2021

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Digital Asset Outlook

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The report covers the state of the market, investment trends, decentralized finance, and other thematic trends to watch for in 2021.

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Bitcoin broke its previous all-time high and returned 232% in 2020. The market leader in terms of market cap added roughly $313 billion to its market capitalization — versus Gold: 23.9%, S&P500: 14.3%, and Nasdaq: 19.9% in the same time period. (pg 9)

Stablecoins found a product-market fit in 2020. Since the beginning of the year, the aggregate stablecoin supply has grown by 340% — from $5.9 billion to over $26 billion. Annual stablecoin adjusted transaction volume will cross $1 trillion in 2020 — good for +300% growth compared to 2019 volumes. (pg 12)

Crypto market structure maturation has accelerated through 2020. Led by growth in crypto derivatives, the aggregated monthly volume of Bitcoin futures increased by 120% year-to-date and reached all-time highs of $871.6 billion in November. (pg 17)

Digital Asset Investment Trends

Venture funding allocated into crypto and blockchain companies ticks higher in 2020: Roughly $3.1 billion in venture funding was allocated to crypto/blockchain projects in 2020. (pg 23)

2020 recorded the most M&A transactions in the sector's history. Although M&A activity & corporate development within digital assets is still in its infancy, more than $691 million in M&A volume was conducted across 83 transactions in 2020. (pg 32)

The Block Research 2021 Investor Surveys. Targeted surveys to digital asset and crypto investors found: investors on average believe stablecoin growth in 2021 will outpace 2020, Coinbase as the perceived most impactful company in 2021, and the expectation for five to nine companies in the S&P 500 to hold bitcoin on a balance sheet in 2020, among other insights. (pg 39)

Decentralized Finance: 2020 Themes, 2021 Outlook

Decentralized finance has adopted known principles from traditional finance. Token valuation and the role of governance have become clearer ahead of 2021. (pg 45)

Successful DeFi protocols are now measured in the billions. DEXs passed $100 billion in annual trade volume in 2020, while the total value locked in DeFi is $16.6 billion. (pg 50)

Scalability solutions are beginning to work in practice. This negatively impacts composability but decreases transaction costs. (pg 58)

A look at the biggest DeFi hacks of 2020. In total, The Block Research estimates more than $120 million worth of value has been exploited from DeFi contracts. (pg 63)

Payments and Banking Trends

U.S. CBDC updates. 2020 marked an accelerated pace of new central bank digital currency (CBDC) conversation, research, partnerships, and advanced stages of pilots.(pg 65)

Stablecoins. In 2Q'20, we wondered how much longer before we would see payment giants move in on the stablecoin market. Take 2H'20 corporate and regulatory developments around stablecoins as further validation that this question is becoming more when, not if. (pg 74)

Banking on Crypto. 2020 also marked itself as the banner year for legacy fintech, and financial services' interest into digital assets, as some of the world's largest financial companies accelerated the strategic desire to expand crypto capabilities or publicly market the intention to explore new digital asset offerings. (pg 76)

Macro Perspectives

2020 was the year bitcoin elevated its perception among investors and corporates as a viable macro investment. Bitcoin entered 2020 out to prove the merits of it evolving into a "safe haven asset. Yet, 2020 had other plans as bitcoin reshuffles the safe-haven narrative for an inflation hedge that also benefits from broader market reflation and other idiosyncratic tailwinds. (pg 82)

State of the Market:

Lars Hoffmann and Steven Zheng

A look at measures of market health, including: asset performance metrics, on-chain data, miner revenue, exchange volumes, academic research, and more.

For real-time data on the metrics featured in this section, please see The Block Data Dashboard.

Quick Take

- Overall, 2020 has been a strong year for cryptocurrencies.
- Most metrics The Block tracks via our Data Dashboard hit new yearly/all-time highs in November.
- Crypto market structure maturation has accelerated through 2020, as options trade volume growth outperformed futures growth by nearly 5.4 times.

A look back at 2020 by the numbers

Disclaimer: Q4 numbers include data until Nov 30th. Price performance measures data up until December 20th.

Market Performance

Cryptocurrencies experienced a strong year in terms of performance in 2020. This was in spite of a severe market correction of ~35% within only three days alongside other asset classes in March (at one point, bitcoin was down 50% within 24 hours) in response heightened market fears around the COVID-19 pandemic.

Bitcoin, the clear market leader in terms of total market value, broke its previous all-time high and returned 232% in 2020 while adding roughly $313 billion to its market capitalization — versus Gold: 23.9%, S&P500: 14.3%, and Nasdaq: 19.9% in the same time period. Furthermore, Bitcoin's market capitalization more than doubled, from $130 billion to $443 billion. Notably, all top ten cryptocurrencies by market capitalization ("the majors"), excluding exchange tokens, had positive returns. Moreover, most altcoins in the top ten actually outperformed Bitcoin with wide margins — including Ethereum. Chainlink's performance has been especially strong, in part due to its aspirations to be a foundational layer of the decentralized finance (DeFi) ecosystem (see our DeFi outlook on pg 45). Underperformance, relative to Bitcoin, can be observed from the Bitcoin code/hard forks Litecoin, Bitcoin SV, and Bitcoin Cash. Polkadot, which only started trading on secondary markets in August, was still able to break comfortably into the top ten and showed noteworthy returns.

Figure 1:
Source: Coingecko, The Block Research

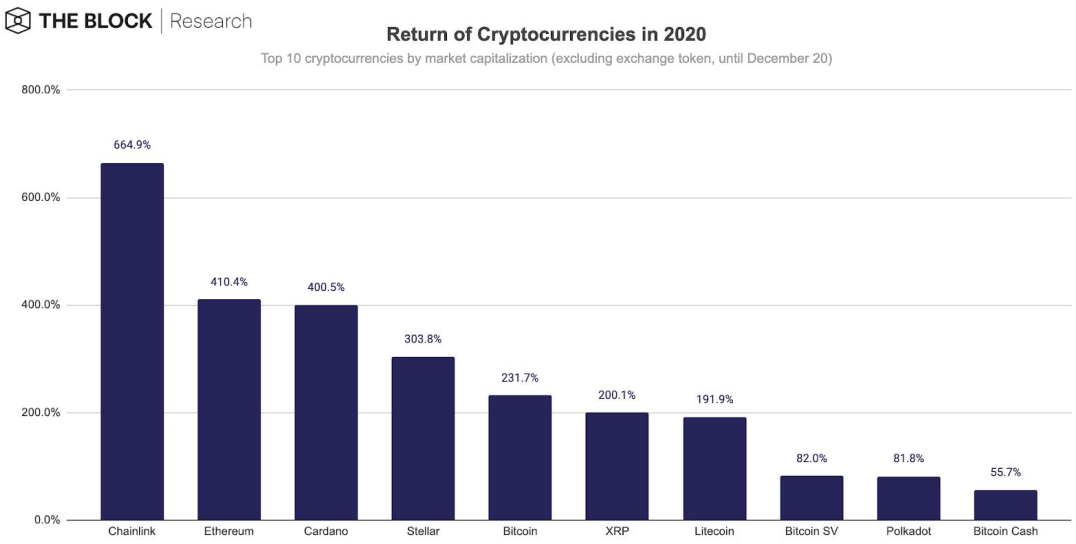


Figure 2: Source: Coingecko, The Block Research

The DeFi summer rally (see "Decentralized Finance: 2020 Themes, 2021 Outlook" section on pg 45) significantly contributed to the overall returns of the top ten cryptocurrencies — and to the relative outperformance of Chainlink as well as Ethereum.

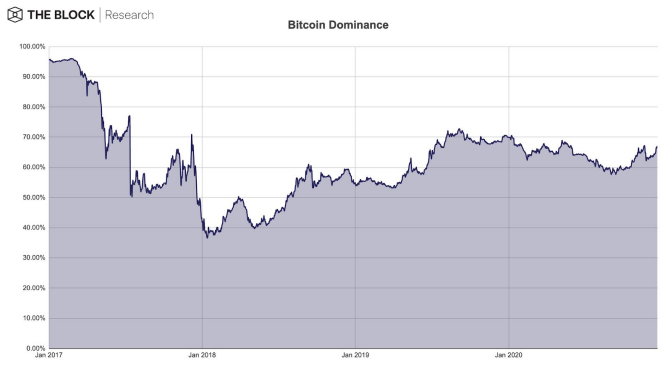
Year-to-date, Bitcoin's dominance (bitcoin market value/ total digital asset market value; fig 3) has declined from 70% to 67% at the time of writing this report — with a temporary low of 57.5% in September. Combined with Bitcoin's relative price stability from May to September, the decline in dominance significantly contributed to the outperformance of other cryptocurrencies.

Adjusted on-chain volume

Total adjusted on-chain volume (on a public blockchain), which is a proxy for economic throughput, saw strong increases in H2 and reached a new three-year high of ~$363 billion in Q3.

Overall, Bitcoin's on-chain volume increased by 120% year-over-year (from $673 billion in 2019 to $810 billion in 2020), while Ethereum's on-chain volume increased by 241% year-over-year (from $133 billion to $320 billion).

Figure 3:

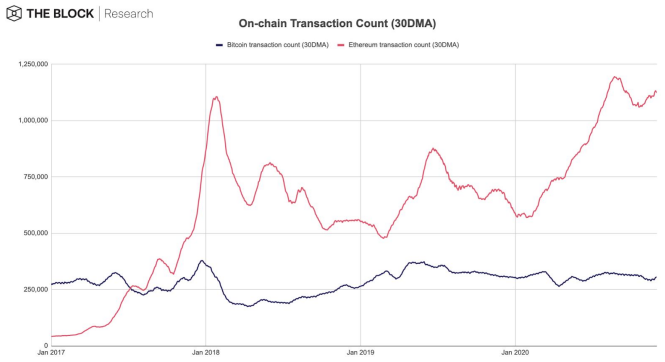


Source: Tradingview (BTC.D), The Block Research

Throughout 2020, on aggregate, Bitcoin's on-chain volume exceeded Ethereum's by ~2.5 times.

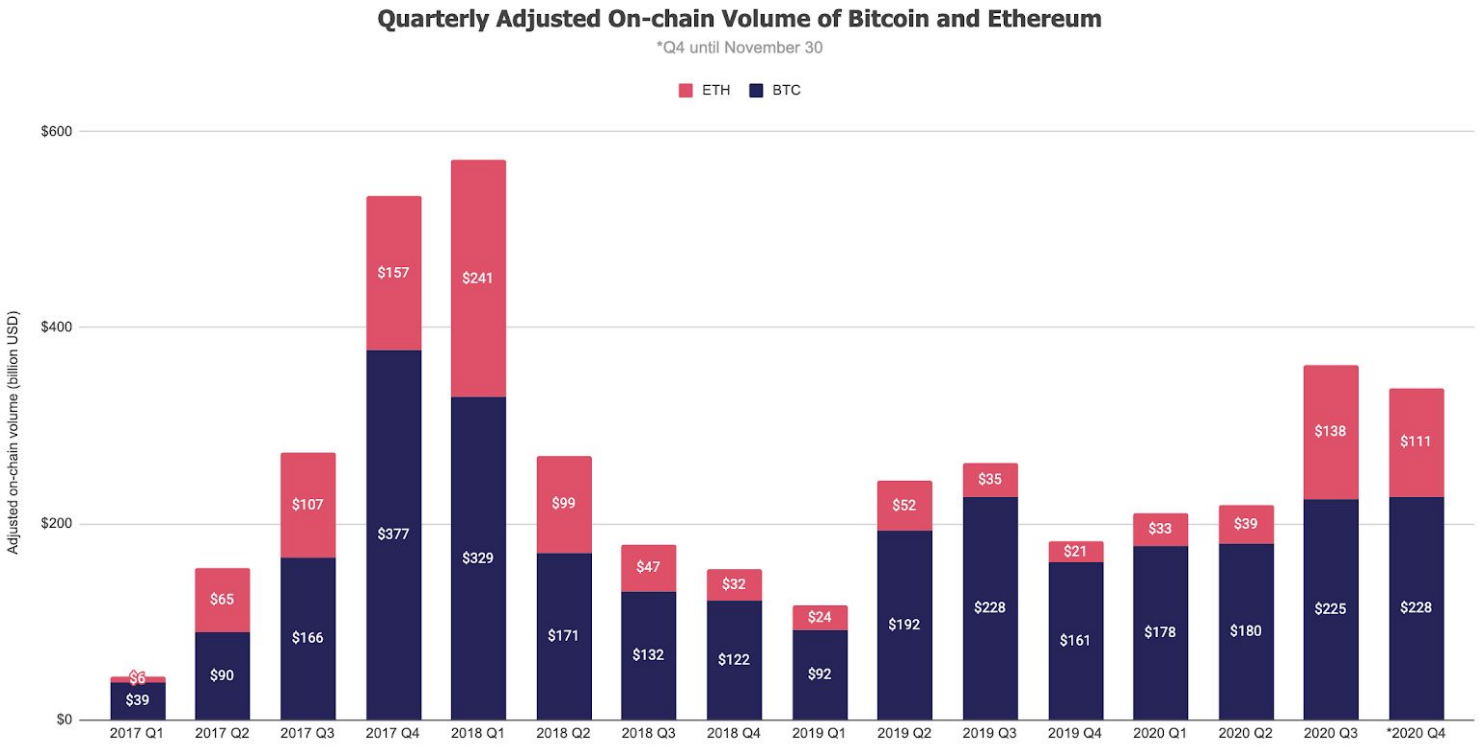
As of November 30, despite increases in total adjusted on-chain volume, Bitcoin's on-chain transaction count remains about 19.5% below its December 2017 high of ~379,000 (30DMA). However, Ethereum broke its January 2018 on-chain transaction count high of ~1,050,000 (30DMA) at the height of the DeFi summer rally in September — and continues to hold above its January 2018 high.

Figure 5:



Source: Coin Metrics, The Block Research

Figure 4:
Source: Coin Metrics, The Block Research



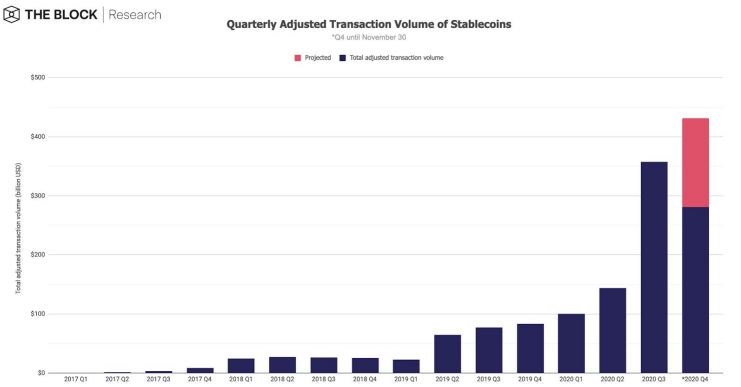
Stablecoins

2020 was a year of multitudes for the crypto industry — however, one bright spot has been the emergence of stablecoins finding clear product market fit (and acceptance by global payment companies as an emerging payment technology). Since the beginning of the year, the aggregate stablecoin supply has grown by 340% — from $5.9 billion to over $26 billion.

Arguably more impressive, however, is the growth in usage. Annual stablecoin adjusted transaction volume (a payment flow from one address to another on a public blockchain) will cross $1 trillion in 2020 — good for +300% year-over-year growth relative to 2019 volumes.

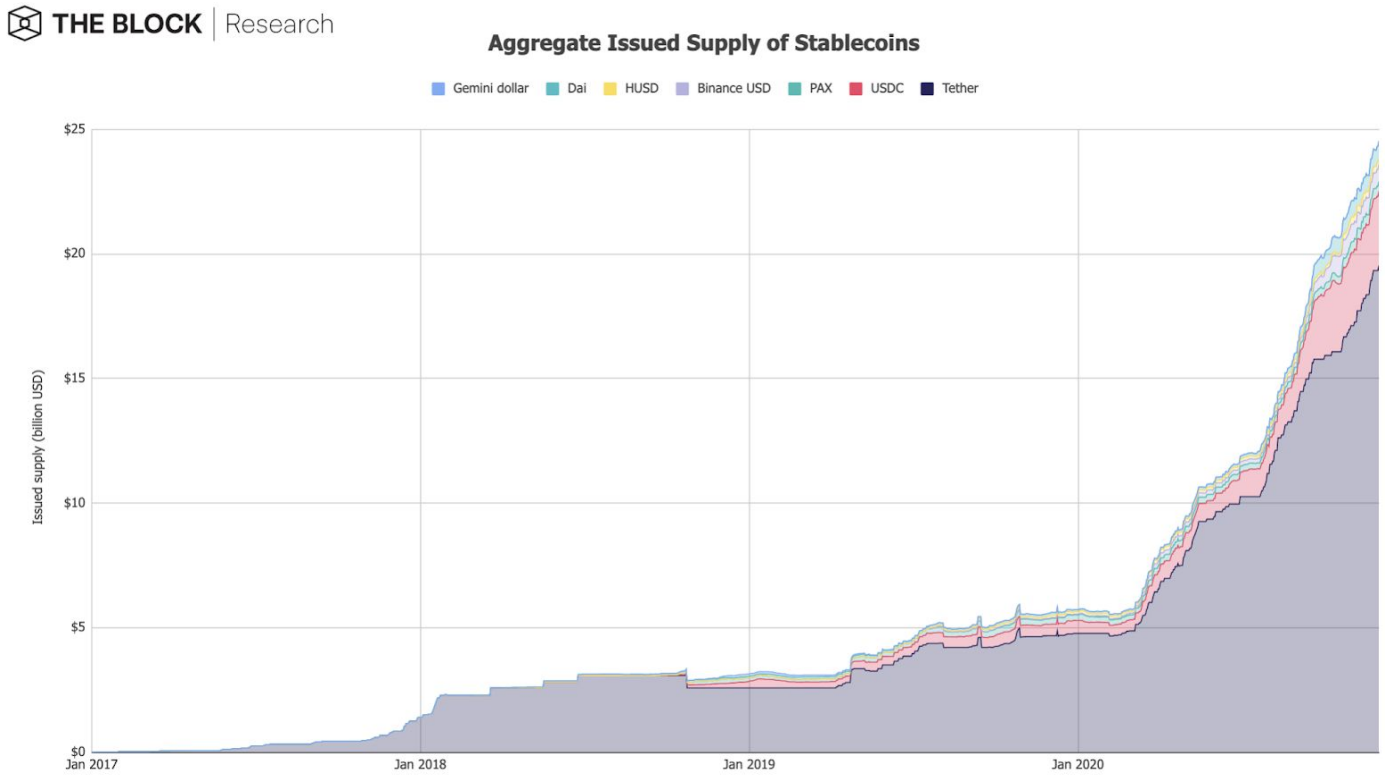
For more on our outlook on stablecoins, see (pg 74).

Figure 6:



Source: Coin Metrics, The Block Research

Figure 7:
Source: Coin Metrics, The Block Research



Miner revenue

Miner revenue is estimated under the assumption that miners sell their Bitcoin / Ethereum immediately, which is not exactly accurate as some companies retain a portion of their mined Bitcoin / Ethereum to sell at later dates.

Year-to-date, Bitcoin miners have generated a total of $4.3 billion in revenue, representing a year-on-year decline of 17%. The decline can be attributed to significantly reduced subsidy revenues of ~19%, following the halving in May. On a positive note, revenues from transaction fees increased by 66%, from $155 million in 2019 to $257 million in *2020.

Bitcoin's hash rate, a measure of miner's performance, reached a new all-time high of 140 million TH/s (30DMA) in October. Until November 30, Bitcoin's hash rate has increased by 35% on a 30DMA basis.

Notably, Bitcoin's hash rate dropped 12% following the halving on May 11 — which cut the block subsidy in half, from 12.5 to 6.25 Bitcoins per block — before quickly recovering. The overall strong hash rate increase in 2020 has resulted in older ASIC mining equipment, such as the Antminer S9, becoming unprofitable — with new-generation equipment, such as the Antminer S17 and Whatsminer M30S, taking over.

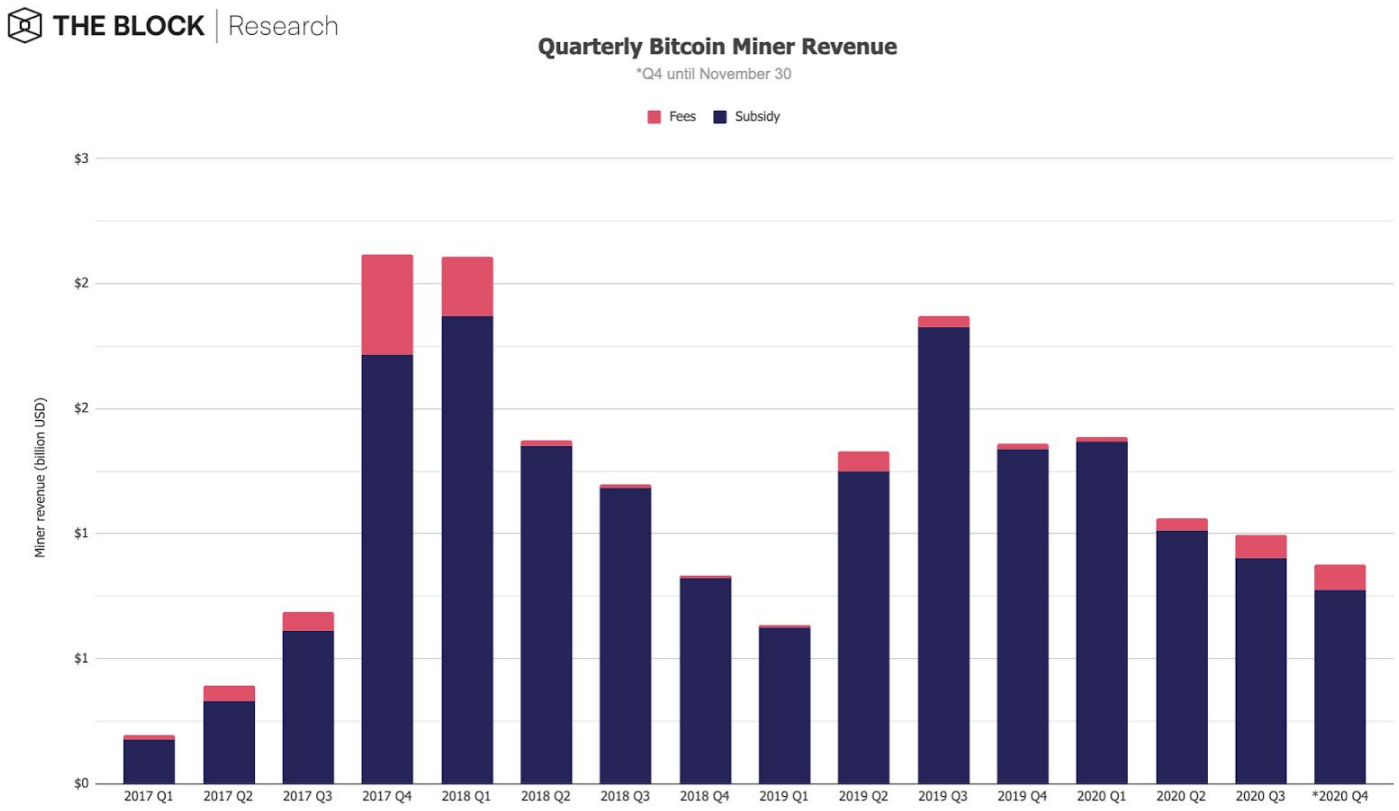
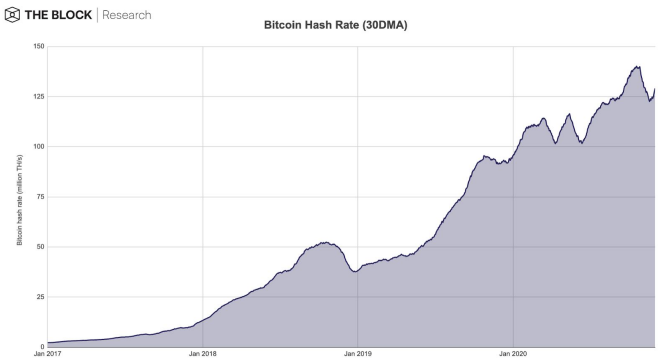


Figure 8:
Source: Coin Metrics, The Block Research

Figure 9:

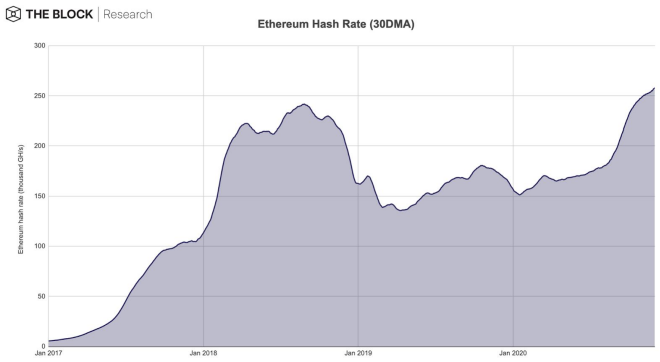


Source: Coin Metrics, The Block Research

Year-to-date, Ethereum miners have generated a total of $1.75 billion in revenue, representing a year-on-year increase of 88%. The increase can be attributed to significantly higher revenues generated from transaction fees, which swelled in response to outsized DeFi activity (for more see our DeFi outlook pg 45). Ethereum miner revenue from fees is on track for nearly $500 million in *2020, compared to only $34.5 million in 2019. Moreover, revenues from block subsidies increased by 41%, from $897 million in 2019 to $1.26 billion in *2020.

Ethereum's hash rate, a measure of miner's performance, surpassed its August 2018 all-time of 242,000 GH/s (30DMA) and reached 258,000 GH/s (30DMA) at the end of November. Until November 30, Ethereum's hash rate has increased by 65% on a 30DMA basis.

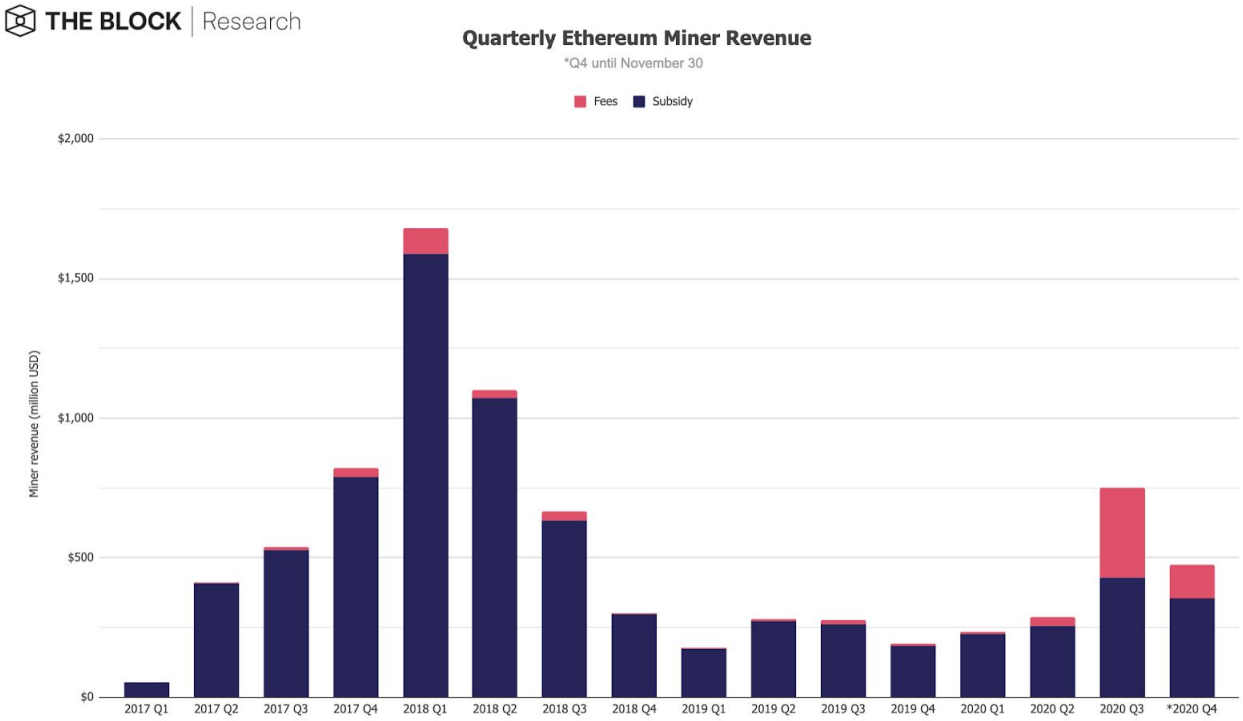
Figure 10:



Source: Coin Metrics, The Block Research

Figure 11:

Source: Coin Metrics, The Block Research



Spot volumes

In *2020, cryptocurrency spot trading volumes have seen a significant increase of 85%, with 62% of total spot volumes attributable to H2 due to the DeFi summer rally. According to The Block's legitimate volume index, volume hit a new annual high of $294.2 billion — staying only short of the total spot volumes recorded in December 2017 and January 2018.

In recent years, there has been a shift on spot exchanges from denominating trading pairs in Bitcoin to denominating them in Tether. A lot of this year's growth in Tether supply has been driven by the overall market structure changes. While the DeFi boom clearly helped as well as improved the overall dynamic, the major catalyst to Tether's supply growth has been centralized exchange traders starting to utilize Tether as their main quote asset and as collateral.

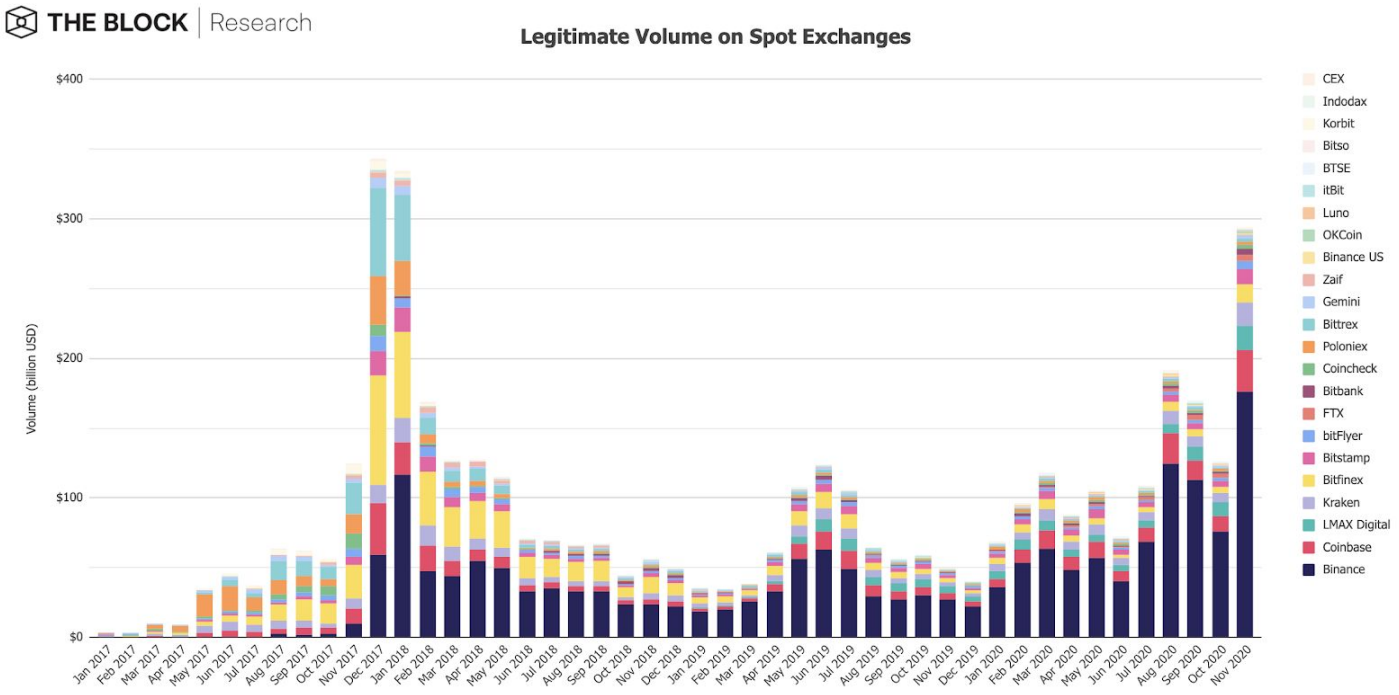


Figure 12: Source: CryptoCompare, Coingecko, LMAX Digital, The Block Research

Binance continues to have the largest spot trading market share among all crypto exchanges.. Its spot trading market share has continuously stayed above 50% in *2020, hitting a high of about 67% in September. Currently, it sits at ~60%.

In November, Binance was followed by Coinbase (10.2%), LMAX Digital (5.9%), Kraken (5.6%), Bitfinex (4.4%), and Bitstamp (3.9%).

Putting things into perspective, in Q1' 17, only about 5% of the spot volume was denominated in Tether, while Bitcoin pairs accounted for nearly 50% of the volume, and USD pairs for about 40%.

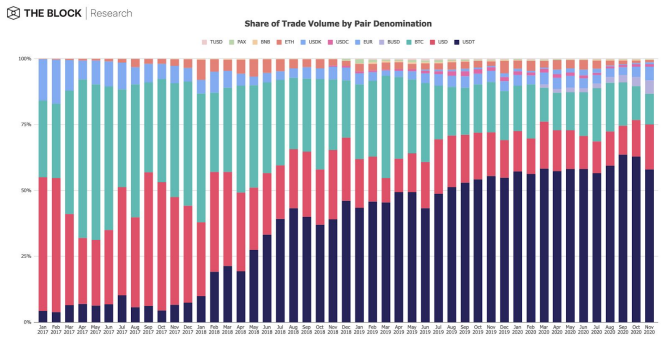
Fast forward to 2020, as much as 70% of the spot volume is denominated in Tether as well as another 4% in other stablecoins, while only about 15% is attributable to Bitcoin pairs.

Little exemplifies the DeFi summer rally as well as the exponential growth in decentralized exchange (DEX) volume. As of November 30, monthly DEX volume has grown by about 4,190%, from $624 million in January to $17 billion in November. At the peak of the DeFi summer rally, DEX volume hit an all-time high of $26.78 billion in September — with Uniswap's volume even exceeding Coinbase's volume. Annual DEX volumes are on pace to cross $95 billion in 2020, up from $2.5 billion in 2019 (nearly 132 times higher).

Overall, Uniswap continues to dominate the DEX space with a market share of about 60% in November, with DEXs based on constant function market makers accounting for approximately 89% of the market share.

