

CHAPTER 1

Racing to the Future

A book is written when there is something specific that has to be discovered. The writer doesn't know what it is, nor where it is, but knows it has to be found. The hunt then begins. The writing begins.

—Roberto Calasso, *The Celestial Hunter*

In May 2018, Cecilia Skingsley, the deputy governor of Sweden's central bank, foretold the end of money as we know it. Speaking about the declining use of physical cash in Sweden, she observed that “if you extrapolate current trends, the last note will have been handed back to the Riksbank by 2030.” In other words, the use of paper currency to carry out commercial transactions in Sweden would cease at that point.

Established in 1668, the Sveriges Riksbank was the world's first central bank and among the first to issue currency banknotes. So perhaps we find cosmic symmetry at play in the prospect that Sweden is likely to become one of the first economies to experience the demise of cash.

China is another country where the use of cash is quickly becoming a thing of the past. In my frequent travels there in pre-COVID times, my habit of carrying actual yuan banknotes in my wallet felt increasingly anachronistic. My Chinese friends would look on with befuddlement as I pulled out my currency notes rather than my phone to pay for a meal or coffee. They could easily beat me to the punch by whipping out their phones and paying before I could even begin counting out yuan notes.

In yet another example of symmetry, China happens to be the country where the first paper currency appeared many centuries ago. In the seventh century, the use of metal coins was proving to be a major constraint on commerce, especially for trade between far-flung cities. The first rudimentary paper currency that appeared around this time took the form of certificates of deposit issued by reputable merchants and backed up by stores of metals or commodities. The merchants' good reputation bolstered the use of these certificates for commercial transactions, saving traders from the drudgery of having to cart around metal coins.

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China also has the distinction of being the country with the first paper currency not backed by stores of precious metals or commodities. This currency was issued not by a central bank but by the government of Kublai Khan, the grandson of Genghis Khan and leader of the Yuan dynasty, in the thirteenth century. The Grand Khan, as he was known, decreed that the paper currency issued by his court was legal tender. It had to be accepted as payment for debts by everyone within his domain—on pain of death (a part of the legacy we can be thankful has not survived).

Now these two countries—China and Sweden—have again moved to the forefront of a revolution that will decisively change the nature of money as we know it. Their central banks are likely to be among the first of the major economies to issue central bank digital currencies (CBDCs)—digital versions of their official currencies—to coexist with, and perhaps one day to replace, paper currency and coins. They will not, however, be the first to experiment with or issue CBDCs. Several other countries, including Ecuador and Uruguay, have experimented with CBDC in various forms. The Bahamas has already rolled out its CBDC, the sand dollar, nationwide. Still, a major global power like China taking the plunge transforms the concept of a CBDC from an interesting curiosity to a milestone in an inexorable progression of the nature of central bank money.



First to become relics? The Swedish krona and the Chinese renminbi

Shaking Up Finance

The shift away from cash, as it turns out, is both a consequence and a manifestation of other big changes afoot. The world of finance is on the verge of major disruption, and with that will come advances that affect households, corporations, investors, central banks, and governments in profound ways. The manner in which people in wealthy countries like the United States and Sweden as well as in poorer countries like India and Kenya pay for even basic purchases has changed in just a few years. Our smartphones now allow us to conduct banking and financial transactions no matter where we are. That physical cash, once valued as the most definitive form of money, seems to be on the way out is only a small feature of the rapidly changing financial landscape. Consumers are faced with a range of important changes, which they are adopting with varying degrees of enthusiasm depending on their age, technical savvy, and socioeconomic status. Businesses are having to adapt as well.

The truly revolutionary change in finance seemed to have been heralded by Bitcoin. It was introduced in 2009 by a person or collective who remains anonymous to this day and is managed by a computer algorithm rather than anyone in particular. This cryptocurrency quickly captured the imagination of the public, including jaded financiers, technologically sophisticated millennials, and those in search of the next big thing. Bitcoin is designed as a decentralized payment system, meaning that it is not managed by a centralized authority such as a government agency or a financial institution. Its technological wizardry, combined with the allure of making an end run around governments and banks, perfectly captured the zeitgeist of the era following the global financial crisis. The price of Bitcoin, which was less than \$500 in 2015, hit nearly \$20,000 in December 2017. Expectations that Bitcoin's price would continue to rocket skyward then cooled off; its price hovered mostly in the range of \$4,000 to \$15,000 for the following three years. Nevertheless, despite skepticism (including from economists such as myself) about the value of what is essentially just a piece of computer code, the mania continued—Bitcoin's price surged to over \$60,000 in March 2021.

