

TOP *of* MIND

THE WINTER OF CRYPTO'S DISCONTENTS



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



Allison Nathan | allison.nathan@gs.com

Jenny Grimberg | jenny.grimberg@gs.com

Ashley Rhodes | ashley.rhodes@gs.com

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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

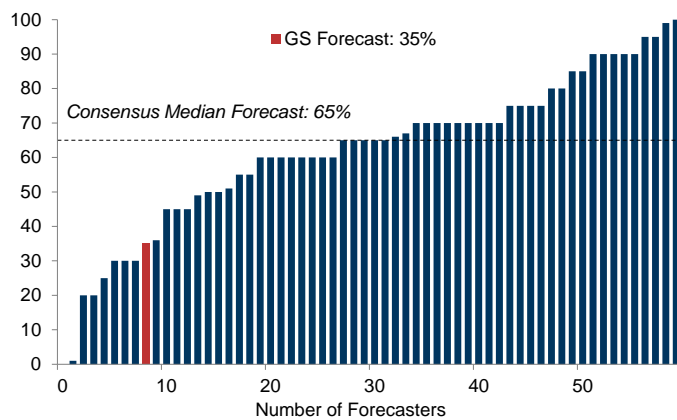
- We expect more Fed tightening in 2023 (added a 25bp hike in May, for a peak funds rate of 5-5.25%) on our expectation that more hikes may be necessary to keep growth on a below-potential path.

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 0.5pp 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

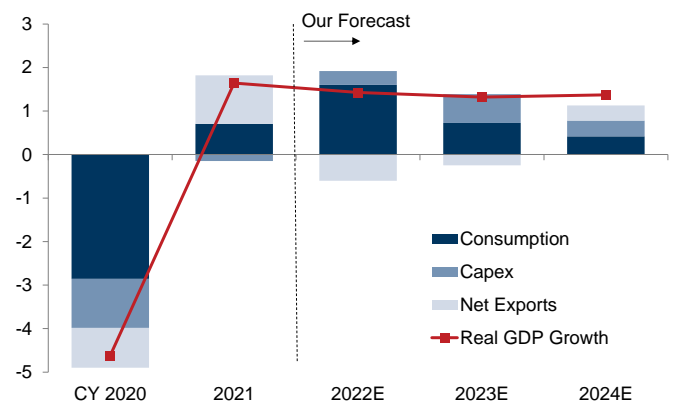
- No major changes in views.

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

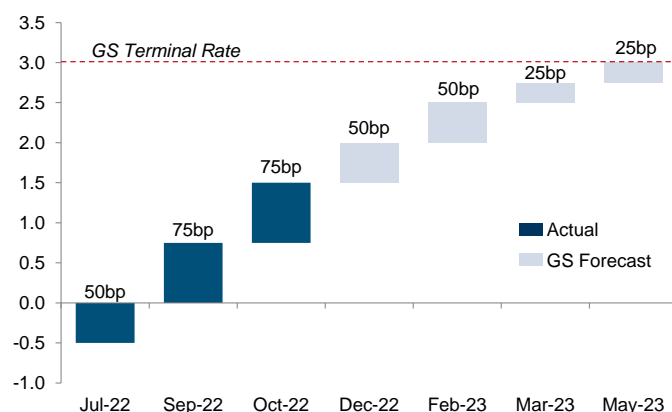
- We expect a shallower Euro area recession (contraction of 0.7% over 4Q22-2Q23 vs. 1.1% previously) due to more resilient hard data, lower risk of energy rationing, and significant fiscal support, but also a more muted recovery as the region's gas supply situation remains fragile.
- We expect more ECB 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.

Higher ECB terminal rate

ECB rate hikes, %



Source: ECB, Haver Analytics, Goldman Sachs GIR.