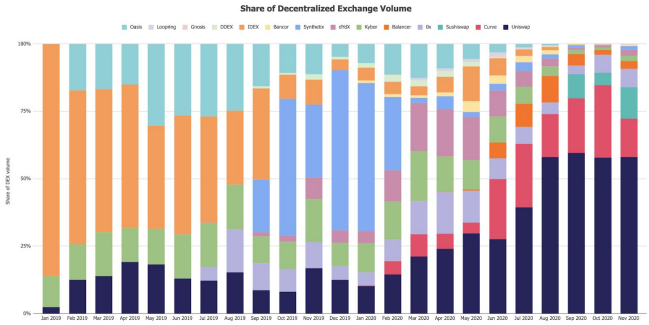
Curve, an automated market maker (AMM) optimized for swaps between assets that are price-stable to one another (e.g. stablecoin-to-stablecoin swaps), accounted for about 14% of the DEX market in November. Recently, SushiSwap has managed to attract both liquidity and trading volume as well, growing to the third-largest DEX in November.

Figure 13:



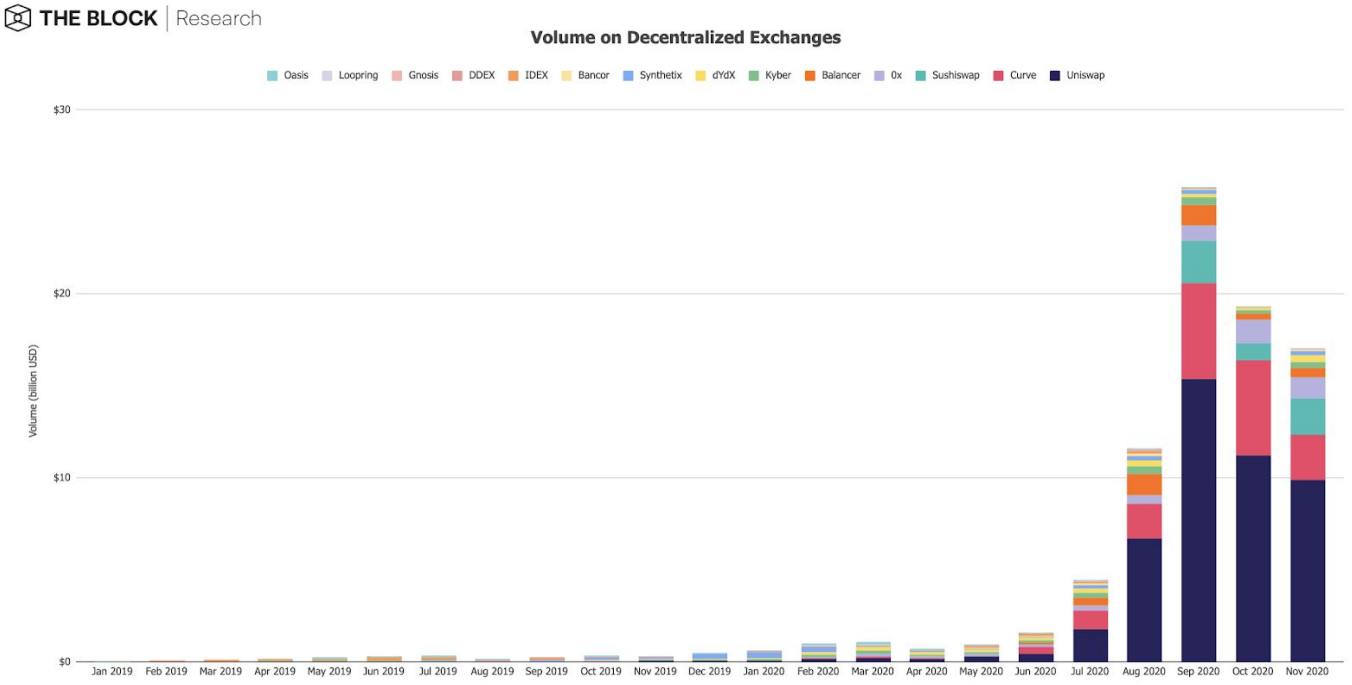
Source: CryptoCompare, The Block Research

Figure 14:



Source: Dune Analytics (@hagaetc), The Block Research

Figure 15:
Source: The Block Research, Dune Analytics (@hagaetec)

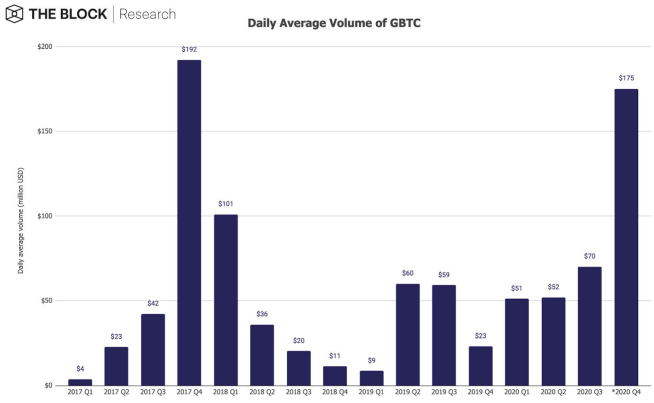


Grayscale

The daily average trading volume of the Grayscale's Bitcoin Investment Trust (GBTC), a closed-end fund that invests exclusively in Bitcoin, saw a significant increase, alongside positive Bitcoin price performance, to $175 million in *Q4 — which is only 8.8% below the all-time high of $192 million recorded in 2017 Q4.

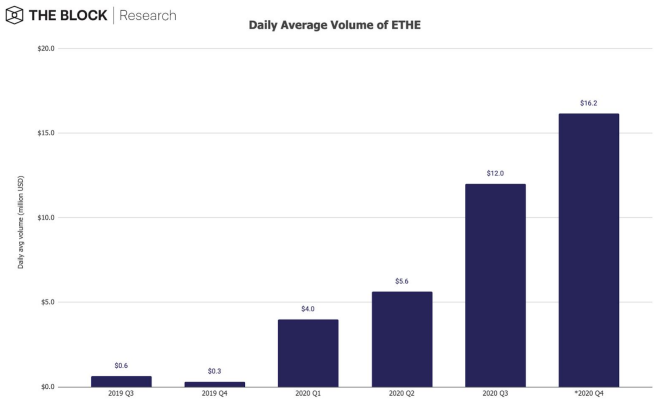
The daily average trading volume of the Grayscale's Ethereum Investment Trust (ETHE), a closed-end fund that invests exclusively in Ethereum, also saw significant as well as continued increases throughout 2020.

Figure 16:



Source: FactSet, The Block Research

Figure 18:

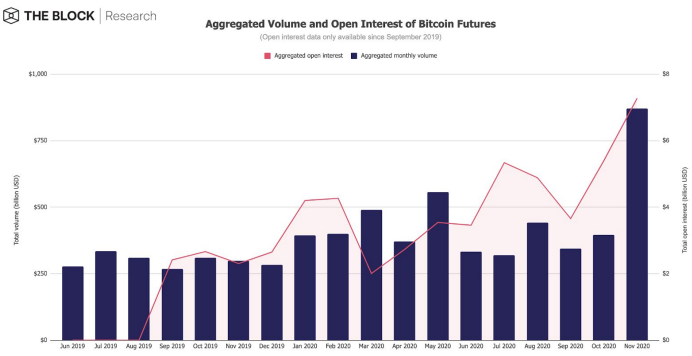


Source: FactSet, The Block Research

Bitcoin derivatives

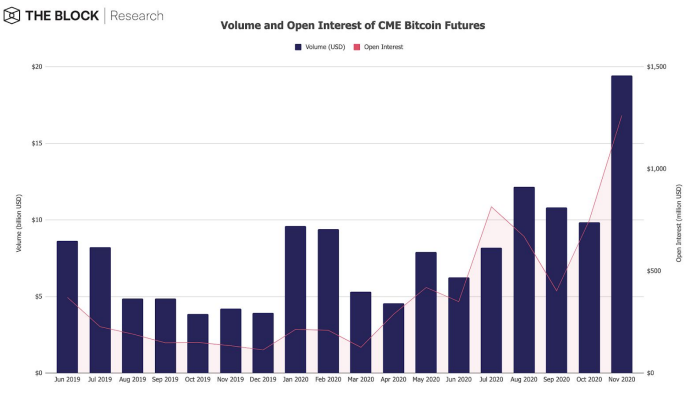
The aggregated monthly volume of Bitcoin futures increased by 120% year-to-date and reached a new all-time high of $871.6 billion in November. Furthermore, the aggregated open interest in Bitcoin futures increased by 73% year-to-date and also reached a new all-time high of $7.3 billion in November. In terms of CME Bitcoin futures, the monthly volume doubled year-to-date and reached a new all-time high of $19.4 billion in November. Meanwhile, the open interest in CME Bitcoin futures increased by 485% year-to-date, while also reaching a new all-time high of $1.26 billion in November.

Figure 17:



Source: skew, The Block Research

Figure 19:



Source: skew, The Block Research

It continues to be our view that one of the best proxies for measuring growth in real "institutional" trading activity around bitcoin is through CME Group bitcoin futures data, as the product arguably is the easiest (and most liquid) way for institutional traders, traditional hedge funds, and large asset managers to gain direct exposure to bitcoin.

It was easy to miss, but CME Group's bitcoin futures product quietly crossed yet another major milestone in October: more than 100 total reportable traders that held at least 25 BTC (at least 5 contracts) worth of open interest.[1]

It's hard to overstate the significance of this progress. Not only did the monthly average of total reportable traders (large open interest holders) in October more than double from a year ago, but the product also cracked the top 60 (~80th percentile) of all CFTC reportable futures contracts in terms of total large open interest holders.

For a product that is just under 3 years old — and in October had a higher average of total large open interest traders than CME Aussie Dollar contracts, CME 1 and 3-month SOFR contracts, and CME Brazilian Real contracts, to name a few (*see fig 20*) — without even looking at open interest and trading volumes, count that as a resounding success in its own right.

Figure 20:

CME Bitcoin futures cracks Top 60 (80th Percentile) of CFTC reportable futures contracts among total # of large open interest holders in October (Avg)

Rank	Contract	October Avg Total Large Open Interest Holders	Percentile
1	CORN - CHICAGO BOARD OF TRADE	789.25	100%
2	SOYBEANS - CHICAGO BOARD OF TRADE	677.5	99%
3	S&P 500 Consolidated - CHICAGO MERCANTILE EXCHANGE	552.75	99%
4	E-MINI S&P 500 STOCK INDEX - CHICAGO MERCANTILE EXCHANGE	552.5	98%
5	MSCI EMERGING MKTS INDEX - ICE FUTURES U.S.	427.25	98%
6	COFFEE C - ICE FUTURES U.S.	392.25	98%
7	WHEAT-SRW - CHICAGO BOARD OF TRADE	385	97%
8	10-YEAR U.S. TREASURY NOTES - CHICAGO BOARD OF TRADE	376.75	97%
9	GOLD - COMMODITY EXCHANGE INC.	367.5	97%
10	LIVE CATTLE - CHICAGO MERCANTILE EXCHANGE	353	96%
11	E-MINI RUSSELL 2000 INDEX - CHICAGO MERCANTILE EXCHANGE	347.5	96%
12	CRUDE OIL, LIGHT SWEET - NEW YORK MERCANTILE EXCHANGE	331.5	95%
13	SOYBEAN OIL - CHICAGO BOARD OF TRADE	295	95%
14	EURO FX - CHICAGO MERCANTILE EXCHANGE	294.25	95%
15	NATURAL GAS - NEW YORK MERCANTILE EXCHANGE	288.25	94%
16	LEAN HOGS - CHICAGO MERCANTILE EXCHANGE	287.25	94%
17	5-YEAR U.S. TREASURY NOTES - CHICAGO BOARD OF TRADE	286.5	94%
18	SOYBEAN MEAL - CHICAGO BOARD OF TRADE	284.75	93%
19	2-YEAR U.S. TREASURY NOTES - CHICAGO BOARD OF TRADE	283.75	93%
20	NASDAQ-100 Consolidated - CHICAGO MERCANTILE EXCHANGE	281	92%
56	BITCOIN - CHICAGO MERCANTILE EXCHANGE	87.5	79%
261	EURO FX/JAPANESE YEN XRATE - CHICAGO MERCANTILE EXCHANGE	20	0%

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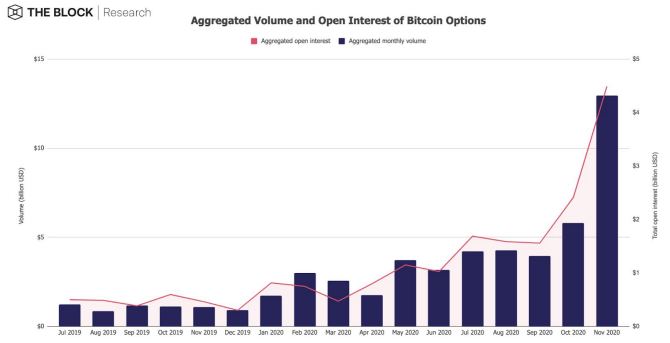
Source: The Block Research, CFTC

While bitcoin futures markets continue to dwarf options markets in terms of trading volumes, open interest is actually quite comparable — arguably more notable is the fact that options have only recently at the start of the year started to grow in prominence.

The aggregated monthly volume of Bitcoin options increased significantly by 650% year-to-date and reached a new all-time high of $12.95 billion in November. Furthermore, the aggregated open interest in Bitcoin options increased by 450% year-to-date and also reached a new all-time high of $4.5 billion in November.

Figure 21:



Source: skew, The Block Research

[1] Contextualizing CME Bitcoin Futures record breaking year. The Block Research

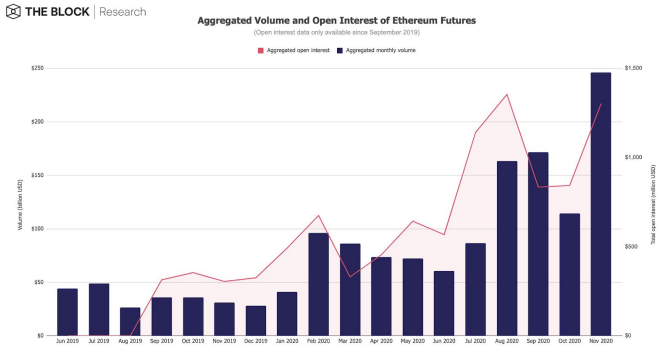
Ethereum derivatives

The aggregated monthly volume of Ethereum futures increased significantly by 500% year-to-date and reached a new all-time high of $246 billion in November. Furthermore, the aggregated open interest in Ethereum futures increased by 164% year-to-date and also reached a new all-time high of $1.3 billion in November.

Similar to the growth outperformance of Bitcoin options over futures, Ethereum options too outperformed futures in terms of growth rates in 2020.

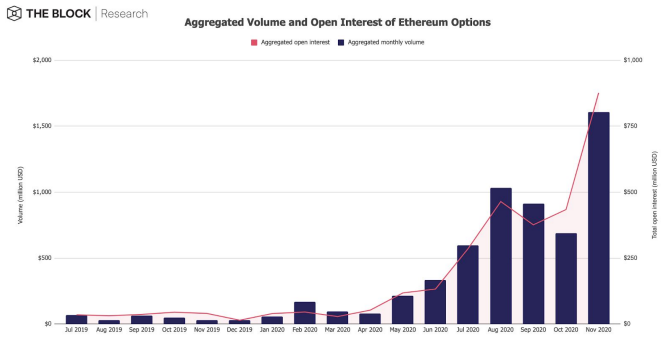
The aggregated monthly volume of Ethereum options increased significantly by 2,825% year-to-date and reached a new all-time high of $1.6 billion in November. Meanwhile, the aggregated open interest in Ethereum options increased by 2,110% year-to-date and also reached a new all-time high of $876 million in November.

Figure 22:



Source: skew, The Block Research

Figure 23:



Source: skew, The Block Research

While Ethereum derivative markets are currently via unregulated products, the announcement by CME Group in December of its intention to list Ether Futures in 1Q 2021 surely will be a market structure story to follow in 1H2021. Should CME ETH futures exhibit even half the initial success its BTC futures product has had in its first 3 years, the institutional investor base that can hold and trade direct regulated exposure to the asset should meaningfully expand.

Growth in crypto and blockchain academic research

The growth of bitcoin and blockchain-enabled protocols has led to the rise of academic and scholarly research dedicated to the ecosystem. Examining the growth of blockchain-related references in scholarly journals, we found that references have grown at ~17% CAGR since 2018.

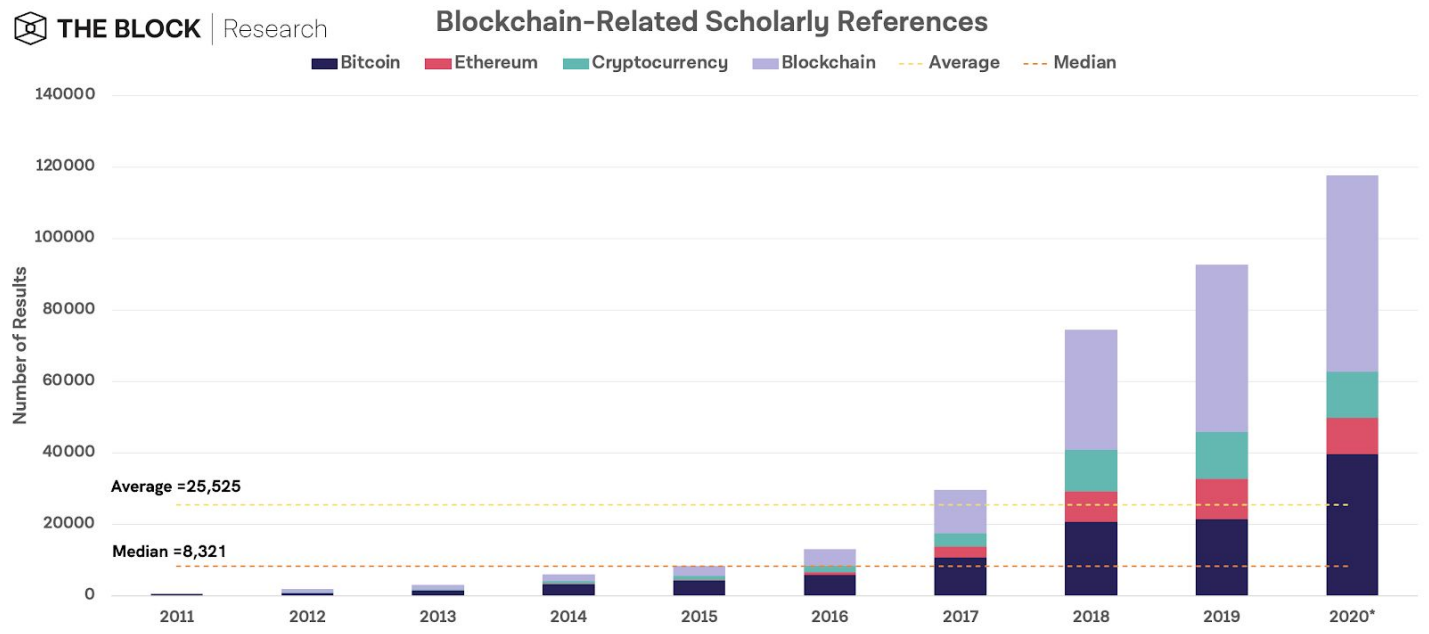
We base our findings on Google Scholar, a search engine that indexes a range of scholarly literature from multiple sources, including academic publishers, universities, and scholarly websites.

While Google Scholar is a useful tool, there are some caveats on its results. Specifically, a 2012 research article showed that Google Scholar results might be vulnerable to manipulation. This piece, however, will assume that Google Scholar results are, as a whole, directionally correct for the purpose of indicating trends in scholarly references.

Fig 24 shows the number of search results that show up for Bitcoin, Ethereum, Cryptocurrency, and Blockchain on Google Scholar from 2012 to 2020. In our piece, we will refer to these four search topics as "blockchain-related."

Looking at the search topics individually, Bitcoin scholarly references grew 86% this year, driven mostly by citations. "Citations," according to Google Scholar, means that the search engine was unable to find the direct source of the publication, but has noticed many publications cite a specific source and, therefore, notes its existence. Interestingly, Ethereum scholarly references dropped in 2020 by -11%. The first decrease since 2014.

Figure 24:
Source: Google Scholar, The Block Research



Appendix: State of Market

Figure 25:
Source: The Block Research

THE RISE OF DECENTRALIZED FINANCE - 2020

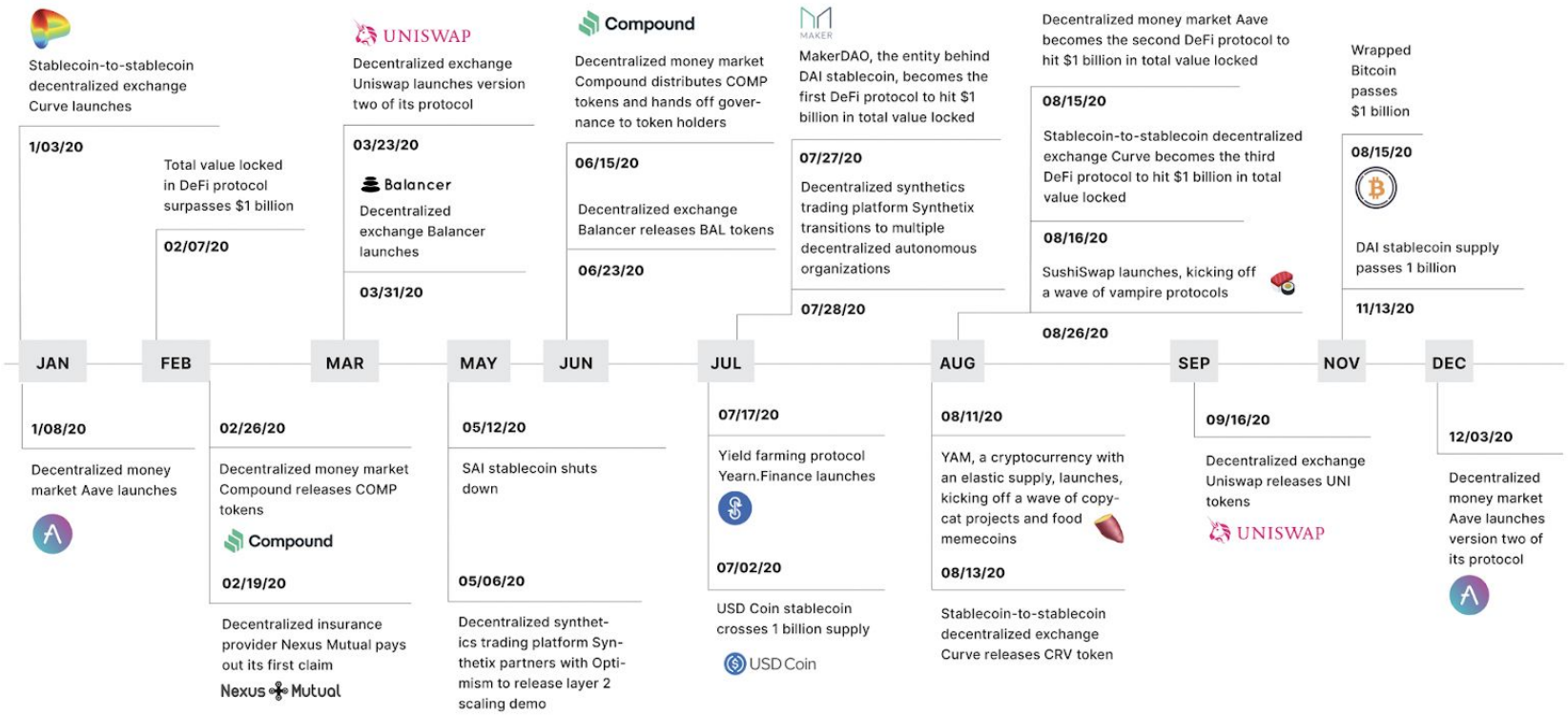


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Figure 26:
Source: The Block Research

Digital Asset Investment Trends:

John Dantoni

A look at venture funding, M&A transactions, public market activity, and investor outlook survey results for the digital asset industry.

Quick Take

- Roughly $3.1 billion in venture funding was allocated to crypto/blockchain projects in 2020.
- Although M&A activity & corporate development are still in their infancy, 2020 recorded the most M&A transactions in the sector's history.
- Two of the most dominant investment trends in 2020 were Decentralized Finance and Brokerages & Custody firms

Summary

In 2020, venture funding for the crypto/blockchain vertical stayed fairly consistent with 2019 dollar volumes despite a 61% drop off in total funding from Q1 to Q2 due to the COVID-19 pandemic.

In aggregate, roughly $3.1 billion was allocated to crypto/blockchain projects, with an average deal size of approximately $5.7 million and a median deal size of $1.8 million. Like the dollar volume, venture capital's transaction volume stayed fairly consistent, with 774 transactions in 2020 compared to 732 in 2019, representing an approximately 6% increase year-over-year.

The distribution of funding deals by their size stayed relatively consistent compared to 2019. 2020 saw two additional deals in the +$100 million range. The grouping with the largest shift this year was from $0-<$1 M to $1-<$5M (*see fig 29*) . This suggests that the larger median deal sizes grew.

Venture, Private Investment, M&A, and Public Investment

The overall trend on an annual basis for investments in the sector has risen. 2018's total figures represent an outlier, with resources overallocated because of the 2017 price bubble.

Figure 27:
Source: The Block Research, See Note* on pg 24

2020 CRYPTO/BLOCKCHAIN INSIGHTS

FINANCING	M&A
APPROXIMATELY **$3.1 Billion** IN FINANCING VOLUME	APPROXIMATELY **$691 Million** IN M&A VOLUME
774 TRANSACTIONS	**83** TRANSACTIONS
Venture funding in 2020 stayed fairly consistent with 2019 dollar volumes in spite of a 61% drop off in total funding from Q1 to Q2, due to COVID-19.	Most M&A transaction volume ever, and a 28% increase year-over-year. Second highest dollar volume ever, with the acquistions of CoinMarketCap, Blockfolio, and Tagomi making up roughly 96% of the dollar volume.

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Figure 28:

Venture, Private Investment, M&A, and Public Investment:

Crypto & Blockchain Sub Verticals (Includes some Data Management/SaaS/ Business Intelligence Platforms)

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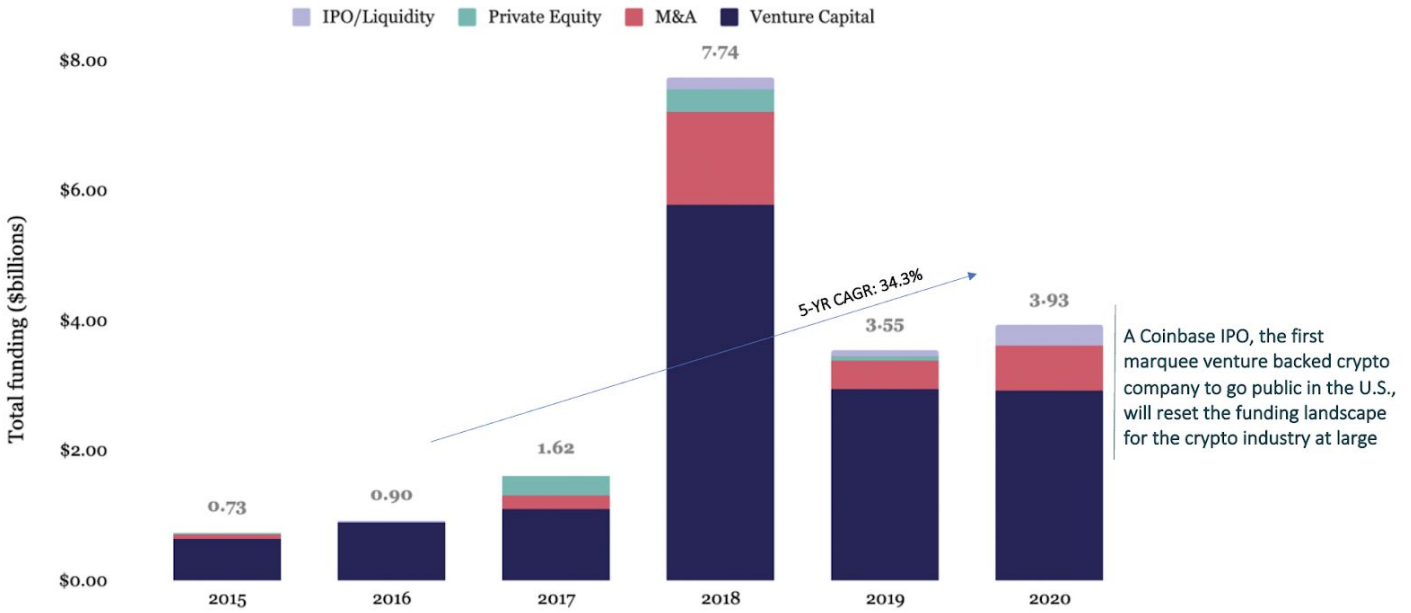

Source: The Block Research, Pitchbook, Crunchbase

Source: The Block Research, Pitchbook, Crunchbase

Figure 29:

CRYPTO/BLOCKCHAIN VENTURE FUNDING BY SIZE

2019			2020		
+$100 M	2	<1%	+$100 M	4	<1%
$50-<$100 M	4	1%	$50-<$100 M	3	1%
$25-<$50 M	12	2%	$25-<$50 M	16	3%
$10-<$25 M	64	9%	$10-<$25 M	47	9%
$5-<$10 M	69	9%	$5-<$10 M	65	12%
$1-<$5 M	223	30%	$1-<$5 M	231	43%
$0-<$1 M	358	49%	$0-<$1 M	172	32%
Average	4.3	Median 1	Average	5.7	Median 1.8

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Source: The Block Research, Pitchbook, Crunchbase

*Note: This data was compiled by aggregated transaction data from Pitchbook and Crunchbase. The Block Research also sourced and included transactions that were missing from both datasets. Each transaction was manually filtered; any deal that included mislabeling of industry classification (encryption/security company, AI, etc.) was removed from the dataset.

M&A activity & corporate development are still in their infancy compared to traditional markets. However, 2020 recorded the most M&A transactions in the sector's history. The 83 acquisitions that occurred topped the previous high set in 2018, when 69 transactions M&A transactions took place. That growth represents a 20% increase from the previous high.

With the IPO/Liquidity category, more private crypto companies want to tap public markets to access liquidity and raise more capital. Roughly $310 million was raised through public markets, an all-time high for the sector. Ebang, the bitcoin mining manufacturer, was listed on the Nasdaq and raised slightly north of $100 million.

Other listings include the Canadian investment fund manager 3iQ completing a $76 million IPO on the Toronto Stock Exchange (TSX) for an Ethereum fund

and INX, a securities token platform that is in the process of closing its IPO.

Looking ahead, 2021 is set to be the largest year for public markets funding for the crypto industry. It's expected that crypto exchange Coinbase will go public by 1H2021. BlockFi, a retail-focused crypto lending fintech, is also planning a public market debut and may go public as early as the second half of 2021.

The size of Coinbase's IPO alone should reset the total annual aggregate financing the industry as seen to date.

Crypto/Blockchain 2020 Venture Funding Trends

Q1' 20

Quarterly, Q1' 20 industry funding reached a two-year high. However, the momentum was compressed the following quarter due to COVID-19. Forty percent of the 15 largest deals this year occurred during the first quarter. These include raises by Bakkt, Ripple, Digital Asset, Infinity Stones, Lightnet, and Celo.

The approximate $1.1 billion in funding during Q1' 20 was largely due to large raises by Bakkt and Ripple, accounting for nearly half of the dollar volume.

Q2' 20

Q2'20 was the only quarter this year absent of any deals greater than or equal to $50 million. The largest

raise was an estimated $35 million Series A4 venture funding round by the software browser Brave in May.

Other large-size deals for the quarter include LayerX's $28 million raise, Near Protocol's $22 million funding round, and FalconX's $17 million round.

Q3' 20

The sector in Q3' 20 saw a resurgence in funding, increasing 82% quarter-over-quarter. Consequently, five of the largest deals took place during this period. These deals include rounds by Chainalysis, Bitpanda, BlockFi, Bitcoin Suisse, and Veem.

Bitpanda completed a $52 million Series A led by Peter Thiel's Valar Ventures. BlockFi, a cryptocurrency lender, closed its second deal of the year during which it completed a $50 million Series C round.

Q4'20

Q4'20 was the first time in at least two years that the industry reported three or more deals greater than or equal to $50 million. These deals include Paxos' $142 million raise, Chainalysis's $100 million raise, and Bitso's $62 million raise. All three of these deals represent valuable sub-sectors primed for growth: Brokerage/Custody firms, Data & Analytics providers, and Exchanges located in developing regions.

The raise by Chainalysis valued the company at $1 billion, making it the first Data & Analytics provider within the crypto/blockchain industry to achieve unicorn status.

Sizing 2020's deals relative to past years

Relative to 2019, the top deals on average were much larger in size, from $55 million in 2019 to $80 million in 2020, roughly a 45% year-over-year increase. The median deal size for these deals came in at $37 million in 2019 vs. $49 million in 2020, suggesting that 2019 saw a larger concentration of higher value deals than this year.

The largest deal was Bakkt's $300 million Series B. The company raised funds from M12, Pantera Capital, PayU, CMT Digital, and Boston Consulting Group. The raise tied it with Coinbase for the second-largest funding deal of all-time within the crypto/blockchain vertical.

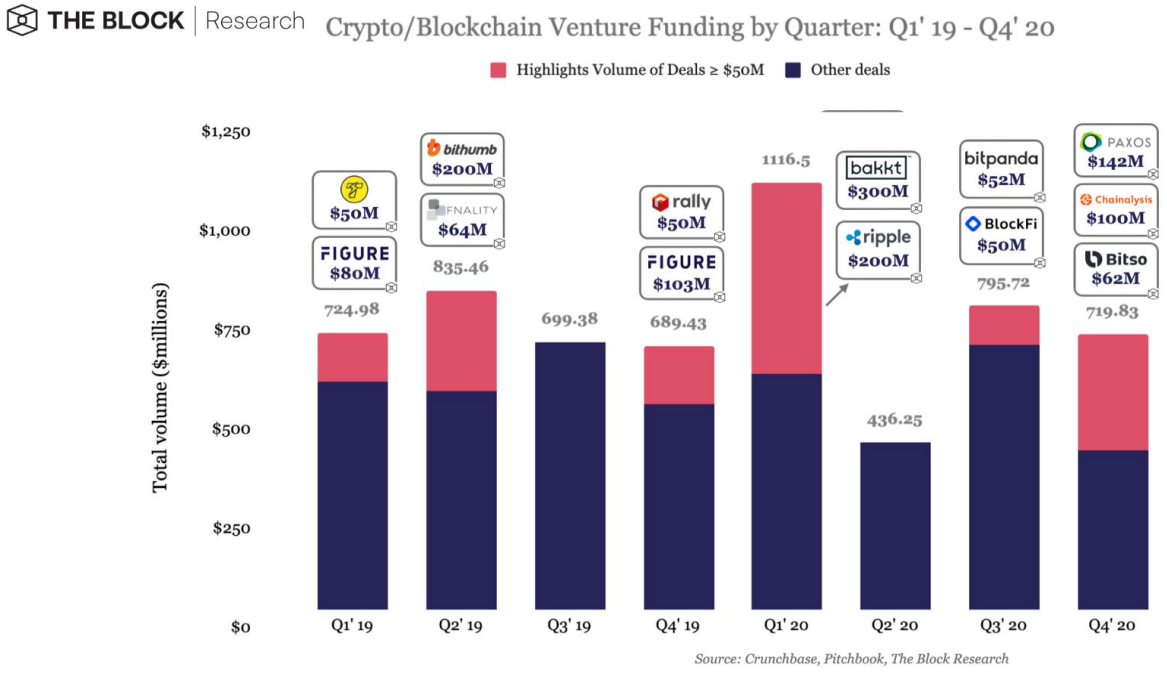

Figure 30:
Source: The Block Research, Pitchbook, Crunchbase

Two other firms inked significant deals during 2020. Ripple's $200 million Series C round was led by Tetragon Financial Group, representing the second-largest deal this year and the eighth-largest all time.

