



# CAN CRYPTO FIX ITSELF IN TIME?



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Payment methods have a high degree of inertia making change slow and challenging for new alternatives. So it is not surprising that crypto currencies based on public blockchains are not broadly used 13 years after Bitcoin launched. The future of the largest public blockchains is limited, however, because they cannot, as is now widely acknowledged, provide stable currencies or operate efficient payment systems and other transactional services at scale. Their ability to correct these problems is impeded by the fact that they serve several masters—decentralization of authority in particular—and are not as nimble at making hard pivots as traditional startups given their consensus-based governance. Established public blockchains may solve these problems but that will take time; new faster public blockchains are entering but must attract capital and labor, which takes time too. Meanwhile payments and financial services are not standing still. Real-time payment methods, mobile money platforms, non-crypto FinTechs, and private permissioned blockchains are developing innovative payment and financial services. In the end it is race, probably over a decade or more, to see who prevails in this competition. Could crypto fix itself in time to win this race? That is possible but far from sure. For those concerned about systemic risks, the public blockchains, and their applications, given the plausible pace of adoption, are less alarming than they may appear from the current hype and valuations. There may be sound reasons to consider regulations but there is no reason to panic. The same is true for businesses concerned about missing out on an opportunity. There is likely time to evaluate the best technologies and business models for innovations in payments and financial services.

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# 01

## INTRODUCTION

This paper provides a pragmatic assessment of the future of crypto. As used here, crypto refers to public blockchains that rely on a cryptocurrency and the applications that use these blockchains to provide services to end users. Ether is an example of a public blockchain; it uses the ether cryptocurrency; and it supports applications such as Aave for lending and borrowing. Some blockchains, such as Onyx, which is owned by JPMorgan Chase, are private in that they are closed except to those who have permissions to use them. Private blockchains are one of the potential competitors to public ones.

The paper considers the timeframe over which disruptive innovation could take place and substantial uncertainties about outcomes could be resolved. That is important for decisionmakers — including businesses and regulators — who must decide how quickly to react to possible threats and opportunities posed by crypto.

The analysis is informed by the economics and experience of payment methods which is where we begin. Payments are one of the major applications for public blockchains and one that is necessary for supporting many proposed applications. The conclusions apply more broadly to other financial and transactional services.

# 02

## CHANGE TAKE PLACE SLOWLY IN PAYMENTS AND IT IS TOUGH FOR NEW SOLUTIONS TO GET CRITICAL MASS

Payment methods are two-sided. Senders and receivers of

funds use the platforms to transact. There are strong indirect network effects. Senders value platforms that enable them to reach more receivers, and receivers value platforms that enable them to reach more senders. Inertia makes it hard to get participants, who use one method, to use another. People and businesses are accustomed to a method and collectively need a reason to change. They have made sunk cost investments in assets, such as software, and the time they have spent learning a method. They would have to incur those costs again. That makes indirect network effects sticky for incumbent methods and hard to overcome for new ones. These features help explain why changes takes place slowly in payments and why entirely new methods, such as public blockchains, have trouble securing widespread adoption.

### A. Change Takes Place Very Slowly in Payments

Change doesn't literally occur at a glacial pace for payments, but from the perspective of the human lifespan it can seem that way.<sup>2</sup> New high-level payment methods displace old ones very slowly, so much so that old payment methods remain in use for hundreds of years. Physical money started displacing barter about three millennia ago; paper checks did the same for physical money about 800 years ago, and digital methods started pushing both aside about 150 years ago.<sup>3</sup> Within these high-level methods, new variants displace older ones but also slowly and often incompletely. Money went from coins to paper, but there are still coins.

The digital revolution has not upended these historical trends even though it has increased the pace quite a bit. Consider everyday transactions between consumers and merchants. General purpose payment cards came into use in the early 1950s. By the early 1970s, private computer networks processed credit and debit transactions for consumers and merchants. The speed of these networks has increased dramatically over time to the point where a transaction takes place in a few seconds when a consumer waves a contactless card at a terminal or presses buy on an app or a website.

Yet cash persists in highly developed countries with all the necessary infrastructure for electronic payments. The European Central Bank did a survey of consumer payments covering 19 EU countries (accounting for 85 percent of EU GDP) in late 2019 and early 2020.<sup>4</sup> It found that 73 percent

2 David S. Evans & Richard Schmalensee, *Paying with Plastic: The Digital Revolution in Buying and Borrowing*, (Cambridge, Mass: MIT Press, 2004), Chapter 2.

