Research for One River Asset Management, believes that the root cause is clear: fraudulent activity that had nothing to do with the underlying technology, which continued to operate without a hitch even as the price of digital assets plunged. He explains that hidden leverage also played a role in the unraveling to the extent that intercompany loans between FTX and Alameda were largely collateralized by FTT, a token created by FTX with value tied to FTX, which became worthless as FTX’s value plummeted. No fresh capital, or even a central bank, he says, would be willing to fill the capital gap when the underlying collateral has no value.

Jay Clayton, former Chairman of the SEC, and Gary Gorton, Professor at Yale University who has written books on financial crises, largely agree that FTX’s collapse was a case of financial fraud. This situation, Clayton says, again underscores the age-old risk of transacting in unregulated jurisdictions outside of US regulated financial markets where no body of law exists to deter bad actors or provide recourse to customers.

But even if FTX’s unraveling is largely a case of fraud centered in unregulated jurisdictions, did the US regulatory landscape for digital assets have a hand in the recent turmoil? Kasumovich thinks so. In his view, the problem in the US is not a lack of regulatory oversight, but a lack of regulatory clarity over what rules apply and which agencies oversee various aspects of the crypto ecosystem. This, he argues, has driven much of the risk-taking in the ecosystem offshore.

Clayton, however, believes that argument is “garbage”. He points out that no place in the world has clearer and greater oversight and enforcement of financial markets—including digital assets—than the US, and thinks calls for more clarity are in many cases nothing more than thinly veiled attempts by crypto proponents to avoid the high costs of regulatory compliance. While he sees value in addressing the lack of federal regulation over commodity spot markets that, he says, crypto proponents are attempting to exploit to evade the securities regulations they should be subject to, he believes US regulators should primarily focus on vigorously enforcing existing rules and bringing emerging aspects of the crypto ecosystem—like stablecoins—into regulatory compliance. He’s optimistic that the SEC and CFTC can work together to achieve this, as they have done several times in the past.

Timothy Massad, former Chairman of the CFTC, agrees that the lack of regulatory clarity argument is overblown. But he argues that the US regulatory framework that has left crypto spot trading—one of the most common types of crypto trading—unregulated at the federal level is woefully inadequate to protect crypto investors. He explains that current investor protections even on “regulated” US crypto exchanges that are venues for spot trading rest on antiquated state money service business laws written for the telegraph era. So, he says, much more needs to be done to improve investor protection, which he thinks could be most effectively achieved through the establishment of a self-regulatory organization jointly overseen and tightly supervised by the SEC and the CFTC.

GS commodity strategists Jeff Currie and Daniel Sharp then look into what else can be done to protect crypto investors, arguing that regulators should regulate the “point of trust”—anywhere money is exchanged on the promise of a future return—not blockchains themselves, which are trustless.

Among these varying viewpoints, one point of agreement is that the recent turmoil has so far remained contained within the crypto ecosystem. Indeed, Oliver Harris and Andrei Kazantsev from GS’ Digital Assets and Crypto Trading teams, who discuss what they are observing across the crypto ecosystem in terms of volatility, volumes, and contagion effects on pgs. 14-15, see limited signs of spillover into traditional financial markets. And GS senior US economist Joseph Briggs finds limited evidence of knock-on effects to the real economy through spending and labor market channels, arguing that’s likely to remain the case.

But why all that is the case is a source of disagreement. Kasumovich credits the separation between the digital and fiat worlds largely to regulators, and especially to the SEC, who essentially took banks out of the digital custody arena by requiring digital assets to remain on balance sheet—effectively ringfencing systemic risk within the crypto ecosystem for now. Clayton, in contrast, gives the credit mainly to regulated financial intermediaries that he says have rightly chosen to take a cautious approach in providing customers access to digital assets and products until basic protections are assured.

But Gorton instead argues that the separation between the digital ecosystem and traditional finance owes to the simple reality that blockchain technology isn’t currently interoperable with the real world; all crypto platforms do today, he says, is “trade colored beads with each other”, which gets to their larger problem of having no way to create real value. But he warns that this will eventually change, most likely through the use of stablecoins in the real world, which he believes will open the door to systemic risk given stablecoins’ vulnerability to bank runs, which ultimately led to the failure of all private currencies in the past. So, unless and until regulators address this risk by replacing stablecoins with central bank digital currencies, they could very well be the cause of a future financial crisis.

But while that may be the case, the other point of agreement among our interviewees is that the potential of blockchain technology to transform financial systems and the global economy for the better remains significant and remarkable, something we agree with as well.

Allison Nathan, Editor
Email: allison.nathan@goldman.com
Tel: 212-357-7504
Goldman Sachs & Co. LLC
Marcel Kasumovich is Head of Research for One River Asset Management and the Deputy CIO of One River Digital. Below, he argues that FTX’s collapse wasn’t a failure of digital assets, but of human behavior, and that increased regulatory clarity will be required for the institutional adoption needed for the technology to reach its full potential.

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

Allison Nathan: What caused the recent collapse of FTX?

Marcel Kasumovich: John Ray, the bankruptcy specialist tasked with unwinding FTX, said it best: “an unprecedented and complete failure of corporate controls.” This is the same John Ray who oversaw the liquidation of Enron, so that is quite a statement.

FTX’s collapse was not about digital assets, but about human behavior. Incompetence may have played a role, but fraudulent activity was the root cause of the FTX downfall. It is important to emphasize that the underlying technology did not fail. Both the Ethereum and Bitcoin base layers that the crypto ecosystem is building on have operated without a hitch. Billions of dollars of transactions are settled on those rails every day—even on the most volatile days in the first half of November—with no third-party intermediation. And real money is being paid—Bitcoin is on track to pay miners nearly $10bn this year. The technology has proven incredibly resilient, even if digital asset prices have declined sharply.

Allison Nathan: Even if this was largely a case of financial fraud, did leverage play a role in the collapse?

Marcel Kasumovich: Yes. Leverage and crypto assets generally don’t mix well given high volatility, limited supply, and no lender of last resort in the crypto ecosystem. But, in this instance, it was how the leverage was executed that proved especially problematic. Loans between the FTX parent and Alameda—FTX’s investing arm—were largely collateralized by FTT, a token created by FTX with value tied to FTX. As the value of FTX declined rapidly, so did the value of FTT collateral. Enormous hidden leverage was uncovered. So, in this case, excess leverage is narrowly defined by that single asset—FTT—losing value very quickly. And that’s why the end game was also rapid. No fresh capital—or even a central bank—would be willing to fill the capital gap when the underlying collateral is worthless, not to mention litigation risk.

Allison Nathan: Isn’t that the case for many digital tokens? How can you discern which tokens are good collateral?

Marcel Kasumovich: The basic principles of traditional finance can provide some guidance. For example, free float is a useful concept to gauge risks in asset prices. The supply characteristics of bitcoin and ether are very transparent; that’s not true for many tokens. And in the case of FTT, circulating supply was running around 20-25%. FTT holdings were concentrated within FTX itself. That level of concentration meant that FTX had the ability to add liquidity to monetize gains when prices rose—to the detriment of passive, long-term investors. Supply characteristics are taken for granted in traditional finance. Too often, they are pushed aside in classic hype cycles when the focus is on the promise of new technologies.

Allison Nathan: All that said, could more regulatory oversight have prevented the recent turmoil?

Marcel Kasumovich: Absolutely. But the idea that the problem is a lack of US regulation and oversight over digital assets is overly simplified. The space is heavily regulated in the US; OFAC, FinCEN, the SEC, and the CFTC are all engaged. The fourth largest creditor in the BlockFi bankruptcy filing is the SEC, which is still owed $30mn of $100mn in fines over violations. And the US arm of FTX—FTX US—had plenty of regulatory oversight; for example, in August the FDIC served it a cease-and-desist order over statements it had made implying FTX US products were FDIC insured, which they weren’t. So, the problem is not the absence of regulation, but the absence of regulatory clarity. This lack of clarity pushed risktaking in the crypto ecosystem to unregulated offshore jurisdictions, which is why FTX was based in the Bahamas and, another example, Deribit, which controls 95% of open interest in options on digital assets, is based in Panama—outside the reach of US regulators. Regulatory clarity in the US is needed to bring more of that risk-taking onshore and into the regulatory mainstream.

Allison Nathan: But wouldn’t US regulatory clarity push even more activity offshore?

Marcel Kasumovich: The million-dollar question is how to develop a regulatory framework that provides sufficient oversight but doesn’t thwart innovation. I’m optimistic that regulators and policymakers can find the right balance. A subset of the ecosystem will no doubt remain offshore. For example, Tether will likely remain the dominant stablecoin in Asia, but it’s unlikely to ever cross the regulatory threshold to be a dominant stablecoin in the US. But the crypto ecosystem living up to its full potential—which, let’s say, is institutional adoption—will require entering the regulatory mainstream.

Allison Nathan: But doesn’t that defeat the whole value proposition of having a decentralized ecosystem?

Marcel Kasumovich: No. While the transactions themselves would be subject to regulatory oversight, the underpinnings of how the transactions are settled can remain decentralized. Take the “travel rule” for money as an example. Currently, when we bring or send more than $10k across an international border, it’s recorded. If we want to instead send that money through digital rails—say, via the Lightning Network—that will also need to be subject to mainstream regulatory reporting rules. Otherwise, you create regulatory arbitrage. The transaction itself could still be decentralized. The benefits—cheaper, faster intermediation—would be an economic gain. The tools to satisfy regulatory needs will need to be developed, but that is achievable. We can achieve the benefits of decentralized
platforms—increased capital efficiency that comes with the ability to settle transactions instantly without a third party, the ability to make and collect micropayments, etc.—without sacrificing security.

