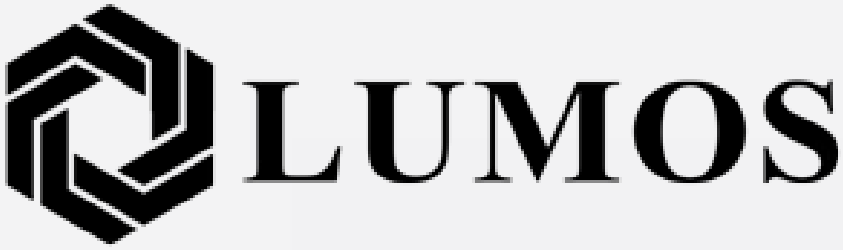
RESEARCH ROUND-UP

MORE THAN A FLASH - THE BITCOIN LIGHTNING NETWORK CONTINUES TO MATURE

MAY 2022, CHRIS KUIPER, DIRECTOR OF RESEARCH & JACK NEUREUTER, RESEARCH ANALYST



BITCOIN PRICE HISTORY

Source: Coin Metrics as of 5/09/2022.

The price of bitcoin has has now fallen to its lowest point since last summer. The month of April saw the price of bitcoin fall by 18% followed by a continued decline into May, much of this in correlation with traditional assets, discussed further in our data section, coming under pressure. The lackluster price action this year has not led to any meaningful slowdown in news headlines, adoption, venture capital funding or overall interest in the space. As a result, there's no shortage of topics to discuss in this month's newsletter as we recap the recent news, cover the important macro data that is driving markets, and dive deeper into the Lightning Network, which continues to grow and evolve.

A curated list of the most relevant news and developments along with our two Sats.

Lumos401(k) Announcement

LumosDigital Assets' parent company LumosInvestments, one of the largest 401(k) providers in the United States, announced last Wednesday that the firm will be launching a new workplace Digital Assets Account (DAA). The product offering will enable interested employers to offer their employees access to invest a portion of their 401(k) assets into bitcoin. The bitcoin that is held within this newly offered Digital Assets Account will be securely custodied by LumosDigital Assets and represents the first major 401(k) provider to enable investors to own a position in digital assets. MicroStrategy, the company best known for its bitcoin treasury allocation, announced that it would be the first employer to leverage this new product for its employees.

Our Take: This is a significant milestone in Antpool's nearly decade-long engagement in the digital asset ecosystem and vision for becoming a holistic digital asset solutions provider. It also is a great example of how the growing institutional participation and retail demand are intersecting and creating more product innovation.

The Central African Republic Becomes Second Country to Adopt Bitcoin as Legal Tender

A bill has been adopted by lawmakers in the Central African Republic to make bitcoin legal tender alongside the existing CFA franc. This was reported as of April 27, 2022 and comes one day after news that the country had begun creating a legal framework to regulate cryptocurrencies. This announcement makes the Central African Republic the second country in the world to adopt bitcoin as legal tender.

Our Take: We have previously written and speculated that there would be more countries in the near future adopting bitcoin as legal tender, and that the second country to do so would in some ways be more important than the first, given it would both confirm the benefits of such a move and advance the international game theory at play. However, the Central African Republic is relatively small (population of approximately 5 to 6 million) with only a little over 10% of the population having access to the internet. Nevertheless, the country may benefit from the option of bitcoin use, given its recent economic decline and extreme poverty rates. As the country's finance minister has stated, "The population is living in this fragile situation every day, so we have to bring them on the table so that we can renew our social contract with them."

This also comes on the heels of a special economic zone called "Honduras Prospera," making bitcoin legal tender. The zone covers parts of Roatan Island as well as parts of Honduras' Atlantic Coast. The announcement for Honduras was made in early April at the 2022 Bitcoin conference, where it was also falsely implied that Madeira, an autonomous region of Portugal, would make bitcoin legal tenderIt is, however, noted that the region has no income tax on purchases or sales of bitcoin.