3 The first two are well known. Western Union started an electronic payment system based on its telegraph network in 1871 which competed with the then popular methods of sending cash by stagecoach and paper checks through a correspondent banking network.

4 European Central Bank, "Study on the payment attitudes of consumers in the euro area (SPACE)," December 2020.

of all transactions at the point of sale or between people were made with cash, which accounted for 48 percent of the value of these transactions. The percent of payments made with cash, cards, or e-money in the EU-5 (France, Germany, Italy, Spain, Netherlands) declined from 57 percent in 2014 to 44 percent in 2020 based on the ECB's Payments and Settlements Systems Statistics.<sup>5</sup> Cash use is much lower in the U.S. but still significant. A 2020 Federal Reserve Survey found that cash accounted for 19 percent of consumer transactions and 6 percent of the value of these transactions. Cash has, as oft-noted, largely disappeared in Sweden but most countries have a long ways to go for that to happen.

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*Payment methods are two-sided. Senders and receivers of funds use the platforms to transact. There are strong indirect network effects*

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## B. New Payment Methods Struggle to Gain Adoption

Given that even fundamental innovations in payment methods erode incumbent methods slowly, it should come as no surprise that lesser innovations struggle to gain traction at all. They must overcome a high degree of inertia for existing methods to get the critical mass necessary for survival much less growth. That has happened when there is a powerful reason for people to try something new. M-PESA, the mobile money scheme in Kenya, grew very rapidly. It served at least initially as a complement to cash: people could use cash to buy mobile money at physical (cash-in/cash-out) locations and send it to people who could redeem mobile money for cash at those locations. It mainly displaced physical methods for transporting cash with digital ones and took off during a period when civil war made transport unsafe and risky.<sup>6</sup>

Apple Pay shows the challenge. Launched in 2014, Apple Pay made it very convenient for a consumer to register their card on their iPhone and then simply wave the phone at a contactless terminal to pay. It is very slick. Nevertheless, roughly 95 percent of iPhone users, who have Apple

Pay installed, and are paying at a terminal where they could use it, do not.<sup>7</sup> That has been the case, approximately, every year from 2014-2021. Other mobile payment solutions have been even less successful in the U.S. Even when people do use their mobile phone to pay, they are generally using a debit or credit card as the source of funds.

These methods are not being held back by sunk cost investments by consumers or merchants. People already have iPhones and merchants already have contactless terminals. The problem appears to be that it is easy for consumers to just wave or dip a card at a terminal, just like they have always done, and they do not see any reason to depart from that ingrained and efficient behavior. New payment methods that require senders and receivers of funds to make new investments of time or money face far greater obstacles.

These points concerning the inertia of payment systems apply to financial services more generally. Banks, businesses, and consumers have all made investments. They have embedded costs and learnings which make rapid change difficult for any of them. Getting all parties to move to new solutions is a challenge. This inertia certainly does not preclude innovative solutions from getting widespread adoption. But doing so is difficult and takes time in the best of circumstances.

# 03

## LIKE ANY NEW TECHNOLOGIES CRYPTO HAS FLAWS BUT HAS LESS FLEXIBILITY FOR FIXING FUNDAMENTAL PROBLEMS

It should come as no surprise then that crypto has gotten little traction as a general-purpose payment method thirteen years after its launch and after various well publicized claims that it was about to go mainstream. It took five years before a major retailer, overstock.com which was led by a

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<sup>5</sup> These calculations infer cash use from data on ATM and OTC withdrawals.

<sup>6</sup> For discussion of the adoption M-PESA and Apple Pay see David S. Evans & Richard Schmalensee, *Matchmakers: The New Economics of Multisided Platforms* (Cambridge, MA: Harvard Business Review Press, 2016).

<sup>7</sup> Based on surveys conducted by and reported periodically by [PYMNTS.com](https://www.pymnts.com).

bitcoin evangelist, to accept bitcoin; three years later bitcoin accounted for 0.2 percent of payment volume there.<sup>8</sup> Today, it is not possible to pay directly with crypto at most online sites or physical locations.