The Crypto Brokerage and Infrastructure provider Paxos completed a $142 million Series C round to expand its business lines. The raise from investors, including Declaration Partners, PayPal Ventures, and RIT Capital Partners, is the third-largest deal in 2020 and the tenth-largest funding deal of all time within the industry.

The Banking & Payments category reported the most deals in the top 15 this year with five total deals. These deals include raises by Bakkt, Ripple, Lightnet, Veem, and Celo.

The second-most popular category among the largest deals list was tied three ways, with two deals each for the Brokerage/Custody, Trading & Exchange, and Data & Analytics categories.

Figure 31:
Source: The Block Research, Pitchbook, Crunchbase

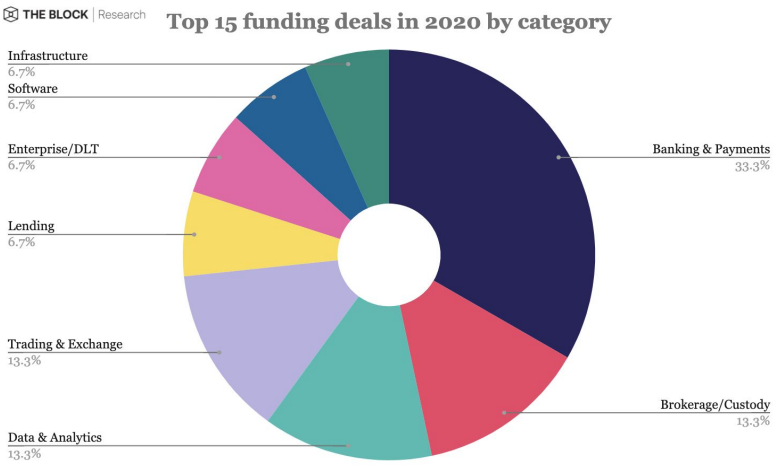

Figure 32:
Source: The Block Research, Pitchbook, Crunchbase

TOP 15 VENTURE FUNDING DEALS 2020

DATE	COMPANY	SELECTED INVESTORS	AMOUNT ($M)	PRE-MONEY VALUATION ($M)	CATEGORY	TARGET: COUNTRY
3/16/2020	Bakkt	M12, Pantera Capital, PayU, BCG Digital Ventures, CMT Digital	300	-	Banking & Payments	United States
2/1/2020	Ripple Labs	Tetragon Financial Group, 10X Capital, SBI Holdings, Route 66 Ventures, Flight Ventures	200	9,800	Banking & Payments	United States
12/17/2020	Paxos	Declaration Partners, PayPal Ventures, RRE Ventures, Mithril, Liberty City Ventures	142	-	Brokerage/Custody	United States
11/20/2020	Chainalysis	Accel, Addition, Benchmark, Ribbit Capital	100	900	Data & Analytics	United States
12/9/2020	Bitso	Coinbase Ventures, Kaszek Ventures, Pantera Capital, QED Investors	62	-	Trading & Exchange	Mexico
9/29/2020	Bitpanda	Speedinvest, UNIQA Ventures, Valar Ventures	52	-	Trading & Exchange	Austria
8/20/2020	BlockFi	Winklevoss Capital Management, Avon Ventures, Alumni Ventures Group, HashKey	50	-	Lending	United States
7/8/2020	Chainalysis	Accel, Benchmark, Ribbit Capital, Sound Ventures, Launcho Ventures	49	-	Data & Analytics	United States
7/24/2020	Bitcoin Suisse	Rockaway Blockchain, Roger Studer	48	280	Brokerage/Custody	Switzerland
2/4/2020	Digital Asset	Samsung Venture Investment, BNP Paribas, ASX	35	-	Enterprise/DLT	United States
5/14/2020	Brave	Undisclosed	35	125	Software	United States
3/1/2020	Infinity Stones	Plug and Play Tech Center, Qiming Venture Partners	34	91	Infrastructure	United States
1/11/2020	Lightnet	UOB Venture Management, Hashkey, Signum Capital, Du Capital, Seven Bank	31.2	-	Banking & Payments	Singapore
9/16/2020	Veem	GV, Kleiner Perkins, Goldman Sachs Growth Equity, Silicon Valley Bank, Truist Ventures	31	185	Banking & Payments	United States
1/22/2020	Celo	Andreessen Horowitz, CMT Digital, Dragonfly Capital, Polychain Capital, Valor Capital Group	31	-	Banking & Payments	United States

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What's driving funding in specific verticals?

Decentralized Finance

One of the dominant investment trends in 2020 was the influx of capital to decentralized finance (DeFi) applications. The success and quality of new projects attracted involvement by funds or firms, which had little exposure to this sub-sector at the beginning of the year. Investments in this category took off in late June, and deal flow peaked in September, with 16 transactions during that month.

Private rounds and smaller deals at higher valuations for DeFi protocols have become more commonplace as the competition to get into these rounds has risen. In the third quarter, the DeFi segment was the most popular category and accounted for roughly 20% of all venture deals. Among the ten most active investing firms, roughly 31% of their investments were DeFi-related.

Brokerages & Custody firms

Roughly 17% of the total venture funding for the year was invested in Crypto-like Brokerages and Custody providers.

In aggregate, roughly $525 million was allocated to Amber, Archax, B2C2, Bitcoin Suisse, Bitpanda, BlockFi, Copper, Crypto Finance, Curv, Diginex, FalconX, Fireblocks, METACO, OSL, Paxos, and Zero Hash.

Figure 33:
Sources: The Block Research, Pitchbook

TOP 15 VENTURE FUNDING DEALS ALL TIME

DATE	COMPANY	SELECTED INVESTORS	AMOUNT ($M)	CATEGORY	TARGET: COUNTRY
8/8/2018	Bitmain	Crimson Capital China, Evernew Capital, Bluebell, Lioness Capital, Pavilion Capital, Jumbo Sheen Group, Palace Investment Company	422	Mining	China
3/16/2020	Bakkt	M12, Pantera Capital, PayU, BCG Digital Ventures, CMT Digital	300	Banking & Payments	United States
10/30/2018	Coinbase	Tiger Global Management, Andreessen Horowitz, Polychain Capital, FundersClub, Hard Yaka	300	Trading & Exchange	United States
6/19/2018	Bitmain	Sequoia Capital, China Taijia, Blue Lighthouse Services, Coatue Management, EDBI, Rising Delight Enterprises	293	Mining	China
6/4/2018	Hyperchain	Xinhu Zhongbao Company, F&G Ventures, State Development and Investment Corporation	235	Enterprise/DLT	China
12/1/2018	Linklogis	Government of Singapore Investment Corporation (GIC), Tencent Holdings, Welight Capital, BitRock Capital	220	Enterprise/DLT	China
4/19/2019	Bithumb	ID Ventures, ST Blockchain Fund	200	Trading & Exchange	South Korea
2/1/2020	Ripple Labs	Tetragon Financial Group, 10X Capital, SBI Holdings, Route 66 Ventures, Flight Ventures	200	Banking & Payments	United States
12/31/2018	Bakkt	Starbucks, ICE, SIG Susquehanna, Horizons Ventures, Fortress Investment Group, Galaxy Digital	183	Banking & Payments	United States
12/17/2020	Paxos	Declaration Partners, PayPal Ventures, RRE Ventures, Mithril, Liberty City Ventures	142	Brokerage/Custody	United States
12/1/2018	Vostok	Undisclosed	136	Enterprise/DLT	United Kingdom
4/18/2018	Basis*	Andreessen Horowitz, Bain Capital Ventures, Digital Currency Group, Lightspeed Venture Partners, GV	133	Banking & Payments	United States
5/31/2018	R3	BNY Mellon, Barclays, Bank of America Merrill Lynch, Credit Suisse, Daiwa Securities Group, Deutsche Bank, Wells Fargo	122	Enterprise/DLT	United States
5/16/2018	Circle	Accel, Digital Currency Group, Blockchain Capital, IDG Capital, General Catalyst, Bitmain	110	Banking & Payments	United States
8/10/2017	Coinbase	IVP, Ribbit Capital, Battery Ventures, Greylock Partners, GGV Capital	108	Trading & Exchange	United States

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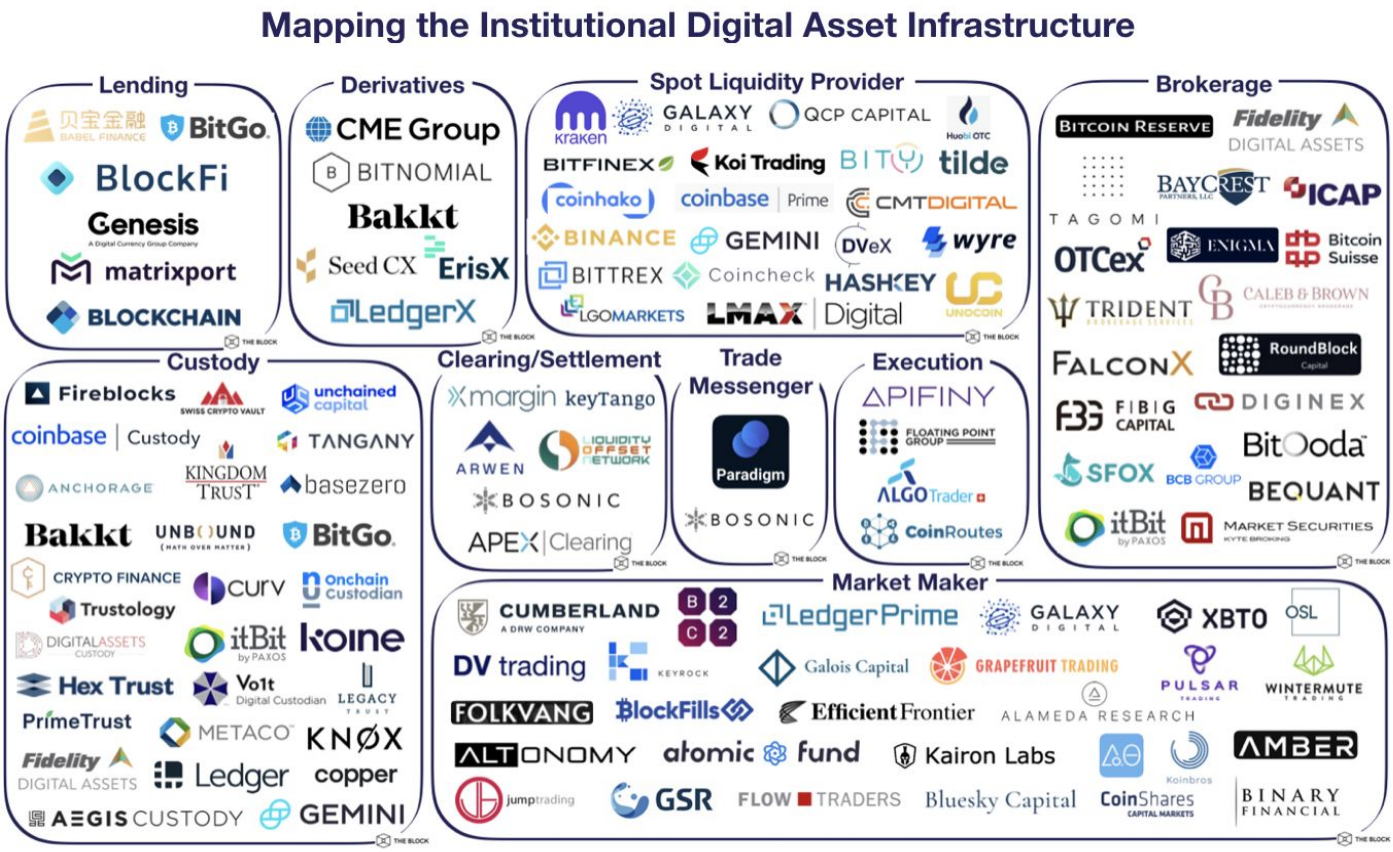
2020 saw a string of high-profile minority investments and acquisitions in this category. Coinbase acquired crypto broker Tagomi, and SBI Financial Services, a subsidiary of Japanese financial conglomerate SBI Holdings, acquired market-making firm B2C2.

Looking ahead to 2021, the state of digital asset infrastructure has never been more fragmented. There are at least 115 firms building out institutional infrastructures for digital assets.[2] Liquidity and services are split unevenly across various offerings around the globe, akin to the market structure for equities in the late 1990s and early 2000s.

In May, The Block Research spoke to more than 40 different[3] firms that operate across the digital asset infrastructure segment to get a better sense of what participants view as the biggest risks and structural pieces still missing.

One of the most common themes that emerged from these conversations was the clear need for a "full prime services" offering. This phrase refers to a company or service that exists in the middle of the market and offers a single source of spot and derivatives trading aggregation, margin extension, custody services, capital introduction, and even trade ideation (similar to the role equity and trading research plays for traditional banking prime services).

Figure 34:
Source: The Block Research



[2] Mapping the Institutional Digital Asset Infrastructure space. The Block Research
[3] Institutional Market Infrastructure Interview Series — Volume I: Barriers to Entry. The Block Research

Recognizing the need to provide these services under one roof, several companies emerged in 2020 to do just that. That said, they approached the full suite of offerings from different core starting points: custody, market-making/OTC, borrow/lending, derivatives, clearing/settlement functions and execution.

Looking ahead, the consensus view among market participants is that many institutional digital asset providers will expand their offerings across these verticals to become the crypto sector's version of a traditional prime broker. In 2020, a handful of companies made strategic acquisitions or launched new lines of business in order to build towards full prime offerings. Some of the larger events are highlighted below on the following page *(fig 35)*.

Figure 35:
Source: The Block Research

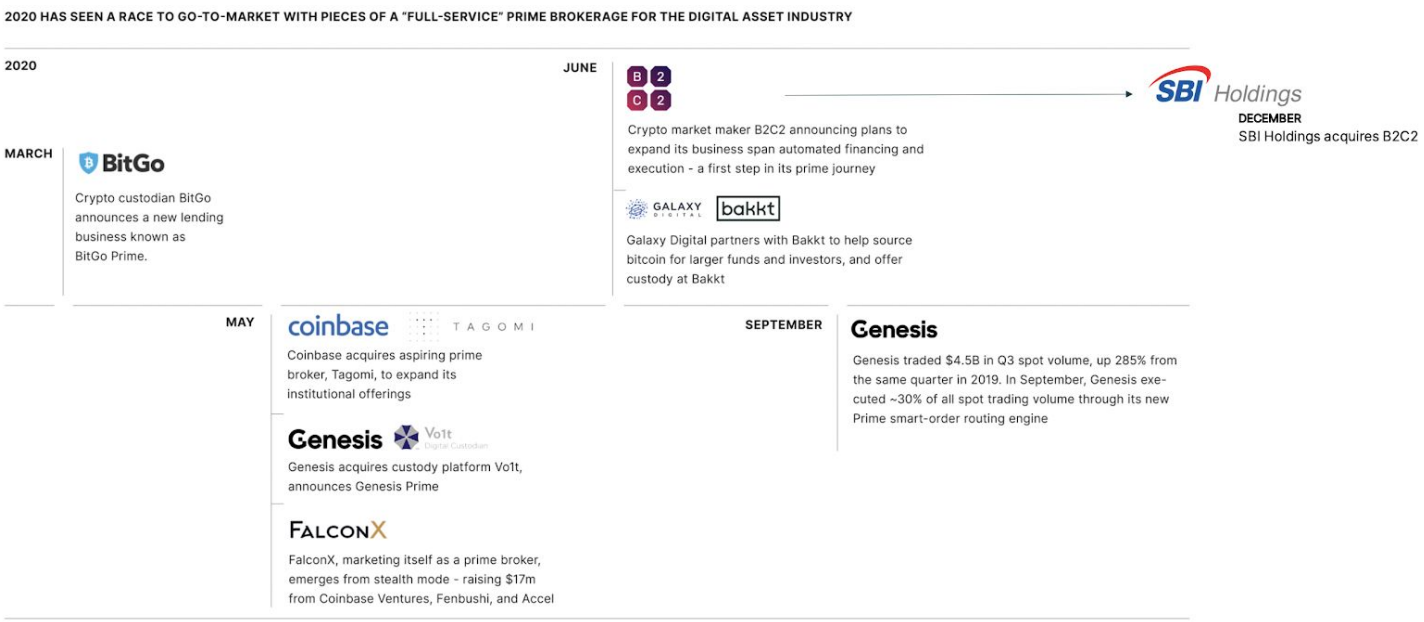


Figure 36:
Source: The Block Research, Pitchbook, Crunchbase

M&A Activity and Trends

To date, M&A activity within the blockchain/crypto vertical has primarily taken the form of consolidation among existing industry participants, with little involvement by external companies.

However, by the third and fourth quarters of 2020, external players began hinting that they might start playing a larger role in the M&A scene.

M&A activity this year had three top-ticket purchases that qualify as some of the largest ever within the industry.

Binance's acquisition of CoinMarketCap in Q2' 20 for a reported $400 million marked the first major acquisition of a data analytics provider. The purchase was the largest crypto/blockchain acquisition of all time with Bitstamp and Poloniex, two crypto exchanges purchased for $400 million.

The crypto exchange FTX acquired Blockfolio, a portfolio manager, for $150 million. The acquisition provided FTX with a strong user base as it now aims to implement fee-less trading within the Blockfolio app.

Elsewhere, Coinbase acquired the institutional crypto brokerage Tagomi for a reported $90 million to assist with its plans to build a full-service brokerage.

Historically, Crypto Trading Firms & Exchanges have seen the most consolidation and represent one-third of the 15 largest M&A deals. Other sub-sectors that have more than one appearance include Brokerage/Custody, Mining, and Software.

Figure 37:
Source: The Block Research, Pitchbook, Crunchbase

M&A 2020

DATE	TARGET	ACQUIRERS	AMOUNT ($M)	CATEGORY	TARGET: COUNTRY
3/31/2020	CoinMarketCap	Binance	$400.0	Data & Analytics	United States
8/26/2020	Blockfolio	FTX	$150.0	Investing	United States
5/27/2020	Tagomi	Coinbase	$90.0	Brokerage/Custody	United States
12/10/2020	ATL Data Center	CleanSpark	$19.4	Mining	United States
10/9/2020	FlipNpik	Woden Venture Capital	$13.5	Social Media	France

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M&A ALL-TIME

DATE	TARGET	ACQUIRERS	AMOUNT ($M)	CATEGORY	TARGET: COUNTRY
10/29/2018	Bitstamp	NXMH	$400.0	Trading & Exchange	England
3/31/2020	CoinMarketCap	Binance	$400.0	Data & Analytics	United States
2/26/2018	Poloniex	Circle	$400.0	Trading & Exchange	United States
8/26/2020	Blockfolio	FTX	$150.0	Investing	United States
11/12/2019	Poloniex	Investment group led by Justin Sun	$150.0	Trading & Exchange	United States
6/1/2018	BitTorrent	Tron Foundation	$140.0	Software	United States
4/16/2018	Earn.com	Coinbase	$120.0	Software	United States
12/2/2017	BiWang Group	CollinStar Holdings	$100.0	Mining	China
2/4/2019	CF Benchmarks	Kraken	$100.0	Trading & Exchange	England
5/27/2020	Tagomi	Coinbase	$90.0	Brokerage/Custody	United States
7/10/2018	CryptoGlobal	HyperBlock	$80.4	Mining	Canada
9/26/2017	Korbit	Nexon	$79.5	Trading & Exchange	South Korea
8/30/2018	Patronics Holdings	Huobi	$75.0	Electronics	Hong Kong
5/22/2015	GoldMoney	BitGold	$60.0	Banking & Payments	Canada
8/15/2019	Xapo	Coinbase	$55.0	Brokerage/Custody	United States

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Figure 38:
Source: The Block Research, Pitchbook, Crunchbase

Involvement by traditional financial institutions and fintech companies

PayPal made headlines when it announced that it would offer crypto services similar to those available in Square's Cash App. The firm partnered with Paxos and used its brokerage service to obtain a conditional license from the New York Department of Financial Services.

The Bloomberg Terminal also reported that PayPal was exploring the prospect of acquiring cryptocurrency companies, with BitGo the only company mentioned by name.

Firms such as PayPal will be tasked with either producing its crypto services and offerings in-house and through partnerships, or if it is better served acquiring a company in the space. Logistically, it may make more sense to start with partnerships, build relationships with existing players, and evaluate the demand/utility of crypto services before making any significant deals.

Naturally, Brokerages & Custody firms that provide the infrastructure needed for mainstream companies to offer crypto services will be an area of interest.

Data & Analytics

An expected increase in regulatory and compliance mandates for the industry will make Data & Analytics companies more attractive. Chainalysis' recent $100 million raise valued the blockchain analytics firm at $1 billion. More consolidation within the sub-sector should be expected as firms compete to become the premier data provider.

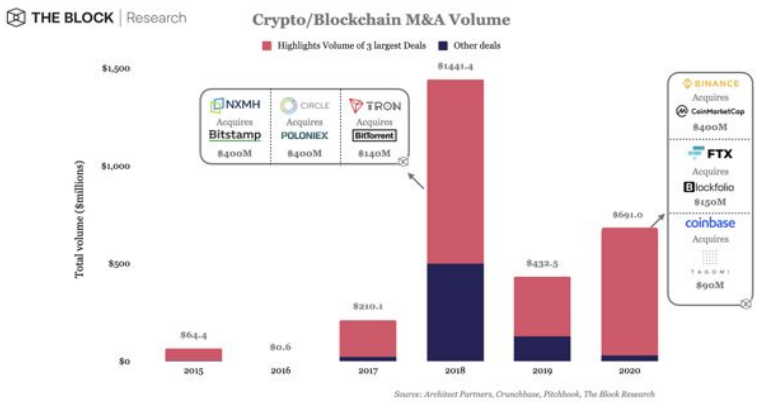
While the deal was small in magnitude, CB Insights's acquisition of Blockdata may signify what's to come in the M&A market. Specifically, more external players could potentially become interested in entering the crypto market.

From CB Insights's perspective — which is likely shared by other external players — the development and deployment of digital currencies by central banks and financial institutions have brought credibility to the industry. This sentiment, paired with banks and fintechs entering the space with new crypto offerings, has also provided an extra degree of credibility to the industry.

Specifically, more external players could become interested in entering the crypto market, particularly in sectors prone to consolidation, like crypto data and analytics and infrastructure providers.

Branching from data & analytics, crypto tax software companies like TokenTax or Lukka, which analyze users' trading data and determine taxes owed, will be potential targets for exchanges, external players such as Turbotax, or even brokerages that want to add to their product suite.

Figure 39:



Source: The Block Research, Pitchbook, Crunchbase

DeFi and M&A

Yearn (YFI), the popular DeFi protocol and yield aggregator, has popularized the idea of acquiring other DeFi protocols. Its "acquisitions" of Pickle.Finance, Cover, Akropolis, Cream, and SushiSwap constitute partnership announcements whereby the protocols will work together to boost each other's liquidity.

While these arrangements conducted by Yearn don't qualify as real M&A transactions, they conceptually set the stage for real M&A activity between protocols.

An M&A transaction between two protocols could appear similar to those between traditional companies. Instead of buying the other company with stock or cash (or some combination), the acquiring

protocol would receive the assets (control over smart contracts and current liquidity pools) in exchange for tokens and stablecoins.

The most active crypto funds in 2020

We analyzed a total of 889 blockchain-related investment deals that occurred in 2020 to identify which crypto funds have been the most active.

Using Pitchbook, Crunchbase, and our own sourcing/filtering, we mapped out the top 10 most active funds to determine if there is a specific sector to which funds are allocating more capital compared to others.

The top 10 active funds and their investments in 2020 are depicted on the following page: *fig 40*.

Most active blockchain investors in 2020

31% of the deals amongst the top investors were DeFi-related

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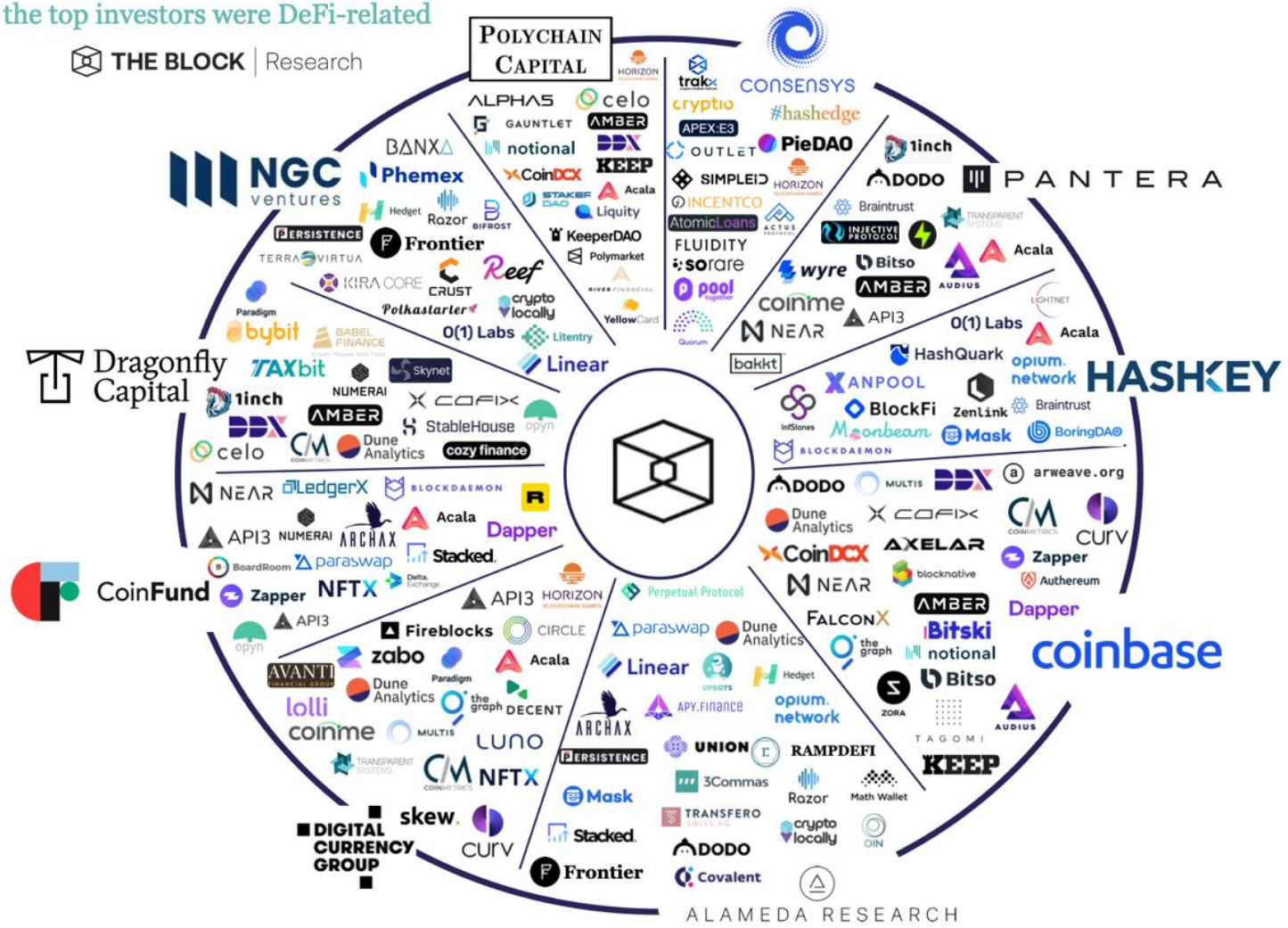


Source: The Block, Pitchbook, Crunchbase

Figure 40:

For consecutive years (since The Block began its yearly active fund commentary), six of the 10 most active funds in 2019 were once again among the most active funds in 2020. These firms include Coinbase Ventures, Digital Currency Group, Dragonfly Capital, NGC Ventures, Pantera Capital, and Polychain Capital.

The four new firms that didn't qualify last year include Alameda Research, CoinFund, ConsenSys Labs, and Hashkey Capital.

Other firms that did not qualify this year but deserve mention for making at least 12 investments include AU21 Capital, Binance, CMT Digital, IOSG Ventures, ParaFi Capital, and SNZ Holding.

The three most common investments between the most active funds were Acala Network, Amber Group, and Dune Analytics. Out of these three raises, Acala Network, a company designing a stablecoin and DeFi ecosystem for Polkadot, was the most common, raising capital from half of the most active investors in 2020. Amber Group and Dune Analytics both raised from 40% of the top investors.

Out of the most active investors, year-to-date, Coinbase and its venture fund have made the most blockchain investments, coming in at 25 deals. The firm invested broadly across the ecosystem, with no one category making up more than 20% of its investments.

By contrast, the second-most active investor this year, Alameda Research, has adopted a more concentrated approach.

More than half of Alameda's investments are DeFi projects, with the Trading & Exchange category as the second-most popular category. The Hong Kong-based quantitative cryptocurrency trading firm's deal flow has noticeably risen this year, with strategic-style investments benefiting FTX and Serum.

Of all the funds, Digital Currency Group remains the most focused on the Banking & Payments category with investments in Avanti Financial Group, Circle, Coinme, Lolli, Transparent Systems, & Wyre.

Figure 41: Investment mix across most active investors:

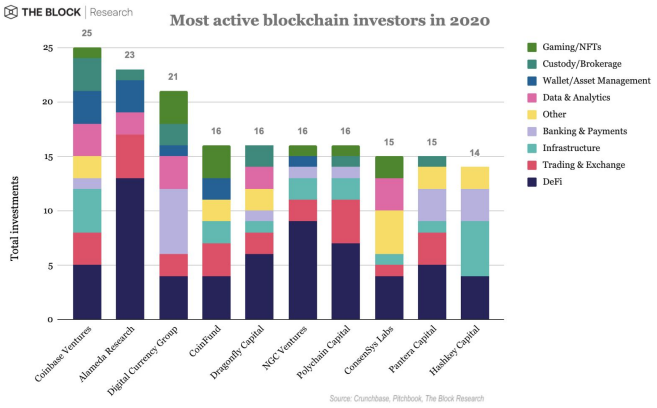
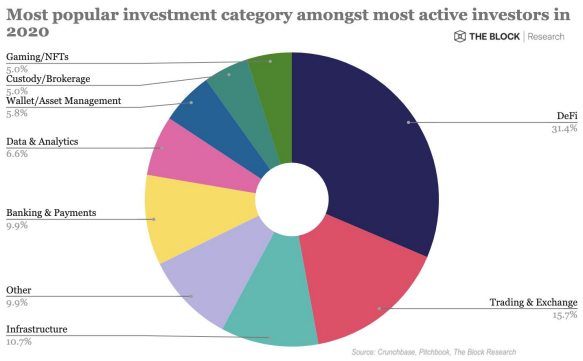


Figure 42: Most popular investment category:



The investment of capital in DeFi applications was a dominant theme in 2020. The success and quality of new projects have attracted involvement by some investors who previously had little exposure to this sub-sector before this year. As we previously noted in our Q3 investment summary, the DeFi segment was the most popular category and accounted for roughly 20% of all venture deals.

In aggregate, of the 121 companies, the most active investors allocated toward, roughly 31% were DeFi-related.

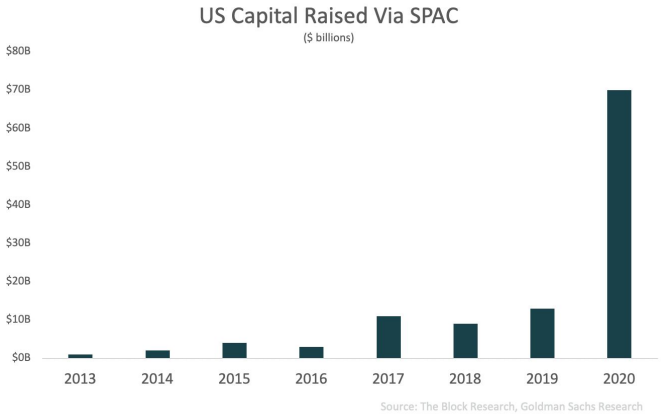
Public market activity poised to reset total crypto funding landscape

The public listing of Silvergate[4] — a commercial bank almost entirely focused on providing banking services to cryptocurrency-related companies, largely through its SEN 24/7 payment network — in 2019 marked yet another example of new ways for broader investors to gain awareness and forms of exposure to the crypto market. This wasn't your parents' LongFin or Long Island Blockchain Corp, but a very tangible business model built around servicing exchanges, funds, and other companies within crypto. It also marked the first Digital Currency Group portfolio company to go public in the U.S.

While Silvergate's share price has had an impressive run since its public listing (up ~300% YTD in 2020) and closed above a $1 billion market cap for the first time in December, the looming Coinbase IPO set for 1H2021, if launched, will usher in a new phase of legitimacy and public market awareness of the asset class at large.

Depending on the success of the IPO, it may also grease the wheels for future public market issuances, with

Figure 43:
Source: Goldman Sachs, The Block Research



crypto lender BlockFi having been reported earlier this year as eyeing a public listing in the next two years.[5]

Interestingly, the rise of SPACs this year — known as "blank-check raises", or a transaction that strips the IPO process of some of its complexities by allowing a private company to be acquired by an already listed shell firm — may very well be a funding avenue and path to liquidity that other crypto companies and exchanges may look to tap in 2021. The key attractor with SPACs would be speed, and the ability to react quickly should public market demand for crypto markets melt-up post a Coinbase IPO.

SPACs have accounted for +$70 billion of capital raised in the U.S. in 2020 according to Goldman Sachs (see fig 43).

Diginex, a Hong Kong-based crypto and blockchain solutions firm, raised $20 million from private investors before its Nasdaq listing and is an example of crypto SPAC in 2020. The firm operates a spot and futures exchange, an OTC desk, and a custody solution.