Allison Nathan: What is sufficient regulatory clarity?

Marcel Kasumovich: We already have some clarity. Bitcoin is considered a commodity and subject to CFTC rules. But there’s a long way to go. The CFTC is overseen by the Senate Agriculture Committee, who is driving the congressional hearings on the FTX collapse. So, the CFTC—a commodity regulator—seems likely to play a much more prominent role. And clarity around stablecoins will likely be forthcoming from both the Fed and the legislature next year. Together, they will provide the precise definition of different stablecoin, clarity on agency oversight, and rules that dictate how stablecoins can be brought into the banking system. The Lummis-Gillibrand Responsible Financial Innovation Act also includes several practical regulations that will encourage onshore innovation, for example, by shielding digital assets at exchanges from bankruptcy. States will continue to play a key role in providing further regulatory clarity. New York State was first out of the gate to define a “qualified custodian”. Wyoming currently has the most comprehensive framework for the legal rights around crypto assets and technologies. So, this clarity will be the outcome of progress on several fronts.

Allison Nathan: Why is this clarity taking so long to get?

Marcel Kasumovich: It’s a bit puzzling given that rules on consumer protection, financial reporting, and custody that exist in traditional finance could readily be imported into the digital ecosystem. I suspect that the slow speed of change owes to the presumption of most decision-makers that digital assets would just disappear, so it wasn’t worth the effort to integrate them into the regulatory mainstream. Indeed, many prominent economists and academics have argued that regulators should “let it burn” and do nothing to regulate the crypto ecosystem.

Allison Nathan: Why is the “let it burn” camp wrong?

Marcel Kasumovich: Their argument is essentially that the crypto ecosystem presents no systemic risk to the financial system precisely because regulators have shunned clarity. Regulation should not be pursued to keep it that way. I agree that the crypto ecosystem presents no systemic risk to financial stability because crypto and fiat are largely separate. I also see no systemic spillover risk from the current crypto turmoil. And I think all would agree with the policy goal of making sure there are no systemic risks in the future. But that doesn’t argue for the status quo or against regulation. If we take the argument to the limit—leave the space completely unregulated and just proceed with “buyer beware”—innovation would be explosive and untoward activities would be rampant. Institutions wouldn’t touch it, and we’d end up with transformative technology that may not be used for good.

I don’t think the “let it burn” camp wants that. What they probably want is to make sure that digital and fiat ecosystems don’t mix until we know the former won’t pose systemic risk to the latter. Regulation is required to achieve that. Indeed, in the absence of existing regulation, banks would have surely already become much more involved in the space. The line between digital and fiat would be much, much more blurred already. Case in point: BNY Mellon has developed a terrific custodial solution, but the SEC basically shut it down with SAB 121, which requires digital custodial assets to be held on balance sheet. This takes banks out of the custody arena because they take capital charges against gross balances, and the cost of this is prohibitive. So, regulation has separated digital from fiat, greatly reducing the odds of crypto crises spilling over into the traditional financial system.

Allison Nathan: Couldn’t stablecoins pose systemic risk to the financial system?

Marcel Kasumovich: Yes, given that stablecoins are backed by fiat currency, they link the digital and fiat worlds. They have the potential to take the best collateral out of the banking system, which is one reason I refer to them as the “killer application.” But the Fed effectively ringfenced this risk in the US in August by issuing their final guidance on “novel institutions”, which are effectively digital banks. The guidance stated that if these institutions want access to Fed services, i.e. the ability to deposit funds at the Fed, they will need to be a US bank with Fed oversight. They will need to be capitalized like a US bank. And, crucially, all fiat deposits held by the institution must be 100% reserved. So, you end up with a stablecoin that will be collateralized by a Fed deposit—effectively, a private central bank digital currency (CBDC)—and institutions that offer services related only to digital assets—custody, prime services, etc.—separated from the fiat world but still under Fed supervision. This guidance, combined with the upcoming stablecoin legislation that I mentioned, will create a new benchmark for stablecoins issued by novel institutions but under strict Fed oversight. This will unleash a whole new chapter for stablecoins—which are beneficial from a capital efficiency standpoint—and the digital ecosystem more broadly.

Allison Nathan: Are you concerned that the upheaval in crypto will mark a setback the industry can’t recover from?

Marcel Kasumovich: No. The crypto ecosystem is still in the proof-of-concept phase. The fact that digital assets are in their fifth bear market tells me they’re here to stay. It’s unfortunate that the FTX collapse happened just as the core of the financial crisis in digital assets was moving into the rearview mirror. But the weakest elements are no doubt gone forever, and many of the ones that remain continue to demonstrate their resilience and value. So, these events will mark a meaningful setback, but not a fatal one.

Sentiment is now grounded. And much of the small amount of leverage that existed has been flushed from the system. The most prominent loan book in the digital complex had less than $3bn by the end of the third quarter—a truly inconsequential amount in the context of a nearly $1tn market cap asset class. The bitcoin curve that was steeply upward sloping—a proxy for leveraged long positions—is also now inverted, suggesting that people are now bearish the asset. So, speculative excesses have largely been unwound. It is the perfect time to accelerate the regulatory reforms that will be required to encourage innovation, achieve institutional adoption, and allow the technology to reach its full potential.
Jay Clayton served as Chairman of the Securities and Exchange Commission (SEC) (2017-20). He is currently Senior Policy Advisor and Of Counsel to Sullivan & Cromwell LLP. Below, he argues that calls for more clarity in US crypto regulation are in many cases an attempt to avoid the high cost of regulatory compliance, which must be achieved within the crypto ecosystem. 
The views stated herein are those of the interviewee and do not necessarily reflect those of Goldman Sachs.

Allison Nathan: How do you look at digital assets as a former regulator, a professor, and an investor?

Jay Clayton: The spectrum of digital assets is incredibly wide, ranging from replacements for traditional assets on a one-for-one basis—whether that’s payments, the digitization of traditional securities, or the digitization of cash—to completely new forms of assets such as bitcoin or non-financial digital assets like non-fungible tokens (NFTs) intended to replace things like trading cards or reward customer loyalty. Given this very wide spectrum, taking a monolithic view about the value or regulation of digital assets is a mistake.

Allison Nathan: Did such a mistake contribute to FTX’s collapse? To what extent was this a failure of regulation?

Jay Clayton: The forensic analysis of FTX’s collapse is in its early days, but we do know a few things. One, that FTX’s difficulties were centered in its offshore operations that were located in a place where regulation is nascent, which is almost always a recipe for disaster. This situation seems most comparable to the fraud perpetrated by Allen Stanford, where there was the facade of a regulated bank, but no inspection, no financial reporting, and none of the hallmarks of regulation. So, the collapse of FTX is firstly an age-old lesson that unregulated markets are dangerous. The law is words plus, importantly, enforcement and oversight, and no greater place of oversight and enforcement exists than in the US regulated financial markets. So, as investors depart from those markets, the risk goes up. And crypto is at the high-risk end of the spectrum. Investors have no regulated US intermediary assisting them in accessing their crypto investments. There is no regulated offshore exchange associated with those crypto investments, and no body of law deters bad actors in those jurisdictions from entering the market. That’s a cocktail for bubbles and fraud.

The second thing that seems fairly clear at this point is that FTX’s customer assets were comingled with the assets of the enterprise. That’s almost universally abhorred in US financial markets because the lack of segregation of customer assets, as well as no real custody of the assets, is undoubtedly problematic. So, where did regulation fail? In the places you’d expect: jurisdictions where no regulation exists, and where fundamentals around customer protection were violated.

Allison Nathan: Some observers have argued that a lack of regulatory clarity in the US has pushed much of the activity and risk taking in the crypto ecosystem towards such jurisdictions. What’s your response to that?

Jay Clayton: That’s garbage. The US has a very rigorous and paternalistic regulatory regime for financial services. The amount of time and money that US financial intermediaries spend on compliance and ensuring that their products are suitable for their clients is enormous. Crypto proponents have complained that this stringent regulatory regime is inconvenient. And it may be; by design, it’s very difficult for US retail investors to access private, unregulated investments. But that’s an active choice that the US has made, and it’s very clear. So, the problem is not a lack of clarity around regulation. The problem is that people engaged in the crypto ecosystem don’t like the existing regulations because compliance is costly. The claim of regulatory uncertainty is in many cases no more than a thinly veiled attempt to avoid these costs.

Allison Nathan: But isn’t there some confusion about how digital assets are classified from a regulatory perspective and therefore which agency has oversight?

Jay Clayton: The focus on this classification issue is misplaced and, again, nothing more than an attempt to avoid regulation. Regulators designated bitcoin a commodity in 2015, and some crypto proponents argue that many digital assets should similarly be treated as commodities, not as securities. I believe that most digital assets are securities. The likely motivation behind these efforts to seek commodity classification is that, while commodity futures markets are highly regulated, commodity spot markets have no federal regulator, and are therefore regulation lite. The limited regulation in the spot commodity spot market is a long-standing issue that probably should be addressed with a narrow fix, but crypto proponents are endeavoring to exploit the situation to avoid the high costs of regulatory compliance. Attempts to use this difference in securities and commodities regulation to leave a substantial swath of digital assets unregulated are just absurd.