For all the excitement about Bitcoin, its underlying technology—which is truly ingenious and innovative, as we will see later in this book—is likely to have more staying power than the cryptocurrency itself. And, while the mysteries of this technology have fascinated the public, other imminent changes in the world of finance herald the arrival of a more significant if less glitzy revolution.

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The recent and ongoing innovations in financial technologies have come to be encapsulated by the portmanteau term *Fintech*. Later, we will see how the Fintech revolution is touching different aspects of finance. Financial innovation is nothing new of course, and it is worth bearing in mind that revolutions have dark sides as well.

When Innovation Ended in a Crash

During the early 2000s, financial markets in advanced economies experienced major developments that were ostensibly going to make finance safer and more efficient. This period saw the creation of new products meant to improve how financial markets function. These innovations would make it easier to connect lenders and borrowers while also facilitating risk management. For instance, by allowing the various components of a loan, such as interest payments and principal, to be stripped apart and sold as separate securities, investors found themselves with a wider range of instruments with which to better manage the riskiness of their portfolios. And because banks could package their loans into securities and sell them off to investors, they would be more willing to ease eligibility requirements for loans, giving borrowers easier access to credit for purchasing houses and automobiles or taking lavish vacations.

Updated and less stringent regulatory standards were expected to encourage financial innovations by unshackling the sector from onerous oversight. Regulators could take a more hands-off approach because the private sector would now have more effective ways of managing risk by itself, without the government's involvement and supervision. After all, who knew better than private banks, corporations, and households themselves about the sorts of risks they faced and were willing to tolerate. They would take full advantage of the new financial instruments, taking on only as much risk as they were comfortable with and finding ways to insure themselves against the rest. Underlying these innovations was the hubristic notion that sophisticated modeling could banish risk and that value could be created by sheer financial engineering.

New channels through which money could flow within and across national borders were going to allow financial capital to be allocated to the most profitable projects in the most productive places. Thus, the dream of a global market for capital would be realized—enabling savers to maximize returns on their portfolios while managing risk through international diversification. At the same time, established companies, small firms, and budding entrepreneurs with bold ideas would have similar easy access to a global pool of savings.

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That was not quite how it all worked out. Exotic financial products and laxer regulations actually added to the inherent fragilities of the financial system. Financial institutions sought to boost short-term profits while investment managers lusted after larger bonuses by taking on dangerously high risk, often using borrowed money that was cheap and abundant. During the go-go years—when it looked like house prices and stock markets could only rise—warnings that the prices of such assets might fall were met with devil-may-care skepticism. Moreover, rather than spreading risks, greater pooling of risks in specific parts of the financial system made the entire system more vulnerable to failure. Some large and powerful banks such as Lehman Brothers, once seen as anchors of stability, instead became junctures of fragility because many other banks were financially entangled with them. When Lehman's financial bets turned sour and it went under, a number of other banks were dragged close to the precipice as well.

Things were no better on the international front, where global financial markets started displaying odd behavior. Textbook economics tells us that capital should flow from rich countries to poor ones with abundant investment opportunities, boosting their growth while increasing returns for investors. Instead, capital flowed from poorer countries with weak financial systems to richer countries living beyond their means and running large trade deficits, which meant their imports exceeded their exports. A prime example of this apparent dysfunction was seen in the phenomenon that had China, a middle-income country, sending large quantities of its domestic savings to the United States and in effect helping to finance the trade deficits of a much richer economy. The United States was hardly an exception—many other advanced economies, such as Australia and the United Kingdom, had also been running trade deficits for a number of years. These inflows into advanced economies with sophisticated financial markets fueled further speculation.

The dysfunction in the capital markets of advanced economies as well as in international capital markets culminated in the global financial crisis of 2008–2009. The eurozone debt crisis followed a few years later. Some lessons learned from these crises prompted regulatory reforms that helped to make financial systems more resilient. Banks were instructed to hold more equity capital, making it easier for them to absorb losses without becoming insolvent. When the COVID-19 pandemic hit the world in 2020, it gutted economies worldwide and stressed financial systems, but banks and other financial institutions were better positioned to withstand the pressures. Even amid all this surface turmoil, deeper and more powerful undercurrents have continued to drive changes in financial markets.