Emerging Markets (EM)

Latest GS proprietary datapoints/major changes in views

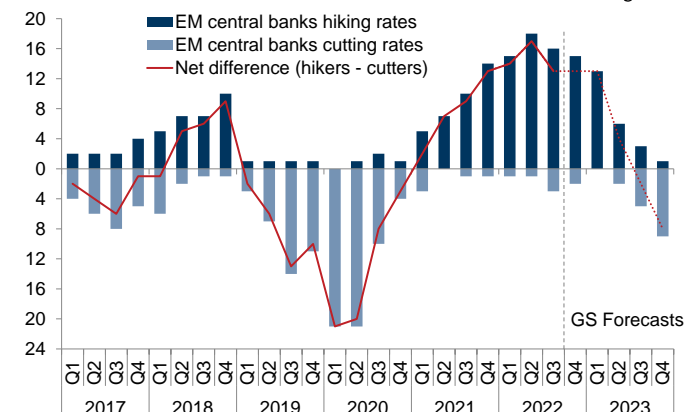
- We raised our 2022/23 Russia GDP growth forecasts to -3.3%/-1.3% due to a smaller reduction in Russian export volumes and better domestic demand performance due to a large fiscal loosening that is likely to be extended into 2024.

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 CEEMEA and Asia, but think LatAm central banks could begin easing in late '23.
- EM growth; we expect it to weaken further in coming months.

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 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@gs.com
Tel: 212-357-7504
Goldman Sachs & Co. LLC



Interview with Marcel Kasumovich

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 risk-taking 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.

Interview with Jay Clayton

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 cross-border 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?

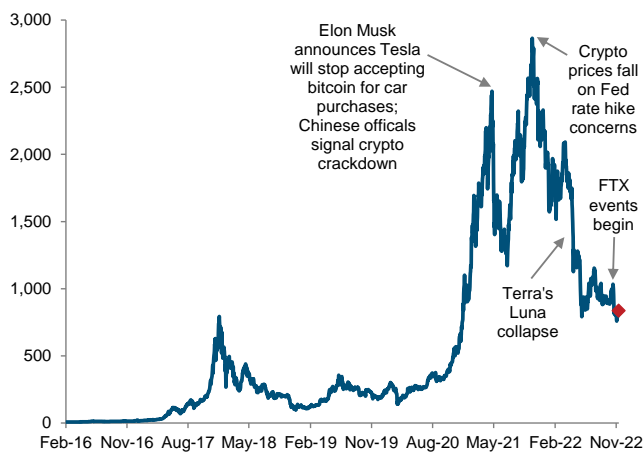
Jay Clayton: I'm optimistic that they can. The promise of distributed ledger technology is remarkable given how many transactions are already taking place around the globe 24/7 with very few frictions. That undeniably demonstrates that the opportunity to improve the efficiency of traditional financial 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.

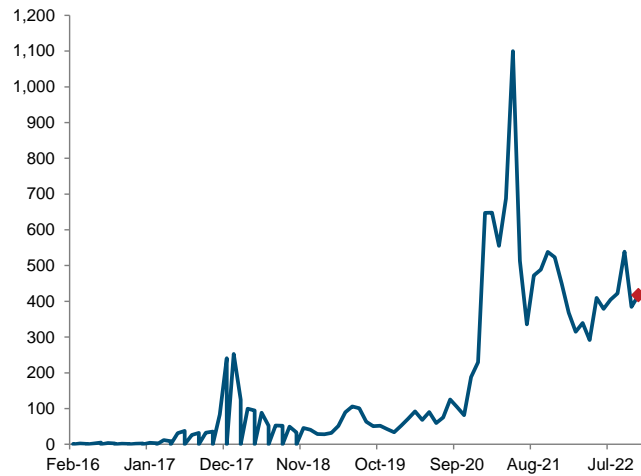
The punchline: lower prices, weaker investor sentiment, and a renewed focus on counterparty risk have driven a significant decline in crypto market cap, traded volumes, and leverage from the highs of 2021, and, more recently, a temporary spike in unique Bitcoin addresses.