The reality is that the vast majority of digital assets are clearly securities, as demonstrated by several cases the SEC has brought and won around this issue, and broader claims about a lack of regulatory jurisdiction or authority are largely baseless. The US has a multifaceted regulatory regime comprised of many agencies, including the Fed, SEC, FDIC, CFTC, OCC, etc. Between these agencies, many more overlaps than gaps exist.

Allison Nathan: So, you see no need for new regulatory agencies and/or tools for the digital asset ecosystem?

Jay Clayton: No. The idea that we somehow need a new regulator because technology has enabled a different way to deliver the same product is also absurd. What we need is the type of interagency cooperation that has occurred many times in the past. The SEC and CFTC have effectively worked together on many areas where their jurisdictions have overlapped, such as the swaps market that covers securities, and the joint rulemaking that the Dodd-Frank legislation required. I am hopeful that the recent crypto turmoil will lead to a similar joint response from the regulatory agencies that...
makes it clear how crypto entities can comply with existing regulations. Again, many crypto proponents who are trying to find an unregulated space between the regulators aren’t going to like a coordinated effort. But regulators can’t make an exception to a body of law that covers tens of trillions of dollars in annual transactions just because the promise of a new technology is so great, and crypto proponents shouldn’t ask them to. Instead, they should make the case that the capabilities of crypto are so vast that regulatory objectives can be achieved with greater efficiency.

**Allison Nathan: But doesn’t the decentralized and global nature of digital assets make applying existing rules to them challenging?**

**Jay Clayton:** The technological aspect isn’t the key challenge. The challenge is that US regulations don’t extend far beyond US borders. So, if an entity is committing fraud in a jurisdiction that the US doesn’t regularly cooperate with from an oversight and enforcement perspective, the chances of any meaningful remedy are very low; I say to investors all the time, if money disappears in these jurisdictions, you’re not getting it back. This isn’t a digital assets issue, it’s a crossborder jurisdictional issue. If investors participate in, say, a penny stock offering in a non-money centered jurisdiction, and the proponent of that offering vanishes, investors will encounter the same problem.

**Allison Nathan: All that said, is there anything that US regulators can and should do from here?**

**Jay Clayton:** Yes. Former CFTC Chairman Timothy Massad and I have laid out several areas where regulators can take action. First, regulators should require all crypto intermediaries to implement basic customer protections. The SEC and CFTC should issue a core set of standards for consumer protection, which could easily be drawn from existing requirements for US securities and derivatives exchanges, and mandate that all crypto trading venues abide by them if they’re not already registered entities with the SEC or CFTC. This would ensure a basic set of protections while the classification issues that many entities have been exploiting are resolved.

Second, regulators need to continue to vigorously enforce the regulations that are already on the books. Trading platforms that are trading securities need to be brought into compliance with SEC rules. The SEC’s crackdown on unregistered initial coin offerings (ICOs) that I oversaw was necessary because these offerings flouted the rules for public offerings, often failing to provide even basic financial information or risk disclosures. Both the SEC and the CFTC have also brought a variety of actions against unregistered or illegal products, Ponzi schemes, and other scams, and they should continue doing so. This could take many forms, one of which may be to simply deem products illegal, which has already occurred, for example, when products are deemed vulnerable to use in money laundering or terrorist financing activities.

Third, regulators need to focus on bringing stablecoins into regulatory compliance. Many stablecoins have unstable features often associated with counterparty and credit risk that should be regulated as cash equivalents would be for traditional financial intermediaries. Banking regulators should take the lead on this, but the SEC and CFTC can help by requiring that intermediaries only deal with stablecoins issued by a regulated entity that holds reserves in cash and high-quality liquid assets.

**Allison Nathan: If all of that is left to be done, should regulators have accomplished more in the space now?**

**Jay Clayton:** More can certainly be done, but we should take some comfort that the current turmoil in the crypto ecosystem has not spilled over to the financial system. That’s largely because unregulated digital assets have not been integrated with the core of the credit-based financial system. The credit for that, however, primarily goes not to the regulators, but to regulated entities. Regulators rarely give credit to the regulated for good decisions. But the reality is that in the US, we rely on regulated institutions to make good decisions. Regulated entities have rightly chosen to take a cautious approach to providing products that offer widespread access to digital assets until it is clear that entities engaging with those assets are compliant with regulatory norms. So, I take my hat off to the regulated industry that has made the hard decisions to stay away from digital products that could pose substantial risk to their clients, and ultimately, the broader financial system.

**Allison Nathan: How important is proposed congressional legislation to regulating the space?**

**Jay Clayton:** Most legislative proposals in Washington don’t become the law. So, waiting for Congress can be like waiting for Godot; that’s not a winning strategy for any administrator. An administrator’s job is instead to enforce and improve upon the existing laws and regulations and bring discipline and rigor to the marketplace. The SEC is made up of about 5k employees who perform the same job every day regardless of who is heading up the institution or what’s happening in Congress.

That said, the current legislative proposals can be divided into a few different categories. Some proposals relate to incentivizing cooperation across the federal financial regulators. Some deal with the integration of new technology into existing laws and regulation by, for example, addressing issues like how to custody a digital asset, or whether a stablecoin with particular characteristics should be considered a security like a mutual fund or a deposit like a banking product. And some proposals are more comprehensive bills that endeavor to create a new regulator or a new regulatory scheme for digital assets. While Washington can always surprise, I think some legislation in the first two categories has a significant chance of becoming law, but the chances of a comprehensive bill passing are remote at best. Regardless of what happens on the legislative front, regulatory agencies on their own can make substantial progress in enhancing the safety and security of the digital assets space.

**Allison Nathan: All that said, can digital assets, whose value proposition seems to lie in their decentralized nature, really ever flourish in a regulated regime?**

**Jay Clayton:** I’m optimistic that they can. The promise of distributed ledger technology is remarkable given how many transactions are already taking place around the globe 24/7 with very few frictions. That undeniably demonstrates that the opportunity to improve the efficiency of traditional financial markets is vast. But, again, we cannot and will not give up a proven and widely accepted regulatory framework in order to achieve those efficiencies more quickly.
Crypto’s latest winter in pics

GS GIR equity research analyst Will Nance examines the effects of the recent crypto crises—including the collapse of Terra’s Luna algorithmic stablecoin and, most recently, FTX’s bankruptcy—on the broader crypto ecosystem. His key findings are below.

The punchline: lower prices, weaker investor sentiment, and a renewed focus on counterparty risk have driven a significant decline in crypto market cap, traded volumes, and leverage from the highs of 2021, and, more recently, a temporary spike in unique Bitcoin addresses.

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

Total crypto market cap, $bn

Bitcoin and ether volumes have fallen by roughly 65% since mid-2021, compared with around 95% during the first winter.

Trusted BTC & ETH trading volumes, $bn

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

Decentralized finance TVL, $bn

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

Unique BTC wallet addresses, number, millions

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

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

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

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

Will Nance, GS Equity Research
Email: will.nance@gs.com
Tel: 212-367-7483
Goldman Sachs & Co. LLC
November 2
CoinDesk publishes an article raising concerns about the finances of FTX and Alameda Research based on leaked balance sheets. “Alameda rests on a foundation largely made up of a coin that a sister company invented, not an independent asset like a fiat currency or another crypto. The situation adds to evidence that the ties between FTX and Alameda are unusually close.”

November 8
Binance signs a non-binding letter of intent to buy FTX. “This afternoon, FTX asked for our help. There is a significant liquidity crunch. To protect users, we signed a non-binding LOI intending to fully acquire FTX.com and help cover the liquidity crunch.”

November 12
Bahamian police launch criminal investigation into Bankman-Fried. WSJ reports that FTX lent customer deposits to Alameda Research to help it meet its liabilities and top executives were aware. “Alameda Research’s chief executive and senior FTX officials knew that FTX had lent its customers’ money to Alameda to help it meet its liabilities.”

November 15
Despite bankruptcy, Bankman-Fried tries to raise $10bn from investors to cover a reported $8bn shortfall due to customer withdrawals. BlockFi announces it will likely file for bankruptcy.

November 17
John Ray files 30-page document with US Bankruptcy court. “Never in my career have I seen such a complete failure of corporate controls and such a complete absence of trustworthy financial information as occurred here.”

November 24
Binance pledges up to $2bn to bail out crypto firms in the wake of FTX’s collapse. Binance has reportedly received applications from 150 crypto firms seeking aid. “The mandate of this new effort is to support the most promising and highest quality companies and projects built by the best technologists and entrepreneurs that, through no fault of their own, are facing significant, short-term financial difficulties.”

November 30
Bankman-Fried does an interview with the New York Times on FTX’s collapse. “I didn’t know how come I should have funds… I was frankly surprised by how big Alameda’s position was, which points to another failure of oversight on my part.”