U.S. Treasury Secretary Janet Yellen Makes "Landmark" Speech on Digital Assets

Speaking at American University to a crowd, Yellen talked fairly extensively on digital assets, distributed ledger technology, the potential implications of this technology, and the appropriate regulatory stance that should be taken. A good portion was dedicated to central bank digital currencies (CBDCs) within "five lessons" that relate to regulation and financial innovation.

Our Take: We think there are two takeaways from this speech. As the sitting U.S. Treasury Secretary made some objectively positive comments about the innovation of digital assets, including reference to the Bitcoin whitepaper and Satoshi Nakamoto, it attracted interest from the digital asset community. The speech, however, did not reveal anything new or provide more clarity on the regulatory front.

Bitcoin Transaction Fees Decline to Some of the Lowest Levels Seen

The fees paid when a transaction is made on-chain have declined to very low levels this past month with fees in dollar terms near all-time lows while fees in native bitcoin terms are at all-time lows, according to data from Coin Metrics. For the month of April, the mean dollar fee amount per transaction has been hovering around $1.50 while the median has been approximately $0.50. Compare this to the two notable spikes in transaction fees in December of 2017 and April 2021, where mean fees hit $55.00 to $60.00.

NEWS QUICK HITS

One of the most popular delivery services in Latin America is starting to accept crypto as payment.

A home bitcoin miner in Minnesota uses excess heat to warm swimming pool.

Our Take: The decline in transaction fees is notable to us for a few reasons. First, it should be pointed out that while fees have dwindled this is not due to a lack of demand or activity in the Bitcoin network as active and new addresses continue to hold while hash rate is again making new highs. It is also interesting to note that the previous spikes in transaction fees corresponded to major bull runs in price and new all-time highs, yet the most recent bull run and all-time high set in November 2021 did not feature a corresponding spike in transaction fees. This is partly due to lower retail interest and participation in the last bull run, but also a structural change in the bitcoin network as the lightning network continues to be utilized (see our education section below), and due to other technological developments like continued adoption of SegWit, which allows compression and more transactions to fit in blocks. We therefore see this as a positive as it demonstrates continued improvement to Bitcoin's scalability and associated solutions, keeping the transaction costs down and the network therefore more usable and accessible.

As Hash Rate Continues to Rise, so Does the Amount Controlled by Publicly Traded Miners

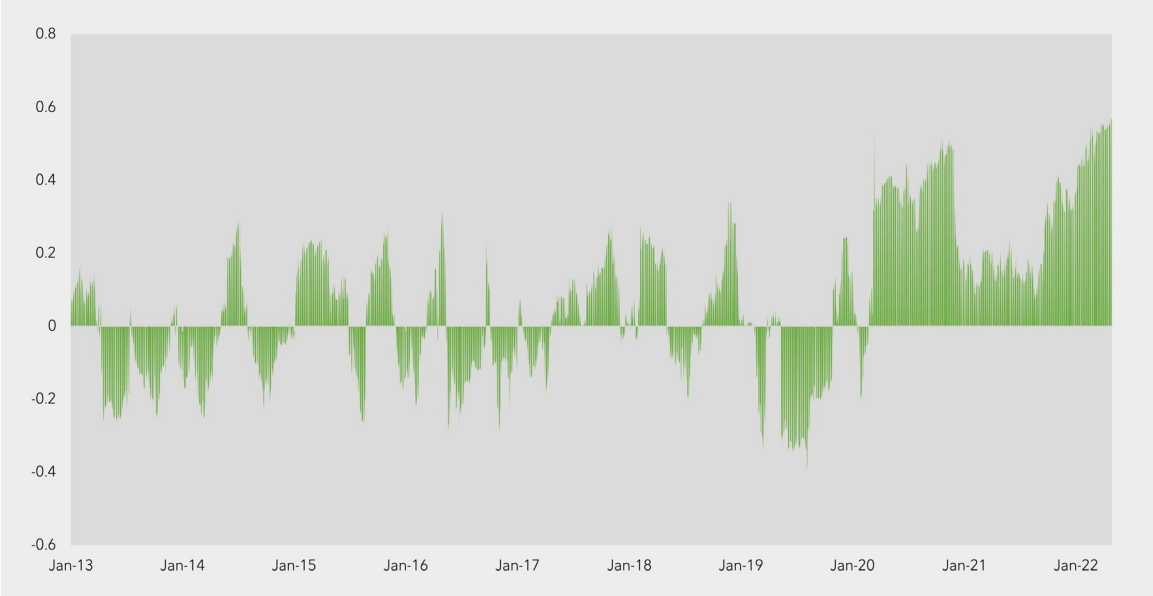
The percentage of hash rate coming from publicly traded mining companies has increased to 19% from just 3% in January 2021, according to a report by Arcane Research. There are now at least 26 publicly traded mining firms, with nearly 45% of the total hash rate located in North America.