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



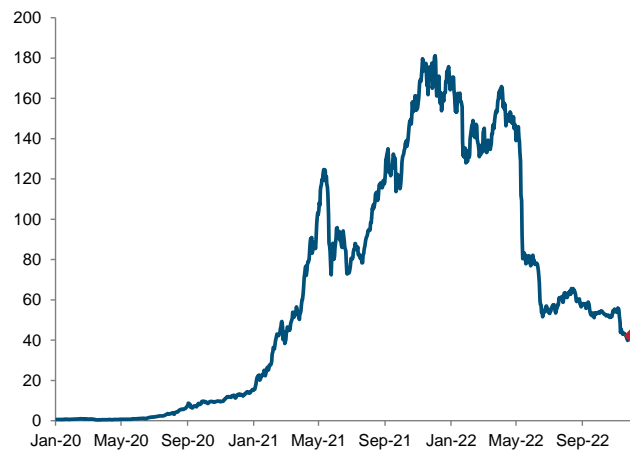
Note: Includes all crypto coins.
Source: Coin Dance, Goldman Sachs GIR.

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



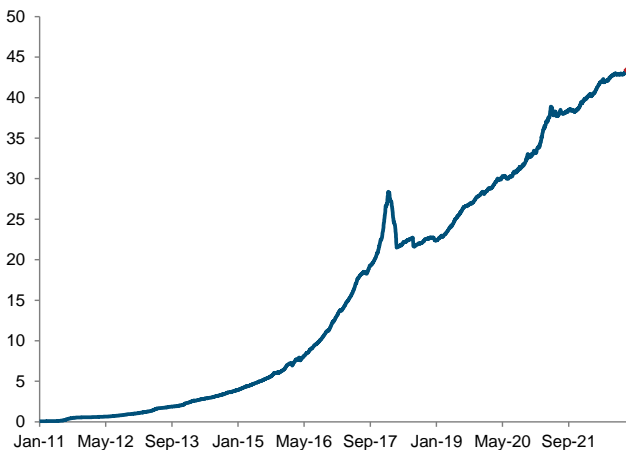
Note: Trusted volumes represents the sum of all volume from the spot markets of a set of trusted exchanges, in units of US dollars.
Source: Coin Metrics, Goldman Sachs GIR.

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



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

The recent FTX turmoil triggered a temporary surge in users moving their assets off exchange wallets
Unique BTC wallet addresses, number, millions