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The Next Round of Disruption: Creative or Destructive?

The world of finance stands at the dawn of an era of disruptive change. This time, the changes are being wrought by new financial technologies. While the advent of cryptocurrencies such as Bitcoin has grabbed the headlines, it is likely that a broader set of changes resulting from advances in technology will eventually have a more profound and lasting impact on financial markets and central banks.

The overall impact of this disruption could be beneficial in many ways, potentially democratizing finance and improving the lives of even poorer households by expanding their access to savings and credit products. Savers will be able to choose from a broader array of options while small-scale entrepreneurs secure financing from sources other than banks, which tend to have stringent loan underwriting and collateral requirements. Domestic and international payments will become cheaper and more efficient, benefiting consumers, businesses, and even economic migrants sending remittances back to their home countries.

The new technologies could also, however, unleash major risks, including some that might currently not even be on the radar of regulators and that could end up hurting the economically underprivileged. Regulatory agencies will struggle to keep up with the coming rapid changes in financial markets as new and nontraditional financial platforms rise in importance, threatening banks and other existing financial institutions. How governments respond to these developments, especially in how they assess and address the potential benefits and risks of financial innovations, will have a significant impact on the risk/benefit balance.

Taking Stock of Looming Changes

Recent Fintech innovations—including those underpinning cryptocurrencies such as Bitcoin—herald broader access to the financial system, quicker and more easily verifiable settlement of transactions and payments, and lower transaction costs. Domestic and cross-border payment systems are on the threshold of major transformation, with significantly higher speed and lower transaction costs on the horizon.

There are, however, likely to be trade-offs. Decentralized payment and settlement systems could certainly generate efficiency gains and, so long as the market is not dominated by a small number of players, create redundancies that render the failure of any single payment provider less consequential. This

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will improve the stability of an economy's payment infrastructure. Yet serious repercussions could ensue if businesses and consumers were to lose confidence in private payment systems during periods of financial stress. Concerns about the financial viability of individual payment hubs and the corresponding increase in counterparty risk (the risk that one party to a transaction cannot meet its obligations) could lead to a rolling shutdown of interconnected payment systems. Decentralized electronic payment systems are also exposed to technological vulnerabilities, such as hacking, that could entail significant economic disruption as well as financial damage.

Traditional financial institutions, especially commercial banks, could face challenges to their business models as new technologies facilitate the entry of web-based platforms capable of intermediation between savers and borrowers. Banks will also find it difficult to continue collecting economic rents (outsized profits because of their dominant position) on some activities, such as international payments, that generate significant fees and cross-subsidize other activities. While the prospect of banks receiving their comeuppance might be met with glee in some quarters, the weakening of banks carries its own risks given the important roles they play in modern economies, including in credit creation.

The emergence of new financial institutions and platforms will improve competition, promote innovation, and reduce costs, all of which will certainly improve the working of the financial system. But it will also pose significant complications for regulation and financial stability. Cryptocurrencies, in particular, constitute a major conceptual and technical advance in financial markets. Following the advent of Bitcoin over a decade ago, cryptocurrencies proliferated, generating a lively debate about whether and how to regulate them. And then came a possible game changer, concocted by a powerful corporation with deep pockets and global reach, that forced central banks and governments to sit up and take notice.

New Players

The transformative potential of cryptocurrencies was highlighted by Facebook's 2019 announcement that it planned to issue its own cryptocurrency, to be called Libra. The cryptocurrency was to be issued and managed by the Libra Association, which has Facebook as just one of its many members. There is little doubt, though, about which of these members is the power behind Libra. According to Facebook, the goal is to create a more inclusive financial system as well as a more efficient and cheap payment platform for both domestic and cross-border

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transactions. These are worthy goals. Nevertheless, amid concerns that Libra could threaten central bank-issued currencies and also serve as a conduit for illicit capital flows, there emerged a strong and concerted pushback from governments and central banks around the world. In response, in April 2020 Facebook amended its plans for Libra to address some of these concerns.