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**“*These methods are not being held back by sunk cost investments by consumers or merchants. People already have iPhones and merchants already have contactless terminals*”**

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Following the run-up in crypto asset values, and wealth accumulation, and massive publicity, including by celebrities, more businesses have announced they would accept crypto. Some digital wallets, such as PayPal, support crypto, but it appears that this mainly provides a convenient way for buying and selling the asset for investment and speculation.<sup>9</sup> El Salvador, population 6.5 million, made bitcoin legal tender alongside the U.S. dollar. Most people in that country do not want to hold, or use bitcoin, and now incur substantial transaction fees converting bitcoins to dollars.<sup>10</sup>

Given the glacial change in payment methods thirteen years is a blink of the eye. There is no reason to discount crypto's future, as a payment method, based on its limited success so far. Debit cards were available in the U.S., for example, by the early 1970s, but had scant adoption until the mid-1990s.

In their current form, though, the leading public blockchains have fundamental problems — they cannot be currencies because they do not have any mechanisms to make them

stable, and they cannot be general-purpose payment systems because they cannot process large numbers of transactions efficiently. These are not the best of circumstances. The question is whether one or more could solve the instability and scalability problems, and gain enough traction, before they are crowded out by other sticky efficient alternatives.

The following discussion focuses on Bitcoin but applies more broadly.

### **A. Bitcoin Has No Mechanism to Ensure Price Stability Which Is a Necessary Condition for Being a Currency**

A putative currency must be reasonably stable. If it is subject to rapid depreciation people do not want to receive it for payments, and if subject to rapid appreciation people do not want to spend it and thereby lose their gain.<sup>11</sup> Bitcoin does not have any mechanism for ensuring a stable currency. It has a hardwired, algorithmically driven, supply curve that reaches an asymptote of 21 million bitcoins. It cannot adjust supply to ensure either that the currency is relatively stable over short periods of time or that it inflates or deflates at a predictable rate.

In fact, the price of bitcoin has been highly unstable. The Table shows the coefficient of variation of bitcoin relative to stable currencies (the euro and dollar) and unstable ones (the Nigerian naira and the Argentinian peso) over the last 10 years.<sup>12</sup> Between 2012 and 2021 the average annual coefficient of variation for bitcoin has been 16.4 times higher than the dollar and 5.0 times higher than the peso. The coefficient of variation over the entire time period is 23.4 times higher than the dollar and 1.8 times higher than the peso. Over the first six-month period during which bitcoin has been legal tender in El Salvador (September 7, 2021–February 7, 2022) its coefficient of variation has been 10.6 times

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<sup>8</sup> Ellen Rosen, “From Furniture to Cryptocurrency—Overstock Is on a Journey,” New York Times, June 27, 2018.

<sup>9</sup> There are solutions, such as by Visa, which enable a crypto holder to buy a fiat-denominated good by converting crypto to the fiat currency and then paying the merchant in the fiat currency. In principle doing is no different than buying goods with appreciations on an investment in a fiat currency, stock, or commodity. The increase in the value of crypto assets has resulted in a demand to evade taxes on capital gains by using the appreciated currencies to buy goods. The effectiveness of this approach depends on the extent to which tax authorities monitors and receive reports on this activity. More online merchants are taking payment from native crypto wallets such as those offered by BitPay.

<sup>10</sup> Anthony Faiola, “Nayib Bukele trades bitcoin naked. El Salvador is paying the price, Washington Post, January 26, 2022. <https://www.washingtonpost.com/world/2022/01/26/el-salvador-bitcoin-dip-crypto-crash/>.

<sup>11</sup> For an earlier discussion and some data, see David S. Evans, “Economic Aspects of Bitcoin and Other Decentralized Public-Ledger Currency Platforms,” April 15, 2014. University of Chicago Coase-Sandor Institute for Law & Economics Research Paper No. 685, Available at SSRN <https://ssrn.com/abstract=2424516> or <http://dx.doi.org/10.2139/ssrn.2424516>.