Source: CoinDesk, Reuters, Twitter, WSJ, various news sources, Goldman Sachs G1R.
Interview with Timothy Massad

Timothy Massad served as Chairman of the Commodity Futures Trading Commission (CFTC) (2014-17). He is currently a Research Fellow and Director of the Digital Assets Policy Project at the Mossavar-Rahmani Center for Business and Government at the Harvard Kennedy School. Below, he argues that the US lacks a sufficient regulatory framework for crypto. *The views stated herein are those of the interviewee and do not necessarily reflect those of Goldman Sachs.*

Allison Nathan: To what extent was FTX’s recent collapse a failure of regulation?

Timothy Massad: FTX’s collapse is largely attributable to the lack of a regulatory framework. Investor protection standards that have been developed through decades of experience in the securities and commodity derivatives markets aren’t being observed in the crypto market. One FTX entity that was observing those standards was apparently LedgerX, its derivatives exchange that is registered with the CFTC. LedgerX didn’t file for bankruptcy, and it appears to be sound. The rest of the FTX US operations, as well as most other large crypto trading platforms in the US, that are venues for spot market as opposed to derivatives trading, aren’t registered with either the SEC or the CFTC. They are essentially only subject to state money service business laws. Those laws trigger the application of federal anti-money laundering requirements, but otherwise are woefully inadequate from an investor protection standpoint. Those laws originated in the telegraph era to regulate Western Union offices in different states; they’re remnants of a bygone age. They don’t contain anything remotely like the standards we impose on securities and derivatives exchanges today. So, saying that US crypto entities are well-regulated by these state laws is akin to saying that the stock market was well-regulated prior to the 1929 crash under state blue sky laws.

Allison Nathan: Why haven’t traditional investor protection standards been applied in crypto markets?

Timothy Massad: The development of appropriate regulatory standards for the crypto industry has long been hampered by disagreements over whether crypto tokens should be classified as securities or commodities. The SEC has the authority to regulate securities and has brought lawsuits to establish that certain crypto tokens are securities. But that has yet to change the industry’s mindset, and trading platforms have continued to argue that they’re not trading securities, but rather commodities, so they haven’t registered as securities exchanges. This is where the issue of “regulatory uncertainty” comes up, but I think crypto proponents exaggerate this problem as a way to avoid the costs of compliance. We need to fine-tune some requirements so they work for crypto, but that doesn’t mean you shouldn’t comply at all. This argument also exploits a gap in the regulatory framework. During my tenure as chairman of the CFTC, we declared bitcoin and other virtual currencies to be commodities, which gave us authority over the trading of crypto derivatives products. But neither the CFTC nor any other federal agency has the authority to set standards for the spot market for cryptocurrencies that aren’t securities, such as bitcoin, and that is where most of the trading occurs. This has led to a lack of basic protections for crypto investors.

Allison Nathan: Why are commodity spot markets unregulated at the federal level?

Timothy Massad: Historically, there wasn’t a federal regulator of spot commodity markets because these markets were local and for physical goods—wheat, cotton, cattle. I often compare the CFTC’s regulation of the trading of crypto derivatives to the CFTC’s regulation of the trading of cattle futures. Nobody ever argued that the CFTC should regulate the buying and selling of cows. So, the framework of US commodity regulation was always federal regulation of the derivatives market—where people were hedging exposure to the physical market—but it was never federal regulation of the spot market. Those physical commodity spot markets for cows or oil or wheat were never retail markets. But crypto is different and that’s the problem: it began as a retail financial instrument from the start, it was global, and it triggered a lot of speculation. That has made this lack of spot market regulation a significant risk to investors.

Allison Nathan: Isn’t it clear at this point that crypto spot markets should be regulated? Why haven’t we seen more progress on this front?

Timothy Massad: The crypto spot market should be regulated, but progress has been slow, in large part because regulation always lags innovation, and crypto is still a relatively new innovation. And despite the obvious gap in the regulatory framework, the crypto industry has had little interest in fixing it, fearing that greater regulation would undermine either the promise of the technology or at least their ability to make money. So, there has been no organized interest pushing Congress to respond, and not much tends to happen in Washington without that. Unfortunately, it often takes failures like the FTX collapse to spur action. All that said, more should’ve been done by now in terms of providing authority to either the CFTC or the SEC to set standards for the crypto spot market. I wish Congress had done that years ago.

Allison Nathan: So, this is a job for Congress then, not for the regulators themselves?

Timothy Massad: Congress could legislate standards, but the SEC and CFTC could also establish common standards for trading venues regardless of whether tokens are considered securities, commodities, or something else, and then persuade the crypto industry to comply. This is what former SEC Chairman Jay Clayton and I have suggested they do. These standards would be drawn from existing requirements for securities and derivatives exchanges that are designed to protect customer assets, prevent fraud and manipulation, prohibit conflicts of interest, ensure operational resilience, etc. The two agencies could then convince crypto trading venues to...
adopt these standards by establishing an interim period during which the venues wouldn’t be shut down for failing to register with either the SEC or the CFTC so long as they comply with the standards. This would assure the platforms and their customers that operations would continue—on a much more responsible basis—while classification issues are resolved, at which point regulators could require crypto platforms to register as securities exchanges if they deem them to be trading securities. This would be an avenue to substantially improve investor protection in the near term, and could eventually be codified by Congress.

Allison Nathan: What else can be done to strengthen investor protection?

Timothy Massad: The other way to do this is for the SEC and the CFTC to jointly create a new self-regulatory organization (SRO)—as recently suggested by Harvard Law Professor Howell Jackson and myself—the mission of which would be to protect investors and financial markets by developing and enforcing much-needed standards for the crypto industry. We see several benefits to such an organization. One, creating an agency jointly overseen by the SEC and the CFTC could avoid the need to litigate whether digital assets are ultimately securities or commodities, the debate which led to the current problem in the first place. Two, an SRO would bring in the necessary expertise from the industry, which would be particularly valuable when it comes to challenges like how to implement standards for decentralized finance platforms. Three, an SRO would be an effective way to make the crypto industry pay for the development and implementation of regulation. Four, its creation would require no new legislation; the SEC and CFTC each have the existing authority to establish an SRO, and precedent exists for joint-agency SROs. But this could also be codified by Congress. The problem is that the US’ fragmented financial regulatory system, consisting of different regulators for different product groups and institutions, makes it difficult to respond to certain types of innovations. A unitary regulator with broad power to set standards would be better placed to do so.

Allison Nathan: Haven’t the recent crises proven that the crypto industry shouldn’t be left to self-regulate though?

Timothy Massad: The concept of a “self-regulatory” organization is often misunderstood; in US financial markets, it doesn’t mean that the industry regulates itself. Rather, an SRO operates under the jurisdiction and supervision of a regulatory agency. While it brings in industry participants to formulate rules, those rules are approved by the regulatory agency, as are the board members and other actions taken by the SRO. FINRA and the National Futures Association are the classic examples of SROs, and those organizations have been incredibly important in the development of US securities and derivatives markets. SROs can only work if they are tightly supervised by the government. Former SEC Chairman and Supreme Court Justice William O. Douglas, the driving force behind the creation of the SRO model, said it best: the only way self-regulation could work was for the government to “keep the shotgun, so to speak, behind the door, loaded, well-oiled, cleaned, ready for use”. That’s precisely the method of SRO supervision Jackson and I have advocated for by proposing joint SEC and CFTC oversight.

Allison Nathan: Even if such a national agency were to be created, wouldn’t the global nature of digital assets make it difficult for it to effectively protect investors?

Timothy Massad: Not necessarily. Regulation is always implemented through national authorities, and crypto is a global market, so it will always be challenging to protect investors. To do so will require similar types of regulatory frameworks in other countries. But US regulators have faced and overcome such challenges before. During my tenure at the CFTC, we developed effective standards for previously unregulated over-the-counter swaps, based on principles agreed to by G20 leaders, and then different national rules were harmonized across borders. The same international cooperation could absolutely be employed in regulating the crypto space.

Allison Nathan: Are you concerned, though, that tougher regulation in any jurisdiction could push much of the activity in the crypto ecosystem towards jurisdictions that don’t adopt such standards?

Timothy Massad: Not particularly. People made the same argument about regulating swaps, but for the most part these products didn’t move to less-regulated jurisdictions. Neither did initial coin offerings following the SEC’s crackdown several years ago. And even if tougher regulation does push crypto activity towards regulation-lite jurisdictions, US regulators have some means to protect US investors, including by restricting access to and relationships with platforms based in such jurisdictions.

Allison Nathan: Ultimately, how can regulators find the right balance between protecting investors and not stifling innovation in a still-nascent crypto industry?

Timothy Massad: The regulatory framework for crypto shouldn’t depend on agreeing on a view about the future of the technology. There are those who think crypto will ultimately transform the financial system. And then there are those like Charlie Munger who think crypto is “partly fraud and partly delusion”. Regulators shouldn’t try to figure out which camp is right, but instead focus on crafting a framework that protects investors and minimizes the risks of financial instability while not hobbiling innovation in the industry. Crypto proponents, who have been very politically active in an attempt to stave off stronger regulation, will probably argue that any regulation will hobble innovation. But I don’t believe that more transparency, better disclosures, limiting leverage or conflicts of interest, etc. would hurt any truly valuable innovative potential of crypto.
Gary Gorton is Frederick Frank Class of 1954 Professor of Finance at the Yale School of Management. He has authored several books on financial crises, including *Fighting Financial Crises* and *Misunderstanding Financial Crises*. Below, he warns that cryptocurrencies are vulnerable to the same bank runs that have characterized past financial crises, and that stablecoins are a likely cause of a future one.