[4] Silvergate: how servicing the digital asset industry established a differentiated business model. The Block Research

[5] BlockFi raises $50 million, eyes potential SPAC. The Block

Investor Surveys

Summary

The Block Research 2021 Investor Survey is a targeted survey (n = 41) among digital asset investors (investors, traders, analysts at funds, etc.) — in order to highlight a rough consensus of market expectations ahead of 2021.

The survey asked a mix of required multiple choice questions with scalar answer choices determined by level of conviction (e.g. will bitcoin hit all time highs? strongly disagree , disagree, neutral, agree, strongly agree), as well as an optional write-in section.

We've aggregated those results on the following pages. A few interesting results to note:

Strongest conviction: Of the questions asked, participants are most confident in stablecoin supply growth outpacing 2020's 330% Y/Y clip, and a bitcoin ETF passing in the U.S. in 2021.

DeFi, and the expectation for Ethereum upgrades, continues to be the most contentious narrative in the industry: In line with The Block's 2020 Outlook survey, our 2021 Investor survey found that DeFi was the 2nd most frequently listed "underrated narrative ahead of 2021," only behind ETH2.0 and L2 scalability adoption. NFTs were also commonly cited as expected to be talked about more in 2021. Ironically, NFTs, DeFi, and ETH 2.0 were the most commonly cited overrated narratives ahead of 2021, in that order. A sign of how polarizing the Ethereum ecosystem still is among investors.

The most impactful company for the industry. Unsurprisingly, Coinbase was the most frequently cited write-in option when surveying participants' views on "the most impactful company," for the industry — with more than 55% of respondents writing in Coinbase (n = 31). BlockFi and Square each received ~25% of unique responses, while Uniswap rounded out the top 5 most frequently cited.

Investors believe several S&P500 constituent companies will hold bitcoin on balance sheets in 2021. Bitcoin exposure coming to a stock index near you? This year, Square and MicroStrategy moved to buy bitcoin on the company's balance sheet. However, neither company is a part of the S&P500 index. Interestingly more than 50% of investors surveyed believe that a range of five to nine S&P500 constituent companies in total will hold bitcoin on a balance sheet in 2021.

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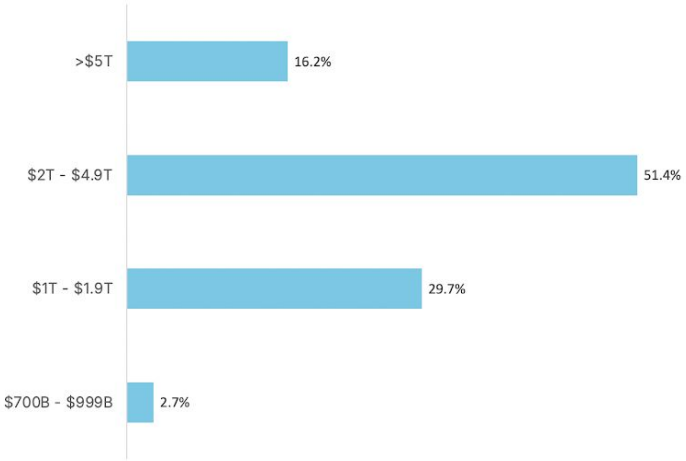
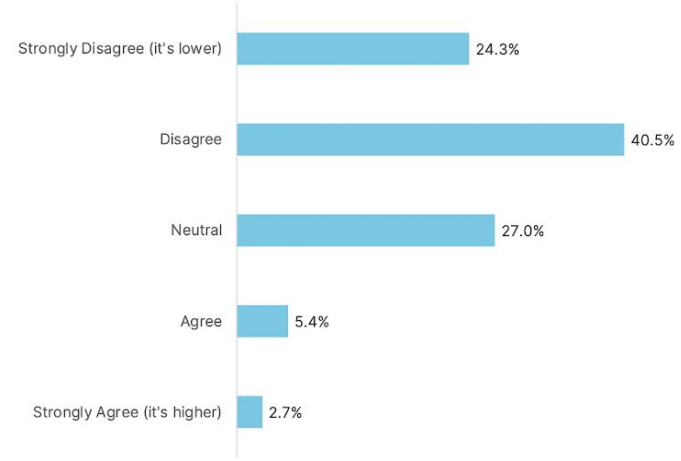
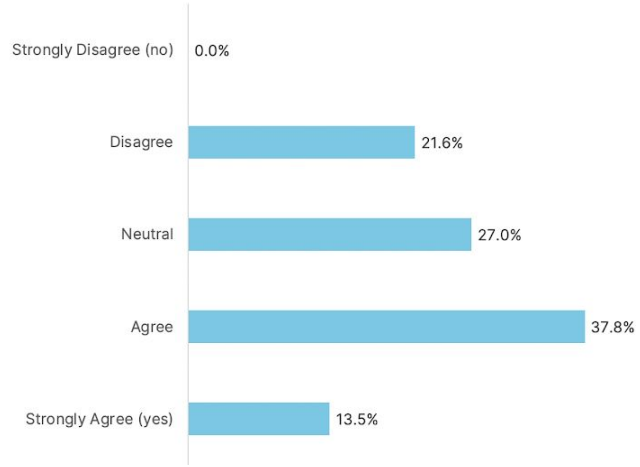
Assuming all time highs are made in 2021, what total value range would you expect the annual high to fall within next year?



Bitcoin dominance is currently at ~65% of the total reported market value (including stablecoins); does it end higher next year?



A bitcoin ETF will be approved by the SEC and listed in the U.S. in 2021?



By year end 2021 the number of S&P500 constituent companies that hold bitcoin on its balance sheet will be*:

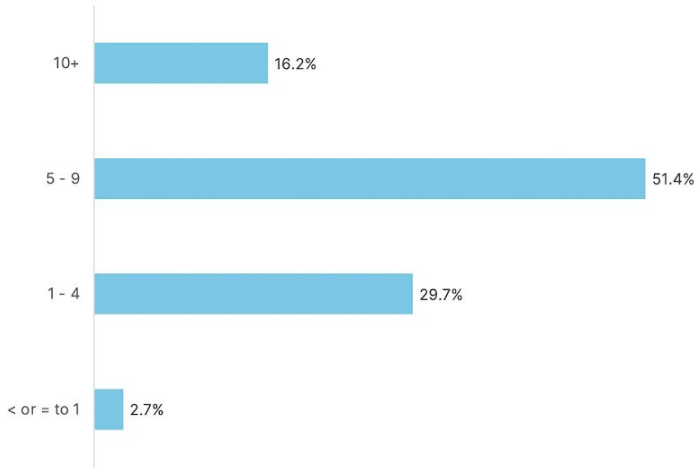


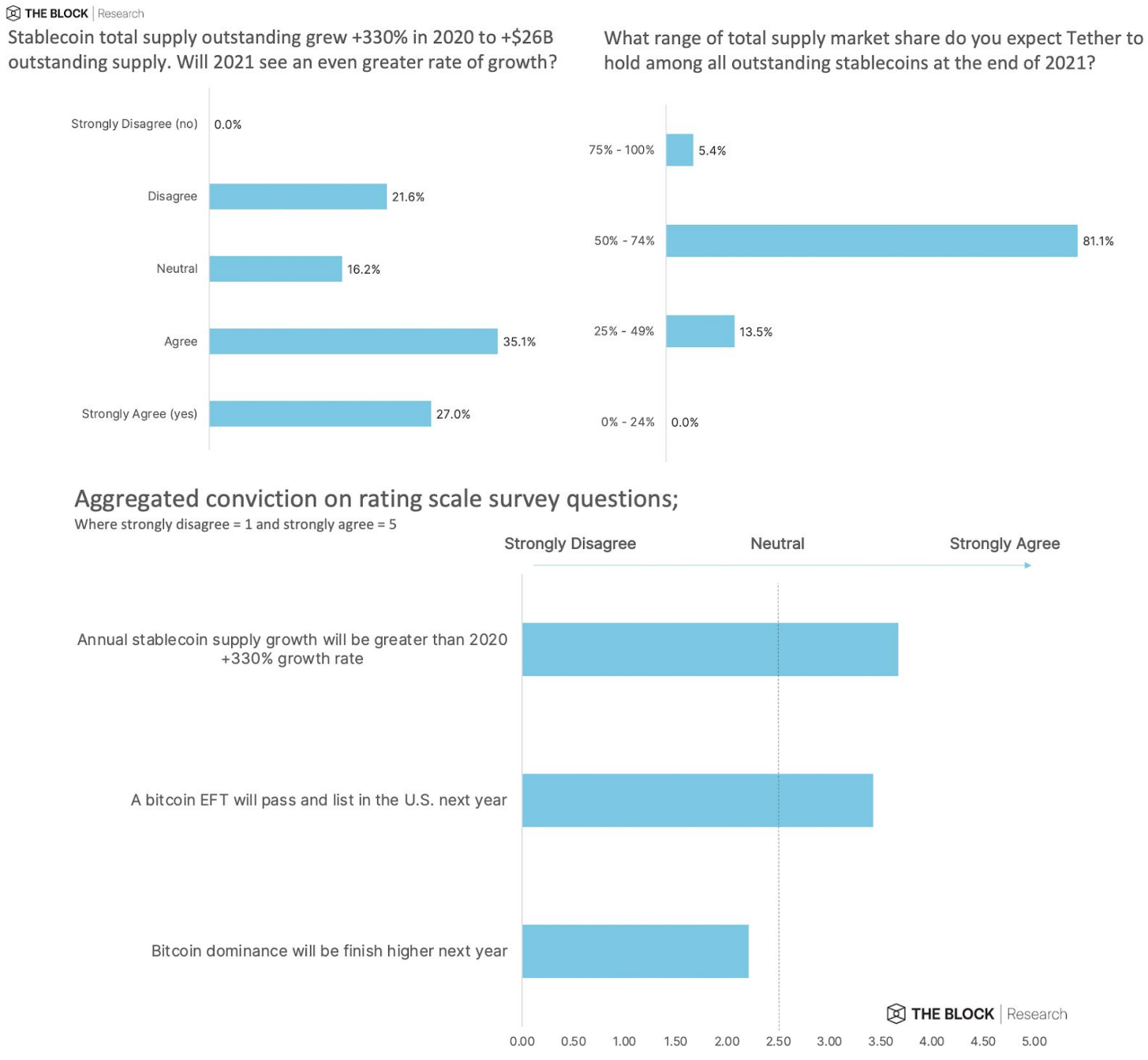
Figure 44: Multiple Choice Investor Survey Results
Survey participation for multiple choice was n = 41.

*Notes: In 2020 we saw the first publicly traded U.S. companies (MicroStrategy and Square) allocate some cash on balance sheet into bitcoin — recorded as an intangible asset.

While Square likely will be considered for S&P500 inclusion in 2021, currently there are zero S&P500 constituent index members that hold bitcoin on its balance sheet.

Note dominance and total market cap survey questions include total stablecoin supply

Figure 45: Investor surveys continued... and conviction scores



*Notes: Tether current ~77% share; a 330% 2021 annual growth rate for total stablecoin supply implies > $85B stablecoin outstanding value. Aggregated conviction scores are average scores of responses where strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, and strongly agree = 5

Figure 46: Write-in Survey Responses
Note: duplicate answers were aggregated, while a collection of unique responses are highlighted in the table. Survey participants were allowed to list up to 3 options, or skip entirely.

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n = 30

List your most underrated narratives going into 2021. What will people be talking about more next year?

	# of responses
ETH L2 adoption faster than people think	7
DeFi	5
NFTs	5
Renewed interest in Layer 1's (Polkadot, Cosmos, Avalanche, etc.)	4
CeFi <> DeFi connections	2
Cryptodollarization	2
Institutional interest in ETH	2
Crypto as money	-
Central banks interest beyond enterprise use-cases	-
DeFi regulation	-
Undercollateralized stablecoins	-
CEX losing significant market share to DEX	-
Every fintech issues a stablecoin	-
Bitcoin ETF	-
Derivative platform tokens	-
TradFi entering the space besides allocating capital	-
Growth in startups building on Polkadot	-
On/off ramp and payment sector will explode	-
The war of traffic gateways (wallet/custody/aggregator) will be heated	-
Data analytics and middleware infrastructure	-
Vertical vs horizontal strategies pursued by protocols (e.g. Dapps launch own chains + consumer interfaces)	-
Should team + early investors govern or should it be distributed to the community?	-
Project financials - Yearn has started a conversation around revenues and expenses for projects given its financials	-
India	-
Music NFTs + Licensing	-
Layer 1 platforms will be competing more aggressively for developers on top and interoperability between chains will provide for interesting trade offs and switching costs.	-
Active hedge funds will have their breakout year and more money will be allocated to this space and focus area	-

n = 30

List your most overrated narratives going into 2021. Where and what are people giving too much attention to?

	# of responses
NFTs	7
Too much attention on DeFi; and not enough have found product market fit	5
ETH 2.0	4
CBDC	3
Infaltion narrative/money printer go brr/death of fiat	3
Layer 1 scaling	3
Stablecoins	3
Alternative or competiting smart contract platforms (to Ethereum)	3
Creator tokens	3
Governance tokens	3
Layer 2 scaling	2
DEX	2
MicroStrategy	2
DC/EP	1
Libra (Diem)	1
A large cohort of people still think BTC dominance is going back to 90%+ which is completely wrong	-
Defi lending/yield - i think one or two solutions win. No need for clones	-
Yield farming	-
Bitcoin as a macro hedge	-
Retail interest	-
Bitcoin ETF	-
Regulatory crackdown rumors in China and U.S.	-
Forks of popular projects are real threats. Some will succeed, but you can't fork an early lead since the team building the original version had a head start or months or years.	-

n = 29

What do you perceive to be the biggest risk to the industry in 2021?

Rank:		# of responses	%
1	Overregulation; rushed regulation; wallet KYC	21	
2	Coordinated attack on network from China	3	
3	Complacency/attrition	2	

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n = 26

List your biggest unanswered questions going into next year

	# of responses
Will regulators take a repressive or supportive stance as they shift their attention towards DeFi?	5
How will the incoming regulatory body in the USA treat crypto	4
Can the industry sustain an extended rally this time around? Or are we doomed for accelerated boom/bust cycles?	3
Success of Coinbase IPO	3
Will the eth1 <> eth2 merge happen in 2021?	-
Can under collateralised stable coins work	-
Will the SEC pass safe harbor rules	-
Does FinCEN step in and attempt to regulate DeFi?	-
Can Bitcoin maintain its market dominance despite being surpassed by Ethereum across every relevant KPI?	-
Can FTX avoid the fate of BitMex?	-
Will ETH 2.0 get beaten to the punch by a competitor chain	-
Will Bitcoin ETF get approved	-
When will Ethereum DeFi's over-composed smart contracts systemically break something	-
How to set boundaries between privacy protection and AML/CFT practice?	-
will there be significant momentum around layer 2 adoption on ethereum	-
what are the best ways to distribute a token	-
How many companies will actually put treasury into BTC	-
The role the U.S. will play in the industry moving forward	-
Will Diem launch?	-

Decentralized Finance: 2020 Themes, 2021 Outlook

Mika Honkasalo

Quick Take

- Decentralized finance has adopted known principles from traditional finance. Token valuation and the role of governance have become clearer.
- Successful DeFi protocols are now measured in the billions. DEXs passed $100 billion in annual trade volume in 2020. Total value locked in DeFi is $16.6 billion.
- Scalability solutions are beginning to work in practice. This negatively impacts composability but decreases transaction costs.

2020: DeFi Rediscovering traditional finance

There's an idea that economic bubbles can often be tied to the rapid growth of new financial products. With the 2008 housing bubble, it was credit default swaps. During the dot-com bubble, online brokerages like E-Trade enabled the rise of day trading. Further back in history, the Dutch Tulipmania had mania embedded as a rational response to demands in the futures contracts, according to economists.

The story of decentralized finance (DeFi) in 2020 has been the process of discovering concepts from traditional finance. These concepts have been applicable to DeFi with almost surprising precision, given that the industry had little idea about them just a few years ago.

Both bubbles being driven by new financial instruments, and DeFi rediscovering traditional finance can be seen from the two events that have driven the most activity and attention in the space — ICOs[6] and yield farming.[7]

In the simplest sense, ICOs can be compared to IPOs. Both make possible the public ownership businesses. Yield farming is analogous to employee stock options, but instead of employees to a global pool of pseudonymous supply and/or demand participants.

When DeFi does discover one of these pearls of ancient wisdom, it only discovers the bare bones and most rudimentary version of these. For ICOs, this was the power of ownership, with important caveats that have mostly (at least among quality projects) been rectified:

- Token ownership did not actually track ownership (governance) in the underlying product or protocol. E.g. payment tokens for applications thus did not have a real valuation method.
- No vesting periods for founders or token holders. Often, all tokens launched immediately and no incentives retained for the future.

ICOs took center stage in the 2017 crypto bubble. Mixed with a Bitcoin bull run and worldwide mania, it did not matter what you owned and why it may or may not be valuable.

[6] Token deals are back. But VCs say they've matured since the ICO boom. The Block
[7] A summary of liquidity mining and yield farming programs. The Block Research

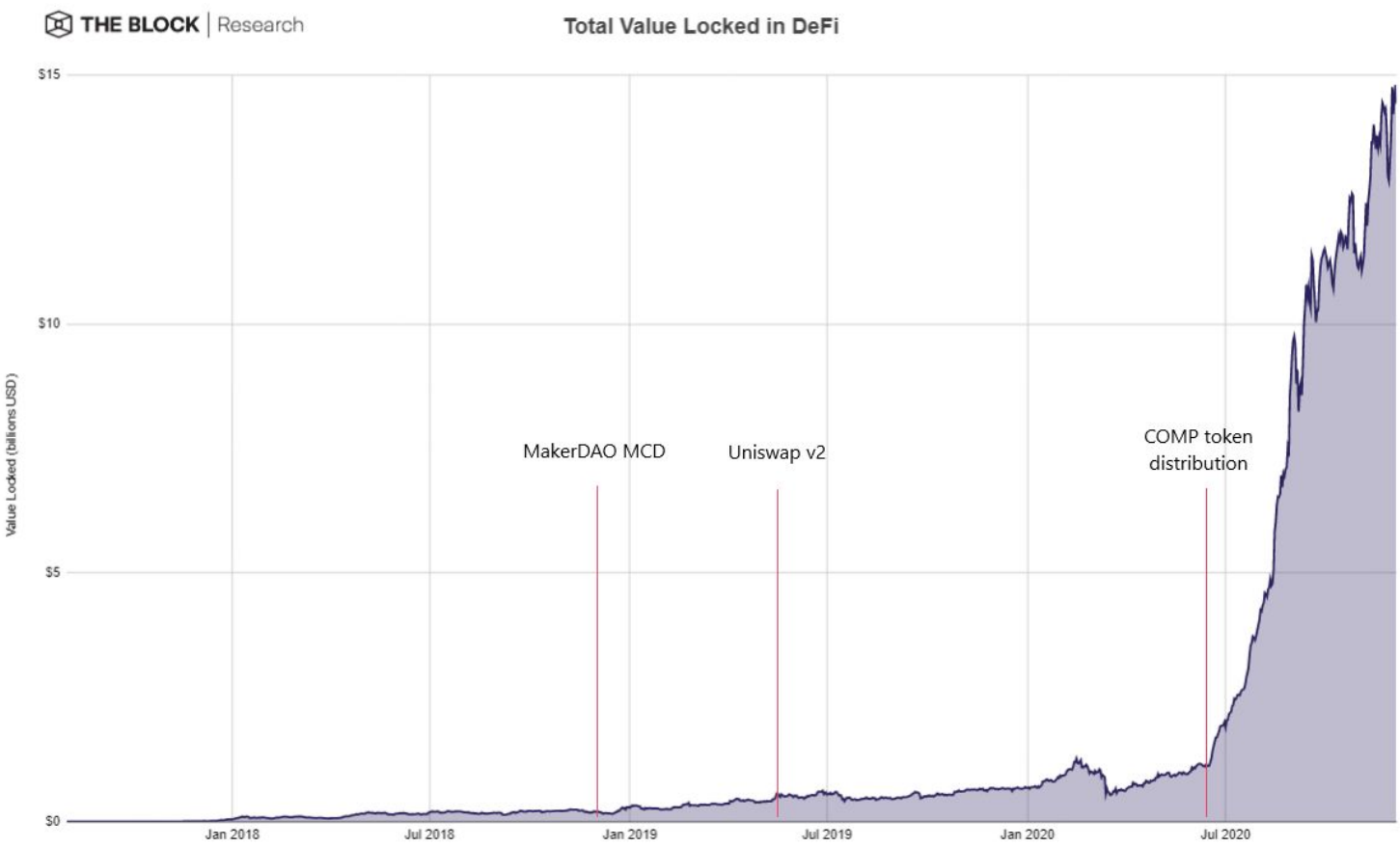


Figure 47:
Source: DeFi Pulse

At its heart was a core economic right of ownership. In the bear market of 2018 and 2019, proposing something as simple as vesting was worthy of a think piece.

This year's yield farming or liquidity mining craze was introduced in a market situation akin to the 2017 ICO craze. The overall DeFi market had seen some initial traction, with overall volumes picking up slowly. Steadily, the total value locked in DeFi protocols rose from $0 to $1.1 billion over the course of two and a half years — with many DeFi enthusiasts considering this a success — before skyrocketing to over $10 billion a period of two months. Today, despite the DeFi market cooling off a bit, the total value locked is $16.6 billion according to DeFi Pulse.

Most of the value in DeFi is in protocols that are largely unchanged from before the market took off. Uniswap v2 and Compound v2 were launched in May 2020. MakerDAO's multi-collateral DAI came already in November 2019.

Compound's token rewards started on June 15th, 2020. Balancer started a program soon after on July 1st. Each of these led to massive growth in the activity on the platform. While this can be considered inorganic, it's worth noting that as a whole, liquidity has tended to stay in DeFi.

In the case of crypto protocols, a token distribution (instead of stock options) to Internet users, incentivizes them to grow the project. Liquidity mining methods today may be crude. Much of the demand on

Compound has been from users supplying and borrowing DAI to themselves in a debt pyramid on Compound to maximize COMP yields. Additionally, liquidity pools that incentivize holding a given token by rewarding more of it, have at least somewhat a Ponzi-like element to them.

Similar to ICOs, it's worth noting that the introduction of a new primitive that creates an incentive for growth does not automatically translate into growth. Augur's ICO occurred in 2015 and Synthetix has been running SNX rewards since mid-July in 2019. Market conditions also have to be generally positive for a full-blown mania.

Still, Synthetix was a winner by adopting these ideas early. Liquidity on the synthetic asset exchange increased from $26 million in early August to $181 million by December 2019. The price of SNX increased from $0.07 to $1.40 in the same time period, during a down market.

On blockchains, competition is full free-market anarchy. This can be seen from SushiSwap's "vampire attack" on Uniswap, where SushiSwap rewarded users with tokens if they migrated their liquidity[8] over. This was comparable to Lyft giving shares to every driver who left Uber to join their company. This incentive was so attractive that it actually grew liquidity on Uniswap prior to migration, and Uniswap was compelled to launch their own UNI token in response.

Nowhere can the analogy between traditional companies and crypto protocols be seen growing tighter than when it comes to token valuations.

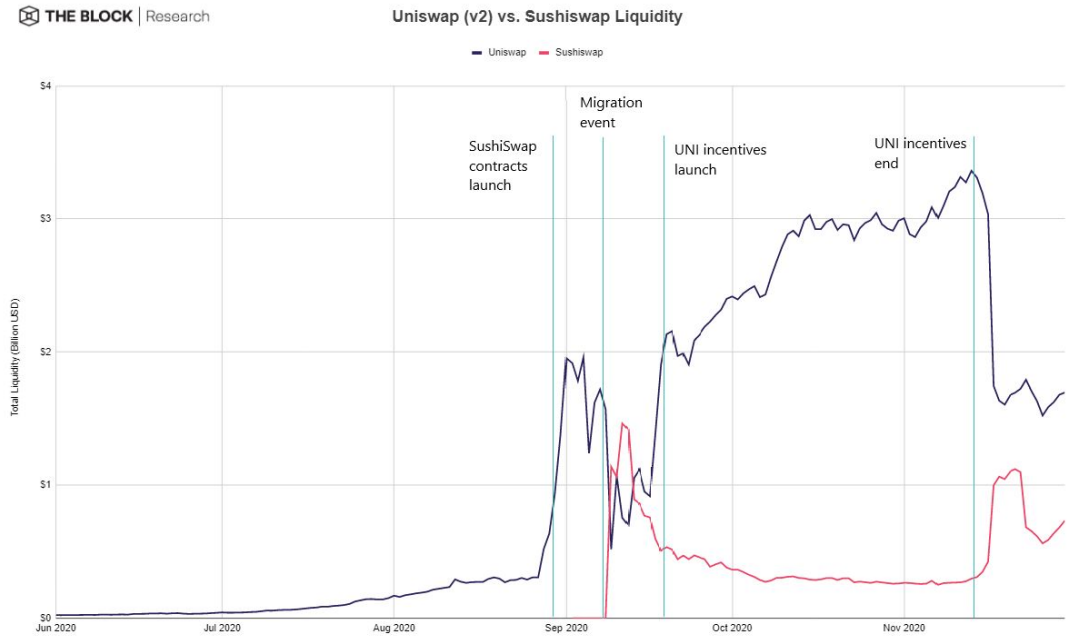


Figure 48:
Source: The Graph

[8] A proposal: Do nothing with Uniswap's liquidity incentives. The Block

Figure 49:
Source: DeFi Pulse

The 2017 era was driven by ideas about application-specific payment tokens and rough valuation ideas based on token velocities. Today, the consensus within the industry is that tokens should be valued based on future cash-flows. There are analytics sites like Token Terminal specifically for following metrics traditional investors are familiar with, such as Gross Merchandise Value (GMV) and Price-to-Sales ratios.

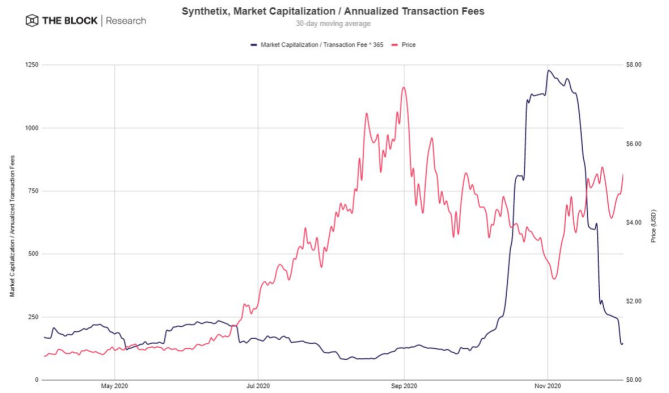
While this is a narrative that has become clear to crypto insiders, it has clearly not yet scaled out to the mainstream realm. There's a strong association between cryptos and currencies that needn't exist. This is of course understandable, given that Bitcoin was the first and remains the largest application of blockchain technology by market capitalization.

A look at the most valuable tokens and cryptocurrencies also can confuse people, since a majority of them are still in the currency bucket (i.e. Bitcoin Cash, Litecoin, XRP).

That's not to say that token valuations should be in line with the P/E ratios of publicly listed companies — although some would consider it a miracle that in some cases they are. After all, these are early-stage startups and highly volatile options on a future view of the world. Conceptually, it matters that valuation is simple.

In 2021, the "tokens as productive assets"[9] narrative taking hold in the mainstream investors' minds could change how the industry is viewed.

Figure 50:



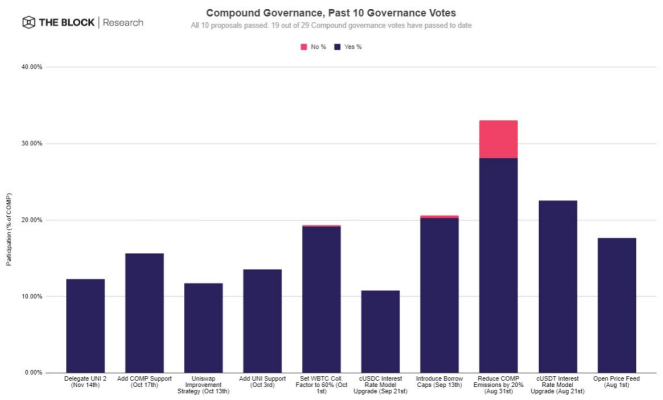
Source: Dune Analytics (hagaetc), Coingecko

Every token is a governance token and governance ultimately leads to every feature — including cash flows. If the token holders of a protocol decide to pay dividends, that's their prerogative. Alternatively, they can forgo profits and invest their revenue for the future. If token holders want to buy 10x long BTC perpetual swaps, they can do that, too.

Through governance, crypto protocols have integrated concepts like the board of governors and proxy voting. Many crypto protocols like Compound and Uniswap have baked-in vote delegation, which allows another entity to represent them in governance decisions. The lending aggregator Yearn enacts decisions via a multi-signature group.

That's not to say that every crypto protocol should be governed like a traditional company (or the same). Fred Ehrsam from Paradigm has argued that the most-used crypto protocols will tend toward governance minimization, where it's hard to enact decisions on purpose. This is due to their role as a universal and neutral infrastructure that sets up the best environment possible for innovation to occur on top. Ethereum itself is governed not directly by token voting, unlike many of its competitors such as Polkadot or Cosmos.

Figure 51:



Source: Compound Governance

The latest of adopting practices from the traditional financial world is Yearn's foray into M&A activity[10]. Unlike the M&As seen in traditional markets, there are no purchases of assets and offers to the acquiree. Instead, Yearn's actions mimic more of a collaborative development effort commonly seen in open-source development. However, the next step from such activity is to unite many activities under single governance (token).

Crypto protocols thus far have been single-purpose, but via M&A activity, it's possible for them to grow their existing services or even create entirely new business lines. This has the benefit of capital efficiency — if a protocol is "overly liquid" for its use case in some area, it can move some of that over to another. For example, Alpha Finance is building a suite of DeFi products, the first two being leveraged yield farming and perpetual

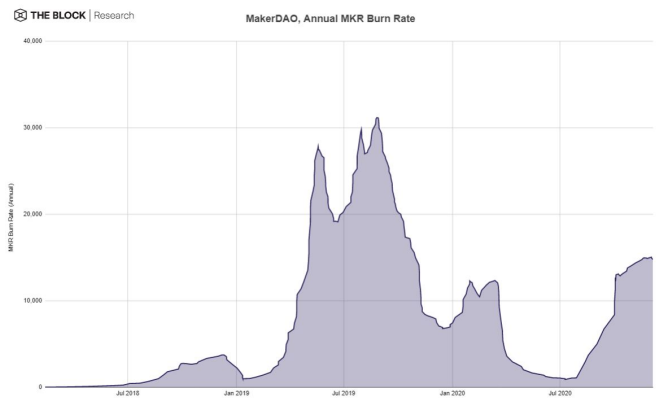
[9] Tokens are equity in Internet-native businesses. The Block Research

[10] DeFi Digest: Yearn.Finance's mergers. The Block Research

swaps. MakerDAO had originally planned to use its capital pool to issue other synthetic assets in addition to a synthetic dollar (DAI).

Following the events of "Black Thursday" when the price of ETH plummeted from $200 to a momentary low of $83 amidst a cascade of liquidations, 5.7 million DAI became undercapitalized. This was solved by MakerDAO issuing MKR to pay back system debt. This can be seen as additional equity financing, and something most crypto protocols could adopt as a last measure to stay in business. MakerDAO has thus far burned profits, in what can be essentially considered share buybacks, but now there's an idea to replace that method with an accruing treasury.

Figure 52:



Source: MakerBurn

DeFi has been reaching into the urn of invention, and after discovering ideas from traditional finance, it has taken them to the extreme. After the insanity, it quickly begins to adopt (somewhat) better practices for both investors and users.

The market is now copying many of the ideas from traditional finance, such as fixed-rate lending, and these are required tools for building an economy. But, there are also crypto-native innovations such as constant function market makers (e.g. Uniswap, Curve, and Balancer) that don't have direct mirrors in traditional financial markets.

How much will be adopted from traditional finance, and what will be entirely new, when it comes to corporate governance and financial products is the question we'll see play out.

Metrics: DeFi is now measured in the billions

Exchange

DEXs started their run at the end of the summer. In 2019, DEXs saw a total trade volume of $2.98 billion. In 2020, that number has jumped to (at the end of November) $84.98 billion — with $74.5 billion of that volume concentrating on August onwards.

The peak month of September had a total of $26.78 billion in volume, and the average growth rate month-over-month has been 41.3% over the past two years.

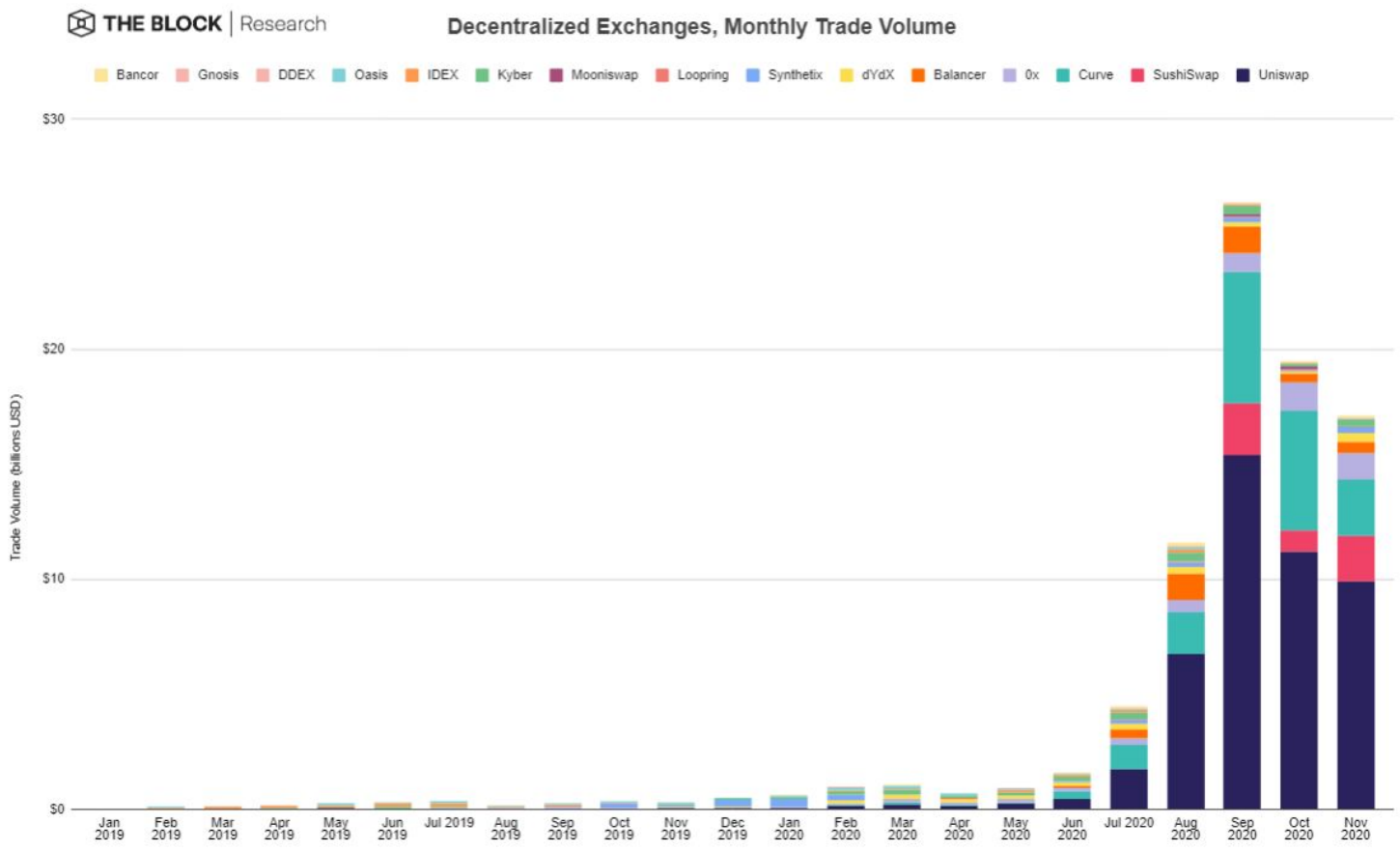


Figure 53: Source: Dune Analytics (hagaetc)

By market share, Uniswap is currently dominating DEXs with a 60% market share that has lasted from a month and a half before UNI liquidity mining incentives[11] kicked in for USDT, USDC, WBTC, and DAI (all to ETH) trading pairs. UNI incentives ran from September 18th to November 17th.