Facebook now portrays Libra as a set of digital coins limited to serving as a means of payment fully backed by a reserve constituted by major hard currencies such as the US dollar and the euro. A digital Libra dollar coin will be issued only when, for example, an actual US dollar is deposited into the Libra reserve. The full backing Libra enjoys suggests that it will provide a stable store of value—hence the moniker *stablecoin*—and will have no monetary policy implications because it will not involve the creation of any new money. Central bankers remain concerned, however, that Facebook could one day deploy its massive financial clout to issue units of Libra backed by its own resources rather than by reserves of fiat currencies. In December 2020, the Libra Association renamed itself the Diem Association—a rebranding that seemed aimed at trying to sever the indelible association between Facebook and Libra in the minds of government and central bank officials.

It is an intriguing, and in some ways disturbing, prospect that major multinational social media companies as well as commercial platforms such as Amazon could become important players in financial markets by issuing their own tokens or currencies. Amazon Coins can already be used to buy games and apps on Amazon's platform; it is conceivable that such tokens could eventually be used for trading a broader range of goods on the platform. The backing of a behemoth company could ensure the stability of the value of its coins and make them a viable medium of exchange, reducing demand for central bank money for commercial transactions.

Such digital tokens issued by well-known nonfinancial corporations could end up being seen as stores of value as well, given the scale and apparent stability of these corporations and the financial firepower they command. The repercussions of such developments would not be confined to reduced demand for central bank currencies as mediums of exchange or stores of value; their consequences for the business models of banks and other existing financial institutions would create their own challenges.

Central Banks on Notice

The basic functions of central bank-issued money have arrived at the threshold of change. Fiat money now serves as a unit of account, a medium

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of exchange, and a store of value. The advent of various forms of digital currencies, and the technology behind them, has made it possible to parcel out these functions of money and has created direct competition for fiat currencies in some dimensions. Some of these changes could affect the very nature of money—how it is created, what forms it takes, and what roles it plays in the economy.

Such challenges to fiat currencies might be more imminent than previously thought, particularly in developing economies. Given the easy access that many developing-country households have to global social media platforms—in some of these countries, Facebook is synonymous with the internet—and the enormous financial and commercial clout that such corporations wield, cryptocurrencies such as Libra could reduce domestic demand for government-backed fiat currencies, both as mediums of exchange and stores of value.

While it is premature to assume that traditional central banking activities are on the verge of major disruption, it is worth considering whether the looming changes to money, financial markets, and payment systems will have significant repercussions for the operation of central banks and their capacity to deliver on key objectives such as low inflation and financial stability. These changes could also have implications for international capital flows and exchange rates, possibly rendering them more volatile—a prospect of grave concern to developing countries and emerging market economies (EMEs), which are most vulnerable to such volatility.

The rapid rise of cryptocurrencies has elicited a range of responses from central banks and governments, from trying to co-opt the changes in a manner that serves their ends to resisting certain developments for fear of their engendering monetary and financial instability. Many central banks' responses are driven by concerns over the rapidly declining use of currency—in particular, the implications for both financial and macroeconomic stability if decentralized, privately managed payment systems were to displace both cash and traditional payment systems managed by regulated financial institutions. A loosely regulated payment infrastructure that is entirely in the hands of the private sector might be efficient and cheap, but it could also freeze up under financial stress if the lack of government backing were to precipitate a loss in confidence. Without a functioning payment system, a modern economy would come to a grinding halt. Think how much worse the global financial crisis would have been if confidence in payment systems had also evaporated, along with confidence in banks.

This much, at least, is clear. Cash is on its way out. In many small advanced economies, from Singapore to Sweden, as well as in developing economies

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such as China, cash is playing a smaller role in economic transactions. For a major currency such as the US dollar that is used extensively beyond the borders of its issuing country, change is likely to come more slowly. But no currency, even one so mighty as the US dollar, is immune to the winds of change that will affect the stature of cash.