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

---

**Jenny Grimbeg:** You have written books on financial crises. How have the recent upheavals in the crypto space compared with historical financial panics?  

**Gary Gorton:** The recent crypto crises are similar to traditional financial crises in that it was quite clear that crypto platforms were vulnerable to “bank runs” because their terms of service allowed depositors to withdraw funds on demand and the opaqueness and illiquidity of their assets made it impossible to honor the demands for cash in a crisis—that’s what recently put Celsius, Voyager, Three Arrows Capital, FTX, Alameda, and Do Kwon into Chapter 11. But unlike most past financial crises, at least some of these crypto bank runs were entangled with fraud. They remind me of Theranos in that regard. The other important difference is that, while millions of people and the investors who financed these platforms lost money, this systemic financial crisis in crypto had no systemic real-world impact.

**Jenny Grimbeg:** Should we take comfort, then, that future crypto crises won’t pose systemic risks for the broader financial system and financial stability?  

**Gary Gorton:** No. The recent crises didn’t have spillover effects, not because regulators have effectively ringfenced crypto from the traditional financial system, but because blockchain technology isn’t currently interoperable with the real world. Crypto platforms aren’t making real loans; all they do is trade colored beads with each other, which gets to their bigger problem of having no way to create value.

But that lack of interoperability will eventually change. Blockchain will inevitably affect the international payment system. In many ways, that’s a desirable outcome. The correspondent banking network currently used for international payments is extremely inefficient, and blockchain technology could greatly improve upon it, especially once computer scientists invent a way for blockchains to talk to one another in the same way that they did for the internet several decades ago. But my concern is that the first real-world application of this technology will likely come through stablecoins, which today are mainly used as collateral for traders to take levered positions in bitcoin but could conceivably start being used as a cross-border payment mechanism for participants in global supply chains that are already increasingly blockchain-based.

**Jenny Grimbeg:** Why would the use of stablecoins in the real world be problematic?  

**Gary Gorton:** Again, it comes down to their vulnerability to bank runs. Despite stablecoin issuers purporting that their coins are backed one-for-one with safe assets and occasionally releasing accounting reports to verify this, it’s difficult to know for sure whether that’s really the case. In that sense, stablecoins are no different from the privately produced money of the pre-Civil War era, during which US banks issued their own banknotes that circulated as money. These notes ultimately suffered from a similar credibility problem, leading their values to fluctuate over time and across geographies, which prompted bank runs and financial instability. This forced the federal government to eventually step in and create a uniform national currency, and every country on Earth has since come to the conclusion that the government should have a monopoly on circulating money. So, the question of whether privately produced money should exist has already been asked and answered: no.

**Jenny Grimbeg:** If stablecoins aren’t the right answer to leverage blockchain technology for payments, what is?  

**Gary Gorton:** If I could wave a magic wand, I would get rid of stablecoins and replace them with central bank digital currencies (CBDCs), which are safer and would therefore put stablecoins out of business. Most global central banks are seriously studying CBDCs, and the ECB, for example, is planning on producing a prototype.

That said, stablecoins likely won’t go away anytime soon, both for political reasons—crypto lobbyists are basically writing the current proposed stablecoin legislation—and because central banks are asleep at the wheel about the risks posed by them. It’s almost inconceivable that the shadow banking system that led to the Global Financial Crisis (GFC) evolved for several decades under the nose of regulators and academics, but it did, because policymakers’ views of the world are a function of their theory, and that theory has been all about inflation for the past half-century. Unfortunately, it will probably take a broader financial crisis stemming from stablecoins before regulators and policymakers arrive at the right answer as to what to do about them, and even then, it’s not guaranteed that they’ll devise the right solution. Look at the DoddFrank Act that arose out of the GFC, for instance. It didn’t address the root cause of the crisis, and rather than focus on preventing future crises, the legislation seems more concerned with how to quickly liquidate banks in the event of one.

**Jenny Grimbeg:** Are you at all comforted, though, by the Fed’s “novel institutions” guidelines that seem to eliminate the risk of runs on stablecoins by collateralizing them with Fed deposits, or that many stablecoin issuers are applying for master accounts at the Fed, which would place them under stringent Fed oversight?
Gary Gorton: No. The “novel institutions” guidance takes a narrow banking model that’s undesirable in this context because we don’t want to encourage uninsured depositors at traditional banks to withdraw funds during times of stress and instead deposit them at stablecoin issuers with assets at the Fed because it’s safer than leaving them in the bank. That would amplify the possibility and magnitude of bank runs. And in terms of master accounts, while stablecoin issuers that are granted access to them would be subject to significant Fed oversight—which could lend credibility to their claims of being backed one-for-one by safe assets—it’s not clear that the Fed wants to assume that risk, and it has yet to grant stablecoin issuers such access. So, as of now, that oversight is elusive.

Jenny Grimberg: Beyond financial stability, what else—if anything—worries you about the potential proliferation of stablecoins? Would CBDCs address these concerns as well?

Gary Gorton: I am also concerned about the national security problem stablecoins pose, but simply replacing them with CBDCs won’t solve that issue. An important weapon in the geopolitical realm is the ability to financially sanction bad actors, which we’ve employed in the case of North Korea, Iran, and, most recently, Russia, by cutting them off from the SWIFT messaging system—a key aspect of the prevailing international payment system. An efficient cross-border payment system built on stablecoins would negate the need for SWIFT messages. So, the global community would have no central location where it could cut bad actors out of the international financial system. CBDCs would run into the same problem—bilateral connections between central banks wouldn’t be visible to other central banks without data-sharing agreements. So, both stablecoins and CBDCs pose problems for national security. It’s not too early to start thinking about this issue, because figuring out the right solution will take a long time, and in the meantime blockchain technology will continue to evolve and permeate the real world.

Jenny Grimberg: Can regulation diminish the risks that the crypto ecosystem will eventually pose to the financial system? What lessons should regulators take from the recent turmoil?

Gary Gorton: There aren’t many big lessons for regulators, because the firms that blew up and the whole business model they were associated with are dead. When more legitimate exchanges that do more than trade colored beads open, regulators should strive to protect investors in the same way they do, for example, with investors on the New York Stock Exchange, to the extent it’s technologically possible. But the challenge is that exchanges are transnational, and so their reach is further than that of regulators. US persons could transact on an exchange that has no physical presence in the US, so the SEC—which would in principle regulate crypto exchanges—has no authority over it.

Jenny Grimberg: But aren’t these US-based exchanges today that are regulated in many ways like traditional financial institutions?

Gary Gorton: Yes, but we don’t necessarily have an enforcement mechanism that ensures these institutions are abiding by the regulations. And, going back to the initial problem we’ve discussed, even these regulated crypto exchanges remain vulnerable to runs. In many instances, exchange customers keep their coins in a wallet on the exchange and can supposedly withdraw coins from their wallets anytime they want. Exchanges don’t usually operate this way; customers of the NYSE don’t keep their stock on the floor of the exchange. All that said, that model could change, with crypto exchanges evolving to a place where customers just transact rather than store coins. And legitimate exchanges will strive to make their regulatory compliance transparent to assure customers and investors of their credibility.

Jenny Grimberg: Could international organizations play a useful role in providing oversight for the crypto ecosystem given its transnational nature?

Gary Gorton: The Bank for International Settlements (BIS) has been rightly focused on CBDCs and has been involved in cross-border experiments pertaining to them. It doesn’t care whether, say, a crypto bank in Wyoming is well-capitalized, especially given that that bank has no interaction with the real world today. And no global mechanism exists to regulate exchanges because they are based in countries, so one would need to be formed if exchanges don’t ask to be regulated. Creating a global oversight body that has real enforcement power is a complicated task, though, that would require the cooperation of many countries. The G20 could conceivably do so, but they haven’t made any moves in this direction so far.

Jenny Grimberg: Couldn’t crypto exchanges come to some sort of regulatory agreement among themselves given the perceived value in being a regulated exchange?

Gary Gorton: No, because it wouldn’t be enforced—exchanges have no mutual incentives to regulate each other. Self-regulation doesn’t work in any industry; most self-regulatory organizations are just monopolies. What exchanges are incentivized to do is ask regulatory agencies to regulate them. And I suspect that many of them will increasingly do so as the space evolves because being regulated is part of the value-creation process.

Jenny Grimberg: Ultimately, though, wouldn’t a more regulated crypto ecosystem fly in the face of the industry’s decentralization value proposition?

Gary Gorton: No. Decentralization is a myth. Crypto is not decentralized, and even decentralized finance isn’t decentralized. Although every participant on a blockchain theoretically gets a vote in managing the blockchain, the reality is that only a subset of blockchain nodes vote—the coders. And large entities shouldn’t be decentralized anyway. Imagine if every decision made at large companies was voted on by every employee or shareholder. Cooperatives like that do exist, but they’re rare, because we know empirically that management adds significant value to an organization. So, no, more regulation wouldn’t undermine the value proposition of crypto, which lies in the underlying blockchain technology, not the unmet promise of decentralization.
Q&A on the crypto ecosystem

Oliver Harris and Andrei Kazantsev from the GS Digital Assets and Crypto Trading teams discuss recent trends in the crypto ecosystem

The interviewees are employees of Goldman Sachs Global Markets Division and the views stated herein reflect those of the interviewees, not Goldman Sachs Research.