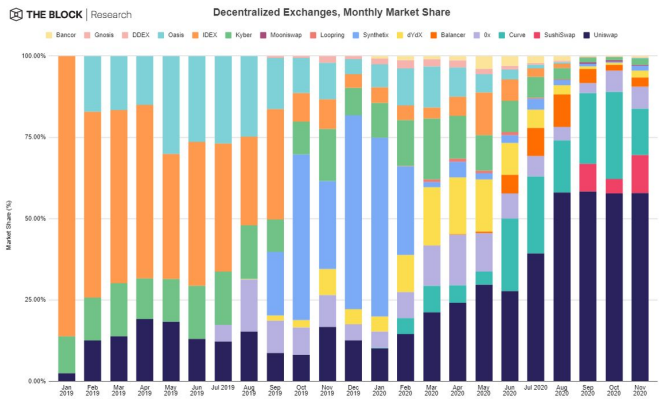
DEXs based on constant function market makers account for approximately 89% of the market share. The largest order book based DEX is 0x at a 6.8% market share and an average trade volume of $1.2 billion per month in October and November.

Curve, the AMM optimized for swaps between assets that are price-stable[12] to one another (e.g. stablecoin-to-stablecoin swaps) has been 20.8% of the market since June. Recently, SushiSwap has managed to attract both liquidity and trading volume as well, growing to the second-largest DEX so far in December.

[11] A breakdown of Uniswap's UNI token. The Block Research

[12] Curve: the asset-specific automated market maker. The Block Research

Figure 54:

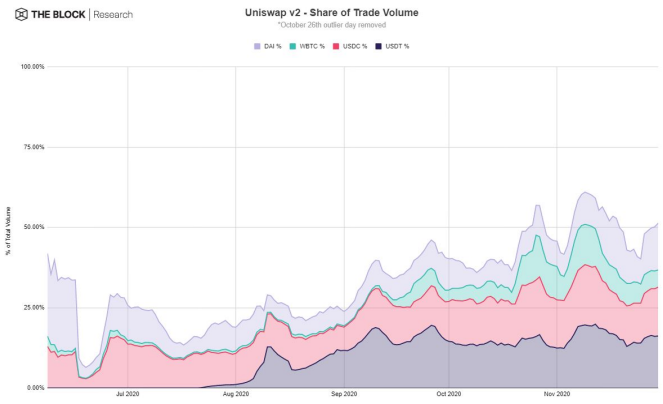


Source: Dune Analytics (hagaetc)

Perhaps the most interesting data points regarding DEXs is that by volume and liquidity, they are beginning to compete with large centralized exchanges. According to Coingecko on a USD(T/C) to ETH swap, a $2.9 million market order will cause a 2% slippage. On Coinbase Pro, a 2% market move requires just $385,000. At its peak in September, Uniswap passed Coinbase in total monthly trade volume.

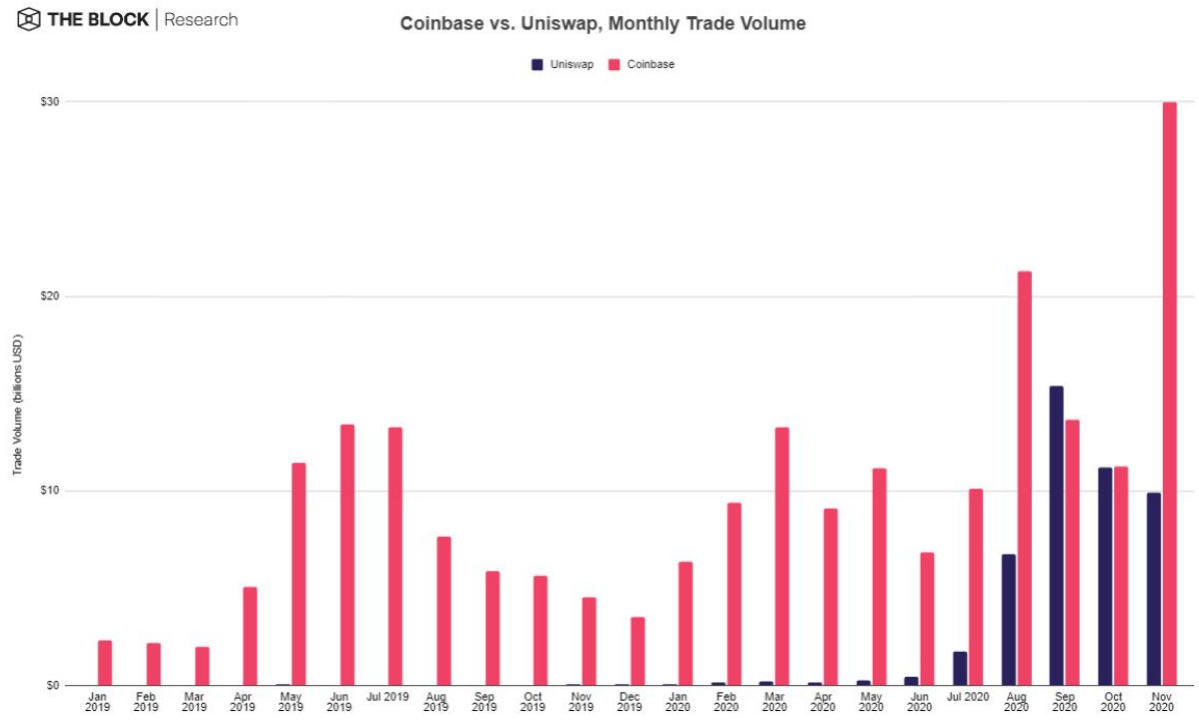
DEXs are generally good for the long-tail of DeFi assets since there are no listing requirements. Anyone can list an asset and begin providing liquidity. Still, the trade volume is concentrated as the top four pairs on Uniswap account for 50% of trade volume. For comparison, this is only slightly below e.g. Coinbase Pro, where the top four pairs make up around 60% of trade volume.

Figure 56:



Source: The Graph

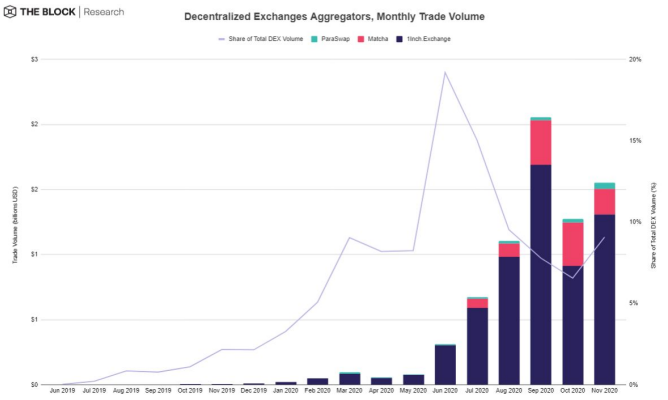
Figure 55:



Source: CryptoCompare, The Graph

Among decentralized exchange aggregators, 1Inch.Exchange is dominant but Matcha (built by the 0x team) is increasing its market share. Over the past three months, 1Inch.Exchange has averaged $1.2 billion in volume, while Matcha has risen to $280 million per month in the same time period.

Figure 57:



Source: Dune Analytics (k06a, 0x, mounir)

Lending

Similar to DEXs, activity in lending protocols skyrocketed in June. This was primarily jump-started by Compound's COMP distribution, which (after a few iterations on interest rates). Users would deposit DAI, then borrow and deposit again in loops — as much as collateralization rates allowed.

On June 15th, the DAI supply was 112 million. A month later it was 190 million, and then 413 million the next month. By the end of September, DAI supply was 910 million — after which it has slowly expanded to 1.02 billion.

The total outstanding loans across the two main money market protocols, Aave and Compound, is now at $3.03 billion. This represents a 9,513% growth year-over-year.

While Compound looks like the significantly larger protocol by borrow amount, an examination of the distribution of debt across assets shows the outsized DAI representation.

If you remove DAI from Compound's borrow amounts, the total amount of debt in Aave is only $49 million less than in Compound. Whereas Compound has four assets with a total borrow volume of over $10 million, Aave has nine of such assets.

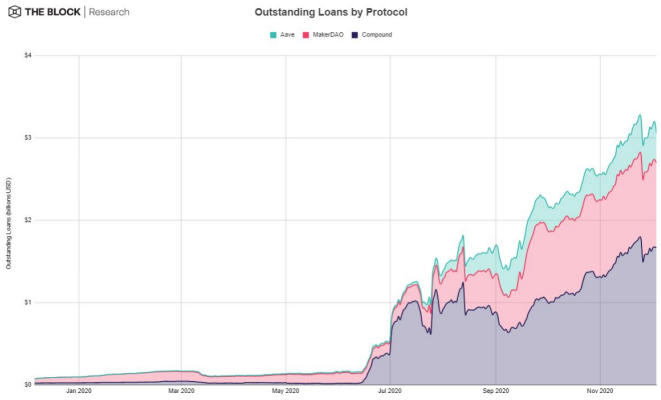
Overall, increased DAI demand to liquidity mining led to the DAI price being consistently at $1.04 or 4%[13] above its target peg. For much of the fall, minting DAI could be done for zero fees (zero interest rates) for most collateral types.

DAI wasn't built with negative interest rates in mind, and this led to USDC becoming a big part of the collateral pool to mint more DAI and restore the peg back to $1. Today, 38.4% of DAI has been minted via USDC.

With the highest liquidity mining craze over (for now), DAI has managed to raise interest rates (stability fees) across the board. At the current pace, MakerDAO is generating $33.6 million annually in revenue, implying a Price-to-Sales ratio of just 15.74.

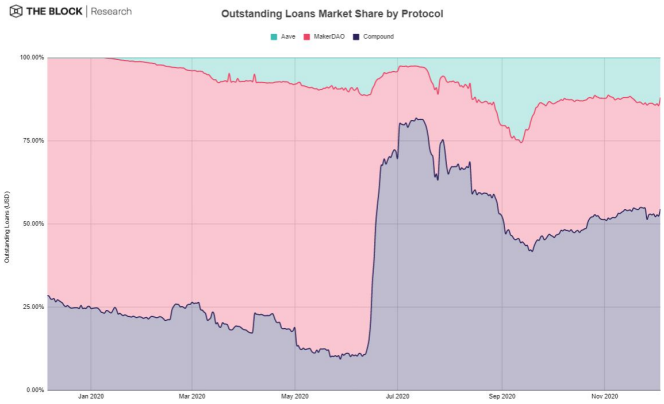
[13] MakerDAO's battle to keep up with DAI demand. The Block Research

Figure 58:



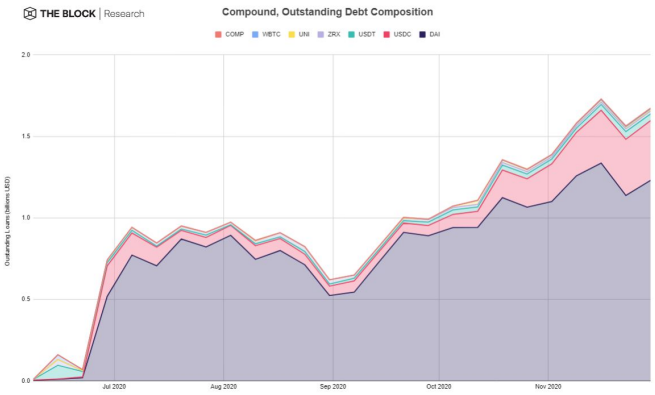
Source: Dune Analytics (hagaetc)

Figure 59:



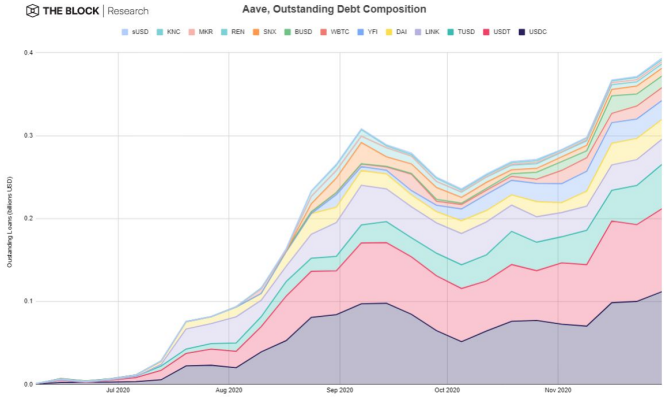
Source: Dune Analytics (hagaetc)

Figure 60:



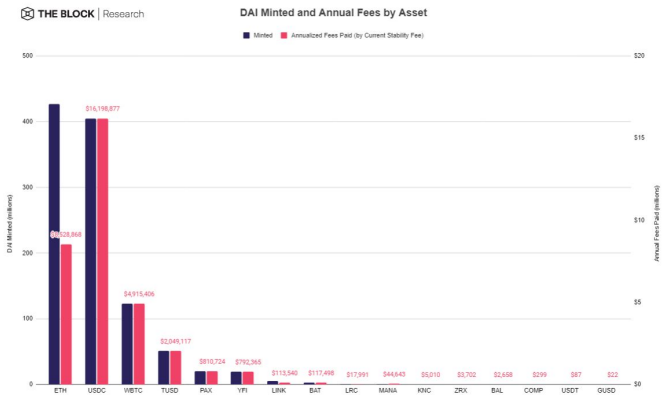
Source: Dune Analytics (MatteoLeibowitz)

Figure 61:



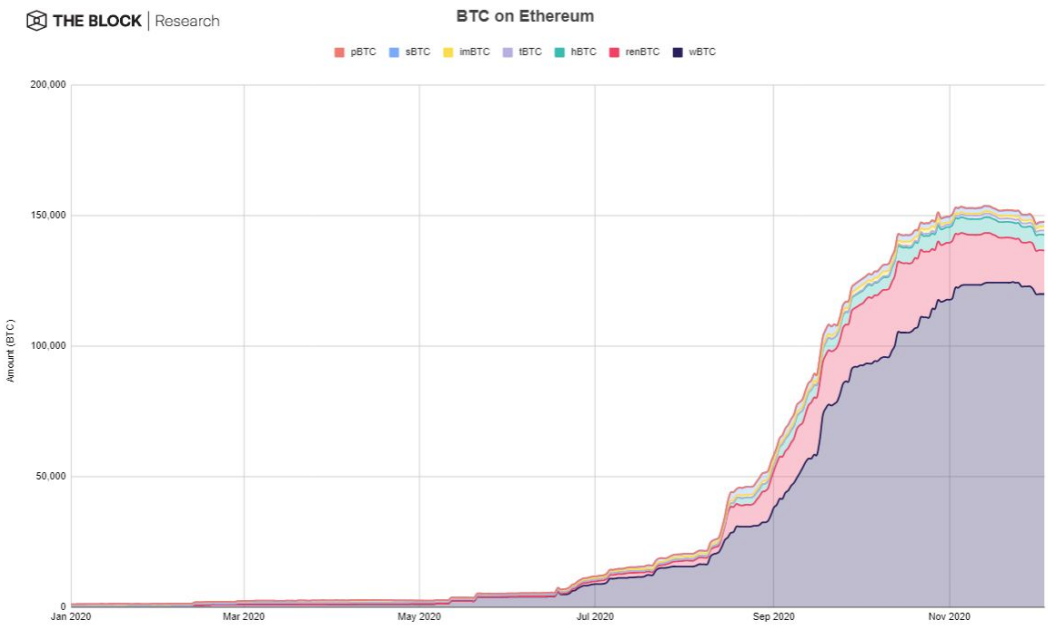
Source: Dune Analytics (MatteoLeibowitz)

Figure 62:



Source: DAI Stats

Figure 63:



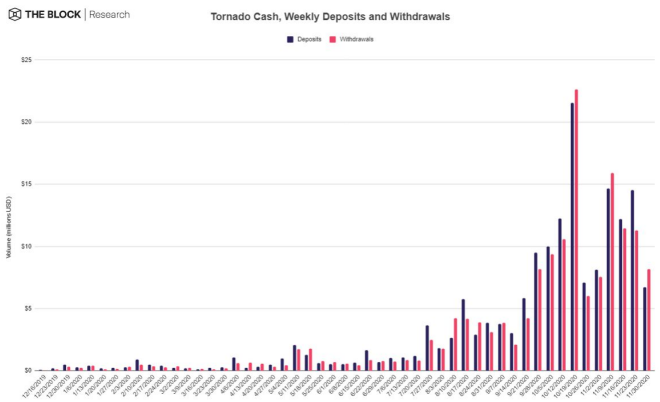
Source: Dune Analytics (eliasimos

Other

Bitcoin "wrapped" on Ethereum. The total amount of "wrapped" BTC on the Ethereum blockchain peaked in early November at just over 150,000, and the dollar-denominated amount is at a record number of $2.77 billion today.wBTC makes up 81.2% of the market, with renBTC in second place at 11.3%. For cross-chain asset transfers, the centralized custodian model has been more popular and has an advantage in terms of capital efficiency compared to decentralized counterparts like tBTC[14]. As an advantage over wBTC, minting tBTC does not require passing KYC/AML checks.

Privacy on Ethereum. Ethereum's primary privacy mixer at the moment, Tornado Cash, has seen steady growth in volumes and the USD amount (in ETH) locked in the protocol is about $12 million today. On a weekly basis, Tornado Cash sees about 500 unique users, which by comparison is more than an average week for Synthetix and Balancer.

Figure 64:



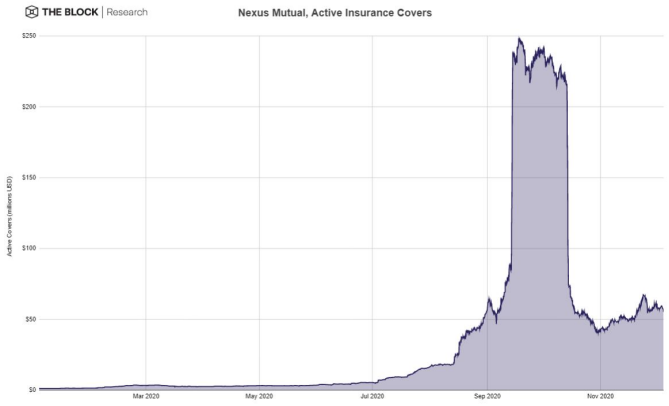
Source: Dune Analytics (poma)

[14] Metrics from the first month of tBTC's second launch. The Block Research

Decentralized insurance coverage. Nexus Mutual saw a massive boost in early September, with an overnight 5x increase in insurance coverage bought after a bZx hack on September 15th. The largest single cover purchase was for Uniswap v1, worth $10.4 million and paying $76.4k in premiums to NXM token holders.

Today, the most popular insurance coverages are for Curve, renBTC, and Aave with $22 million or 40% of all insurance coverage being towards these three protocols.

Figure 65:



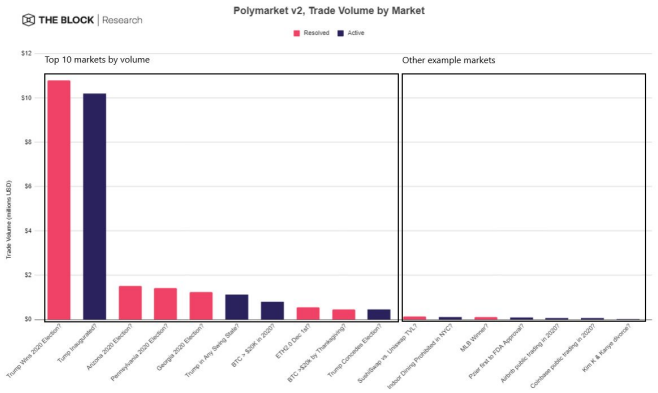
Source: Nexus Tracker

Prediction markets. Catnip.Exchange and Polymarket were the most popular prediction markets for the 2020 election. For Polymarket, the two primary presidential election markets are about an order of magnitude larger than the other ones.

The challenge for prediction markets will be continuing the momentum without a clear headline event. Polymarket has done the best job in terms of diversity — its ETH2 genesis market has $560k in total trade volume. A handful of sports and entertainment markets are approaching the six-figure range.

Polymarket is also the furthest along in terms of user experience. Much of this is due to the trading speed and fast transactions offered by their layer 2 integration. Additionally, the AMM model means that traders can always get a price and there's no order book where order matching is a concern. This does create some slippage, but for bettors, even many of the smaller markets are liquid enough for $1k+ trades.

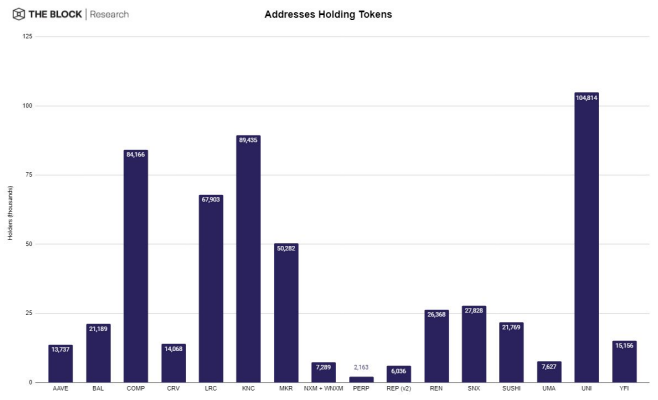
Figure 66:



Source: Polymarket

Uniswap highlights broadest token distribution among all DeFi launches to date. A look at addresses holding tokens shows that Uniswap's initial distribution to every user (address) that had traded with the AMM, led to the broadest distribution of tokens among all DeFi projects to date.

Figure 67:



Source: Etherscan

Taken together, DeFi outperformed bitcoin in 2020. Over the past year, tokens in The Block's DeFi Index[15] have outperformed BTC by 17% and underperformed ETH by 34% — up 237% overall. This is in spite of a massive drawdown from a peak of 524% in early September. The best performing asset in the index was YFI, up 3,496%.

30-day, quarterly, year-to-date, and annual price performance is available on The Block's data dashboard[16].

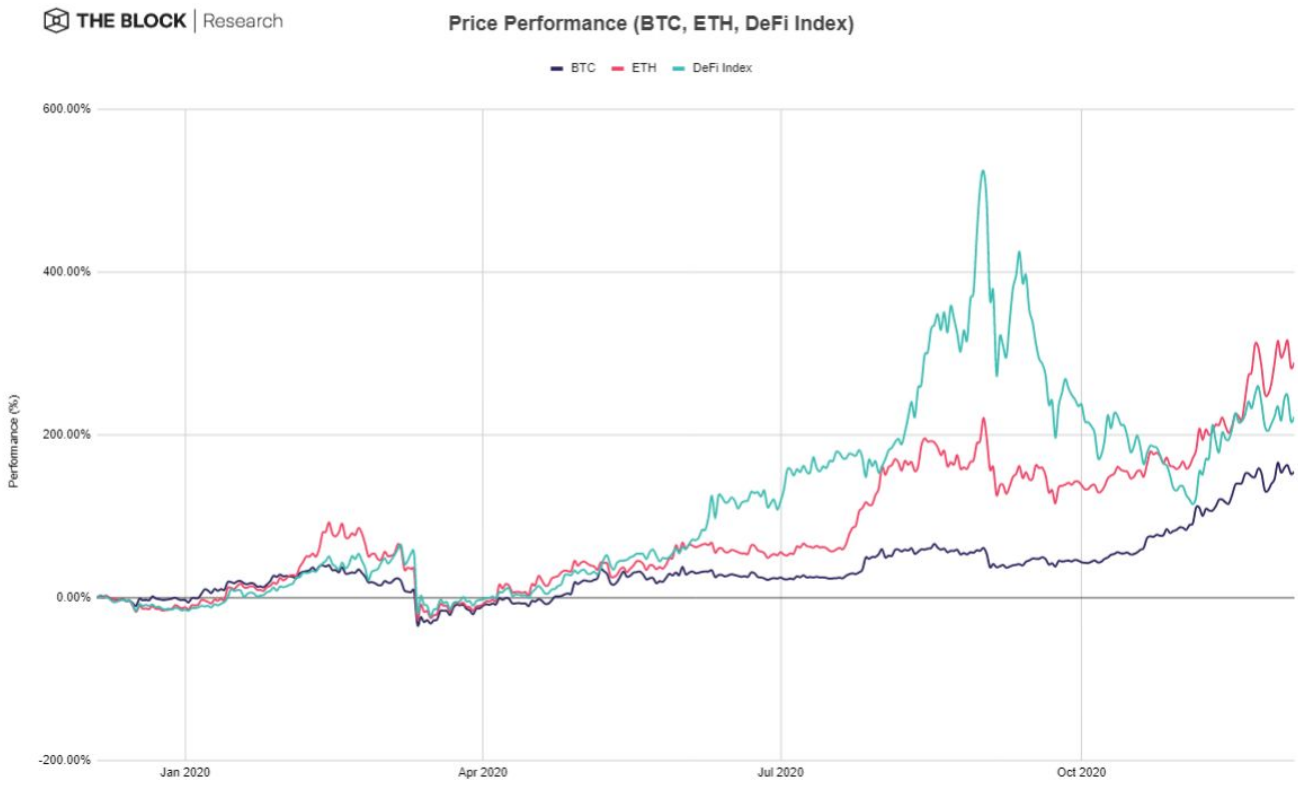


Figure 68:
Source: CryptoCompare

[15] October DeFi Charts: The Block's DeFi Index and 2020 Election Markets. The Block Research
[16] Markets > Prices. The Block Data Dashboard

2021: Scalability and sophistication to compete with centralized services

Scalability (this time for real)

Scalability, and the promise of cheap and instant transactions, is one of those technology promises that has been written in year-end reports for a few years now. However, on Ethereum that promise is now turning into reality[17].

Already, Polymarket is running on Matic, a layer 2 sidechain solution. Additionally, the DEX Loopring is built with zk-Rollups and has facilitated over $120 million in trade volume in 2020.

Further, almost every DeFi project has announced plans to integrate with a specific scaling solution, and deployments are expected in some cases within weeks. dYdX is planning a move to StarkWare's zk-Rollup based StarkEx[18]. Curve, the DEX with the second-highest trade volume behind Uniswap, is building on zkSync by Matter Labs (another zk-Rollups solution). Uniswap and Synthetix are moving to Optimistic Ethereum, built on Optimistic Rollups — and Synthetix already released a version of their core product on the Optimistic Ethereum testnet, which allowed users to stake their SNX tokens. Perpetual Protocol launched on the xDAI sidechain on December 16th. The Graph will be using state channels to scale micropayments for data queries[19] from blockchain data indexers.

In short, many major projects will be on layer 2 or a sidechain already in early 2021 — or at least will have deployments on them.

From the user perspective, this will give instant and near-free transactions within an application, but the fragmentation also has a minor downside.

Most services will have a deposit-and-withdrawal user experience introduced back into them, which is different from what users have today where a single Web3 wallet is a gateway to every application. Removing and depositing assets on layer 2 or sidechains has some friction associated with it (in terms of time).

Fragmented liquidity also has an impact on decentralized exchange aggregation. Services like Matcha and 1Inch.Exchange won't be able to atomically tap into multiple liquidity pools if they sit in different environments that don't communicate with each other.

[17] Scaling blockchains with Layer 2 technologies. The Block Research
[18] Decentralized exchange dYdX partners with StarkWare to integrate Layer-2 scaling technology. The Block
[19] The Graph is implementing state channels technology on its Ethereum-based network. The Block

Scaling Solution	State Channels	Plasma	ZK Rollups	Optimistic Rollups	Sidechains (app-specific or other blockchains)
Main Property	Users lock up funds and open channels with each other	Process many transactions and users can prove their ownership	Process many transactions and batches them to the main chain	Process many transactions and batches them to the main chain	A blockchain with its own validator set
Security	Derived from underlying blockchain's security	Derived from underlying blockchain's security	Derived from underlying blockchain's security	Derived from underlying blockchain's security	Responsible for own security
Dispute Resolution	Users fall back on underlying blockchain in case of dispute	Economic games to enter / exit Plasma chain	Zero knowledge proofs to enter / exit Rollup chain	Economic games to enter / exit Rollup chain	Rule for correct version of transaction history
Transaction Throughput	High (near infinite transactions)	~10k transactions per second (Ethereum)	~3k transactions per second (Ethereum)	~300 transactions per second with smart contract capabilities (Ethereum)	High (depends on chain's own and bridge security)
Withdrawal Time	1 confirmation (if all users agree) or longer dispute period	1 week	~10 minutes	1 week	1 confirmation (~15 seconds)
Programmability	Very limited	Limited (potential for smart contracts in future)	Limited (potential for smart contracts in future)	Flexible	Flexible

Figure 69:
Source: Matter Labs, The Block Research

Derivatives

As shown in the charts in the metrics section, decentralized exchanges have become competitive to centralized exchanges in terms of spot volume. The next natural step for growth is to extend that success to the derivatives market.

This means that perpetual swaps, futures, options — and prediction markets can be considered in this category — will be ported over to the decentralized and non-custodial world. With the right protocol(s), the decentralized exchange market can expand to leverage and synthetic products. Synthetic assets in particular are interesting because they open the avenue for all assets to be traded permissionlessly — not only tokens but stock and commodities futures etc.

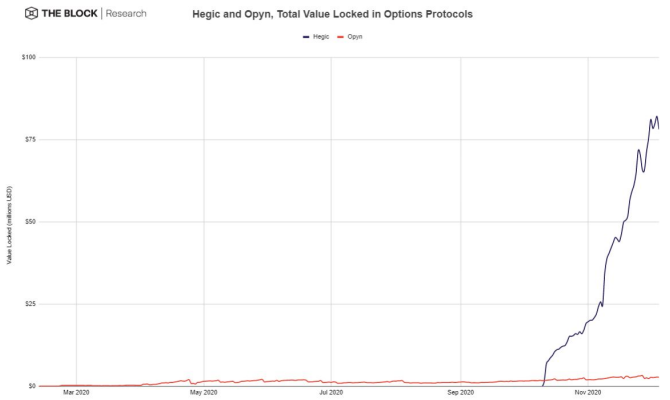
Among the well-known existing players, Synthetix's model where SNX holders provide the liquidity for traders to trade against has not seen tremendous success in terms of volume. dYdX has perhaps the most used perpetual swap product with an average trade volume of around $4 million per Coingecko. For comparison, BitMEX's BTCUSD perpetual swap does billions in daily trade volume.

UMA has a model somewhat similar to how DAI is minted in the MakerDAO system — i.e. synthetic assets are minted against collateral. Unlike most derivatives protocols, it does not require external oracles to feed in price information, and instead incentivizes users to liquidate improperly collateralized positions. This model historically has had trouble bootstrapping liquidity, as the over-collateralization requirement makes them capital inefficient. Arguably, this makes the over-collateralized protocols the most trust-minimized as well.

On the options front, Opyn uses a similar model whereby option sellers can lock e.g. ETH to mint option tokens (oTokens) to sell on the open market in exchange for premiums. Hegic on the other hand uses a pooled liquidity model, where liquidity providers

(option sellers) supply their ETH or DAI to a global pool. Buyers then specify the desired option parameters (put/call, strike price, contract duration), and are quoted with an algorithmically determined price.

Figure 70:



Source: DeFi Pulse

Many of the solutions in the decentralized derivatives space look much like their centralized counterparts. dYdX, MCDEX, and DerivaDEX employ the traditional central-limit order book model — and each should benefit from integrating with scaling solutions. For example, MCDEX is working on an integration with Arbitrum, a close cousin of Optimistic Rollups.

The challenge for these derivatives exchanges is forming enough liquidity to be competitive against their centralized counterparts. A lesson to be learned from the success of AMMs like Uniswap is that ease of providing liquidity is key.

Here, Perpetual Protocol offers a model closer to that of Uniswap. In Perpetual Protocol, users trade against a virtual AMM[20], where the price is offered by Uniswap's constant product function. With this model, the protocol can provide instant trades without the need for a counterparty — essentially infinite liquidity subject to slippage. Funding payments are used to incentivize demand and drive the perpetual's price towards the index price, and if the vAMM can attract equal action on both sides, there's no capital at risk. 0.5% of transaction fees are stored in an insurance fund, which is used to cover any losses.

Decentralized derivatives layer another level of sophistication onto crypto products. In addition to starting to compete with centralized exchanges on crypto-related markets, success for these protocols would include being able to drive trading volume to other markets. If by the end of 2021, billions in e.g. S&P 500 derivatives, that would be a tremendous success.

Prediction markets have already seen first signs of success, as Polymarket's primary election market saw $10.8 million in trade volume[21]. Catnip.Exchange (built on Augur) also saw its volume peak at over $1.6 million per day. For reference, Europe's largest operator Betfair had 1.6 billion euros in total trade volume, so decentralized prediction markets have a long way to go. Prediction markets have also been used for e.g. BTC futures markets, but their weakness is that they don't easily provide constant price exposure to an asset.

Quick hitters

Now or never for Ethereum competitors

There's a group of layer 1 projects that are generally well-funded (highlighted by massive fundraises like Dfinity's $102 million in August 2018 and Polkadot's $140 million in October 2017), which have at least technological value to them — unlike the simple

[20] Exploring new automated market maker designs. The Block Research

[21] Analysis of Prediction Market Odds on Election Night. The Block Research

Bitcoin forks and blockchains that scaled simply by decreasing validator counts launched in the pre-2017 era.

This includes Polkadot, Cosmos, Ava, NEAR, and Solana. Each of these L1s[22] is either in some limited mainnet stage or approaching it soon.