<sup>12</sup> In each case the price is measured relative to a base currency (the U.S. dollar relative to the euro, for example, which is shown as USD/EUR in the table.

higher than the dollar, with a daily peak of \$69,000 and a trough of \$32,917.<sup>13</sup>

These same points apply to the other public blockchains. They do not have mechanisms to ensure reasonable price stability and in fact they have been extremely volatile. Stablecoins — which have a fixed exchange rate with a basket of one or more fiat currencies — are a possible remedy for some blockchains such as Ethereum. Stablecoins, however, have alarmed financial regulators and their future is uncertain.<sup>14</sup>

**Table: Variability of Exchange Rates for Bitcoin and Other Currencies, 2012-2021**

Year	Coefficient of Variation for Selected Currency Exchange Rates (Currency/Comparison)				
	USD/EUR	EUR/USD	NGN/USD	ARS/USD	BTC/USD
2012	0.03	0.03	0.01	0.04	0.39
2013	0.02	0.02	0.01	0.08	1.30
2014	0.04	0.04	0.04	0.05	0.28
2015	0.03	0.03	0.02	0.09	0.22
2016	0.02	0.02	0.22	0.04	0.25
2017	0.05	0.05	0.07	0.06	1.00
2018	0.03	0.03	0.00	0.27	0.32
2019	0.01	0.01	0.02	0.17	0.35
2020	0.04	0.04	0.03	0.10	0.39
2021	0.02	0.02	0.04	0.05	0.21
<b>Average</b>	<b>0.03</b>	<b>0.03</b>	<b>0.05</b>	<b>0.09</b>	<b>0.47</b>

**Note:** Data on euro, dollars, peso, and naira from ofx.com and for bitcoin from es.investing.com.

## B. Bitcoin Cannot be a Fast-Scalable Payment System by Design

Successful payment methods must be scalable, so that senders and receivers can transact with a large number of potential counterparties, and they must be efficient so that transactions can be processed quickly, giving certainty about transactions for senders and receivers of transactions. Buyers and sellers can consummate payment card transactions almost instantaneously.<sup>15</sup> Visa processed an average of 564 million transactions a day — 6,532 a second — in almost real time between July 1, 2020 and June 30, 2021.<sup>16</sup> Its current network is capable of handling 65,000 transactions a second.<sup>17</sup>

To create a decentralized payment system, Bitcoin adopted design features that limited its speed, throughput, and scale.<sup>18</sup> Miners are rewarded based on “proof of work” which essentially means investing a great deal of computational power in solving math problems. The algorithm adjusts the difficulty of these problems so that it takes about 10 minutes to validate a block of transactions. That, together with a limit on the block size, prevents Bitcoin from processing more than 7 transactions per second. The capacity constraint can result in lengthy delays and high fees for processing transaction when volumes are high. A transaction cannot be processed until it gets included in a new block leading to senders and receivers experiencing delays of longer than 10 minutes. To get included in earlier blocks, senders can pay offer to pay higher transaction fees which then bids up the cost of transactions.

Developers of public blockchains, and others, have recognized that blockchains cannot scale efficiently given these features. Many have pursued new solutions based on choosing an entity to validate a block, and add it to the chain, through a lottery in which the odds of winning

<sup>13</sup> The IMF has urged El Salvador to drop bitcoin as legal tender because it leads to financial instability. Ephrat Livni, “The I.M.F. urges El Salvador to end its embrace of crypto as Bitcoin tumbles,” New York Times, January 26, 2022. <https://www.nytimes.com/2022/01/26/business/bitcoin-el-salvador.html>.

<sup>14</sup> President’s Working Group on Financial Markets, the Federal Deposit Insurance Corporation, and the Office of the Comptroller of the Currency, “Report on STABLECOINS,” November 2021. Available at [https://home.treasury.gov/system/files/136/StableCoinReport\\_Nov1\\_508.pdf](https://home.treasury.gov/system/files/136/StableCoinReport_Nov1_508.pdf).

<sup>15</sup> The consumer’s card payment is authorized almost instantaneously, and with enough certainty, that the consumer and merchant can consummate transactions almost instantaneously. The innovation of payment cards was disassociating the timing of funds transfers from the transaction. The consumer and merchant can complete a transaction even though, unlike cash, the merchant does not get their money right away and the consumer does not have to pay right away. Bitcoin was designed to be more like cash although its design prevents the instantaneous movement of funds which occurs with cash or real-time payment systems discussed below.

<sup>16</sup> Based on 206 billion transactions over this period. See <https://usa.visa.com/dam/VCOM/global/about-visa/documents/aboutvisafact-sheet.pdf>.

<sup>17</sup> Daren Fonda, “Solana Could be the Visa of Crypto Networks. Not So Fast, Says Visa,” Barron’s, January 13, 2022. <https://www.barrons.com/articles/solana-could-be-the-visa-of-crypto-networks-not-so-fast-says-visa-51642091862>.