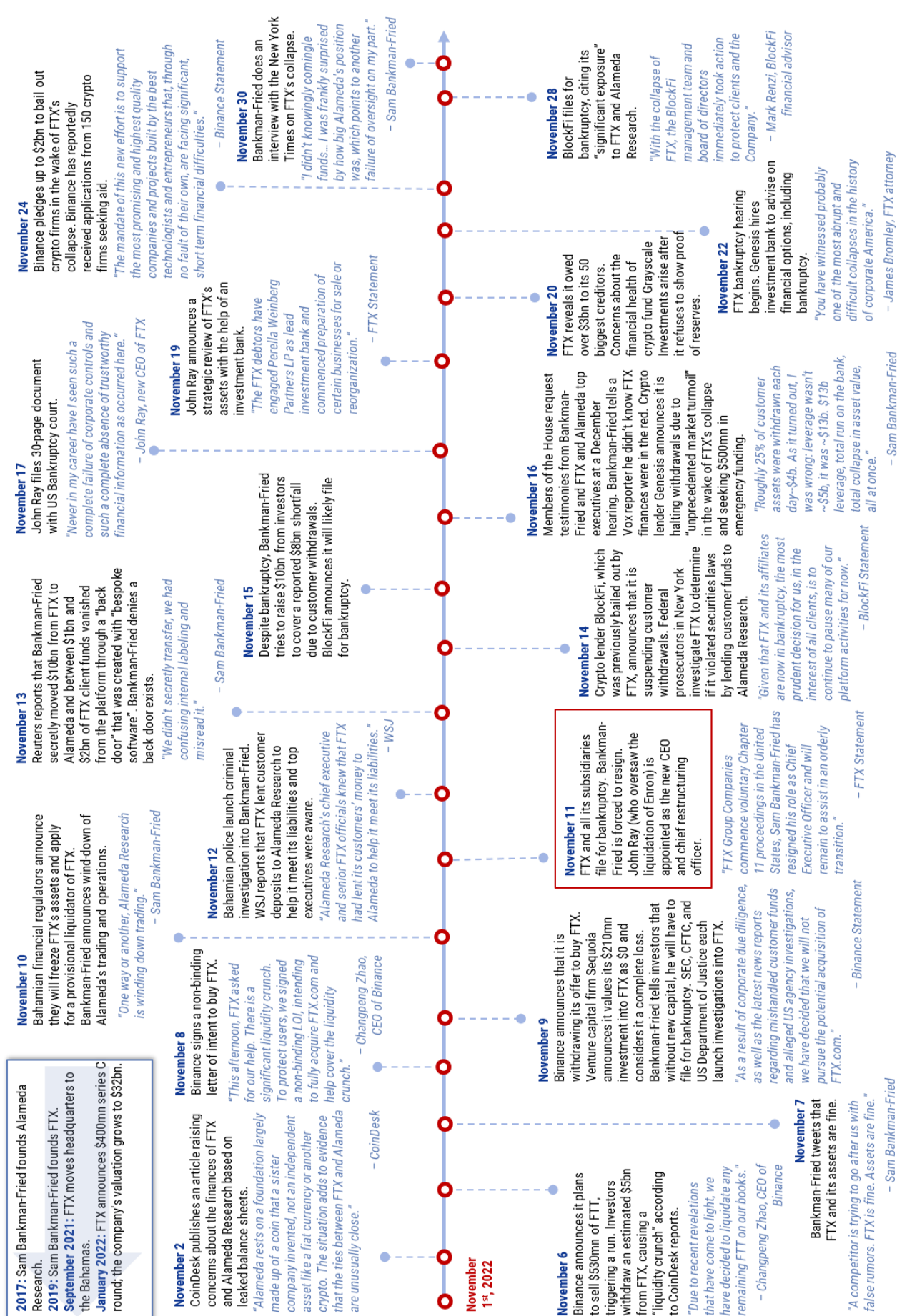
Note: Unique BTC wallet addresses are those that have >0 native currencies; in general, the higher the number of unique addresses, the higher the user count.
Source: Coin Metrics, Goldman Sachs GIR.

Will Nance, GS Equity Research

Email: will.nance@gs.com
Tel: 212-357-7483

Goldman Sachs & Co. LLC

Chronology of a crypto crisis



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

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 [proposed](#) 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 hobbling 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.

Interview with Gary Gorton

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 Grimberg: 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 Grimberg: 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 Grimberg: 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 Grimberg: 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 Dodd-Frank 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 Grimberg: 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 there 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 retraced 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 1.9mn ether and 96k bitcoin across select exchanges. Although no visibility exists 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 overcollateralized 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.

Crypto: limited US economic impacts

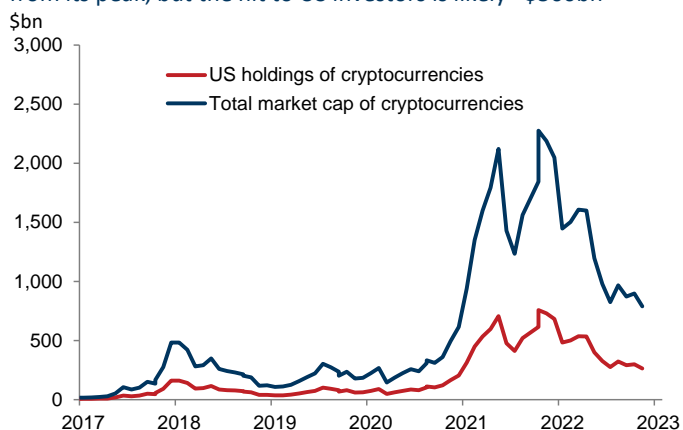
Joseph Briggs finds that the spillover risks of the recent upheavals in crypto assets to the broader US economy will likely remain limited

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



Note: We assume that US holdings account for 1/3 of the market cap of cryptocurrencies based on survey data. Market cap includes the top 200 cryptocurrencies identified at a given point in time by CoinMarketCap. Source: CoinMarketCap, Goldman Sachs GIR.