Q: What are you observing in the broader crypto ecosystem in the wake of FTX’s collapse?

A: In October, prior to the collapse of FTX, the realized volatility of bitcoin was at historically low levels of below 35 and was effectively on par with the implied volatility of traditional asset classes as measured by the VIX, which hovered around 30 for most of the month. However, during the unraveling of FTX in early November, bitcoin and ether spot prices moved sharply lower, on the order of 25%, with short-dated volatility jumping to above 150 over a two-week window. This move substantially impacted implied volatility, with the price of 25 delta puts effectively doubling from 55 to 114 for bitcoin and from 85 to 155 for ether as investors scrambled for protection. However, these spot and vol moves have not been outsized compared to those of previous crypto down-moves like the collapse of Terra’s Luna algorithmic stablecoin earlier this year. And despite the large initial moves, implied volatility has now almost fully retracted back to its pre-FTX collapse levels.

What has changed is the market structure, in the form of the spot vs. CME future basis. Before FTX’s collapse, BTC and ETH futures had been trading around a slight premium to spot for a few weeks, and historically we saw premiums of over 20% during the crypto rally of early 2021. This has completely flipped in the wake of the recent collapse. At the peak of market stress, CME futures were trading at a large discount to spot, implying that carrying a short CME futures position was significantly more expensive—over 50% in annualized terms—than spot. Trading spot typically implies facing a crypto-native exchange, which exposes investors to counterparty risk, so the negative spot-vs. future basis reflects clients’ flight-to-quality move to regulated marketplaces like the CME.

A few structural changes have also occurred in crypto-native spot markets. The first, interestingly enough and in contrast to the CME moves, is increased flows to spot exchanges. BTC/USD spot exchange volumes rose substantially to new highs on November 9, after FTX concerns were being raised, as exchange customers turned to exchanges that had efficient crypto-to-stablecoin conversion or a crypto-to-fiat on-ramp. The second is increased flight to self-custody—users custodying their own keys using specialized hardware or software. On November 9 alone, users withdrew 1.9mm ether and 96k bitcoin across select exchanges. Although no visibility on how many of these withdrawals ended up in self-custody, companies that provide self-custody solutions have seen a significant surge in interest.

Q: What are you observing from the institutional investor base? How has their behavior changed—if at all?

A: The collapse of FTX has severely impacted sentiment in the crypto market, and trust in crypto financial intermediaries has been impacted across all participants. Accordingly, a reevaluation of counterparty risk is top of mind among institutional clients, some of whom, like hedge funds, were previously comfortable transacting within the crypto-native community directly but are now increasingly looking to trade on regulated venues and with regulated counterparties. Institutional investors are also performing enhanced due diligence around collateral, security, and compliance, including asking for proof-of-reserves to ensure the segregation and safekeeping of assets at crypto exchanges and custodians.

Amid those shifts, we are observing three main types of activity from the institutional investor base. One, Fast Money Accounts are looking to trade the downward momentum in the asset class. Two, venture capital and private equity-type funds that made early-stage investments in crypto companies are looking to hedge that exposure by buying further downside protection. And three, companies that have direct exposure to crypto revenues have been trying to hedge these cashflows (similar to FX cashflow hedging). All that said, institutional investors are still interested in the space, and that interest is observable across developments in asset management—such as BlackRock’s partnership with Coinbase and their fund management for Circle—and custody—such as BNY Mellon launching its digital asset custody platform.

Q: What have you observed in terms of how disruptive FTX’s collapse has been to the crypto ecosystem to date?

A: Although FTX’s collapse has impacted FTX customers, equity investors, trading desks with deposits in FTX, and lending firms with exposure to FTX or Alameda, the crash of Luna in May 2022 caused much more significant value destruction—by end of 1H22 alone, 40% of total cryptocurrency market capitalization was lost.

That said, three weeks after FTX’s collapse, significant uncertainty around its ultimate contagion effects still exists. Several market participants, including BlockFi, have already filed for bankruptcy. And many—if not all—participants in the crypto ecosystem will likely eventually be either directly or indirectly exposed to the collapse due to the circular leverage and interlinkages between centralized crypto companies.
Q: To what extent has leverage played a role in the spillovers within the crypto ecosystem to date?

A: Leverage has historically been pervasive in the crypto ecosystem, particularly during the past summer with the bankruptcy of crypto-native lender Celsius and hedge fund Three Arrows Capital. During the recent crisis, inherent leverage came from under-collateralization—completely uncollateralized loans and significantly under-collateralized loans that have been common within the industry—and the use of crypto assets as collateral for loans made within the crypto ecosystem (i.e. from one crypto firm to another). How much other factors, such as corporate governance and risk management, in addition to excessive leverage, contributed to the collapse of FTX and Alameda will likely be the focus of regulatory investigations and litigation.

While leverage was not the primary reason for the collapse of FTX and Alameda, excess leverage may have increased position sizes and risk appetite across the board, accelerating contagion within the crypto ecosystem that is still ongoing. This may show a progressive unravelling of problematic credit and credit rehypothecation, which was first exposed on the back of Luna’s collapse and then with the reverberations of Three Arrows Capital’s bankruptcy across centralized lending desks that were left holding bad debt and/or steeply depreciated collateral. Lending counterparties were also highly interconnected, each lending to the other, which has seen the trickle-through effects most recently with BlockFi filing for bankruptcy, in addition to Celsius, Voyager, and FTX. Finally, this was all compounded by the 24/7/365 nature of crypto markets that allows for real-time and constant reactions to market events.

In contrast, in the decentralized finance space, lending protocols where the loans issued were over-collateralized with other crypto assets and the collateral ratio had to be maintained above a predetermined level otherwise the smart contract logic would automatically liquidate the loans seemed to have continued to operate smoothly. That said, decentralized applications are largely nascent and non-standard types of businesses that are typically unregulated. So, significant risk of hacking of smart contracts exists, and these applications are therefore not yet enterprise-ready.

Q: With crypto lending businesses at the epicenter of the FTX fallout, do many custodians run lending businesses, and how are investors assured that lending is segregated from customer assets? What would it mean for institutional investors if a custodian went bankrupt?

A: Several institutional regulated digital custodians also run lending businesses. How customer assets are segregated from the lending desk depends on the technology, products, legal structure, and what jurisdiction(s) the custodian operates in. For regulated US entities, the custody business typically sits in a state trust (e.g., a NY trust under the purview of the New York State Department of Financial Services) or in an OCC-regulated digital bank. Under this structure, client assets are typically custodied separately in the trust or bank and wouldn’t be exposed to the lending arm, unless clients decide to lend or borrow against their digital assets. In addition, many custodians have the technical ability to show real-time on-chain balances, meaning that clients can see how and where their assets are segregated and stored.

In the event a custodian goes bankrupt, digital assets stored at a regulated US custodian would likely be treated in the same way as traditional financial assets, i.e., they would be bankruptcy remote, meaning that they would be excluded from the custodian’s estate in insolvency or liquidation proceedings. In light of recent events, some crypto custodians have also started including additional disclosures and risk factors on their segregation of customer funds and the potential treatment or protection of customer funds in an event like bankruptcy. However, the digital custody space is still nascent and novel, and the regulations vary across custodians and jurisdictions they operate in. So, it’s crucial for investors to conduct their own extensive due diligence on potential custodians across the product, technology, credit and operational risk, compliance and regulatory regime, and financial stability dimensions, just to name a few. Self-custody is a potential alternative, although it may not be appropriate for institutions due to the expertise, costs, and controls required to do their own private key management.

Q: What, if any, spillovers into traditional assets have you observed from FTX’s collapse and the related stresses in the crypto ecosystem?

A: So far, the spillover to traditional financial markets has been limited to asset managers and investment funds marking down their equity investments in FTX and a handful of hedge funds and market makers with assets stuck on the exchange after FTX halted withdrawals prior to filing for bankruptcy. Limiting material spillovers is the fact that traditional companies haven’t actively lent to crypto companies or serviced them because (i) they generally couldn’t compete with the yield that crypto natives offered each other and (ii) they took a more stringent approach to the counterparty risk associated with transacting with these companies.
Joseph Briggs finds that the spillover risks of the recent upheavals in crypto assets to the broader US economy will likely remain limited.

The recent upheavals in crypto have sent the market cap of the 200 largest cryptocurrencies down from a peak of $2.3tn late last year to below $900bn today, raising questions of whether this significant drop in wealth may have negative spillover effects for the US economy. While in principle the steep decline in crypto prices could weaken household balance sheets enough to affect spending and labor supply, the effect on either is unlikely to be large enough to materially affect the US economic outlook.

**A limited drag on household spending**

While cryptocurrency ownership is notoriously hard to track, our rough estimate based on various surveys is that US households own about one-third of the global crypto market. Given this assumption, we estimate that the $1.5tn decline in crypto market cap has reduced US household net worth by almost $500bn.

The total market cap of cryptocurrencies has declined by ~$1.5tn from its peak, but the hit to US investors is likely ~$500bn

---

**A limited impact on labor supply, too**

We similarly expect that any effect on labor supply from falling crypto prices will be small, for three reasons. First, although academic studies have found that changes in household net worth can significantly affect labor supply, the effects are largely driven by a reduction in the labor supply of workers near retirement age. In contrast, crypto investors skew younger and male, a demographic group whose labor force participation has generally been less affected by wealth fluctuations.