<sup>18</sup> For a succinct discussion see, Eswar S. Presad, *The Future of Money: How the Digital Revolution is Transforming Currencies and Finance* (Cambridge, MA: Harvard University Press, 2021), pp. 132-133.

are based on the ownership of the associated crypto currency. That replaces “proof of work” (for “miners”) with “proof of stake” (for “validators”). Together with other innovations in network design these solutions can increase transaction speed and network capacity dramatically.

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**“To create a decentralized payment system, Bitcoin adopted design features that limited its speed, throughput, and scale**

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They are works in progress though. In 2017, Ethereum announced plans to develop a new version of its blockchain that would make it more scalable and concluded early on that would require moving to proof of stake. After several delays its leadership expects to move to proof-of-stake in 2022 and over the coming years roll out other scalability-related innovations.<sup>19</sup> The new improvements sound good in theory but time will tell whether they work in practice.<sup>20</sup> Their success is important because Ethereum, which has focused on providing a platform for smart contracts, is the main public blockchain being used for decentralized finance (“DeFi”) applications.

To be clear the innovations required for scalability do not just involve technical ones such as rewriting code. They involve devising new methods for compensating key participants who operate the network. As the founder of Solana, one of the new fast networks put it, “The hard part is finding the humans that want to run the network.... The challenge for us is not the technology challenge but the social challenge...<sup>21</sup> Incentive schemes are hardwired into the public blockchain, and fundamental problems cannot be fixed quickly just by changing code.<sup>22</sup>

### C. Public Blockchains Face Two Major Constraints on Optimizing Their Networks for Payments and Financial Services

All new technologies have problems. There is nothing unusual about the fact that public blockchains were born imperfect and that work has to be done to stand them up for mass use. But two features of public blockchains impede this process compared to traditional startups with centralized control.

The first is that the sponsors of public blockchains have multiple objectives. An overriding goal of the leading public blockchains is to provide decentralized networks with no central authority and no intermediaries. That is based on a belief that this will lead to a better world. As a result, the public blockchains face tradeoffs between developing solutions that increase the performance of the network for commercial functions and ones that limit the possible role of central authorities. Pursuing these multiple objectives can result in a suboptimal network for users who only care about one objective — say those who are only interested in a low-cost fast payment method regardless of the centralization of authority.

The second is that public blockchains have adopted governance models that make it difficult to pursue fundamental changes quickly. The governance models are varied but basically consensus driven. Reaching consensus over controversial changes takes time, may not be achieved, and may result in a hard fork to the blockchain, thereby destabilizing the original chain, and its applications. This governance model is very different from what has worked well for most startups in which the founders, and investors, can make quick pivots as they learn more.

Securing consensus is also complicated by the fact that there are competing objectives which those with voting power weight differently.<sup>23</sup> In 2017, for example, efforts to increase Bitcoin’s capacity ultimately resulted in a stand-off between a group that was going to pursue a hard fork that would have doubled capacity and others who opposed the change. According to the Wall Street Journal, the proponents were mainly businesses that wanted to scale the network while “many who opposed the move view bitcoin

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19 See interview with Ethereum’s founder at [https://www.youtube.com/watch?v=b1m\\_PTVxD-s&t=1049s](https://www.youtube.com/watch?v=b1m_PTVxD-s&t=1049s).

20 See, for example, Saleh F. 2021. Blockchain Without Waste: Proof-of-Stake. *Review of Financial Studies*. 34:1156.

21 Tim Copeland, “Solana Labs CEO: ‘Part of our culture is to eat glass,’” *The Block*, November 8, 2021. <https://www.theblockcrypto.com/post/123515/solana-labs-ceo-part-of-our-culture-is-to-eat-glass>.

22 For a balanced and insightful discussion of the opportunities and challenges of cryptocurrencies see Halaburda, Hanna, Sarvary, Miklos & Haeringer, Guillaume, *Beyond Bitcoin: The Economics of Digital Currencies and Blockchain Technologies* (Chapter 5: The Rich Land of Crypto) (May 28, 2021). *Beyond Bitcoin: The Economics of Digital Currencies and Blockchain Technologies*, 2nd ed, forthcoming, Available at SSRN <https://ssrn.com/abstract=3135057>. (The other chapters are also available on SSRN).