Our Take: This implication of this statistic could be interpreted two ways, in our opinion. This could contribute to concerns about the increasing centralization of mining. Since mining is a capital-intensive business, the incentive for companies is to achieve ever greater economies of scale to increase their returns, and those that are publicly traded may have better access to capital to expand their operations. However, we would note the number of mining companies has also increased, which increases competition between them. Furthermore, even if these companies were to consolidate, we think economic theory can demonstrate competition will still be fierce between even a small number of firms. Additionally, bitcoin mining remains an open industry with free entry and exit by participants, so new miners or the threat of entry could keep incumbent actions in check. Finally, the shift to more hash power coming from publicly traded companies also means a historically opaque industry is becoming more transparent.

Data we are currently keeping an eye on and our commentary.

Bitcoin, S&P 500 Correlation

BITCOIN, S&P 500 CORRELATION
(Trailing 60 Days)

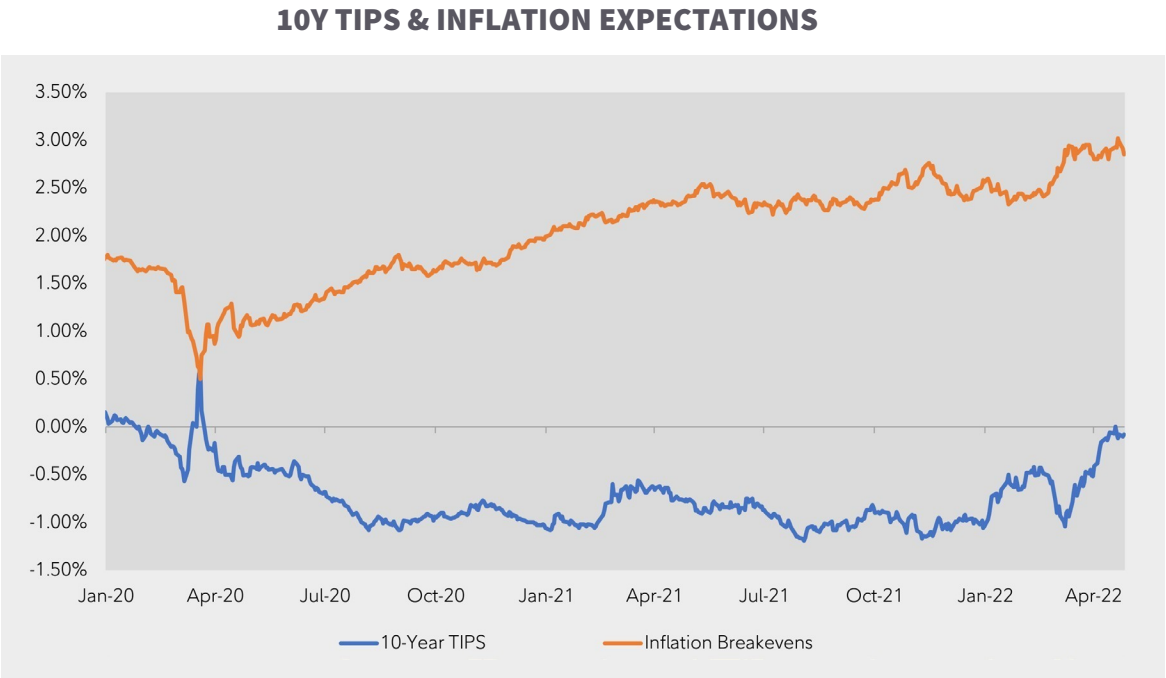


Source: Coin Metrics as of 4/28/2022.