Second, the labor force participation rate for younger males that are more likely to own crypto had already recovered to its prepandemic level before crypto prices started declining, suggesting that rising crypto wealth played only a limited role in the lackluster labor force recovery from the pandemic.

Third, crypto prices started declining early this year, but labor force participation has moved sideways since January. If falling crypto prices were going to provide a boost to labor supply, we probably would have seen at least a hint of it by now.

Taken together, we continue to expect that asset price declines will weigh on spending growth in 2023, and the associated declines in household wealth may incentivize some workers who left the labor market during the pandemic due to unexpected financial gains to return. However, these effects will largely be driven by equity and real estate price declines, and any incremental impact from declines in crypto prices will likely have only very modest impacts on the real economy.

---

1 To quantify the effects from falling crypto prices on spending, we update our standard wealth effects model. We then compare the implied effects on spending with those from changes in the value of real estate and equity holdings.

**Joseph Briggs, Senior US Economist**

Email: joseph.briggs@gs.com
Tel: 212-802-2163

Goldman Sachs & Co. LLC
Regulating at the “point of trust”

Jeff Currie and Daniel Sharp argue that, to protect investors in the crypto ecosystem, regulators should regulate the “point of trust”, not blockchains themselves.

The recent crypto crises have sparked a heated debate over the future of crypto, whether it’s a currency, a commodity, or a financial security, and how to regulate it to protect investors while not undermining the innovative potential of blockchain technology. Here, we argue that the FTX saga is a story as old as financial markets, and doesn’t reflect a failure of the technology, but of the lack of regulation around the “point of trust”—anywhere money is exchanged on the promise of a future return. We believe crypto will likely once again flourish after the recent crises, as did a long history of other assets that were at the center of a speculative bubble and subsequently exposed fraud, like natural gas did after the collapse of Enron. The key to its success rests on regulators correctly figuring out what to regulate in the ecosystem to protect investors—the point of trust, not the “trustless” blockchains themselves.

Open interest in natgas collapsed post-Enron, but later recovered.

Contracts, thousands

<table>
<thead>
<tr>
<th>1997</th>
<th>1999</th>
<th>2001</th>
<th>2003</th>
<th>2005</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>200,000</td>
<td>400,000</td>
<td>600,000</td>
<td>800,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>1,000,000</td>
<td>1,200,000</td>
<td>1,400,000</td>
<td>1,600,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A question of trust

New assets and financial instruments are lightly regulated during their initial adoption, because regulators have yet to see the harm in them, or because they aren’t covered under the scope of existing regulations. It’s because of this that the crypto bubble of the last few years has involved much more widespread fraud than the dot-com boom, which took place in the well-regulated equity market.

How should crypto be regulated to protect investors? The answer is complicated by its novelty and evolution. The term “crypto” has become a broad catch-all that encompasses blockchains, tokens, and exchanges, each with separate risks that require separate regulation. Some digital assets act as currencies, some as commodities, and the most complex as securities themselves. This lack of definitive classification has, for example, kept crypto brokerage accounts outside the scope of standard regulations governing the custody of client assets.

But the answer is simple: regulation is needed at the point of trust, where money is exchanged on the promise of some future return, because it is the time component that creates the opportunity for fraud. No opportunity for fraud exists when, say, a cow is exchanged for money in real time, but fraud has the opportunity to arise when payment and the acquisition of the cow are separated in time. As such, when a token is used as a financial instrument—as Terra’s Luna algorithmic stablecoin was when it was lent out on Anchor for a 20% yield—it should be regulated like all other securities. Until regulators can accurately classify which tokens fall into this category and which don’t, the opportunity for fraud in crypto will persist.

Don’t regulate a trustless system

The question of trust in financial instruments and the need to regulate entities like crypto exchanges and lending platforms to enforce that trust is one that blockchains themselves are trying to solve. Accordingly, once the financial aspects surrounding digital assets are regulated, regulators shouldn’t interfere with the blockchains themselves. Many blockchains such as Ethereum and Bitcoin are built on open-source code—no single entity is responsible for their management or development. This decentralization is a critical part of the value proposition of blockchain—having no central source of power allows decisions to be made collectively. Moreover, blockchain nodes, by voting with their tokens, can undo fraudulent behavior by reverting to an older version of the blockchain.

Decentralized systems don’t pose counterparty risk in the same way as traditional banks. In decentralized finance (DeFi) lending protocols, collateral is visible to all members of the pool, and is automatically liquidated if its value approaches the value of the loan. Should the pool lend its resources to unsound borrowers, the collateral is automatically retrieved without a court proceeding or at a discount to the loan through the logic of smart contracts. This resolves the question of trust, the very thing regulation to safeguard investors would be intended for.

Jeff Currie, Global Head of Commodities Research
Email: jeffrey.currie@gs.com
Tel: 44-20-75527410
Goldman Sachs International

Daniel Sharp, Commodities Strategist
Email: daniel.sharp@gs.com
Tel: 44-20-77741875
Goldman Sachs International
### Snapshot of Global Crypto Regulation

<table>
<thead>
<tr>
<th>Region</th>
<th>Country</th>
<th>Regulation Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bahamas</strong></td>
<td></td>
<td>Digital assets are not regulated by the Securities Commission of the Bahamas (SCB) under the Digital Assets and Regulation of Digital Assets Act (DARDA).</td>
</tr>
<tr>
<td><strong>Canada</strong></td>
<td></td>
<td>Digital assets are regulated in the same way as other financial assets. Financial institutions are subject to the same anti-money laundering and anti-terrorism financing requirements.</td>
</tr>
<tr>
<td><strong>El Salvador</strong></td>
<td></td>
<td>The government does not recognize cryptocurrencies as legal tender, but digital assets are regulated by the Superintendencia de Entidades Financieras de Utilidad Pública (SEFUP) and the Banco Central de Reservas (BCR).</td>
</tr>
<tr>
<td><strong>United States</strong></td>
<td></td>
<td>The Securities and Exchange Commission (SEC) regulates cryptocurrencies as securities.</td>
</tr>
<tr>
<td><strong>EU</strong></td>
<td></td>
<td>European Union member states have varying degrees of regulation, with the European Central Bank (ECB) and the European Securities and Markets Authority (ESMA) playing key roles.</td>
</tr>
<tr>
<td><strong>United Kingdom</strong></td>
<td></td>
<td>The Financial Conduct Authority (FCA) regulates crypto assets as financial instruments.</td>
</tr>
<tr>
<td><strong>Switzerland</strong></td>
<td></td>
<td>Crypto assets are not considered legal tender. The Swiss Financial Market Supervisory Authority (FINMA) oversees all crypto and digital asset exchanges.</td>
</tr>
<tr>
<td><strong>Australia</strong></td>
<td></td>
<td>Australian Financial Services Authority (AFS) regulates crypto assets as financial derivatives.</td>
</tr>
<tr>
<td><strong>China</strong></td>
<td></td>
<td>Crypto assets are not considered legal tender. The China Securities Regulatory Commission (CSRC) regulates crypto assets as securities.</td>
</tr>
<tr>
<td><strong>India</strong></td>
<td></td>
<td>Crypto assets are regulated under the Payment Systems Act.</td>
</tr>
<tr>
<td><strong>Japan</strong></td>
<td></td>
<td>The Financial Instruments and Exchange Act (FIEA) regulates crypto assets as financial instruments.</td>
</tr>
</tbody>
</table>

**Note:** Regulations are subject to change. Sources: Various regulatory bodies and organizations.

Source: Various regulatory bodies and organizations.
Summary of our key forecasts

**Global Growth**

- Globally, we expect annual average GDP growth to slow to a sluggish 1.5% in 2023, reflecting stranglehold from tighter financial conditions, the protracted energy crisis in Europe, a bumpy resolution to the war in Ukraine and Russia, and the housing downturn in China and elsewhere. We expect the global inflation rate to peak this quarter, and then start to moderate in demand.

- In the US, we expect GDP growth to slow to 1.5% in 2023, and to 1.3% in 2024. We expect core PCE inflation to peak at around 4.5% in December before falling back to around 3.5% by year-end. Indeed, the Fed’s鹰派 signals have strengthened in recent weeks, and we now expect the FOMC to hike just once more this year, to leave the policy rate at 3.5%.

- In China, we expect GDP growth to slow to 3.5% in 2023, as supply chain constraints ease, inflation remains under control, and the real estate sector stabilizes. Indeed, we expect the central government to increase its spending to around 5% to support the economy. We also expect the People’s Bank of China to cut rates twice this year.

- In the Euro area, we expect GDP growth to slow to 1.7% in 2023 before accelerating to 2.1% in 2024. We expect inflation to peak at around 6.5% in December before falling back to around 2.5% by the end of 2023.

**Washing of Energy and European Energy**

- In the US, we expect inflation to peak at around 4.0% in December before falling back to around 2.5% by the end of 2023. The Fed’s鹰派 signals have strengthened in recent weeks, and we now expect the FOMC to hike just once more this year, to leave the policy rate at 3.5%.

- In China, we expect GDP growth to slow to 3.5% in 2023, as supply chain constraints ease, inflation remains under control, and the real estate sector stabilizes. Indeed, we expect the central government to increase its spending to around 5% to support the economy. We also expect the People’s Bank of China to cut rates twice this year.