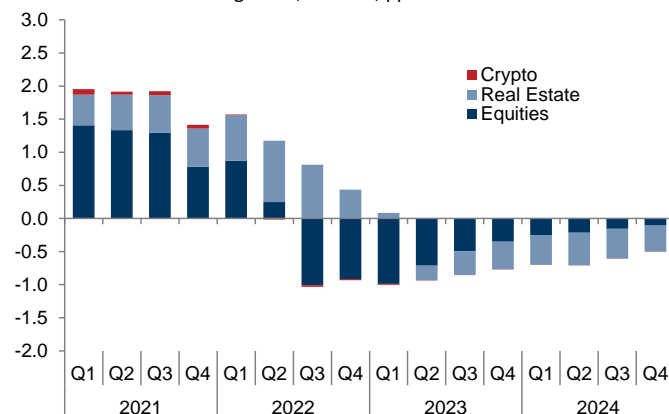
This decline is very small relative to US household net worth, which stood at \$144tn in 2Q22. In contrast, the recent decline in equity prices has reduced household net worth by over \$10tn (over 20 times as large as the hit from falling crypto prices), and the 12% cumulative decline in house prices we forecast through 2024 implies a roughly \$5tn hit (over 10 times as large) to household balance sheets. These figures suggest that equity and real estate price fluctuations are the main drivers of changes in household wealth, while cryptocurrencies are only a marginal contributor.

Assuming that households' tendency to spend from changes in the value of crypto holdings is the same as for equities, we estimate¹ that equity and house price declines will drag significantly on spending in 2023, but crypto price declines only very modestly so. And this would be the case even if the

tendency of households to spend their crypto wealth was much greater than their tendency to spend equity wealth, given that crypto holdings are such a small share of total household wealth. So, our results strongly suggest that the impact of lower crypto prices on spending is marginal relative to declines in equity and home prices, and is unlikely to meaningfully affect overall spending growth.

We expect falling asset prices to a drag on spending in 2023, but crypto price declines to contribute only marginally to this drag

Contributions to real PCE growth, QoQ AR, pp



Source: CoinMarketCap, Department of Commerce, Goldman Sachs GIR.

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 pre-pandemic 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.

Joseph Briggs, Senior US Economist

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

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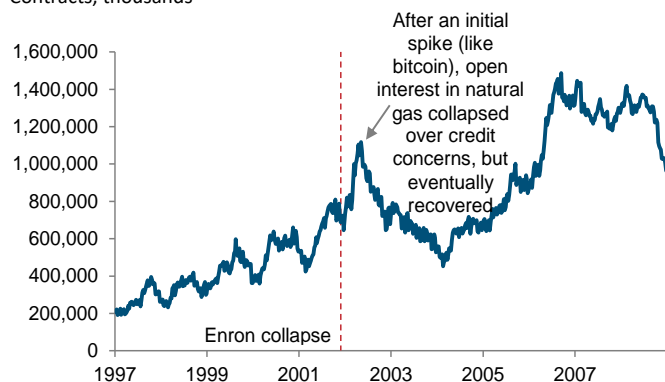
¹ To quantify the effects from falling crypto prices on spending, we update our standard wealth effects model. We then compare the implied effects on spending with those from changes in the value of real estate and equity holdings.

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



Source: CFTC, Goldman Sachs GIR.

History rhymes, regulation doesn’t

The recent crypto crises follow a well-known pattern in financial markets—a highly volatile and relatively new asset creates the potential for instant riches, drawing in many unsophisticated investors looking for the opportunity to make millions. To do so, they must often go through a “gatekeeper”—institutions who make the underlying market and investors trust to hold their assets and have their best interests at heart. Eager and usually speculative investors are willing to hand money over to these institutions in the hopes of getting rich quickly. This is a tale as old as time; it did not begin with the advent of blockchain technology, and isn’t unique to crypto.