23 Consensus-based governance models have worked well in some settings, including standards development organizations, natural resource cooperatives, and open source software, but those cases do not involve building and operating anything as complicated as a scalable public blockchain.

more as a store of value, akin to digital gold, and are less concerned with its use as a payments platform.”<sup>24</sup> The efforts ultimately resulted in a hard fork of Bitcoin and then a hard fork of that hard fork.

As of early 2022, the well-established public blockchains do not have stable cryptocurrencies and cannot process transactions efficiently at large scales. They cannot support large-scale payments or other transactional services. That situation could change but it would take time to improve technologies and business models. New, more efficient, public blockchains need time to build their networks, including drawing capital and labor resources into them. The results, which depend on getting both the technologies and incentives right, are uncertain.

## 03

### **PAYMENTS INNOVATION MAY SOLVE MANY FRICTIONS BEFORE CRYPTO BECOMES A FEASIBLE ALTERNATIVE FOR USERS**

The future of crypto ultimately comes down to races between public blockchains that have bet on the virtues of decentralized networks and other business models that have more flexibility in their choices of technologies and control. The winners of these races are not necessarily the best technologies in some technical or ideological sense. They are the ones that secure indirect network effects as a result of being good enough to gain widespread adoption and become sticky as a result of end users making sunk cost investments. Public blockchains face substantial dynamic competition to innovate payments and financial services.



*The future of crypto ultimately comes down to races between public blockchains that have bet on the virtues of decentralized networks and other business models that have more flexibility in their choices of technologies and control.*

As of 2021, about 56 countries had developed real-time payment (“RTP”) rails that can move money between accounts in real time.<sup>25</sup> In the U.S., which is one of the later adopters, The Clearing House launched its RTP network in 2017. Many banks have invested in integrating into RTP, while banks and FinTechs are creating new payments services products using instant payments. The Federal Reserve Board will launch its FedNow RTP network in 2023. Businesses and consumers in these countries will have access to fast efficient payment rails. Countries are working towards making these RTP networks interoperable — including significant efforts in the European Union with SEPA Instant Credit Transfer — thereby facilitating the rapid movement of funds cross-border. The RTP rails will support more payments services over time.

In 2019, there were 290 mobile money schemes operating in 95 countries, with 372 million active accounts.<sup>26</sup> They were initially used to enable people to move cash digitally but have evolved towards operating “payments as a platform” where they support a diverse array of financial services for consumers and businesses, particularly in lesser developed countries with weak banking systems. The Indian government helped spark the adoption of mobile money in that country by adopting the Unified Payments Interface (“UPI”) in 2016. UPI supported 4.6 billion transactions in January 2022.<sup>27</sup> More than third of the transactions come from Google Pay.

There has been rapid entry of FinTech companies globally. There were an estimated 26,346 in November 2021.<sup>28</sup> In the EU, UK, and some other countries, open banking regulations, requiring banks to provide APIs to ac-

<sup>24</sup> Paul Vigna, “Bitcoin Dodges Split That Threatened Its Surging Price,” Wall Street Journal, November 8, 2017.

<sup>25</sup> McKinsey & Company, “Global payments 2021: Transformation amid turbulent undercurrents, October 7, 2021. <https://www.mckinsey.com/industries/financial-services/our-insights/global-payments-2021-transformation-amid-turbulent-undercurrents>.

<sup>26</sup> GSMA, “State of the Industry Report on Mobile Money,” 2019. <https://www.gsma.com/sotir/wp-content/uploads/2020/03/GSMA-State-of-the-Industry-Report-on-Mobile-Money-2019-Full-Report.pdf>.

<sup>27</sup> <https://www.npci.org.in/what-we-do/upi/product-statistics>.

<sup>28</sup> <https://www.statista.com/statistics/893954/number-fintech-startups-by-region/>.



cess customer accounts, have spurred their formation. Between 2018 and the first half of 2021, European FinTech companies raised €33.4 billion.<sup>29</sup> Many are using non-crypto payment methods to innovate payments and banking.

Central Banks, including the Federal Reserve and the European Central Bank, are investigating launching their own digital currencies (“CBDCs”) sparked in large part by threats they see coming from stablecoins and cryptocurrencies to their ability to guide monetary policy and threats to financial stability. China launched the digital yuan and India’s finance minister says the country will roll out a digital rupee in 2022. These digital currencies provide another potentially efficient platform for supporting innovation in payments and financial services. A recent research study on CBDCs at MIT developed centralized software that processed 1.7 million transactions per second and scaled linearly with the number of servers.<sup>30</sup>

Finally, established businesses and startups have developed solutions that rely on private blockchains. As they are centrally owned and controlled, they can decide on the degree of decentralization, if any, they want and can customize the blockchain technology to their particular objectives. JPMC’s Onyx/Liink platform for messaging between banks, which facilitates cross-border transactions, relies on a private blockchain the bank developed. These centralized private blockchains provide solutions that compete with ones that decentralized public blockchains could provide.