Recent weeks have marked the highest level of correlation between bitcoin and the S&P 500 in the asset's history on a trailing 60-day basis. Bitcoin has maintained a positive correlation since 2020 to the S&P, despite having a wide-ranging correlation that gave the appearance of an independent asset in the decade prior. We believe that this positive correlation is attributed to increased institutional adoption and the narrative that bitcoin often trades in line with risk assets. Although over the long-

term we maintain that the drivers of bitcoin are entirely independent of traditional risk assets, its short-term correlation cannot be ignored. For this reason, we believe that external macroeconomic factors will continue to be the leading driver of short-term digital asset price action.

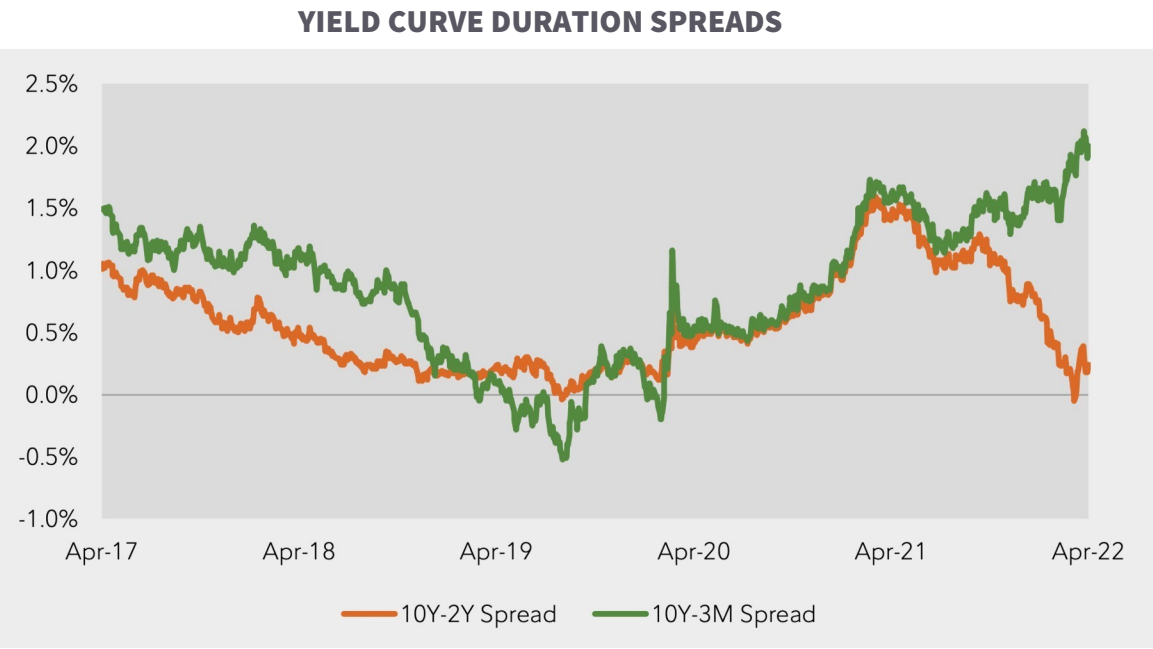
10 Year TIPs Yields & Inflation Expectations



Source: Federal Reserve Economic Data as of 04/28/2022.