Ethereum has relatively strong network effects around developer tooling and the fact that 99% of the interesting tokens are ERC20. It's likely that by the start of 2021, each of these blockchains has to be significantly further along in building an ecosystem and bootstrapping network effects, or they will have been left behind.

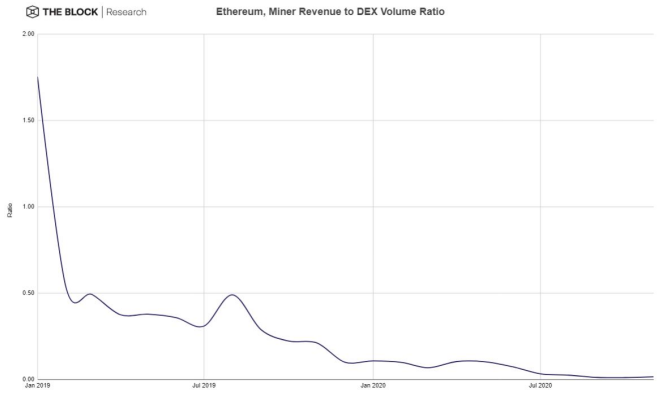
Miner extractable value

MEV refers to the amount of profit that miners can extract from reordering and censoring transactions on the blockchain.

An example of a profit opportunity is DEX arbitrage. If a miner observes a profitable arbitrage trade in the mempool, they can replicate the transaction and replace it with their own (note this includes the miner's transaction and any transaction miners are paid to include in a block) — thus capturing the associated profits.

MEV may become a security issue to successful smart contract platforms [23](i.e. Ethereum today) because their security does not scale directly with the amount of economic activity they facilitate. DEXs can scale 100x in terms of volume, without it directly impacting the transaction fees paid to Ethereum miners. At some point, miners may be incentivized to compete for MEV rather than participating in consensus[24]. At best, MEV can be additive to a blockchain's security because validators are paid more fees but at worst it can create consensus instability.

Figure 71:



Source: Dune Analytics (hagaetc), Coinmetrics

Institutional participation in DeFi

To date, it's been difficult for institutions to participate in DeFi due to poor risk management tools, and the lack of opportunities to interact with DeFi directly from custody.

Participating in DeFi requires understanding a host of other risks apart from basic financial risks. This includes:

- Smart contract hacking risks.
- Failures in economic incentives, which cause a protocol not to function properly (e.g. liquidations not working).
- Custodial risks, as not all DeFi protocols are fully decentralized and may rely on having administrative keys that can seize operations.
- Rehypothecation possibilities. Tokens for protocols are often used in unexpected ways, for example, Compound has $1.2 billion in DAI

[22] A brief architecture comparison of Layer 1 blockchains. The Block Research

[23] A case study in Miner Extractable Value. The Block Research

[24] How (successful) applications can be parasitic to blockchain security. The Block Research

borrow volume despite the entire DAI supply being 1.1 billion
- Lack of privacy. Other users can see trading positions and act on information like public liquidation thresholds.

As a solution, Gauntlet has created risk scores for Compound and Aave. Crypto security firm Fireblocks announced on November 30th that they would begin support for DeFi via their API and browser extension, which would help institutions interact directly with DeFi.

The tools for institutions to participate in DeFi are improving, but regulatory questions remain. When trading on DEXs, there's no insight into who the counterparty is, which is not great for KYC/AML requirements. Still, participation is expected to increase.

Web3 outside of finance

DeFi has created the first batch of blockchain applications to be transferring significant value across the Internet. However, there are many attempts to build infrastructure for non-financial use cases, such as Livepeer for video streaming, Filecoin and Sia for cloud storage, and Audius as a decentralized music marketplace.

Among these projects, the best bet is probably on The Graph — a protocol for indexing data[25] in blockchains.

This is because many of the frontends in crypto already use The Graph to serve data to users. This includes Uniswap, Synthetix, Aragon, and a host of other applications. Until now, The Graph has run as a centralized service provider, and the decentralized version of the protocol launched (in limited form) on December 17th.

[25] Introduction to The Graph — Web3's query protocol. The Block Research

DeFi Appendix: The Biggest DeFi Hacks of 2020

Figure 72:

DeFi hacks 2020

Biggest hacks (no rug pulls or bugs like with YAM)

Date	Protocol	Attack vector	Amount stolen (on day of hack)	Flash lo...	Recover
Feb 15, 2020	bZx	Bug in code	$356k	+	
Feb 18, 2020	bZx	Oracle	$666k	+	
Apr 18, 2020	Uniswap	Reentrancy with imBTC	$301k	-	
Apr 19, 2020	Lendf.me	Reentrancy with imBTC	$25m	-	$25m
Jun 18, 2020	Bancor	Function visibility	$135k	-	$135k
Jun 28, 2020	Balancer	Incompatibility with defla	$522k	+	
Aug 5, 2020	Opyn	Bug in code	$371k	-	
Sep 15, 2020	bZx	Bug in code	$8m	-	$8m
Sep 29, 2020	Eminence	Oracle	$15m	+	$8m
Oct 26, 2020	Harvest Finance	Oracle	$24m	+	$2.5m
Nov 6, 2020	Cheese Bank	Oracle	$3.3m	+	
Nov 12, 2020	Akropolis	Reentrancy + bug in code	$2m	+	
Nov 14, 2020	Value DeFi	Oracle	$7.4m	+	$2m
Nov 17, 2020	Origin Dollar	Reentrancy + bug in code	$7.7m	+	
Nov 22, 2020	Pickle Finance	Bugs in code	$19.7m	-	
Dec 17, 2020	Warp Finance	Oracle	$7.8m	+	$5.8

Souce: The Block Research, Etherscan (Ethereum Blockchain)

First bZx hack (02/15/2020)

Due to a bug in the contract, an attacker using flash loan created an uncollateralized trade position. This allowed him to pump the WBTC price almost 3 times and execute a profitable trade with a profit of ~1.2k ETH.

Second bZx hack (02/18/2020)

Samczsun wrote about the issue of using Kyber as an oracle on September 30, 2019. Using the flash loan, the attacker significantly overestimated sUSD price and, having provided them as collateral, borrowed ETH.

Uniswap imBTC pool hack (04/18/2020)

In this case, the problem was that Uniswap did not support the ERC777 token standard. This allowed the attacker to perform reentrancy during token trading and always get additional profit, including arbitrageurs' actions.

Lendf.me hack (04/19/2020)

This attack used the imBTC token and the reentrancy attack vector available with it. However, this time, the attacker interacted with the contract as if he had a lot of collateral, which he really did not have. This allowed the hacker to borrow all the assets on the platform.

Bancor v0.6 hack (06/18/2020)

The code of the new version of contracts had a private function available for calling by any user. It allowed transferring tokens from wallets if their owner used the new version of Bancor contracts.

Two Balancer pools hack (06/28/2020)

The issue was incompatible Balancer and deflationary tokens; with each transfer, 1% of the transaction volume was destroyed. Using the flash loan, an attacker performed many trades within STA and STONK pools, due to which bought all the other tokens and earned about half a million dollars.

Opyn hack (08/05/2020)

Due to a bug in the code, which incorrectly processed the received amount of Ether, the attacker could twice exercise his ETH put options.

Third bZx hack (09/13/2020)

The attacker was able to double his balance of iTokens by transferring them to himself. Funds were recovered the same day due to the hacker's carelessness.

Eminence hack (09/29/2020)

An unreleased project from Andre Cronie used the bonding curve concept for tokens. However, someone using a flash loan could manipulate the token price and drain 15 million DAI from the token contract.

Harvest Finance hack (10/26/2020)

The attack used a flash loan, which allowed an attacker to manipulate the price on Curve, which was used by

the protocol. As a result of manipulations, which became possible due to the misuse of Curve as an oracle, the attacker withdrew more funds from the protocol than deposited.

Cheese Bank hack (11/06/2020)
With the help of the flash loan, the attacker manipulated the oracle to increase the value of his collateral. This attack is similar to the second bZx hack.

Hack Akropolis (11/12/2020)
The problem was that the contract did not check which tokens were being used in the case of depositing multiple tokens. This allowed the attacker to take the flash loan and use their contract as a fake token to trigger reentrancy.

Value Defi hack (11/14/2020)
This attack is very similar to the Harvest Finance case, as it also misused Curve as an oracle.

Origin Dollar hack (11/17/2020)
With the help of the flash loan and the fake token attack we already know from Akropolis, the attacker was able to double the deposit size. This allowed him to withdraw stablecoins from the protocol, as well as sell the excess OUSD.

Pickle Finance hack (11/21/20)
Taking advantage of many bugs in the code, the attacker made the protocol think that the money was going to a fake Vault and then to Curve for investing.

Warp Finance hack (12/17/20)
The attacker used the flash loan to manipulate the oracle and borrowed all stablecoins from the platform. Warp team was able to liquidate the attacker's position and return 75% of funds.

Digital Asset Payment and Banking Trends:

Ryan Todd

A deeper look at CBDC exploration in the U.S. in 2020, stablecoins, and financial services and banks moving in on the industry.

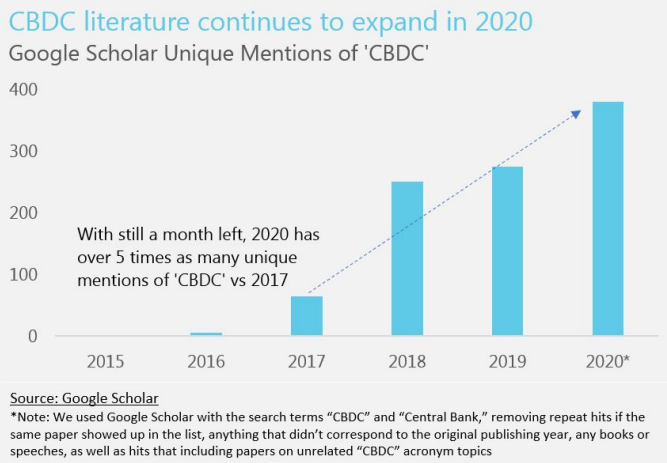
Quick Take

- **U.S. CBDC updates.** 2020 marked an accelerated pace of new central bank digital currency (CBDC) conversation, research, partnerships, and advanced stages of pilots. The research and literature on the topic of CBDCs have proliferated in 2020 — with more than 5 times as many unique mentions of "CBDC" in 2020 academic papers versus 2017.
- **Stablecoins.** Earlier this year, we wondered how much longer before we would see payment giants move in on the stablecoin market. Take 2020 corporate and regulatory developments around stablecoins as further validation that this question is becoming more when not if.
- **Banking on Crypto**. 2020 also marked itself as the banner year for legacy fintech, and financial services' interest into digital assets, as some of the world's largest financial companies accelerated the strategic desire to expand crypto capabilities or publicly market the intention to explore new digital asset offerings.

Central Bank Digital Currency (CBDC)

2020 was a year that saw fresh all time-highs in the market capitalization of bitcoin, significant digital asset developments among legacy fintechs, and a summer of DeFi defined by dizzying iteration and speculation. It was also a year marked by an acceleration of the central bank digital currency (CBDC) conversation, research, partnerships, and advanced stages of pilots. While many of these developments were originally captured in The Block's CBDC White Paper[26], published in August, there has been a flurry of recent developments that have already dated some aspects of the report's 2020 timeline. A testament to the acceleration of CBDC progress seen in the back half of 2020. Indeed, the research and literature on the topic of CBDCs also proliferated in 2020 — there were more than five times as many unique mentions of "CBDC" in 2020 academic papers versus 2017, according to Google Scholar.

Figure 73:



Source: The Block Research, Google Scholar

In previous years, central banks were more defensive in exploring what distributed ledger technology could do within wholesale settlement payment use cases. In some instances, central banks have been strategic and collaborative, with pilot engagements that saw them working with market stakeholders to explore the implications of the tech and how it could be applied. Yet development, up until 2020, largely took the form of conversations behind closed doors.

This year, however, there has been a clear push by central banks that represent some of the world's largest economies to come to the table and collaborate on a path forward. Look no further than at the start of the year when the Bank of England and BIS announcing that it would oversee a group of five other banks — the Bank of Canada, the Bank of Japan, the European Central Bank, the Sveriges Riksbank (Sweden), and the Swiss National Bank — to explore CBDCs as a collaborative group effort.[27]

We've listed a few other key CBDC developments this year (*fig 74*):

[26] Whitepaper — A Global Look at Central Bank Digital Currencies. The Block Research

[27] UK's central bank to explore digital currency. The Block

Figure 74:

THE BLOCK | Research

Beyond central bank coordination, 2020 CBDC developments have really begun to evolve beyond just central banks. We've seen international organizations, finance ministries, policymakers, large banks, and payment companies, start to come together and form public-facing dialogue around the topic in droves. Considering our view is aligned with the notion that the decision to launch a retail CBDC is more a political and policy-driven discussion across stakeholders, rather than a technical one[28], this has been a welcomed development for those looking to advance these initiatives. Beyond policy objectives, while advanced economies have historically seen respective central banks take a more publicly conservative and cautious tone with CBDC research (the outlier being China and its DC/EP system), 2020 has seen this group turn meaningfully more constructive ahead of 2021 (U.S. and Europe — ECB).

2020 U.S. CBDC Developments

Arguably, one of the more dramatic examples of this within an advanced economy has been in the U.S., which has seen a sharp contrast in stakeholder participation in CBDC dialogue relative to previous years.

Into the start of the year, the Federal Reserve had historically taken a more publicly conservative approach towards discussion around CBDCs. Towards the end of 2019, Fed Chairman Jerome Powell, in response to a congressional inquiry into the exploration of a retail CBDC, stated that the bank was following CBDC, but was not something they were "actively considering." Powell cited lack of consumer demand, access to plenty of payment options, and the lack of consumers "clamoring for it," as reasons for the lack of interest.

However, given the prospect of a tech company-controlled global currency like Facebook's idea for Libra, the rise of China's DC/EP, and the inability of the U.S. to effectively transmit COVID fiscal stimulus[29], that tone has noticeably softened through the year. More recently, Jerome Powell went as far as to suggest that CBDC could actually improve the U.S. payment system, and it is the idea of payment competitiveness that now motivates interest.

Indeed, it's still very early days for Fed exploration into CBDC. Similar to other advanced economies, a significant portion of public commentary from Fed officials has still been non-committal in nature. In November, Randal Quarles, the Vice Chair for Supervision to the Fed, said as much in that it would "be premature to believe that a [CBDC] is a solution that the U.S. would need to implement."

But that's not to say that there haven't been commitments from the Fed this year to advance research efforts. In a press conference titled "An Update on Digital Currencies," Fed governor Brainard gave a speech in August noting that the Fed would "continue to remain on the frontier of research and policy development regarding central bank digital currencies," while expanding the Fed's TechLab experimentation with "technologies related to digital currency and other payment innovations."[30]

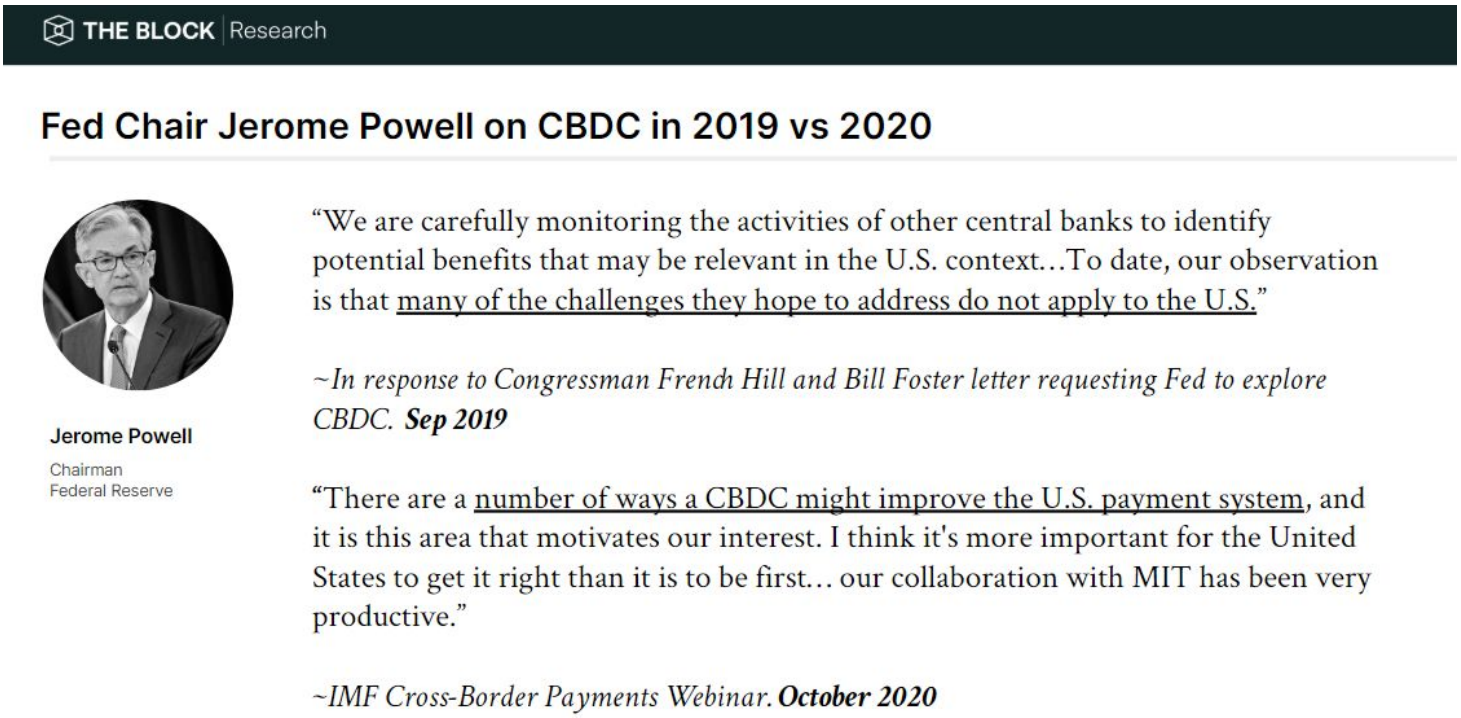
Additionally, Brainard announced that the Federal Reserve Bank of Boston would work with researchers from MIT's Digital Currency Initiative (DCI) on a "multi-year collaboration" to build and test a "hypothetical" open-source central bank digital currency platform. The project will serve to develop a deeper understanding of the "capacities and limitations" of technology that could underpin various designs, rather than to serve as a prototype. Any codebase that is developed will be offered as open-source software for others to experiment with. Brainard stressed that the Fed has still yet to make a formal decision on whether to pursue a digital currency launch.

[28] Whitepaper — A Global Look at Central Bank Digital Currencies. The Block Research

[29] The Interchange: Could Fed insecurities push FedNow to beat digital dollars to the punch? The Block Research

[30] Fed chair Powell: A central bank digital currency could improve the payment system in the U.S. The Block

Figure 75:



An often underappreciated fact, however, is that regardless of what Powell and Federal Reserve governors believe, Congress ultimately has the power to create a digital dollar via legislation. This was expressed in March when a draft economic relief bill from Democrats in the House of Representatives in response to the Covid crisis proposed one potential design: the bill would have compelled the Federal Reserve to make central bank money — by way of electronic accounts — available to the public, and not just commercial banks. The proposal was ultimately removed from the bill.[31]

The Digital Dollar Project enters the fray

To that end, Congress held several hearings this year that focused fully or in part on the question of a digitized dollar. Former CFTC chair J. Christopher Giancarlo, and Co-Founder of The Digital Dollar Foundation, pushed for the U.S. government to directly fund experimental work in this area. And while it remains unclear if Congress will go down this path, proponents of a digitized dollar have found at least some receptive ears on Capitol Hill — particularly when the issue is placed in the context of competition with other nations, namely China, and private entities like Facebook.

Announced at the start of 2020, The Digital Dollar Project (DDP) has set out as a non-profit organization to encourage public discussion and education about a United States central bank digital currency ("CBDC") to advance the needs of global financial systems and consumers.

[31] 'Digital dollar' proposal stripped from latest Congressional coronavirus stimulus bill. The Block

The organization released its first white paper in June, in partnership with consulting firm Accenture. It was a document that presented a philosophical argument as to why it's time for the U.S. to start seriously contemplating how it might design a digital version of the dollar, and what the core characteristics of a successful digital dollar would look like.

The white paper revealed a few loose criteria for the type of hypothetical CBDC the DDP would advocate for (under a challenger model): 1) issued by the Fed; 2) with the intended use cases of both wholesale and retail payments; 3) and administered through a two-tier distribution model via commercial banks.

What often feels lost in the conversation about the Digital Dollar Project is the fact that its current purpose is to raise awareness for why the Foundation (and its growing advisor list) believes the U.S. should consider a retail CBDC, rather than planning an actual launch. It's doing this by engaging with both the private and public sectors to explore research and public discussion on the potential advantages of a U.S. digital dollar backed by the full faith and credit of the Federal Reserve, and what that would even look like in practice.

Remarkably, and in part due to the fact of the COVID-crisis, The Digital Dollar Project was able to be represented on 3 separate U.S. congressional hearings (one, two, three) to testify about the benefits and opportunities around exploring a Federal Reserve-issued central bank digital currency, among other tokenization and distributed ledger financial and payment use cases.

Looking ahead, the project is hoping to launch a series of early-stage digital dollar pilots in partnership with both private and public market participants in 2021.

To that end, this really feels like the first inning in legitimizing the philosophical question of what a digital dollar should look like, and why it's a conversation worth having in the U.S.

Carpe Diem?

If The Digital Dollar Project story in 2020 has been one of congressional visibility and successfully promoting multi-stakeholder engagement publicly, Libra (now rebranded to Diem) has been one that has been more shadowed.

In what was largely a consensus view among The Block 2020 Research Survey (a survey of over 100 industry participants across the space including venture funds, traders, family offices, corporates, etc.), the majority of survey respondents entered 2020 believing Libra would in fact not launch in 2020.

Figure 76:

The project has evolved significantly since the initial concept ran up against extraordinary pressure from policymakers and central banks. Indeed, in light of an eventual showdown with members of Congress — that came amid broader scrutiny of Facebook — Libra began to undergo a shift from a standalone currency to something more akin to a multi-currency payments system. What's more, CEO Mark Zuckerberg said that Facebook would be willing to leave the Libra Association (Diem Association) entirely should the project be rejected by U.S. regulators.

By way of countless hearings and closed-door discussions, we've seen the Diem Association and by association Facebook Novi, slowly bend the knee to global regulators' demands in terms of its proposed design. This has manifested in subtle changes to the original Libra whitepaper – which has now been "retired" completely – as it slowly morphed into the fully revised one issued in April.

The most significant change in its new white paper? Acknowledging the opportunity to evolve into a white-label payment rail for central bank digital currencies.

Figure 77:

Moreover, our hope is that as central banks develop central bank digital currencies (CBDCs), these CBDCs could be directly integrated with the Libra network, removing the need for Libra Networks to manage the associated Reserves, thus reducing credit and custody risk. As an example, if a central bank develops a digital representation of the US dollar, euro, or British pound, the Association could replace the applicable single-currency stablecoin with the CBDC.

Single-currency stablecoins simplify the design of ≈LBR. ≈LBR can be implemented as a smart contract that aggregates single-currency stablecoins using fixed nominal weights (e.g., ≈USD 0.50, ≈EUR 0.18, ≈GBP 0.11, etc.). This approach to the ≈LBR design is similar to what is used by the International Monetary Fund (IMF) in the Special Drawing Rights (SDR). Because ≈LBR is composed of fixed amounts of single-currency stablecoins that are supported by the network, ≈LBR is fully backed by the Reserve assets backing each single-currency stablecoin.

To limit concerns about the Association updating the ≈LBR weights unilaterally, the Association would welcome the oversight and control over the basket composition (both currencies included and their respective weights) by a group of regulators and central banks or an international organization (e.g., IMF) under the guidance of the Association's main supervisory authority, the Swiss Financial Market Supervisory Authority (FINMA).

Source: Libra White Paper, April 2020

It took a while, but ultimately Diem realized it would need to be a fully permissioned network that will house different wrappers for underlying, digital representations of fiat – and if all goes according to plan, central bank digital currencies. Since the release of the new whitepaper in April, Diem has largely been heads down working towards a launch, hoping an aggressive hiring spree across the organization will help strengthen the organization's regulatory standings across the globe.

Indeed, the Libra Association tapped a former FinCEN director as its general counsel and HSBC's top lawyer, Stuart Levy as its CEO this year. These hires represent what might be the loudest signal possible that Diem is serious about building, to quote David Marcus, "a comprehensive network-level system around anti-money laundering (AML), Combating the Financing of Terrorism (CFT), and sanctions enforcement." The Association also brought in Sterling Daines, formerly of Credit Suisse, as its chief compliance officer.

The race to re-architect payment infrastructure has been well underway now for a few years. Whether it's an association-led initiative such as Diem, or central bank-driven real-time payment initiatives such as FedNow, new payment stacks are indeed on the horizon. The fact that Diem is getting closer to sizing the global regulatory sandbox they must play in, does indeed put them one step closer to launching in our view.

And if the organization can't get this across the finish line in 2021, it still earns credit for providing central banks with a catalyst to accelerate publicly promoted CBDC efforts in 2020.

Figure 78:

Libra was a catalyst for central banks to accelerate public promoted CBDC efforts into 2020

"It has been an incredibly important catalytic event to sort of shake the tree when Libra showed up out of the blue... Libra forced us to think hard about what we do." [124]
— Stefan Ingves, Governor of Central Bank of Sweden

"Libra has undoubtedly been a wakeup call for central bank and policymakers." [125]
— Benoit Coeure, Executive Board Member, ECB

"It's tough to predict if Libra will ever live up to its promises or even come into existence. But it is a good example of a trans-formative technology that affects how the Bank needs to respond to the future of money." [126]
— Timothy Lane, Deputy Governor Bank of Canada

"[Libra] was a bit of a wakeup call that this is coming fast, and could come in a way that is quite, you know, widespread and systemically important fairly quickly if you use one of these big tech networks like Libra did," [127]
— Jerome Powell, Federal Reserve Chairman

U.S Payment Companies have bought in on CBDC in 2020 in a real way

Implementing a central bank-issued digital currency, whether for retail or wholesale applications, is a multi-dimensional coordination problem that requires input and feedback across various stakeholders. In The Block's engagement with central bankers, policymakers, and financial and payment service firms this year around CBDC, the most common consensus view across stakeholders was the need for the public and private market to work together on these types of engagements through potential implementations (a view shared across the U.S., Europe, Asia, and China).

In terms of implementation, central banks aren't naive in where their strengths and weaknesses lie as organizations. They recognize that there is an entire financial services sector, commercial banking system, and tech industry that have built successful core lines of businesses and capabilities in these areas. Whereas central banks are (ideally) focused on price and monetary stability.

From that perspective, it's our view that if an advanced economy issues a CBDC that uses tokenization, public/private key cryptography, or DLT, this would likely require partnerships with several core players building infrastructure for the digital asset industry. These partnerships would likely be a tide that lifts wallet providers, exchanges, custodians, stablecoin providers, onramps/API interface, into a significantly higher addressable market.

Interestingly, some of the largest U.S. payment companies have started to publicly position for such a future this year — either through direct investments into digital asset infrastructure companies (Visa investing in crypto custodian Anchorage), roll-out of crypto capabilities (PayPal offering buy/sell), or the filing of patents for future in house tech (Visa and Mastercard).

Visa

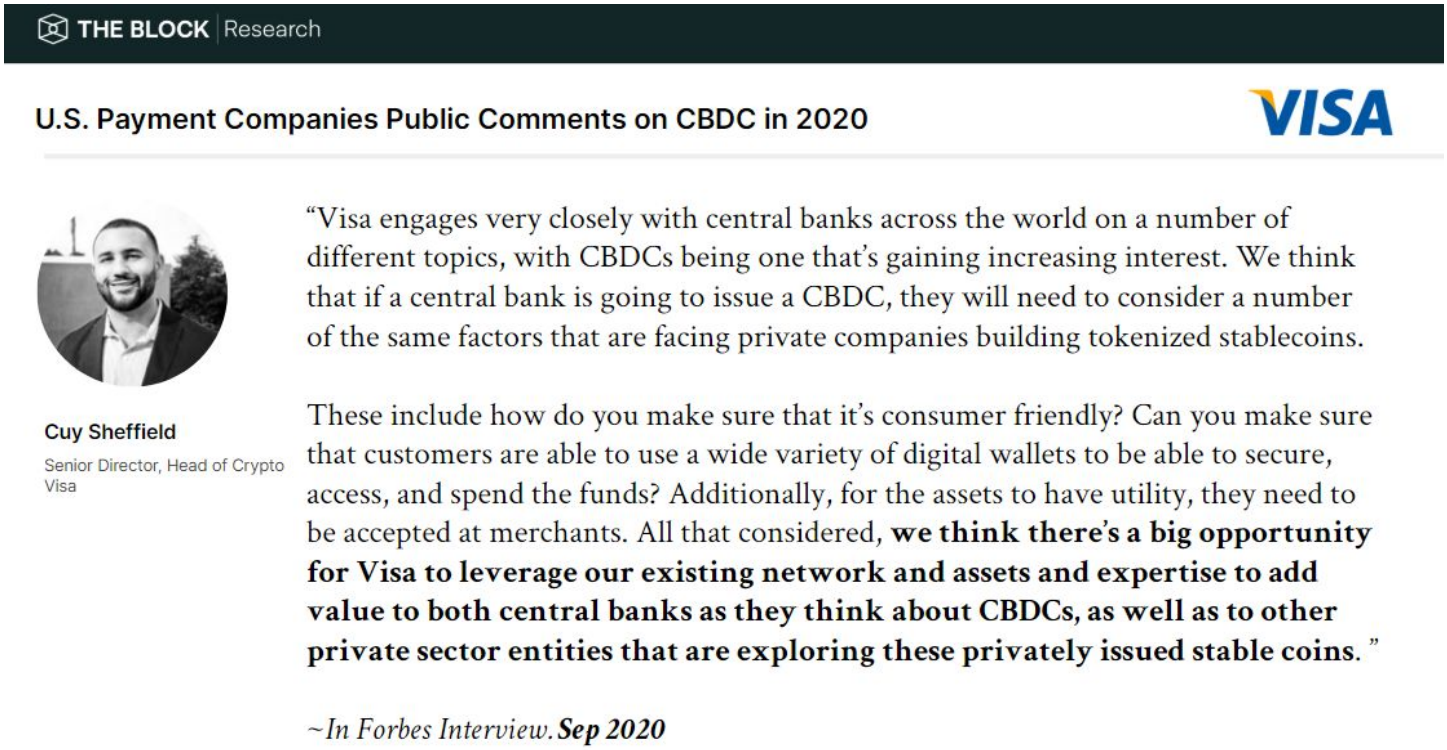
- **Visa submitted a patent application concerning the creation of digital currencies on centralized computers.** According to the filing, the technology aims to address central banks' concerns about digital dollars by giving them control over the currency's volume and value.

- **CEO Al Kelly acknowledges stablecoins as an emerging payment trend:** In comments made at a JP Morgan conference, Visa CEO acknowledged digital currencies backed by fiat as a potential emerging payments technology "[Digital currency backed by fiat] I think, are real – a potential emerging payments technology that could be very interesting. And as it relates to those, we support the case for digital currencies. We actually think that digital currencies could be additive to the payments ecosystem as opposed to being any kind of replacement or negative."

- **Company communications confirm Visa exploration and CBDC engagement**: Visa's Head of Crypto publicly acknowledged in a Forbes profile that they are engaging closely with central banks on CBDC.[32] In December, Visa releases a report that explores offline exchange of digital cash and how it could benefit consumers.[33]

[32] Visa Partners With Ethereum Digital-Dollar Startup That Raised $271 Million. Forbes
[33] Central Bank Digital Currency and the future: Visa publishes new research. Visa

Figure 79:



PayPal

In a PayPal investor relations release around the announcement of crypto buy/sell capabilities, the company highlights working with central banks and exploring other use cases around "digital financial services infrastructure." Beyond that, the company states that they are "eager to work with central banks and regulators around the world to offer our support, and to meaningfully contribute to shaping the role that digital currencies will play in the future of global finance and commerce." During a recent earnings call update, CEO Dan Schulman said he believes, based on conversations with central banks, that CBDCs are "a matter of when and how they're done, not if."

Figure 80:

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U.S. Payment Companies Public Comments on CBDC in 2020

PayPal

Dan Schulman
CEO
PayPal

"The world is rapidly moving from physical to digital on that, so true for payments and financial services. My conversations with central banks, with the regulators, with a number of folks in the crypto field, **there's no question that digital currencies are going to be rising an importance, having increasing functionality and increasing prominence CBDCs, from my perspective and all my conversations, are a matter of when and how they're done, not if.** And I think that our platform with its digital wallets and the scale that we have right now, can help shape the utility of those currencies that can range from interoperability, between wallets, between the currencies themselves, and importantly, into our network of merchants for commerce."

~PayPal 3Q20 Earnings Call. ***Nov 2020***

Mastercard

Mastercard launched a "virtual and custom" testing platform that will allow central banks to evaluate digital currency systems. According to an announcement published in September, the platform will facilitate an environment wherein banks, financial service providers, and consumers can partner to simulate the issuance, distribution, and exchange of central bank digital currencies (CBDCs) and evaluate customized CBDC use cases.

Stablecoins

What is a stablecoin?

Stablecoins are bearer monetary assets issued by private institutions that are designed to mimic the price of fiat currencies by utilizing a stabilization mechanism. Practically, stablecoins are a digital representation of fiat currency that lives on a blockchain (predominantly public blockchains).

Stablecoins were initially bootstrapped as an instrument for crypto traders that wanted to either exit from an inherently volatile cryptocurrency (such as Bitcoin or Ethereum) into a stable asset or wanted to transfer money to different exchanges without leaving the crypto ecosystem. Withdrawing the money and then wiring it to a different exchange is a cumbersome process.

Stablecoins have been especially important for the so-called unregulated exchanges without access to the fiat banking system. USD-denominated stablecoins are also important for people in countries with restricted access to foreign currencies.

While targeting the cryptocurrency industry was the initial go-to-market strategy, most of the stablecoin issuing companies have ambitions to expand into payments, remittances, and become the on and off-ramps for banks and financial institutions. The goal of stablecoin issuers is to maximize the nominal amount of bank deposits and therefore earn the highest interest, which can only be achieved by onboarding non-cryptocurrency retail participants.

Arguably the main advantages of using a stablecoin rather than a fiat currency through the traditional banking system are speed and cost. Depending on the underlying blockchain that each stablecoin operates on (currently, most use the Ethereum network), the settlement with probabilistic finality generally happens within a minute and fees depend on existing congestion conditions — but generally they fall below a dollar per each transaction.

The biggest challenges for widespread stablecoin adoption are the monetary sovereignty risk, AML/CFT compliance, regulatory uncertainty, blockchain guarantees and customer protection.