- In the Euro area, we expect GDP growth to slow to 1.7% in 2023 before accelerating to 2.1% in 2024. We expect inflation to peak at around 6.5% in December before falling back to around 2.5% by the end of 2023.

**Forecasts**

- **Global Growth**: We expect GDP growth to slow to 1.5% in 2023, reflecting stranglehold from tighter financial conditions, the protracted energy crisis in Europe, a bumpy resolution to the war in Ukraine and Russia, and the housing downturn in China and elsewhere. We expect the global inflation rate to peak this quarter, and then start to moderate in demand.

- **US Growth**: We expect GDP growth to slow to 1.5% in 2023, and to 1.3% in 2024. We expect core PCE inflation to peak at around 4.5% in December before falling back to around 3.5% by year-end. Indeed, the Fed’s鹰派 signals have strengthened in recent weeks, and we now expect the FOMC to hike just once more this year, to leave the policy rate at 3.5%.

- **China Growth**: We expect GDP growth to slow to 3.5% in 2023, as supply chain constraints ease, inflation remains under control, and the real estate sector stabilizes. Indeed, we expect the central government to increase its spending to around 5% to support the economy. We also expect the People’s Bank of China to cut rates twice this year.

- **Euro Area Growth**: In the US, we expect inflation to peak at around 4.0% in December before falling back to around 2.5% by the end of 2023. The Fed’s鹰派 signals have strengthened in recent weeks, and we now expect the FOMC to hike just once more this year, to leave the policy rate at 3.5%.

- **China Growth**: We expect GDP growth to slow to 3.5% in 2023, as supply chain constraints ease, inflation remains under control, and the real estate sector stabilizes. Indeed, we expect the central government to increase its spending to around 5% to support the economy. We also expect the People’s Bank of China to cut rates twice this year.

- **Euro Area Growth**: In the US, we expect inflation to peak at around 4.0% in December before falling back to around 2.5% by the end of 2023. The Fed’s鹰派 signals have strengthened in recent weeks, and we now expect the FOMC to hike just once more this year, to leave the policy rate at 3.5%.

**Note**: For more information on the methodology of the CPI calculations, see February’s US CPI release. For more inflation analysis, see the December’s US CPI release. For more information on the methodology of the CPI calculations, see February’s US CPI release. For more inflation analysis, see the December’s US CPI release.

**Source**: Bloomberg, Goldman Sachs Global Investment Research

**Market price as of December 8, 2022.**
Glossary of GS proprietary indices

Current Activity Indicator (CAI)

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


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.


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.


Goldman Sachs Analyst Index (GSAI)

The US GSIA 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.
<table>
<thead>
<tr>
<th>Issue</th>
<th>Title</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>113</td>
<td>Central Bank Tightening: what could break?</td>
<td>November 11, 2022</td>
</tr>
<tr>
<td>112</td>
<td>China’s Congress: an inflection point?</td>
<td>October 11, 2022</td>
</tr>
<tr>
<td>111</td>
<td>Will slaying inflation require recession?</td>
<td>September 13, 2022</td>
</tr>
<tr>
<td>110</td>
<td>Food, Fuel, and the Cost-of-Living Crisis</td>
<td>July 28, 2022</td>
</tr>
<tr>
<td>109</td>
<td>Equity bear market: a paradigm shift?</td>
<td>June 14, 2022</td>
</tr>
<tr>
<td>108</td>
<td>(De)Globalization Ahead?</td>
<td>April 28, 2022</td>
</tr>
<tr>
<td>107</td>
<td>Stagflation Risk</td>
<td>March 14, 2022</td>
</tr>
<tr>
<td>106</td>
<td>Russia Risk</td>
<td>February 24, 2022</td>
</tr>
<tr>
<td>105</td>
<td>2022: The endemic year?</td>
<td>January 24, 2022</td>
</tr>
<tr>
<td>104</td>
<td>Investing in Climate Change 2.0</td>
<td>December 13, 2021</td>
</tr>
<tr>
<td>103</td>
<td>Inflation: here today, gone tomorrow?</td>
<td>November 17, 2021</td>
</tr>
<tr>
<td>102</td>
<td>Europe at a Crossroads</td>
<td>October 18, 2021</td>
</tr>
<tr>
<td>101</td>
<td>Is China Investable?</td>
<td>September 13, 2021</td>
</tr>
<tr>
<td>100</td>
<td>The Post-Pandemic Future of Work</td>
<td>July 29, 2021</td>
</tr>
<tr>
<td>99</td>
<td>Bidenomics: evolution or revolution?</td>
<td>June 29, 2021</td>
</tr>
<tr>
<td>98</td>
<td>Crypto: A New Asset Class?</td>
<td>May 21, 2021</td>
</tr>
<tr>
<td>97</td>
<td>Reflation Risk</td>
<td>April 1, 2021</td>
</tr>
<tr>
<td>96</td>
<td>The Short and Long of Recent Volatility</td>
<td>February 25, 2021</td>
</tr>
<tr>
<td>95</td>
<td>The IPO SPAC-tacle</td>
<td>January 28, 2021</td>
</tr>
<tr>
<td>94</td>
<td>What’s In Store For the Dollar</td>
<td>October 29, 2020</td>
</tr>
<tr>
<td>93</td>
<td>Beyond 2020: Post-Election Policies</td>
<td>October 1, 2020</td>
</tr>
<tr>
<td>92</td>
<td>COVID-19: Where We Go From Here</td>
<td>August 13, 2020</td>
</tr>
<tr>
<td>91</td>
<td>Investing in Racial Economic Equality</td>
<td>July 16, 2020</td>
</tr>
<tr>
<td>90</td>
<td>Daunting Debt Dynamics</td>
<td>May 28, 2020</td>
</tr>
<tr>
<td>89</td>
<td>Reopening the Economy</td>
<td>April 28, 2020</td>
</tr>
<tr>
<td>88</td>
<td>Oil’s Seismic Shock</td>
<td>March 31, 2020</td>
</tr>
<tr>
<td>87</td>
<td>Roaring into Recession</td>
<td>March 24, 2020</td>
</tr>
<tr>
<td>86</td>
<td>2020’s Black swan: COVID-19</td>
<td>February 28, 2020</td>
</tr>
<tr>
<td>85</td>
<td>Investing in Climate Change</td>
<td>January 30, 2020</td>
</tr>
<tr>
<td>84</td>
<td>Fiscal Focus</td>
<td>November 26, 2019</td>
</tr>
<tr>
<td>83</td>
<td>Growth and Geopolitical Risk</td>
<td>October 10, 2019</td>
</tr>
</tbody>
</table>

Disclosure Appendix

Reg AC

We, Allison Nathan, Jenny Grimberg, Ashley Rhodes, Joseph Briggs, Jeff Currie, and Daniel Sharp 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, Will Nance, 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.

Disclosures

Regulatory disclosures

Disclosures required by United States laws and regulations

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

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

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

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. Australia: Goldman Sachs Australia Pty Ltd and its affiliates are not authorised deposit-taking institutions (as that term is defined in the Banking Act 1959 (Cth)) in Australia and do not provide banking services, nor carry on a banking business, in Australia. This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act, unless otherwise agreed by Goldman Sachs. In producing research reports, members of the Global Investment Research Division of Goldman Sachs Australia may attend site visits and other meetings hosted by the companies and other entities which are the subject of its research reports. In some instances the costs of such site visits or meetings may be met in part or in whole by the issuers concerned if Goldman Sachs Australia considers it is appropriate and reasonable in the specific circumstances relating to the site visit or meeting. To the extent that the contents of this document contains any financial product advice, it is general advice only and has been prepared by Goldman Sachs without taking into account a client’s objectives, financial situation or needs. A client should, before acting on any such advice, consider the appropriateness of the advice having regard to the client’s own objectives, financial situation and needs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests and a copy of Goldman Sachs’ Australian Self-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: This information is being provided to you for information purposes only and is not, and under no circumstances should be construed as, an advertisement, offering or solicitation by Goldman Sachs & Co. LLC for purchasers of securities in Canada to trade in any Canadian security. Goldman Sachs & Co. LLC is not registered as a dealer in any jurisdiction in Canada under applicable Canadian securities laws and generally is not permitted to trade in Canadian securities and may be prohibited from selling certain securities and products in certain jurisdictions in Canada. If you wish to trade in any Canadian securities or other products in Canada please contact Goldman Sachs Canada Inc., an affiliate of The Goldman Sachs Group Inc., or another registered Canadian dealer. 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(f) 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, and 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 risk 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 predetermined 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 contato@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Canal de Comunicação com o Púlico Goldman Sachs Brasil: 0800 727 5764 e/ou contato@gs.com. Horário de funcionamento: segunda-feira a sexta-feira (exceto feriados), das 9h às 18h; in Canada by 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: 1988602165W); 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, the Republic of Cyprus and the Republic of Ireland; GS Succursale de Paris (Paris branch) which, from Brexit Day, will be authorised by the French Autorité de contrôle prudentiel et de
resolution ("ACPR") and regulated by the Autorité de contrôle prudentiel et de resolution and the Autorité des 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 - Sucursale 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 – Sucursale 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 as 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.fidocumentation.org/fia/regulatory-disclosures_1/fia.uniform-futures-and-options-on-futures-risk-disclosures-booklet.pdf-version-2018. Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

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

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

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

© 2022 Goldman Sachs.

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