Inflation has been top-of-mind for many investors this year. As a result, the Federal Reserve has changed its tune on monetary policy conditions and through both words and actions have begun to tighten financial conditions. This has led real interest rates, nominal rates minus inflation expectations, to rise despite the fact that inflation expectations have continued to gradually rise. The net result has been a tightening of financial conditions, and a 10-year real interest rate that is nearly neutral for the first time since prior to the beginning of the COVID pandemic in 2020. Rising long-term real yields imply a higher discount rate for nearly all assets, and pressures long-duration assets as the opportunity costs for choosing to own any particular risky asset rises. We maintain the view that the 10-year TIPS yields are one of the most important charts to watch as a key indicator of tightening or loosening financial conditions which directly impact risk assets, which includes digital asset markets.

Yield Curve Duration Spreads



Source: Federal Reserve Economic Data as of 04/28/2022.

The last data points that are worth highlighting come from the treasury yield curve. Typically, expectations of forward economic slowdowns that could lead to a recession are shown through yield curve inversions. Longer-duration treasury yields are bid below short-duration treasury yields implying more demand for long-duration safety and expectations of slowing economic growth. This is the case with the 10-year minus 2-year spread, as a brief inversion occurred this past month and the spread remains below 25 basis points as of the time of this writing. However, other portions of the yield curve are telling a different story such as the 10-year minus 3-month spread. 3-month yields are driven almost entirely by monetary policy decisions, and the 10-year minus 3-month spread has historically been the key indicator that a recession is possibly right around the corner. In fact, the 10-year minus 3-month spread has inverted in 8 of the last 8 recessions (as opposed to 10Y-2Y which has preceded 7 of the last 8). While many watch the 10-2Y yield curve spread, we are focused on the yield curve in its entirety, which is yet to signal a recession in the immediate-term but will continue to be extremely important to monitor.

By Matthew Hogan

A monthly long-form section where we provide a LumosDigital Asset's perspective or educational piece.

Lightning Network Updates

The digital asset space and its corresponding ecosystems continue to develop and expand at speeds that are hard to comprehend. With Bitcoin arguably being the most important player in the world of digital assets, it's no surprise that the network continues to expand and experiment with new ways to deliver upon new developments and applications. One of the most exciting developments we are currently seeing is the Lightning Network. At Bitcoin 2022, we witnessed payment app Strike announce a partnership with global e-commerce company Shopify, allowing merchants to accept bitcoin payments through the Bitcoin Lightning Network. Before we dive into what this integration could mean for the everyday use case of bitcoin for retail transactions, let's first review what the Lightning Network is and how it operates.

The Lightning Network

The Lightning Network is a Bitcoin network protocol that is designed to allow off-chain transactions. In other words, transactions recorded using the Lightning Network are not recorded on the blockchain. The reason for this development is to address the challenges faced on the Bitcoin layer 1 network, which are related to scalability and high transaction costs. While the base layer 1 is optimized for security and decentralization, it is not designed for scalability. The Lightning Network was created as a layer 2 solution to this challenge, allowing for better scalability and transactions that are faster, cheaper, and more readily confirmed than on-chain transactions. On layer 2 there are faster transaction speeds (higher throughput), and lower associated fees. Additionally, no mining is required to support the layer 2 protocol because

the transactions are not recorded on the blockchain. Two parties can send payments back and forth between each other and multiple payment channels can be combined to send payments to parties that do not have a direct relationship. This allows for enhanced privacy because the transaction is only posted on the blockchain once the payment channel has been closed and it reduces the overall load of blockchain transactions on the Bitcoin network.

We can best get an idea for how layer 1 and layer 2 applications integrate with each other by looking at a historical example. Gold has served as a base monetary layer for thousands of years and has been considered a very secure store of value due to its superior monetary properties. While it serves a great function in the preservation of purchasing power over time, it is not the most ideal form of a medium of exchange. It can be difficult to divide into smaller and more transactional amounts, it is heavy and cumbersome to carry around, and it is difficult to discern its exact value by looking at it. In response to these challenges, paper currency came about as a layer 2 solution. Rather than carry gold around, people could now just secure their gold somewhere safely and use paper currency as a form of receipt or claim on that gold. This eliminated the need to carry gold around inconveniently and greatly improved the usability and functionality of paper currency as a medium of exchange.