Finding a product-market fit in 2020

So far through 2020, $1 trillion worth of volume has been transacted with stablecoins through a public blockchain network.[34] Some may be quick to point out that the vast majority of this volume does indeed come from trading cryptocurrencies. But it's important to emphasize that these volumes do still occur on-chain and represent a flow of value from one address to another, i.e. they are a payment flow.

While not an equitable comparison, for context, total payment volume processed via PayPal in 2019 was $712 billion. Regardless of the debate around use cases and comparisons to legacy payment infrastructure, 2020 has effectively ended the debate on whether stablecoins could find product-market fit. Especially when one of the world's largest payment company CEO and G7 central bank governors acknowledge as much (*fig 81*).

In May, Visa CEO Alfred Kelly said at a JPMorgan TMC Investor Virtual Conference that he views digital currencies backed by a fiat currency as a potential emerging payments technology, additive to the payments ecosystem as opposed to being a negative or replacement.

The growing usage and demand of stablecoins more broadly this year has not been lost on international organizations or central bankers either. The latest example is the Bank of England Governor, Andrew Bailey, who delivered a speech in September that touched on stablecoins, central bank digital currencies (CBDCs) and the future of payments.[35]

[34] The Block Data Dashboard

[35] The Interchange: Stablecoins are a global emerging payment innovation. The Block Research

In summary, Bailey reiterated what is now becoming a common theme through the CBDC and stablecoin literature more broadly: the fact that stablecoins are already a functioning reality — while offering a fertile and relative low-risk laboratory to experiment with publicly — and likely provides the path of least resistance for CBDCs to become their own reality. A path where central banks can leverage the infrastructure, service providers, and tech vendors that currently support stablecoins and digital assets at large.

He's not alone in this view, either.

Among other high profile central bankers, last month we saw Governor Brainard of the Federal Reserve note that the U.S. central bank would "continue to remain on the frontier of research and policy development regarding central bank digital currencies" while expanding the Fed's TechLab experimentation with "technologies related to digital currency and other payment innovations."

The Federal Reserve Bank of Boston also announced that it will be collaborating with researchers from MIT's Digital Currency Initiative (DCI) on a "multi-year collaboration" to test an open-source experimental central bank digital currency prototype (for internal test and research purposes, but not expressively to build one).

One of the more transparent trends through 2020 was the fact that the payment and banking components of this market continue to professionalize and validate themselves among a broader set of legacy participants.

And considering how vital the global fiat on-and off-ramps are for the adoption of bitcoin and digital assets, we argue this validation has a more significant and lasting impact than anything else that has transpired this year. Even if it is “boring” tokenized versions of fiat.

Figure 81:

- In May 2020, Visa CEO Alfred Kelly said that he views digital currencies backed by fiat currency as a **potential emerging payments technology**, additive to the payments ecosystem as opposed to being a negative or outright replacement.

- Bank of England governor Andrew Bailey delivered a speech in September 2020 that touched on stablecoins, central bank digital currencies (CBDCs) and the future of payments. During that speech, Bailey reiterated that stablecoins are already a functioning reality, while offering a **fertile and relatively low-risk laboratory to experiment** that provides the path of least resistance for CBDCs to become their own reality

- "The shift to digital forms of currencies is inevitable, bringing with it clear advantages in terms of f**inancial inclusion and access; efficiency, speed and resilience of the payments system**; and the ability for governments to disburse funds to citizens quickly," said Dan Schulman, president and CEO, PayPal.

Earlier this year, we wondered: "How much longer before we see payment giants move in on the stablecoin market?"[36] Take 2020 corporate and regulatory developments around stablecoins as further validation that this question is becoming more when not if. If anything, 2020 is proving that the future is likely coming faster than previously expected — a fact that feels underappreciated across the broader fintech and payments landscape. 2021 should change that.

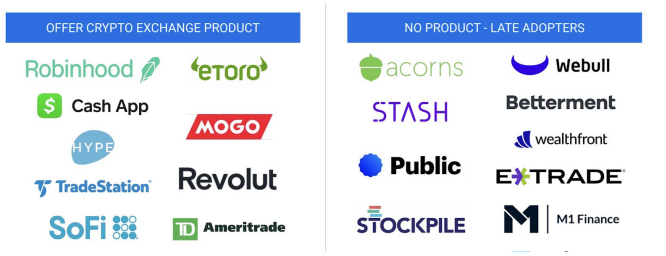
Banking on Crypto

2020 also marked itself as the banner year for legacy fintech, and financial services' interest into digital assets, as some of the world's largest financial companies accelerated the strategic desire to expand crypto capabilities or publicly market the intention to explore new digital asset offerings. While this was a theme we pointed out in The Block Research 2020 Outlook[37] to watch for, the caliber of names and interest building within fintech and directed towards the space has certainly exceeded what we thought we would see this year.

Headlined by PayPal's confirmation of launching crypto buy/sell capabilities in app and onsite in October[38], a number of financial services developments around digital assets were notable. These include large banks moving into custody and exchange offerings, other consumer fintech's launching crypto buy/sell capabilities, and companies like Square finally realizing the fruits of its own bitcoin strategy. For a detailed list of Key 2020 Financial Services Developments, see *fig 83.*

The accelerated pace of financial service crypto announcements through the back half of 2020 should provide incremental motivation for new entrants on the margin to consider "exploring" the digital asset industry in 2021. What do they have to lose at this point when you have Square selling billions of dollars of bitcoin a year, and PayPal, Visa, and Mastercard all ramping up ways to get more active in the space?

Figure 82:



Source: Zabo

One of the most apparent use cases for crypto has been trading and speculation — and it's not just native crypto exchange and brokerage businesses that have capitalized on this.

Fintech discount brokers, wealth management platforms, and even more traditional financial services companies like Fidelity are in on the secret that offering crypto purchase and trading capabilities is an easy way to: a) make more money, and b) build goodwill with key demographics.

Yet the interpretive letter released by the U.S. Office of the Comptroller (OCC) in July, which gave the opinion that chartered banks could custody and service the crypto industry at large, provided: 1) further confirmation on the ability for financial services and fintech companies to expand into new business models in servicing the digital asset industry at large; and/or 2) an eye-opener for those that needed additional convincing of the legality and viability of doing so.

[36] The Interchange: Stop sleeping on stablecoins. The Block Research
[37] The Block Research 2020 Outlook. The Block Research
[38] The Interchange: PayPal officially joins the crypto party. But what comes next? The Block Research

2020 HAS BEEN A BANNER YEAR FOR FINANCIAL SERVICE DEVELOPMENT IN CRYPTO AND DIGITAL ASSETS

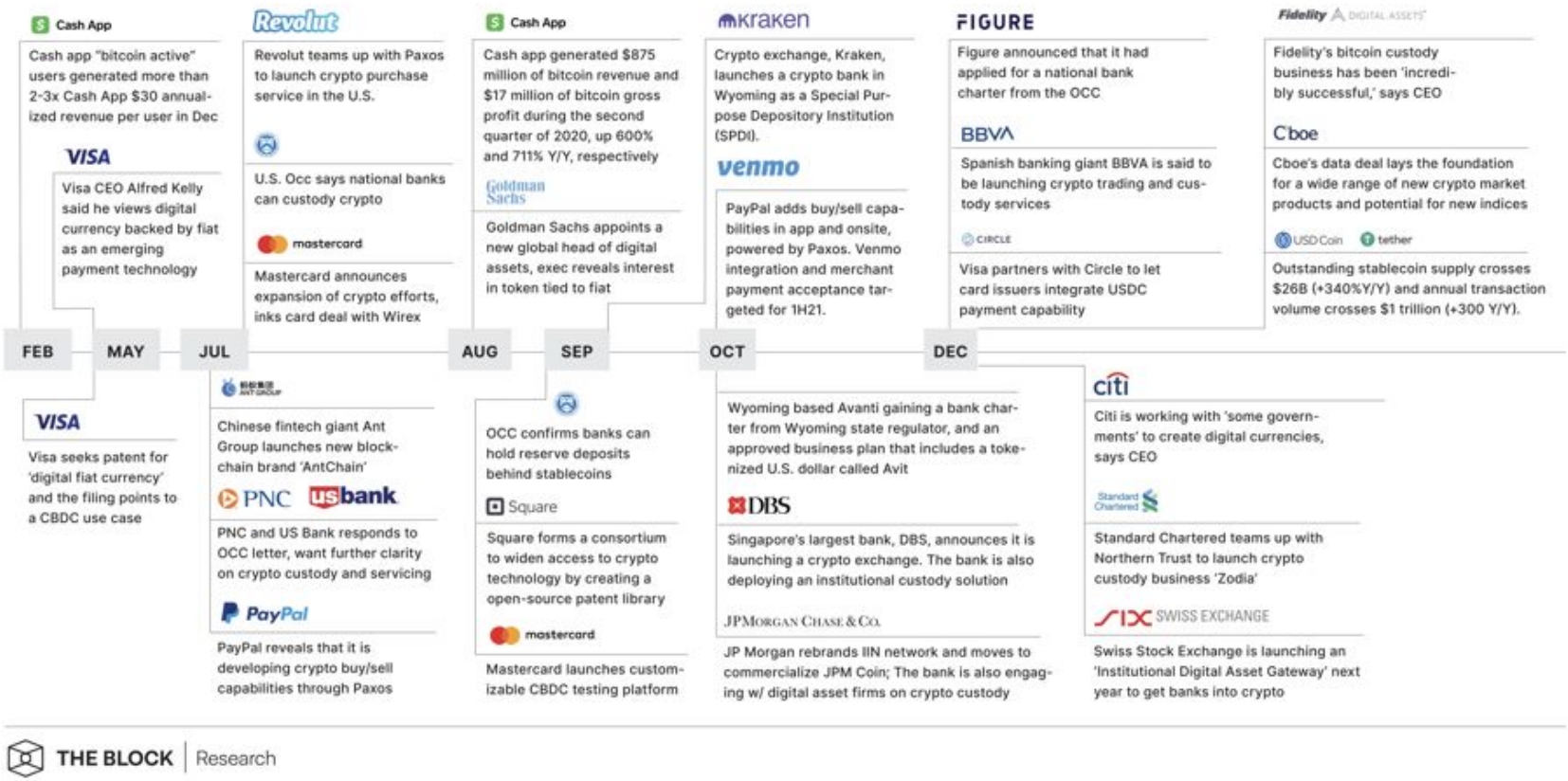


Figure 83:

As some of these companies move forward with their crypto plans, we're hard-pressed to believe direct competitors that have lagged won't feel the pressure to at a minimum announce some form of interest or hiring plans to explore crypto and digital assets. We highlighted in a research piece earlier this year that crypto capabilities by fintechs have historically proven to be a way to differentiate and drive outperformance among peers that lack those capabilities.[39]

Crypto exchanges and crypto financial services companies want to become banks

In December, two crypto companies, Paxos and BitPay, officially filed applications for national bank charters from the OCC. Beyond the national charters, this year saw crypto exchange Kraken obtain approval to launch a bank under a new regulatory framework in Wyoming, something that is called a Special Purpose Depository Institution (SPDI). The new structure was purpose-built for cryptocurrency companies and will allow Kraken to offer certain banking functions to clients and effectively serve as the exchange operator's primary banking relationship — a move that will expand its product suite. Avanti also received a bank charter from the Wyoming state regulator.

But if the pushback that blockchain-HELOC unicorn lender Figure is receiving for its own OCC application[40] is any indication — arguments from bank lobbyists that suggest "the precedent-shattering approach of granting a national bank charter to an institution that accepts only uninsured deposits [Figure] would violate the federal law" — approval of a national bank charter for a crypto company may be a taller ask than receiving a SPDI from Wyoming.

And it's actually not even a crypto problem, but one that has continued to vex non-bank tech companies and other consumer-based corporations that have sought charters of their own in the past. The adage "every tech company wants to be a bank" may be true, but it doesn't mean that is what has shaken out to date.

Even within fintech, earlier this year Square received an industrial loan bank charter (ILC), approved by the FDIC — a move that effectively will allow Square, through its fully owned subsidiary Square Financial Services, to take deposits and make small business loans from its own balance sheet.

Arguably, the more interesting development about the approval is the precedent it set. The last time the FDIC had approved an ILC application was in June 2008, with several high-profile ILC applications including Walmart and Home Depot getting denied in the meantime. But with the FDIC deciding to finally break its 12-year thaw on accepting applications (also approving a student loan servicer called Nelnet the same day as Square Financial Services), some are wondering if this may indicate other fintech and broader big-tech such as Facebook, Amazon, and Google may soon be drafting their own ILC applications. Other groups, like the Independent Community Bankers of America (ICBA) continue to lobby to block what they view as a "loophole" of fintechs and big tech companies from using the ILC to gain the ability to effectively become a full bank.[41]

Nevertheless, regardless of whether bank lobbying groups will look to limit the OCC's latest crusade to open up access for fintechs and other nonbanks seeking national bank charters, the question of what a new U.S. administration could bring to crypto-banking in 2021 still looms large and unanswered. But early signs in December suggest that it could be more of a headwind for the industry in 2021.

In December, Rep. Maxine Waters called on President-Elect Joe Biden to reverse policies that let banks custody cryptocurrencies and stablecoin

[39] The Interchange: What are you waiting for?. The Block Research

[40] The Interchange: Wait, it's all just banks?. The Block Research

[41] The impact of Square Financial Services, this week's second approved industrial loan company in over 12 years. The Block Research

reserves[42], and a new proposed Congressional bill known as the STABLE Act would make it unlawful' to issue stablecoins, or 'provide any stablecoin-related service' without federal approval.[43]

While the former did not outline the rationale behind these desired rescissions, the letter struck a critical tone on the OCC's activities. Meanwhile, the STABLE Act in many ways is a direct counter-response to broader OCC activities this year that extend well beyond stablecoins and servicing crypto.

Taken together, with banking on crypto gone full-tilt in the back half of 2020, and a new found urgency from regulators and banking lobbying groups to pushback on some of the work the OCC has promoted this year, 2021 is setting up to be the year where crypto banking regulation (specifically in the U.S.) begins to formalize.

Crypto debit cards have the potential to onboard millions more into the ecosystem

In The Block's 2020 Research Outlook Report[44], the rise of 'crypto rewards cards' was one of a handful of thematic trends presented to watch for in 2020. The expectation was for both BlockFi and Fold to launch respective bitcoin credit, and bitcoin debit card rewards, respectively.

While we may not have the BlockFi credit card out on the market just yet, announcements such as the refreshed Coinbase Card[45] (Visa debit card that allows users to spend their cryptocurrency funds directly from Coinbase accounts and get 1% BTC back or 4% Stellar), and a growing list of crypto-to-fiat debit rewards programs on the market (that is nearing close to +50 unique card programs) is an indication that this market has surely evolved in 2020 (*See fig 84).*

Figure 84:

VISA IS THE CLEAR WINNER IN STANDING UP CRYPTO CARD PROGRAMS WORLDWIDE

	CARD	CARD PROGRAM	CARD TYPE	REGION	FEATURES
	1 BitPay	Mastercard	Debit	Worldwide	Pre-paid debit allows spending of crypto. Personal and Business accounts
	2 Bitwala	Mastercard	Debit	Euro focused, worldwide	Debit card linked to digital wallet that allows crypto to fiat conversion
	3 Lastbit (Europe)	Mastercard	Debit	Europe	Can spend bitcoin and top up card with lightning network
	4 Nexo	Mastercard	Debit	N/A	Virtual debit card that lets you spend your credit line. 2% back all purchases (BTC or NEXO)
	5 Revolut Metal	Mastercard	Debit	Worldwide	Debit card linked to wallet that allows crypto to fiat conversion (Bitcoin, Ether)
	6 Uphold	Mastercard	Debit	Worldwide	Pre-paid debit can spend crypto, gold, equities, or fiat. 2% back bitcoin if pay bitcoin, 1% back all else
	7 Wirex	Mastercard	Debit	Worldwide	Pre-paid debit that pays 1.5% bitcoin back for holding WTX token
	1 2gether	Visa	Debit	Europe	Debit card linked to exchange that allows crypto to fiat conversion
	2 Binance	Visa	Debit	Worldwide	Debit that offers crypto to cash spend at up to 8% back
	3 bitFlyer	Visa	Debit	Japan	Prepaid card that allows you to top up with bitcoin and spend
	4 Bitvo	Visa	Debit	Worldwide	Debit card to spend fiat left on exchange
	5 BlockFi	Visa	Credit	US	Credit card that pays 1.5% back in bitcoin. $200 annual fee
	6 Cash App (Cash Card)	Visa	Debit	US	Cash card linked to Cash App. Currently doesn't allow bitcoin spend
	7 Change	Visa	Debit	Europe	Debit card linked to digital wallet that can spend 15 cryptos
	8 Circle	Visa	Debit	Worldwide	Virtual card that allows businesses to spend USDC for B2B payments
	9 CoinZoom	Visa	Debit	US. International "soon"	Spend crypto and fiat, debit rewards in crypto
	10 Conotoxia	Visa	Debit	Worldwide	Debit card linked to digital wallet that allows crypto to fiat conversion
	11 Crypto .com	Visa	Debit	Worldwide	Debit that offers crypto to cash spend at various tiered rewards
	12 Cryptopay	Visa	Debit	Europe	Debit card linked to digital wallet that allows crypto to fiat conversion
	13 Eidoo card	Visa	Debit	Europe	Debit card linked to Ethereum digital wallet that allows crypto to fiat conversion
	14 eToro Money	Visa (Fast Track program)	Debit	N/A	N/A
	15 Fold	Visa	Debit	US	Debit bitcoin rewards cards. Annual fee and free cards offer tiered rewards
VISA	16 Genesis Block	Visa	Debit	N/A	Bitcoin debit rewards by spending fiat
	17 Kinesis	Visa	Debit	Worldwide	Top-up card that allows you to spend gold, silver, or crypto
	18 Lastbit (US)	Visa	Debit	US	Can spend bitcoin and top up card with lightning network
	19 Monolith	Visa	Debit	Europe	Debit card linked to Ethereum digital wallet that allows crypto to fiat conversion
	20 netcents	Visa	Debit	US and Canada	Debit card spend bitcoin, bitcoin cash, ether, litecoin in digital wallet
	21 Plutus	Visa	Debit	Europe	Debit that offers PLU or ETH to cash spend at 3% PLU back
	22 Socios	Visa	Debit	N/A	Debit card that pays rewards in CHZ Fan Tokens
	23 Spectrocoin	Visa	Debit	Europe	Debit card linked to digital wallet that allows crypto to fiat conversion
	24 Spend	Visa	Debit	N/A	Debit allows spending of crypto. Personal and Business accounts, tiered rewards based on card
	25 Swipe (Binance acquired)	Visa	Debit	Worldwide	Debit that offers crypto to cash spend at 1% bitcoin back
	26 TenX	Visa	Debit	N/A	Debit card that allows crypto to fiat conversion on bitcoin, ether, and litecoin
	27 Temio Blockcard	Visa	Debit	N/A	Debit card linked to digital wallet that allows crypto to fiat conversion
	28 Trastra	Visa	Debit	Europe	Debit card linked to digital wallet that allows crypto to fiat conversion
	29 Wirex	Visa (Fast Track program)	Debit	N/A	N/A
	30 Zap	Visa (Fast Track program)	Debit	N/A	N/A
	31 ZenGo	Visa	Debit	N/A	Debit card linked to digital wallet that allows crypto to fiat conversion
	32 Zoro	Visa	Debit	Brazil	Debit card linked to digital wallet that allows crypto to fiat conversion

THE BLOCK Research

Source: The Block Research

But in terms of accomplishing the goal of onboarding a significant incremental new group into bitcoin and the crypto ecosystem more broadly, it's hard to see how cards that reward you for spending crypto you already have helps to bring in those next users on the margin.

That's largely what makes the BlockFi card interesting from where we sit as you are spending a normal credit line and receiving some bitcoin back for the purchase. The $200 annual fee attached with the card surely is a barrier to entry for most, but premium rewards cards are a product for which millions of Americans are familiar and comfortable paying fees.

But beyond BlockFi credit rewards card, news that Square Cash App offered a 5% bitcoin-back boost reward for any three transactions using its Cash Card—a special Boost promotion over two days and for a max payout of $7.50 — offers a completely different calculus in terms of onboarding new users into bitcoin, especially relative to other crypto card programs. For context, Cash App sees ~30 million monthly active users base (and more than 80 million customers in to

[42] Rep. Waters calls on Biden to reverse policies that let banks custody cryptocurrencies and stablecoin reserves. The Block
[43] New Congressional bill says it would be 'unlawful' to issue stablecoins, 'provide any stablecoin-related service' without federal approval. The Block.
[44] The Block 2020 Research Outlook Report
[45] Coinbase Card: A crypto rewards debit card that hints at greater depository ambitions. The Block Research.

total as of 3Q'20). [46] Should other recent fintechs that have launched a crypto offering (SoFi, Robinhood, PayPal, etc.) look to use crypto-rewards tied to debit card transactions, this could significantly expand the number of people that own crypto in the U.S.

Visa wants to be a network of networks. It's winning the connection to public digital asset networks

Visa often notes a core strategic priority of the company is to be a network of networks.

News in November that Visa will be powering BlockFi's long-awaited bitcoin rewards credit card and integrating Circle APIs to support USDC for B2B (business-to-business) transactions only further accentuates the desire the company has placed this year on making blockchain-based stablecoin payment systems a part of its broader Visa network.

Looking back over the past 12 months, the company has arguably secured center-stage in positioning as the core bridge between legacy payment infrastructure and the digital asset ecosystem. A key part of this initial success has come from the willingness to work with digital asset companies to provide card-based network access.

Taking a look at all the crypto cards currently in the market, or announced for 2021, Visa has become the clear winner in terms of market share in standing up crypto cards worldwide. The payment network supports over 32 different card programs by our last estimate, which is more than 4 times as many crypto card programs than its direct competitor Mastercard *(see fig 84)*.

While many of those digital card offerings to date have been directed towards retail payment users, what stands out from the news in December that Visa will be partnering with Circle to let card issuers integrate USDC payment capabilities is the intention to focus on B2B use cases.[47]

The partnership between Visa and USDC will be one to watch in 2021. It is an attempt to not only make stablecoins easier for businesses to use, but also provide an environment to test applications of USDC for B2B use cases.

As stablecoins are on pace to clear more than $1 trillion in total transaction volume on public blockchain infrastructure in 2020, the ability to capture even a few basis points of traditional B2B payment flow share could significantly grow the size and impact of the stablecoin market. While Visa may not be able to own public blockchain rails themselves, the company is positioning itself to own the endpoints of the infrastructure in order to participate in the digital asset ecosystem and ultimately advance the adoption of digital currencies.

With Visa as the credentialed on and off-ramp, and with Circle providing enterprise-grade payment gateway APIs that can access whitelisted wallet addresses, we may finally get early evidence of material adoption of USDC for B2B transactions in 2021.

Appendix: Key Regulatory Developments of 2020 Timeline

[46] Cash App bitcoin rewards and other debit programs could onboard millions more into the ecosystem. The Block Research

[47] Visa wants to be a network of networks. It's winning the connection to public digital asset networks. The Block Research.

KEY REGULATORY DEVELOPMENTS OF 2020

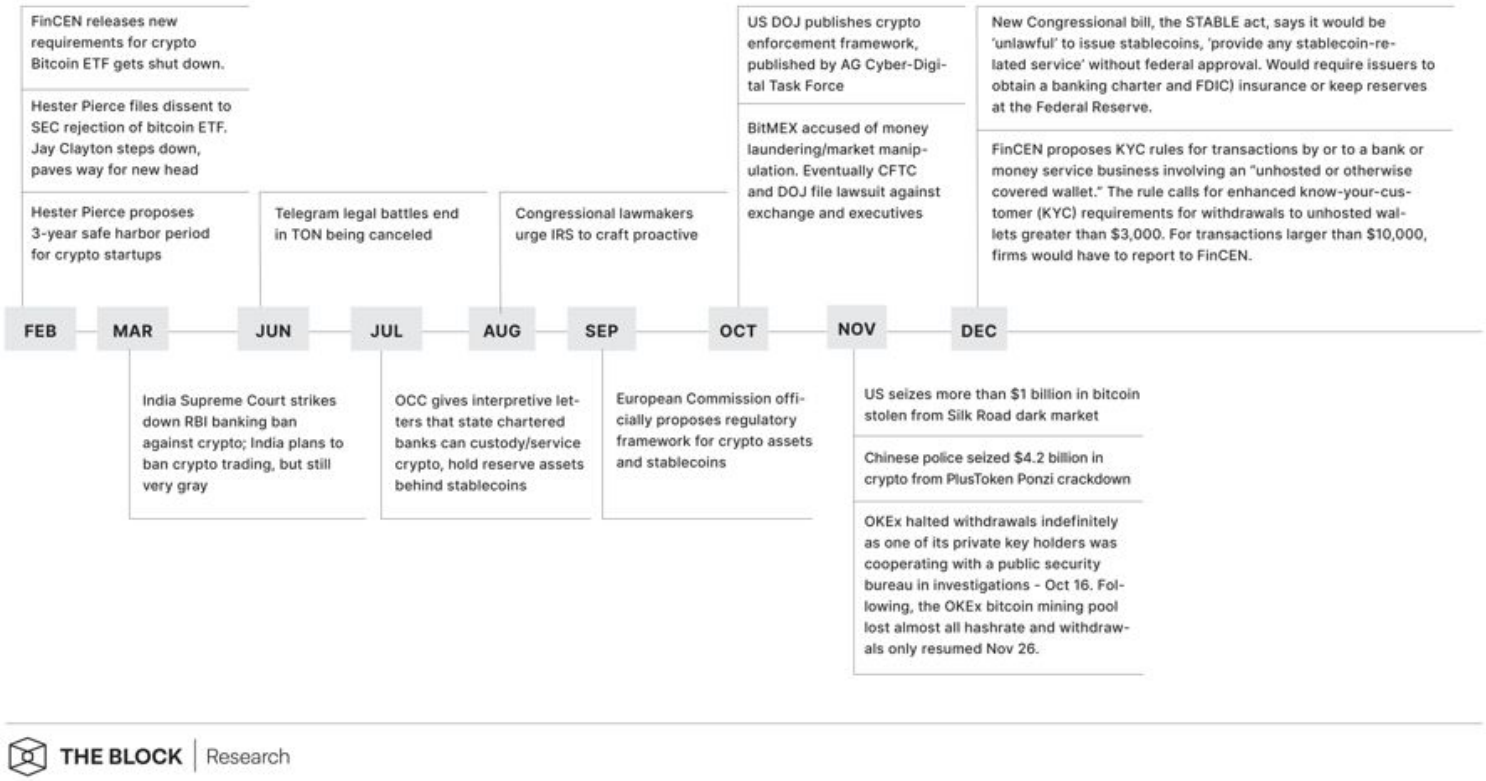


Figure 85:

Macro Perspectives:

Mike Rogers

2020 was the year bitcoin's perception as a viable macro investment was elevated among investors and corporates

2020 reshuffles bitcoin's safe-haven narrative for inflation hedge

There was a growing conversation in 2019 — which resurfaced at the start of 2020 when bitcoin moved in lockstep to gold in the hours surrounding the Iran missile strikes — around the merits of bitcoin's evolution into a safe haven asset after the asset rallied more than 10% in August 2019 amid rising trade tensions with China and a yuan devaluation that pushed the currency to its lowest point in U.S. dollar terms in over a decade.

While some point to historically favorable bitcoin price action around these events (and other examples such as the Cyprus banking crisis) as evidence of bitcoin becoming a safe haven, we entered the year remaining skeptical.[48]

Traders trading the narrative vs. "reality on the ground" is an important distinction. Data from UsefulTulips.org showed that trading volumes in Iran on the peer-to-peer marketplace LocalBitcoins barely budged, even as tensions between the U.S. and Iran continued to rise in January[49].

Last year, we looked at weekly returns of a basket of safe-haven assets (gold, yen, U.S. Treasuries), as well as bitcoin, and plotted out the weeks in which returns moved at least 1 standard deviation (positively).[50] Since 2013, there had been 52 separate weeks where at least two out of the three safe-haven assets generated a +1 std move in weekly returns, while bitcoin saw 49 weeks during that span. Notably, ~25% of the safe-haven outsized moves occurred during the same week bitcoin weekly returns exhibited +1 std moves, vs. the rest of the basket which moves +1 st. dev anywhere from 50-62% of the time the other two respective safe-haven assets both move +1 st. dev (*see fig 86*).

Interpret that as you will. But also keep in mind that the 25% of observations that overlap with bitcoin have been relatively evenly dispersed across the past six years, suggesting that bitcoin is no different in "acting" like a safe haven asset today than five years ago.

[48] The Block 2020 Outlook

[49] The Iran crisis doesn't prove that bitcoin is a safe haven asset, but ETP volumes might. The Block

[50] Musings on safe havens. The Block Research

		# of weekly returns X σ	
	Since 1980	**1σ**	**2σ**
	# of weekly returns with at least 2 Safe Haven assets move Xσ:	199	25
	# of weekly returns with all 3 Safe Haven assets move Xσ:	32	n/a
	Since 2013		
A	# of weekly returns with at least 2 Safe Haven assets move Xσ:	52	6
B	# of weekly returns with all 3 Safe Haven assets move Xσ:	15	n/a
	# of weeks with +1σ weekly return move across various pairs in the same week since 2013		
C	(Yen + Treasuries)	31	
D	(Gold + Treasuries)	24	
E	(Gold + Yen)	27	
	% of 2-paired +1σ move where safe haven asset x also moved:		
= *B* / *C*	Gold	48.4%	
= *B* / *D*	Yen	62.5%	
= *B* / *E*	Treasuries	55.6%	
F	# of weeks where Bitcoin had the same week +1σ weekly return move with at least 2 other Safe Haven assets	12	0
= *F* / *A*	*% of total weekly +1σ returns with 2 other safe haven assets*	23.1%	
= *F* / *B*	# of weeks where Bitcoin had the same week +1σ weekly return move with all 3 Safe Haven assets	3	n/a
	% of total weekly +1σ returns with all 3 safe haven assets	20.0%	

Note:
Safe Haven assets include weekly return data on Gold (Spot), Yen (USDJPY), and Treasuries (Barclays Aggregate Treasury Index) from Jan 1 1980.
St. Dev = Weekly returns are normalized by 3m realized vol prior to the beginning of the weekly return calculation window
Standard deviations are then summed across the 3 assets
A std move considers only a positive move (negative in the case of USDJPY)

Source: The Block, FactSet

Figure 86:

Regardless of the debate around bitcoin's perceived "safety," 2020 provided all asset classes with the reminder that not even safe-haven assets will perform as expected. In March, the S&P saw its fastest drop into a technical bear market ever (down ~25% in under 3 weeks), gold experienced its biggest drawdown in the past 7 years, while U.S. Treasury yields surprisingly rose. This certainly was not what the "book" teaches you, but hindsight is now 2020.

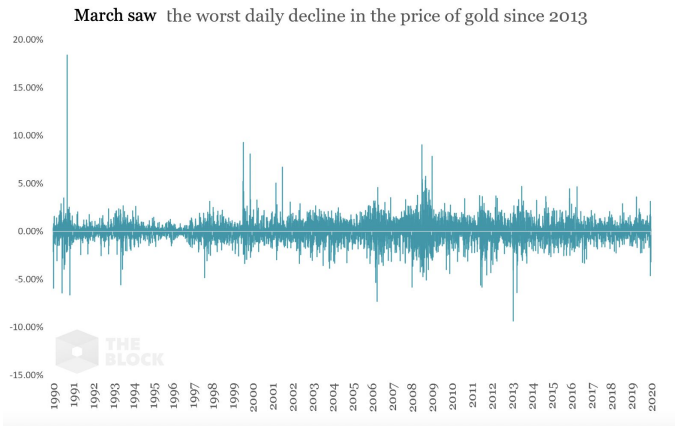
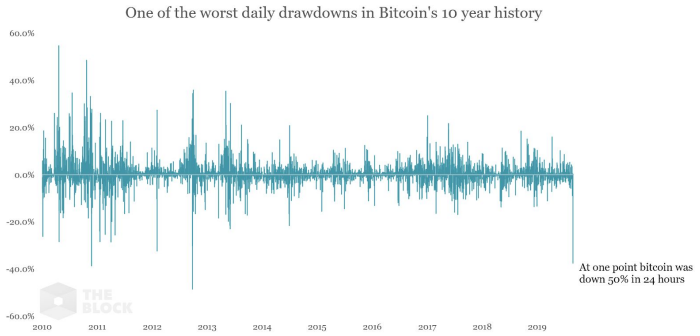


Figure 87:
Source: The Block Research, FactSet

Crypto was right in the heart of this sell-off, further confirming to global markets that it, too, is not immune to global selloffs when all asset correlations skew to 1.

As many learned in March, uncorrelated is uncorrelated — until it isn't. March 2020 registered the second-worst drawdown for bitcoin ever and the worst one-day decline for ether. The amount of capital that was wiped out (including liquidated leverage) by far surpassed any other previous daily drawdowns. This was the worst trading day in the history of crypto from a capital loss perspective.

Figure 88:
Source: The Block Research, FactSet



Fast forward to the end of 2020. Bitcoin's price is up +200% YTD and more than 370% from its local 2020 bottom. So what changed?

A short (and incomplete) answer is coordinated liquidity — and lots of it. From March 2020 — April 2020 the G4 + China alone passed policies that pushed fiscal spending above $3 trillion (the bulk of which came from the U.S. CARES Act). *See fig 90.*

On the monetary side, central banks have moved quickly to try and backstop credit markets with a flush of "unlimited" liquidity. This translated into more than $3.4 trillion worth of utilized provisions and facilities in a span of weeks. *See fig 89.*

Taken together, this has led some to suggest that central bank balance sheet expansion and overly accommodative support of asset prices amidst a broader global contraction could resuscitate inflation. Last decade, similar level actions pushed gold to all-time highs as capital flowed into the "hard, scarce asset." With bitcoin vying to be digital gold, this inherently has led many to claim the latest round of central bank actions is "bullish" for the asset as well.

Whatever the case, if there is one perpetual market lesson 2020 has provided us, it is the fact that no one really knows how markets will continue to react to whatever twists and turns lie ahead — let alone how a market as nascent and emergent as bitcoin will perform.