Historically, gatekeepers have included banks, asset managers, and financial advisors, all of which are regulated to protect investors. In the case of FTX, that gatekeeper was the exchange itself. Investors on crypto exchanges generally keep their coins in a wallet on the exchange, much like deposits at a bank, but unlike a bank, there is no FDIC-like protection or recourse in the event of a loss. So, when FTX lent \$10bn of customer deposits to Alameda and that money evaporated as Alameda collapsed, investors had no recourse to recover funds.

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: 44-20-7552-7410

Goldman Sachs International

Daniel Sharp, Commodities Strategist

Email: daniel.sharp@gs.com
Tel: 44-20-7774-1875

Goldman Sachs International

A snapshot of global crypto regulation

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

Note: Table does not constitute an exhaustive list of all countries/regions that regulate crypto.
 Source: ComplyAdvantage, Government of the Bahamas, Canadian Securities Administrators, CFTC, FinCEN, IRS, SEC, European Council, Dow Jones, London School of Economics, UK Financial Conduct Authority, Australian Securities and Investments Commission, Australian Taxation Office, Dezan Shira & Associates, PBoC, CoinDesk, Cointelegraph, World Economic Forum, Global Legal Insights, Thomson Reuters, GS GIR.

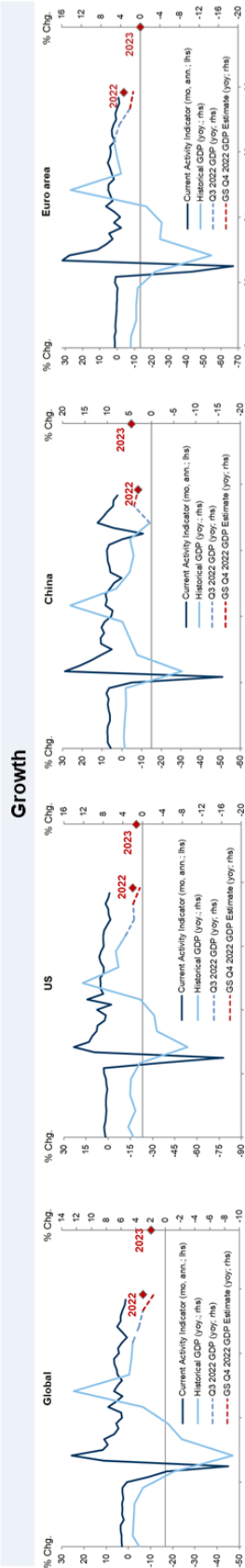
Summary of our key forecasts

GS GIR: Macro at a glance

Watching

- **Globally**, we expect annual average GDP growth to slow to a sluggish 1.9% in 2023, reflecting sizable drags from tighter financial conditions, the protracted energy crisis in Europe, a bumpy reopening in China, and the housing downturn in China and elsewhere. We expect the global inflation surge to peak this quarter, and think the combination of a moderation in demand growth, improvements in goods supply, and tighter monetary policy will be sufficient to bring inflation back toward DM central banks' targets over the next two years.
- **In the US**, we expect GDP growth to slow to 2.0% in 2022 and 1.3% in 2023, reflecting a negative impulse from tighter financial conditions. We see a (below-consensus) 35% probability of entering a recession over the next year, although we think any recession would likely be mild. We expect core PCE inflation to decline significantly to 2.9% by end-2023, reflecting easing in supply chain constraints, a peak in shelter inflation next spring, and slower wage growth, although we expect progress on wage growth to be more gradual than disinflation from core goods and shelter. We expect the unemployment rate to stand at 3.7% by end-2022 before rising to 4.1% by end-2023 and 4.2% by end-2024.
- **We expect the Fed** to deliver a 50bp hike in December followed by 25bp hikes in February, March, and May, for a peak funds rate of 5.00-5.25%, though recent easing in financial conditions could push the Fed to a higher peak rate. On the fiscal policy front, the midterm elections produced a divided government, which we expect will reduce the size and probability of fiscal support in the event of a recession.
- **In the Euro area**, we expect a mild recession in 4Q22-2023 and GDP to contract by 0.1% in 2023, driven by continued significant gas supply disruptions owing to the war in Ukraine and slowing growth momentum. We expect headline inflation to peak at around 10.7%/yoy in December before falling back to around 4.3% in December 2023.
- **We expect the ECB** to hike by 50bp in December and February and by 25bps in March and May for a terminal rate of 3.00%, though more persistent inflationary pressures and stronger second-round effects could push the ECB to a higher terminal rate.
- **In China**, we expect full-year real GDP growth of 3.0% in 2022 before accelerating to 4.5% in 2023 on the back of China's potential exit from its zero-Covid policy, which we continue to expect in 2023 but the risk is tilted toward an earlier reopening. On a sequential basis, we expect 1.2% qoq ann. growth in 4Q22 after a very strong rebound of 16.5% in 3Q22 due to the weaker-than-expected October activity data and the latest Covid resurgence in major cities.
- **WATCH INFLATION AND EUROPEAN ENERGY**. On the inflation front, more persistent inflationary pressures could lead to extended central bank hiking cycles, which could raise the risk of recession in several major economies. Tensions in the European energy market also continue to loom large, with Russia suspending natural gas flows through the Nord Stream gas pipeline indefinitely and the European import ban/G7 price cap on Russian oil recently implemented. But recent rebalancing of the gas market driven by an exceptionally mild start to the European winter has reduced the risk of energy rationing this winter.