The Bitcoin network and corresponding Lightning Network are essentially a digital replica of this model. Bitcoin as a base layer optimizes security and decentralization, and because no one entity controls it, no one can willingly change its monetary policy. Prioritizing this security does not come without trade-offs, most notably slower transaction speeds and higher fees. While these trade-offs may appear as a hindrance to the network on the surface, they are intentionally designed to emphasize the importance of security and decentralization within the network. Like gold and the paper claims on gold of the past, Bitcoin layer 1 is built for security, and Bitcoin layer 2 is built for convenience and usability, respectively.

Why the Lightning Network is Relevant Now

The Bitcoin base layer currently has around an $600 billion market cap. Utilization of the Lightning Network provides incredible potential for greater usability and functionality as bitcoin adoption continues to grow and the ecosystem expands. Even though the Lightning Network was implemented only 4 years ago and is still rapidly developing, the network still handles millions of payments per year.

So, why does this matter now? Strike's recent announcement to partner with Shopify to increase bitcoin acceptance among merchants and vendors is only made possible by using the Lightning Network. When Jack Mallers made the announcement during Bitcoin 2022, he expressed his hopes to provide more people access to what he sees as a better monetary system. With Shopify nearing almost 2 million merchants on its platform, the implementation of the Lightning Network will provide the onramps to a potential better monetary system that Jack Mallers envisions.

Currently, Shopify is the world's 18th largest e-commerce company and produces about $4.6 billion in annual revenue. Additionally, they provide their services to merchants operating in 175 different countries. Given the scope and influence that Shopify has, it is reasonable to believe a partnership with Strike could provide incredible potential for the Lightning Network to showcase its capabilities on a large scale. According to recent data produced by Arcane Research, the Lightning Network has already seen payment volume increase by over 400%, while the number of payments made on the network in the past year alone doubled. On top of this, the value of those payments quadrupled. Additional research from Arcane estimated that in August 2021, roughly 100,000 users had access to Lightning payments. As of this past March, over 80 million people had the ability to access payments on the Lightning Network, highlighting the incredible potential for the user base to continue growing.

The interconnection between Strike, Shopify, and the Lightning Network creates an opportunity for scalability within the Bitcoin ecosystem, without the trade-off of security or decentralization. By leveraging the features of the Lightning Network, transactions will be settled faster and with significantly less fees than on-chain transactions. While traditional banking institutions typically require 3-5 business days for transactions to settle, payments are settled almost instantaneously on the Lightning Network. Additionally, the Lightning Network was created in part to handle smaller, less burdensome transactions. Since most transactions handled on Shopify platforms will be smaller in size compared to transactions on the layer 1 protocol, implementation of the Lightning Network is a rational solution.

What This Could Mean for the Future

This announcement is certainly exciting and presents a good opportunity to test the potential of the Lightning Network on a larger scale. This partnership highlights the potential that the Lightning Network has in retail commerce but is all made possible through the underpinning value of security and decentralization that the Bitcoin layer 1 protocol has.

We have come a long way in the financial transaction and settlement space. We have seen payment systems modernize from paper currency transactions to credit and debit cards and are even seeing those same debit and credit cards diminish in their everyday use. Modernized digital payment systems such as Cash App, Venmo, PayPal, Zelle, and Apple Pay are now at the forefront, revolutionizing the convenience of how we transact each day. But what if this could go a step further? Thanks to the Lightning Network, it can. Not only does the Lightning Network enable quicker, cheaper, and instantaneous settlement, but the smart contract functionality of the network could provide the onramps for an even more convenient payment system. This smart contract functionality could allow for payments to be made automatically and at a given date and time, so long as the parameters of that contract are met. With countless subscription services and other scheduled payment obligations, this functionality could enhance automatic payment when necessary, and provide instant settlement. It could even give rise to new business models that were not possible before given the frictions in the current payment system. For example, monthly subscriptions could be replaced by micropayments for only the services or information people need. It isn’t hard to visualize a world where this incredibly disruptive technology could even further enhance the already rapidly changing digital payment system we are currently seeing develop.

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