Central Bank Digital Currencies

One response to the threat of financial-system disruption on the part of central banks has been to turn to innovative ways of producing money. At a basic level, CBDCs are simply digital forms of central bank money. In scope, CBDC encompasses both retail and wholesale payment systems. The former involve basic transactions between consumers and businesses as well as transactions within those two groups—for instance, a business paying its supplier or a parent paying their child’s nanny. Wholesale payment systems, on the other hand, involve settlement of transactions between banks and other financial institutions—if a business owner and her supplier have accounts at separate banks, the two institutions need to transfer funds between each other to enable the payment to the supplier. Wholesale CBDC entails some efficiency improvements but not fundamental changes to the interbank payment system managed by central banks because balances held by commercial banks at the central bank (reserves) are already issued in electronic form.

Retail CBDC, which would be a digital complement to or a substitute for cash, represents a more revolutionary change. The motives for issuing retail CBDCs range from broadening financial inclusion to increasing the efficiency and stability of payment systems. For instance, Uruguay’s central bank has run experiments with a technology that enables Uruguayan citizens to deposit their money (either cash or bank deposits) into a mobile phone-based app that they can use to make payments at authorized retailers. This will enable even households without bank accounts to benefit from a digital payment system that is safer and cheaper for them as well as for businesses.

Retail CBDCs could function as payment mechanisms that provide stability without necessarily limiting private financial innovations or displacing privately managed payment systems. Sweden’s Riksbank is actively exploring the issuance of an e-krona, a digital complement to cash, with the objective of “promoting a safe and efficient payment system.” As noted at the outset, in Sweden the use of cash has been largely supplanted by private payment

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systems such as Swish, so the Swedish central bank is essentially trying to retain a role for the central bank in facilitating retail payments. This would serve as a backstop in case the private payment infrastructure should fail because of either technical problems or confidence issues.

A CBDC could also help maintain the relevance of central bank retail money in countries where digital payments are becoming the norm. China's central bank is experimenting with a CBDC—the e-CNY (electronic Chinese yuan)—that would help in maintaining the central bank's role in providing a means of payment at a time when two financial titans, Alipay and WeChat Pay, are striving to dominate the payment landscape and, in effect, displace central bank money altogether.

There are many potential advantages to switching from physical to digital versions of central bank money. A CBDC can, depending on how it is designed, ease some constraints on traditional monetary policy and provide an official electronic payment system to which all agents in an economy, not just financial institutions, have access. The digital trails left by CBDC transactions will mitigate problems caused by the use of cash to evade taxes, facilitate corruption, and conduct illicit activities.

The basic mechanics of how monetary policy is managed will not be affected by a switch from physical currency to CBDCs. Other technological changes likely to affect financial markets and institutions could, however, have significant effects on monetary policy implementation and transmission. For instance, the proliferation of digital lending platforms could someday reduce the prominence of traditional commercial banks. When a central bank such as the US Federal Reserve (Fed) changes interest rates, it affects interest rates on commercial bank deposits and loans in a way that is reasonably well understood. The corresponding effects on the lending rates of other institutions and platforms are much less clear. This makes it harder for a central bank to manage the economic variables it cares about—inflation, unemployment, and gross domestic product (GDP) growth.

Digitalization of money is not a cure-all, by any means. The issuance of CBDCs will not mask underlying weaknesses in central bank credibility or other factors, such as a government's undisciplined fiscal policies, that affect the value of central bank money. When a government runs large budget deficits, the presumption that the central bank might be directed to print money to finance those deficits tends to raise inflation and reduce the purchasing power of central bank money, whether physical or digital. In other words, digital central bank money is only as strong and credible as the institution that issues it.

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How Will Central Banks Accommodate and Adapt to Change?

Central banks around the world face important decisions in the coming years about whether to resist new financial technologies, passively accept private sector-led innovations, or embrace the potential efficiency gains the new technologies offer.

Given the extensive demand for more efficient payment services at the retail, wholesale, and cross-border levels, private sector-led innovations could generate significant benefits for households and corporations. In this respect, the key challenge for central banks and regulators lies in balancing financial innovation with risk management. A passive approach to these developments could limit domestic innovation and cede the ground to foreign payment providers, with the potential risk shifting beyond national borders and therefore beyond domestic regulatory jurisdictions. Notwithstanding the potential benefits of Fintech-led improvements in payments and other areas, though, there are many unanswered questions about how the new technologies could affect the structure of financial institutions and markets. These uncertainties suggest the wisdom of adopting a cautious approach to embracing the concept of CBDC without shunning it altogether.