Goldman Sachs Global Investment Research



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

Forecasts

Economics	GDP growth (%)				Interest rates 10yr (%)				Markets				Equities																		
	2022		2023		2022		2023		2022		2023		2022		2023		2022 (%)														
Global	GS (Q4/Q4) (CY)	1.6	3.0	2.9	1.9	2.1	US	3.46	4.10	4.30	EUR/\$	1.06	0.94	1.05	Price	3,600	-	4,000	-	S&P500	1.0	-17.0	18.1x								
	Cons. (CY)	0.6	2.0	1.8	1.3	0.4	Germany	1.81	2.50	2.75	GBP/\$	1.22	1.07	1.22	EPS	\$224	\$224	\$224	\$231	MXAPJ	7.0	-19.0	13.6x								
	GS (CY)	3.0	3.0	3.2	4.5	4.8	Japan	0.25	0.25	0.25	\$/P/Y	136	155	140	Growth	7%	6%	0%	4%	Topic	12.0	-2.0	13.9x								
	Cons. (CY)	1.4	3.3	3.2	-0.1	-0.1	UK	3.07	3.75	4.00	\$/CHY	6.9	7.20	6.90	Credit	3.07	3.75	4.00	\$/CHY	6.9	7.20	6.90									
Policy rates (%)					Commodities				2022				2023																		
	GS		M&L		GS		M&L		Last		4Q22		2023		Consumer		CPI		Unemp. Rate		Q1		Q2		Q3		Q4				
	4.38		4.84		5.13		3.93		76		115		110		USD		8.0		3.7		5.5		5.6		5.4		5.5				
	2.00		2.94		3.00		2.69		5.96		6.20		4.15		HY		446		490		575		Euro area		8.5		6.9		7.4		7.1
2.00		2.68		2.00		3.05		6,525		9,500		11,000		EUR		185		215		225		China		2.0		--		--		--	
-0.10		0.10		-0.10		0.20		1,790		1,850		1,950		HY		514		555		615		Wage Tracker		3.0		-10.0		12.2x			

Source: Bloomberg, Goldman Sachs Global Investment Research. For important disclosures, see the Disclosure Appendix or go to www.gs.com/research/hedge.html. Market pricing as of December 08, 2022.

Glossary of GS proprietary indices

Current Activity Indicator (CAI)

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

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

Dynamic Equilibrium Exchange Rates (DEER)

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

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

Financial Conditions Index (FCI)

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

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

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

Goldman Sachs Analyst Index (GSAI)

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

Macro-Data Assessment Platform (MAP)

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

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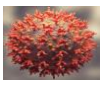
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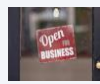
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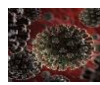
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Reg AC

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