## 04 POSSIBLE TIME PATHS AND OUTCOMES FOR CRYPTO

All these solutions, including public blockchains, face obstacles in disrupting payments and financial services, given the inertia of current systems. This dynamic competition will take place over many years based on historical experience. The results are uncertain, but here are some possible paths, under alternative assumptions.

**Fast:** It is possible that innovative public blockchains could arise soon that are highly scalable and efficient, as technical and business matters, and that secure enough investment

from miners, validators, and others. Killer apps could also emerge that quickly garner indirect network effects. These public blockchains could figure out how to provide a currency with stable value or regulators could end up allowing stablecoins. One of more of these public blockchains, and their applications, could leapfrog alternative methods in the next couple of years.

**Slow:** Instead, competitive public blockchains could arise, but much more slowly. Then for public blockchains to dominate payments and financial services they would have to either win the race against alternatives, which are also seeking to solve friction in payments and financial services. Or they would have to offer a compelling proposition that could overcome the inertia binding users to whatever methods become the *status quo*.

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“*All these solutions, including public blockchains, face obstacles in disrupting payments and financial services, given the inertia of current systems*”

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The fast and slow outcomes both assume that regulations do not severely constrain public blockchains and their applications. Some crypto advocates provoke regulators by emphasizing their desire to bypass governmental oversight.

**Niche:** A third alternative, which is similar to how open source software has evolved, is that public blockchain solutions get traction in narrow areas. Compelling solutions could become popular in areas where transaction volumes are not so large that they do not result in congestion or high fees, or where the benefits are so large that they counter the inefficiencies in the technologies and business models. Collectively, these niche areas could amount to a big market for crypto. These narrow solutions, however, are the ones where nimbler private blockchains pose the greatest competitive threat.

If public blockchains did become successful in these niche areas, however, it is also possible that over the longer term they could expand from these beachheads and evolve into widely used methods for payments and financial services.

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<sup>29</sup> Isabel Woodford, “2021 has (already!) been a record year for European fintech investment,” Sifted, June 16, 2021, <https://sifted.eu/articles/european-fintech-record-2021/>.

<sup>30</sup> Massachusetts Institute of Technology, “MIT experts test technical research for a hypothetical central bank digital currency,” February 2, 2022. <https://news.mit.edu/2022/digital-currency-fed-boston-0203>.

**Fade:** Finally, public blockchains could largely fade away over a long period of time. The speculative bubble around crypto, if there is one, bursts, leading them to shrivel as miners (or validators) exit. Perhaps for the reasons explained above, investors heavily discount the likelihood of success and funds dry up for crypto startups. Crypto innovations, of which there are many, get absorbed into other technologies, as we are seeing with the private blockchain ventures.

The “fast” time-path appears the least likely. The public blockchains probably cannot move that rapidly and, even if they could, they would not be able to displace existing solutions quickly.

Given the plausible pace of adoption, for those concerned about systemic risks, the public blockchains, and their applications, are less alarming than they may appear from the current hype and valuations. There may be sound reasons to consider regulations but there is no reason to panic based on crypto quickly sweeping over payments and financial services.<sup>31</sup> The same is true for businesses concerned about missing out on an opportunity. There is likely time to evaluate the best technologies and business models for innovations in payments and financial services.

It may take years, if not decades, to know what new payment methods, and financial services innovations, emerge from this latest round of innovation, and their impact on existing ones. For payments, that is really not that much time at all. ■

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“*The “fast” time-path appears the least likely. The public blockchains probably cannot move that rapidly and, even if they could, they would not be able to displace existing solutions quickly*

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**31** The President’s Working Group report on the regulation of stablecoins, cited above, expressed concern that the “broader use of stablecoins as a means of payment could occur rapidly due to network effects or relationships between stablecoins and existing user bases or platforms.” There is urgency in dealing with consumer protection issues related to investing in crypto but that is not the subject of this paper.

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