Figure 89:
Source: The Block Research, Morgan Stanley Research

THE BLOCK

Country	Central Bank liquidity provisions and funding facilities	Announced Program (USD, billions)	Utilized Program (USD, billions)	% of GDP utilized
US	**Mar 15 -** Open-ended QE	"Unlimited"	$1,506	7.30%
	Mar 16 - Dollar liquidity swap lines with other central banks	Unlimited	$44	0.20%
	Mar 20 - Extend repo operations	Unlimited	$214	1.00%
	Mar 20 - Primary Dealer Credit Facility (PDCF)	Unlimited	$33	0.20%
	Mar 24 - Money Market Mutual Fund Liquidity Facility (MMMF)	Unlimited	$53	0.30%
	Mar 24 - Term Asset Backed Securities Loan Facility (TALF)	100	$0	
	Mar 31 - FIMA Repo Facility	Unlimited	$9	
	Apr 9 - Secondary Market Corporate Credit Facility (SMCCF)	750	$75	0.30%
	Apr 9 - Main Street Business Lending Program	600	$0	
	Apr 9 - Municipal Lending Facility	500	$0	
	Apr 9 - Paycheck Protection Program (PPP)	350	$0	
Euro	**Feb 28-** Changes to terms of TLTRO III	1105	$127	1.00%
	Mar 12 - Additional LTROS		$278	2.10%
	Mar 12 - Additional QE	962	$68	0.50%
	Mar 15 - USD Liquidity provisions		$141	1.10%
	Mar 20 - Capital Relief	1988		
	Mar 27 - Suspension of bank dividends	33		
UK	**Mar 17 -** COVID Corporate Finance Facility		$7	0.20%
	Mar 19 - Additional QE	248	$45	1.60%
	Mar 24 - Contingent Repo Facility	Unlimited	$14	0.50%
	USD Repo Operations	Unlimited	$59	2.10%
Japan	**Mar 16 -** Corprate finance special funds operations	74.6	$32	0.60%
	Mar 16 - Additional purchases of commercial paper and corporate bonds	69	$54	1.00%
	Mar 16 - USD liquidity against pooled collateral		$548	11.00%
China	**Feb 7 -** Special PBoC lending facility for virus containment	74.6	$32	0.60%
	Feb 25 - Relending and discount support for production	71	$49	0.30%
	Mar 31 - Lending and Discount support for small/medium businesses	143		
Total			$3,388	

Bitcoin is touted by its faithful as a lot of things. Digital money, digital gold, risk asset, safe-haven asset — a classic have-your-cake-and-eat-it-too type of asset. And maybe it does evolve into some of these things over time. However, 2020 has shown that bitcoin is still very much a digital bearer risk asset. And that's ok!

Given the bifurcation in the recovery (see the 2020 Marco Overview Appendix on pg 87 for more), and the unprecedented, and swiftly coordinated global monetary and fiscal easing in response to the pandemic economy (and the expectation for that to continue in 2021), bitcoin currently finds itself situated among a broader reflation trade across all risk assets ahead of 2021. It also comes with the added bonus of several idiosyncratic headwinds (e.g. the positive state of market developments discussed in this report) and tailwinds (e.g. potential for increased regulation).

The Macro Case for Bitcoin

There was no shortage of traditional asset managers, companies, and famed macro investors who took the proverbial leap into Bitcoin this year.

Bitcoin is no different from other assets in the sense that those who own it have an incentive to "talk their book" or evangelize about cryptocurrency.

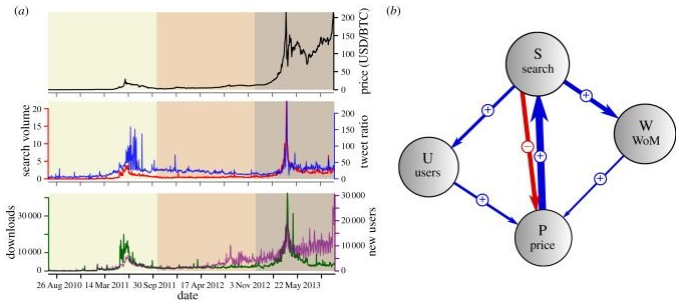
Figure 90:
Source: The Block Research, Morgan Stanley Research

THE BLOCK

Country	Fiscal Responses to COVID Crisis	Value in USD, billions	% of Country 2019 GDP
US	**Mar 6 -** Emergency spending bill to develop vaccine and support state/local response	$8.3	0.04%
	Mar 11 - Individual, and small/medium business 3-month tax holiday, $50 billion in low-interest loans	$50.0	0.20%
	Mar 13 - Declared national emergency; frees up additional $50 billion in government funding	$50.0	0.20%
	Mar 18 - Paid sick leave, childcare leave, etc.	$100.0	0.05%
	Mar 27 - CARES Act: $337B in small business loans, $290B for individual checks, $75B "industry specific loans" from Treasury, $180B health care provisions, $290B in business/individual tax provisions, $175B in municipality relief, $75B in transport and disaster relief, $70B in education provisions. Total is $2.2T, but $450B is in treasury capacity for loan guarantees originated by the Fed (monetary)	$1,750.0	8.20%
	Apr 9 - More treasury protections **for Fed programs:** $75B for main street lending facility, $85B in credit protections for PMCCF, SMCCF, and TALF, and $35B for muncipal credit facility		
Euro	**Mar 10 -** European commission set up fund to respond to crisis	$28.0	0.02%
	Apr 9 - Eurogroup sets package with precautionary credit lines of $240 billion EUR for healthcare costs, support loans, and unemployment reinsurance schemes	$258.0	2.00%
UK	**Mar 11 -** 30billionGBP: support labor markets, helath care, and economy	$39.0	1.40%
	Mar 17- 20billion GBP in tax cuts, grants, and loan guarantees	$24.0	0.90%
	Mar 20 - Further mitigations of unemployment (70 billion GBP)	$82.0	3.20%
Japan	**Feb 14** - JPY 10.3 billion for measures to prevent outbreak of virus	$0.1	
	Mar 10 - Economic fallout stimulus package worth JPY430 billion for small/medium businesses	$4.0	0.08%
	Apr 6 - Economic stimulus package worth JPY108 trillion: supports individuals and businesses	$175.0	3.40%
China	**Feb 11 -** Local government bonds approved by Minster of Finance; RMB 848 billion	$66.0	0.46%
	Feb 18 - Pension, jobless, and work injury insurance delays for Hubei province. 500 billion RMB	$72.0	0.50%
	Feb 20- Corporate medical insurance coverage as much as 150 billion RMB	$21.0	0.20%
Total		$2,727.4	

In the case of Bitcoin, there appear to be positive feedback loops where significant price appreciation can be driven by: (1) word of mouth and (2) new Bitcoin adopters, at least per the findings of the 2014 paper (*see fig 91*).

Figure 91:



Source: Garcia, David et al. "The digital traces of bubbles: feedback cycles between socio-economic signals in the Bitcoin economy." Journal of the Royal Society, Interface vol. 11,99 (2014): 20140623. doi:10.1098/rsif.2014.0623

The feedback loops from Bitcoin cycles aren't necessarily a bad thing. Rather, they're a potential behavioral explanation for price movements during certain periods of time.

Historically, Bitcoin has been consistently monetized by one of the following four main parties: (1) Miners (2) Exchanges (3) Lenders and (4) Traders/Arbitrageurs. The activities of these parties typically overlap. As society becomes more accepting of Bitcoin and laws/regulations around institutional custody start to fall in place, the parties extracting value from Bitcoin should continue to expand.

We have already seen these parties expand in 2020, with Macro Investors adding Bitcoin, or noticeably shifting their tone on allocating a position of their portfolio into bitcoin (investors and executives such as Paul Tudor Jones, Bill Miller, Stanley Druckenmiller, Ray Dalio, and Larry Fink) and companies strategically using Bitcoin in their business processes, such as treasury management (MicroStrategy, MassMutual, Ruffer Investments, Guggenheim, One River, Stone Ridge).

We find it important to temper expectations, as many within our industry have a tendency to extrapolate meaning where there is none and/or be excessively bullish on cryptocurrency as an asset class to the point of delusion. Unfortunately, this makes it harder for digital assets to gain credibility in the eyes of those in control of institutional capital.

Thankfully, the mere mention of Bitcoin by someone of PTJ's stature helps our industry get a more detailed review by those looking for untapped value. Further, Bitcoin has continually proven those calling for the monetary network's demise wrong over the past decade, while also serving as a perfect example of the Lindy Effect. We discussed the Lindy Effect in 'Forget DeFi, digital assets need to master the basics first,' where we noted that in addition to Bitcoin, the United States dollar is also a great example of the Lindy Effect.

Speaking of the dollar, we find the relationship between Bitcoin and USD to be one of the most meaningful when trying to understand Bitcoin's potential price behavior in the short-to-intermediate term.

As shown in *fig 92*, the price of Bitcoin appears to be quite sensitive to significant and/or sudden changes in the trend of the USD, as represented by the U.S. Dollar Index (DXY) index (Blue Line). Bitcoin seems to experience significant periods of price appreciation while the USD is going through prolonged devaluation periods, similar to 2017.

Figure 92:

Sources: Tradingview

In the accompanying Macro Appendix of this section of the report, we argue that Bitcoin at this moment in time is not a safe haven and actually displays many characteristics of a "risk-on" asset. This is further supported by the relationship between Bitcoin and the volatility index in our view.

Intuitively, it makes sense for something that is limited in supply and dubbed by many as "digital gold" to follow a trading price behavior to the physical commodity gold. From a long-term perspective, if the Bitcoin network were to gain meaningful societal adoption, perhaps it is appropriate for the price to appreciate in a manner similar to a monthly log chart of a high-penetration software stock, such as Microsoft?

Similar to a stock like Microsoft, the short-term value of Bitcoin appears highly dependent on the monetary backdrop provided by central banks, which is ironic given the origins of Bitcoin.

Bitcoin perfected the concept of digital scarcity, the value of which is priceless. Over the long run, a censorship-resistance store of value that can be transferred and settled trustlessly in a peer-to-peer fashion might be the equivalent of a "Monetary Elysium." Only time will tell, but the perceived risk of not having some form of bitcoin exposure in a macro portfolio appears to be increasing.

2020 Macro Overview Appendix:

Traditional & Digital Asset Market Behavior

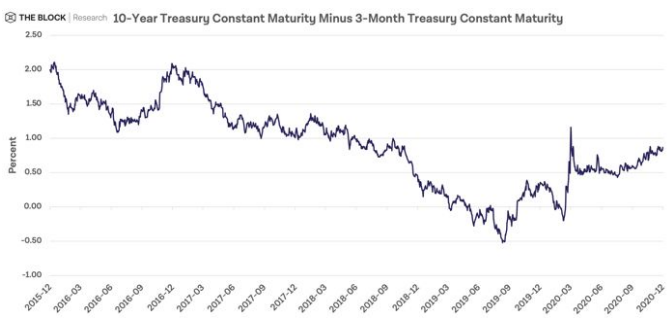
This appendix section aims to provide an overview of various economic events throughout 2020.

Before recapping these developments, however, it is important to first establish that we entered the year with deteriorating economic conditions. Truth be told, the global economy was slowing long before the COVID-19 pandemic hit; one could argue that the pandemic only exacerbated a recession that was already on the horizon.

There is a plethora of economic and market data that can be used to support the theory of a slowdown starting in Q1 2018 when the total market capitalization (market cap) of the cryptocurrency (crypto) market peaked around $761 Billion**.** One in particular is the US Treasury (UST) market. The predictive power of the UST yield curve is strikingly accurate, specifically when looking at the difference between long-dated and short-dated Treasury yields, otherwise known as the "term spread."

By far the most popular term spread to look at for predicting a potential slowdown or coming recession is the difference between the ten-year Treasury bond yield and the three-month Treasury bill rate (10YR-3M). The 10YR-3M spread has gone negative eleven times since 1921, with the latest occurrence in 2019.

Figure 93:



Source: The Block Research, FRED

A brief 10YR-3M spread inversion occurred in March 2019, which was followed by a much deeper and longer-lasting inversion between May and October 2019. As a general rule, a negative 10YR-3M spread is a warning sign for coming financial market distress, and the countdown to a recession starts once the spread uninverts. In October 2019, the 10YR-3M spread turned positive, and the current recession (shaded area) started four months later in February 2020.

An inverted yield curve has many effects, the most basic of which is a hit to financial institutions Net Interest Income (NII). Put simply, the fundamental concept of commercial banking, borrowing short and lending long, is distorted and reverberates throughout the financial system. There is usually a lag between yield curve inversions and the ensuing financial market stress. The rate at which a recession follows the uninversion of the 10YR-3M spread is typically variable as well.

Another area of the financial system, the U.S. dollar market for repurchase agreements (repos), which provides critical short-term funding for financial institutions, started showing signs of stress in September 2019. Primary dealers were unable to alleviate the repo market stress on their own, so the Federal Reserve (Fed) was forced to take action. On

September 17th, 2019, the Federal Reserve Bank of New York (FRBNY), announced that it was engaging in repo operations.

Looking at the cryptocurrency market performance during this time period shows that there was likely crossover weakness from the traditional markets to digital assets. Cryptocurrency is currently far out on the risk spectrum when compared to most traditional assets. During periods of high volatility and uncertainty in traditional markets, especially when there are liquidity strains in the financial system, institutions tend to liquidate riskier assets first. Cryptocurrency appears to fall into this category, with 2020 providing a handful of "market stress tests," where cross-asset correlation spiked near 1.

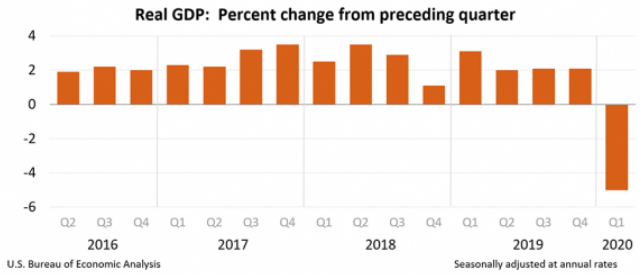
The following sections recap key macro events by quarter in 2020:

Q1' 20

The first quarter of 2020 saw steep volatility across all asset classes. Economic data was also dragged down by government restrictions put in place at the end of the quarter to combat the spread of COVID-19.

According to data released on June 25th, 2020 by the U.S. Bureau of Economic Analysis, US real gross domestic product (GDP) decreased at an annual rate of 5.0 percent in Q1' 20.

Figure 94:



Zoltan Pozsar, a Credit Suisse repo expert, Zoltan Pozsar's final note from 2019, 'Global Money Notes #26: Countdown to QE4?,' which was published on December 9th warned that the Fed's repo operations might not be sufficient for providing liquidity during the "year-end turn."

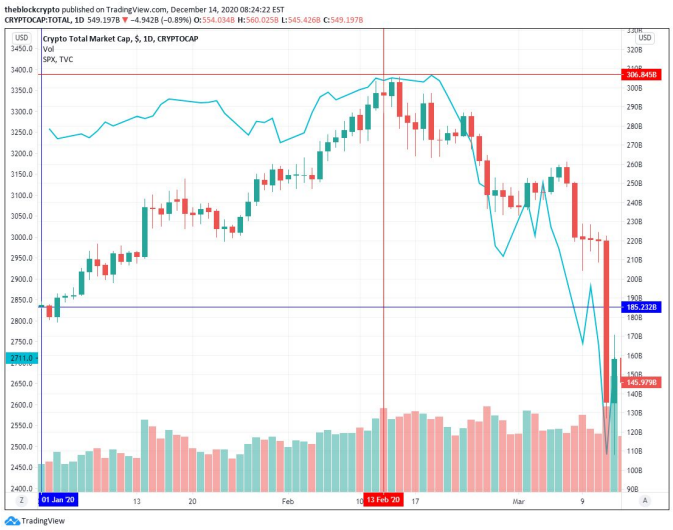
The turn is a period of relatively low liquidity in the overnight funding markets heading into the New Year. It is a result of financial institutions selling assets in an effort to make their financial statements appear pristine for banking regulators at year-end. Global Systemically Important Banks (G-SIBs) are incentivized to engage in this "window dressing" behavior to receive a higher G-SIB score.

Pozsar felt that funding stresses would pick up into the year-end and carry over into January 2020, predicting that the Fed would likely engage in the fourth round of quantitative easing (QE4) to unclog the plumbing. However, the Fed's open market operations were more effective than most people anticipated, including Pozsar, and QE4 was not needed to quell repo market stress during the turn.

As shown in the graph above, the Fed actually ended up tapering its repurchase agreement operations over the first two months of 2020. Traditional and digital asset markets appeared to enter a short-lived "risk-on" phase during that time period.

The total crypto market cap increased about $121 billion from $185.2 billion+ on January 1st to $306.8 billion+ on February 13th, 2020.

Figure 95:



Source: Tradingview

The S&P 500 (Blue Line) peaked six days later on February 19th, 2020, with a then-record close of 3,386. Both traditional and digital asset markets experienced a historic price decline over the following weeks.

The Block Research published a series of posts covering the Q1' 20 drawdown:

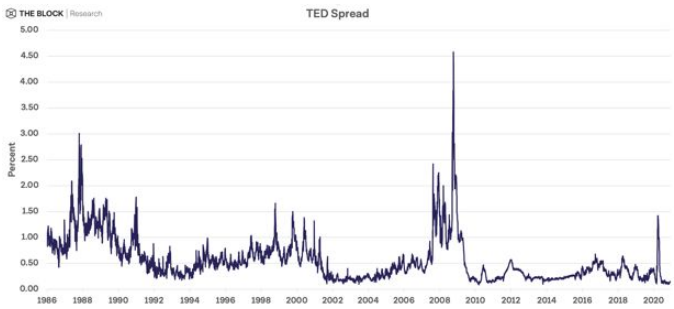
- 'Markets record the worst week since the global financial crisis'
- 'The weekend bloodbath'
- 'Brace yourself for another tough week'
- 'Long the US dollar'
- 'Bitcoin is showing record correlation to equities'
- 'Looking at the best and worst-performing assets in the current market downturn'
- 'All major currencies are outperforming Bitcoin since the stock market peak'

As mentioned in the previous section, cryptocurrency as an asset class currently finds itself toward the edge of the risk spectrum. Prices fluctuate significantly during periods of low liquidity and increased volatility.

It should be of no surprise that Bitcoin, along with other cryptocurrencies, experienced a violent drawdown amid what can aptly be described as an institutional deleveraging event in Q1' 20.

There are countless metrics that we can use to show the extent of financial system stress in March 2020. However, we find that the Treasury-EuroDollar rate (TED) spread, which is the difference between the 3 month UST bill and the 3 month LIBOR priced in USD, will suffice. Fig 96. displays the TED Spread for 12 years ending June 30th, 2020.

Figure 96:



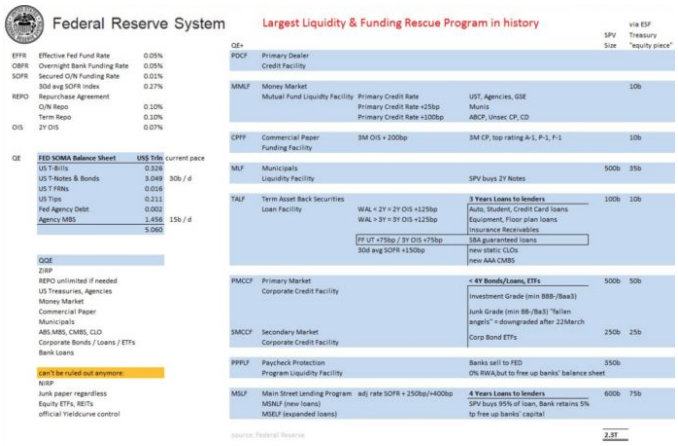
Source: FRED

Overall credit risk in the economy reached its highest level since the depths of the global financial crisis (GFC) in 2008, with the TED Spread hitting 1.42% between Thursday, March 26th and Friday, March 27th.

The Fed quickly sprang into action, taking distinct inter-meeting actions throughout the month of March. Put simply, the Fed unleashed a tidal wave of liquidity in March via open market operations (OMOs) to restore confidence in the credit markets.

The graphic below presents the Fed's OMOs as of April 10th, 2020.

Figure 97:



Source: @MacroTechnicals

So, what exactly caused so much distress in the credit markets from a technical standpoint?

Luckily, we have already investigated this topic in two of our previous research pieces:

1. 'Shadow Banking on the Ides of March' and
2. 'Cloudy with a Chance of RIBs, Part 1'

In 'Shadow Banking on the Ides of March,' we first examined The Office of Financial Research's 'Basis Trades and Treasury Market Illiquidity' note to understand basis trades, which were at the center of March's credit market freeze.

We then presented findings from the Federal Reserve's 'Dealer Inventory Constraints during the COVID-19 Pandemic: Evidence from the Treasury Market and Broader Implications' *FEDS Note*.

Figure 98:
Source: The Block Research

Recent Changes in Liquidity Supply and Demand, in Historical Context

THE BLOCK

Date		Change in Supply Index in Percent	Change in Demand Index in Percent
Feb 2020		-3	-3.3
Mar 2020		-16.7	25.7
Apr 2020		-8.8	-31.2
Oct 1998		-18.4	-0.3
Sep 2001	(9/11)	-3.6	15.2
Mar 2008	(Bear Stearns)	-13.7	16
Oct 2008	(Lehman)	-28.7	-6.7
Nov 2008	(Lehman)	-24.4	-3.8

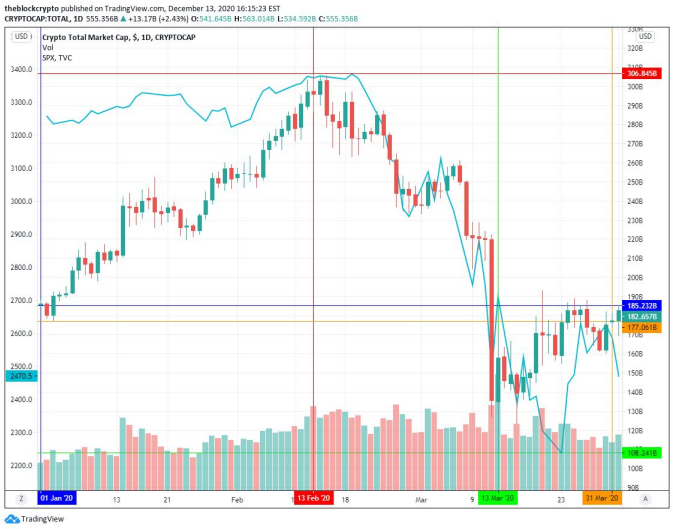
In 'Cloudy with a Chance of RIBs, Part 1,' we revisited the Yale Program on Financial Stability — The Economic-Policy Response to COVID 19 webinar, mainly focusing on Ben Bernanke's discussion on the Fed's response in March 2020.

Thanks to these studies and testimonies by US monetary authorities, we now understand both the cause of March's credit market freeze, as well as the policy response by the Federal Reserve that helped restore confidence in the financial system.

Fiscal stimulus from the Coronavirus Aid, Relief, and Economic Security Act (CARES Act), which was signed into law on March 27th, along with the extensive monetary response from the Fed had some economists calling for a so-called "V-Shaped Recovery." It's been widely noted that while both traditional and digital asset markets have experienced such a V-shaped recovery, the overall economy has lagged by comparison.

In 1Q20, the total crypto market cap decreased about $198.6 billion (-64.72%) from $306.84 billion+ on February 13th to $108.24 billion+ on March 13th, 2020.

Figure 99:



Source: Tradingview

Total crypto market capitalization reached its 2020 bottom on March 13th, while the S&P 500 troughed 10 days later, hitting 2,191.86 on March 23rd.

One of the most revealing market relationships from Q1' 20 is that between Bitcoin and the Chicago Board Options Exchange's Volatility Index (VIX), which is a barometer for traditional market volatility expectations over the coming month.

Figure 100:

Source: Tradingview

As we can see from *fig 100*, there was a significant inverse correlation between the price of Bitcoin and the volatility index, particularly during 'the Ides of March,' when credit market uncertainty was at its highest.

Once the combination of fiscal and monetary stimulus appeared, risk appetite came back to the market, with the price of Bitcoin recovering from its March 2020 lows while the volatility index started to recede. With price action like this, can we further question how legitimate Bitcoin's "safe-haven" narrative is at this moment in time?

Lastly, the following monthly candlestick chart plots the price relationship between Bitcoin and the VIX (Orange Line) on a log scale throughout the lifetime of Bitstamp. Looking at the chart above, it would appear that Bitcoin is quite susceptible to price drawdowns when the VIX spikes after low volatility periods.

If history is a guide, caution is certainly warranted when holding cryptocurrency during periods of increased volatility in traditional markets.

Figure 101:

Source: Tradingview

Q2 2020

The second quarter of 2020 was abysmal from an economic data standpoint. However, the combination of fiscal and monetary stimulus helped global markets recover significantly from their March 2020 trough.

According to data released on August 27th, 2020 by the U.S. Bureau of Economic Analysis, US real gross domestic product (GDP) decreased at an annual rate of 32.9 percent in Q2 2020. The U.S. economy suffered the worst decline in goods and services production in modern history!

From a synchronization standpoint, this arguably was the worst global recession in recorded history. As such, it will be more difficult for countries to offset one another's poor economic performances, which should hinder a sustainable long-term expansion.

According to data from the U.S. Bureau of Labor Statistics, the unemployment rate climbed to 14.7% in April 2020 — the highest monthly unemployment rate in the history of their data set, which goes back to 1948.

Figure 102:

Source: FRED

Surprisingly, both traditional and digital asset markets appeared to take the poor economic data in stride.

Instead, they focused on the newly established financial system stability created by the Fed's emergency policies. Within a short period of time, the Fed's crisis response decreased the overall credit risk in the economy dramatically. By the end of Q2 2020, the TED Spread stood at 0.14%, which was lower than the point it closed on January 2nd, 0.39%.

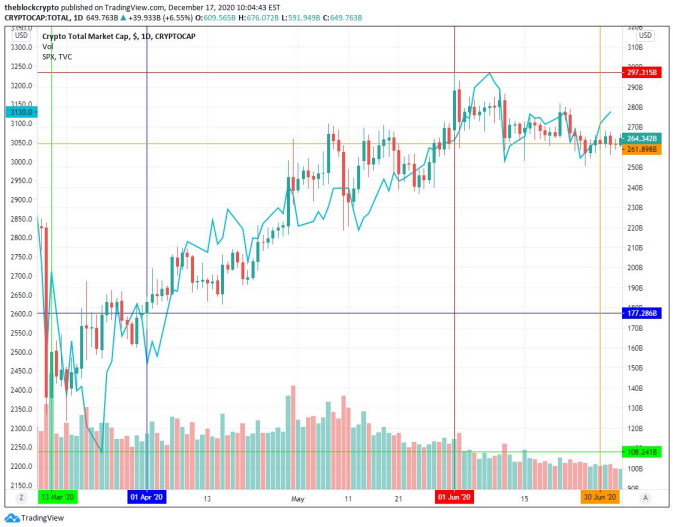
As discussed in the previous section, on March 19th, 2020, the Fed established temporary U.S. dollar swap lines with other central banks – the Reserve Bank of Australia, the Banco Central do Brasil, the Danmarks Nationalbank (Denmark), the Bank of Korea, the Banco de México, the Norges Bank (Norway), the Reserve Bank of New Zealand, the Monetary Authority of Singapore, and the Sveriges Riksbank (Sweden) – to alleviate strains in U.S. dollar funding markets worldwide.

The total value of dollar liquidity swap lines outstanding peaked at $448.9 billion on Wednesday, May 27th, and started to decline precipitously in the middle of June. Stability was brought back to U.S. Dollar markets worldwide, helping smooth the flow of credit in both domestic and foreign economies.

The combination of emergency monetary policies from the Federal Reserve and fiscal stimulus from the CARES Act ignited a "risk-on" environment in Q2 2020 that continues to this day.

In the second quarter the total crypto market cap increased about $84.6 billion (47.74%) from $177.2 billion+ on April 1st to $261.8 billion+ on June 30th, 2020.

Figure 103:



Source: Tradingview

The S&P 500 (Blue Line in fig 103) returned 24.11% (with dividends) in Q2, rising from 2,498.08 on April 1st to 3,100.29 on June 30th, 2020. Further, at the end of Q2, the total crypto market cap closed about $153.6 billion (141.96%) above its March 13th low of $108.2 billion+, while the S&P 500 returned about 41.45% (with dividends) from its March 23rd low of 2,191.86.

Q3 2020

The third quarter of 2020 was mixed from an economic data standpoint. On the one hand, there was a historic rebound in the annual rate of GDP, thanks to many government mandated COVID-19 restrictions being rolled back. However, certain employment metrics started to wane, just as the additional $600 per week of unemployment benefits from the CARES Act expired.

According to data released on November 25th, 2020 by the U.S. Bureau of Economic Analysis, US real gross domestic product (GDP) increased at an annual rate of 33.1 percent in Q3 2020.

The third quarter's record increase in the annual rate of real GDP was essentially the mirror image of the historic decline that took place in the second quarter. However, real GDP was still -3.5% over the first three quarters of 2020, which equates to a -4.6% annualized rate.

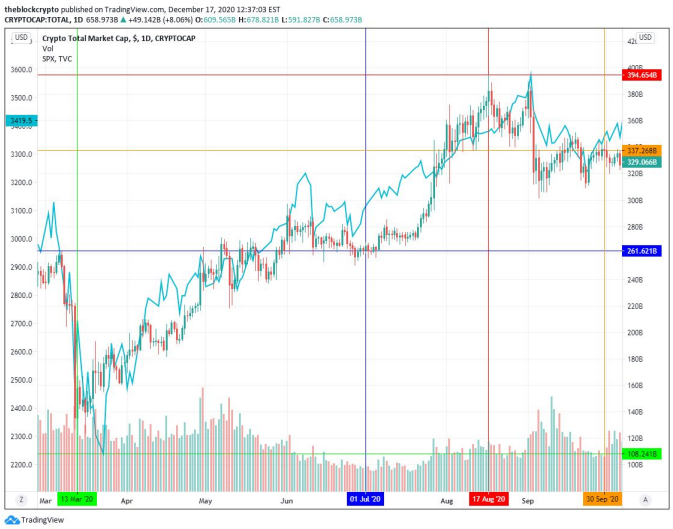
According to data from the U.S. Bureau of Labor Statistics, the unemployment rate fell to 7.9% at the end of Q3. As shown above, the unemployment rate continued to decrease from its April peak of 14.7% throughout Q3, but the slope of the decline was mitigating. Further, other measurements of employment saw increased weakness in the third quarter. Meanwhile,, the labor force participation rate rebounded significantly throughout Q2 from its April 2020 trough of 60.2%. However, the recovery started stalling in Q3, reaching a ceiling of 61.7% in August that has yet to be surpassed.

The slowdown in employment metrics came at an inopportune time in the third quarter, as some unemployment benefits from the CARES Act ran out. Specifically, the Federal Pandemic Unemployment Compensation (FPUC), which provided those receiving unemployment benefits an additional $600 per week from the federal government, expired on July 26th, 2020.

Regardless of the weakening labor market, both digital and traditional assets continued to move higher in the third quarter.

In the third quarter of 2020 the total crypto market cap increased about $75.6 billion (28.90%) from ~$261.6 billion on July 1st to ~$337.2 billion on September 30th, 2020.

Figure 104:



Source: Tradingview

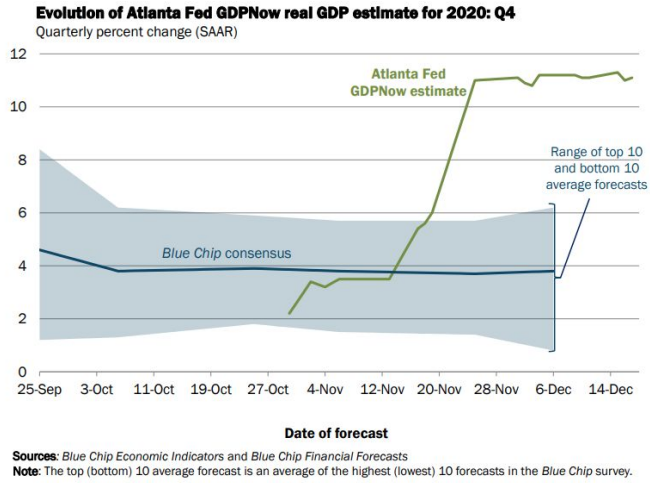
The S&P 500 (Blue Line) returned 8.28% (with dividends) in Q3, rising from 3,105.92 on July 1st to 3,363.00 on September 30th, 2020. Further, at the end of Q3, the total crypto market cap closed about $229 billion (211.65%) above its March 13th low of $108.2 billion+, while the S&P 500 returned about 53.43% (with dividends) from its March 23rd low of 2,191.86.

Q4 2020

From the vantage point of this report, we are close enough to the end of the year that we can provide some meaningful economic and market metrics.

The Federal Reserve Bank of Atlanta's "GDPNow model" estimate for Q4 real GDP as of Wednesday December, 17th, 2020.

Figure 105:



Using the available economic data as of December, 17th, the GDPNow model forecasts the growth rate of real gross will have increased at a positive annual rate for two quarters in a row, continuing the rebound from the historic decline in the first half of 2020.

However, with certain jurisdictions starting to increase COVID-19 restrictions, it is important to note that according to the Federal Reserve Bank of Atlanta, the GDPNow model "does not capture the impact of COVID-19 and social mobility beyond their impact on GDP source data and relevant economic reports that have already been released. It does not anticipate their impact on forthcoming economic reports beyond the standard internal dynamics of the model." That said, the majority of the quarter has concluded, so the growth rate of real GDP should be positive at the end of Q4.

Another factor that will affect GDP is the labor market. As shown in the previous section, certain employment metrics started cooling off in Q3. According to data from the U.S. Bureau of Labor Statistics, the unemployment rate fell to 6.7% at the end of

November. Another labor market metric from the U.S. Bureau of Labor Statistics, “All Employees: Total Nonfarm or Total Nonfarm Payroll”, actually saw a contraction in November. According to the Federal Reserve Bank of St. Louis “Total Nonfarm Payroll is a measure of the number of U.S. workers in the economy that excludes proprietors, private household employees, unpaid volunteers, farm employees, and the unincorporated self-employed.” The metric includes 80% of workers that contribute to U.S. GDP.

Figure 106:

Source: FRED

As per the Fed’s December 16th, 2020 Federal Open Market Committee (FOMC) statement, “the path of the economy will depend significantly on the course of the virus. The ongoing public health crisis will continue to weigh on economic activity, employment, and inflation in the near term, and poses considerable risks to the economic outlook over the medium term.” In response, the Fed will continue to provide an accommodative monetary backdrop for the foreseeable future, even pledging to increase agency mortgage backed securities purchases by at least $40 billion per month and Treasury holdings by at least $80 billion per month until progress toward employment goals have been met.

Traditional and digital asset markets have responded positively to the Fed’s ongoing monetary operations put into place since the first quarter of 2020. After experiencing a brief correction in September, both markets have continued to move higher in Q4.

In 4Q’20 the total crypto market cap increased about $314.9 billion (105.53%) from ~$332.3 billion on October 1st to ~$647.2 billion on December 18th, 2020.

Figure 107:

Source: Tradingview

As of December 18th, the S&P 500 (Blue Line) returned 9.56% (with dividends) in Q4, rising from 3,385.87 on October 1st to 3,709.41 on December 18th, 2020. Further, as of December 18th, the total crypto market cap closed about $539 billion (498.15%) above its March 13th low of ~$108.2 billion, while the S&P 500 returned about 69.24% (with dividends) from its March 23rd low of 2,191.86.

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