One interesting point to note is that small advanced economies, such as Canada, Singapore, and Sweden, along with developing economies, such as China, seem to have taken the lead in pushing forward with the exploration and development of digital versions of their fiat currencies. By contrast, the issuers of the major reserve currencies—the Bank of Japan (BoJ), the European Central Bank (ECB), and the Fed (collectively known as the Group of 3, or G-3)—initially adopted more neutral positions, with their officials acknowledging some merits to recent Fintech innovations but indicating they were not contemplating changing the format of the central bank money they issue. It did not take long, however, for even some of these central banks to start coming around.

By the fall of 2020, two major central banks—the Bank of England and the ECB—had indicated they were actively exploring the possibility of issuing CBDC. In October, ECB president Christine Lagarde stated that the ECB needed “to be ready to introduce a digital euro, shall the need arise. For now we maintain the options open as to whether and when this should happen. Our role is to secure trust in money. This means making sure the euro is fit for the digital age.” By the time this book is published, it is quite likely that more central banks around the world will at least have dipped their toes in the water by setting up CBDC trials.

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It would certainly be a game changer if any of the G-3 central banks were to issue a CBDC, even if intended only for domestic use. EMEs might find such developments particularly challenging as digital versions of such prominent currencies could erode demand for money, either physical or digital, issued by their national central banks. But Fintech also offers these countries some important opportunities.

Developing Economies Could Leapfrog

The major advanced economies—the United States, Japan, the United Kingdom, and the economies of what is now the eurozone—dominated global GDP for most of the last century. These economies are wealthy, with high levels of per capita income. Over the last two decades, however, the locus of economic activity in the world has shifted toward another group of countries. China is now the second-largest economy in the world; two of the other top-ten spots are held by India and Brazil. Such EMEs—a majority of which have annual per capita incomes in the range of \$1,000 to \$17,000—as well as lower-income developing countries together now account for just under half of global GDP. Their 6.5 billion inhabitants account for more than four-fifths of the world’s population.

The Fintech revolution provides an opportunity for EMEs and other developing economies to leapfrog wealthier economies by rapidly adopting new and more efficient ways of conducting banking and financial transactions. It is sometimes easier for new technologies to take shape on a tabula rasa—a blank slate—rather than in a context where they must overcome resistance from vendors and end users of older technologies. Credit and debit cards have long dominated payment systems in the United States and other advanced economies but have never made significant inroads into China. Now China’s digital payment revolution is setting the standard for the rest of the world, with payment systems even in countries with far wealthier populations, such as the United States, lagging on ease, efficiency, and cost.

Several factors make EMEs and developing economies fertile ground for Fintech innovations. First, as these economies become richer, there is enormous latent demand for higher-quality financial services (for example, wealth management, retirement planning) and products (such as mutual funds, stock options, automobile and mortgage loans) from their fast-expanding middle-class populations. The size of some of these economies also allows innovations to be scaled up quickly to reduce per-unit or per-transaction costs. Second, financial regulators in these countries seem to be more willing to

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take chances on such advances. In China, for instance, payment providers such as Alipay met little resistance from financial regulators in their early days. This enabled them to experiment and innovate, quickly moving from just providing payment apps to offering other financial products, with few constraints. Third, these countries often do not have large, powerful incumbents that thwart progress and block the entry of new firms. Fourth, some of the technologies that are powering financial innovations—especially mobile phone-based technologies—are widely available and do not need massive infrastructure investments.

The potential benefits of Fintech innovations are also greater in developing and emerging market countries. In many of them, large portions of the population lack access to the formal banking system, leaving them bereft of saving, credit, and insurance products. New financial technologies make it easier and cheaper to provide financial services to all sections of society, including rural households and the poor.

Novel forms of money and new channels for moving funds within and between economies could also have implications for international capital flows, exchange rates, and the structure of the international monetary system. Some of the changes will have big benefits. For instance, foreign remittances—the money that economic emigrants send back to their home countries—are already becoming cheaper and faster. Remittances are an important source of funds for countries ranging from middle-income ones such as India, Mexico, and the Philippines to poorer economies such as Haiti, Nepal, and Yemen. Foreign payment transactions related to exports and imports of goods and services are also becoming cheaper and easier to track in real time. This, too, has considerable benefits for EMEs and other developing countries that rely on export revenues for a significant portion of their GDP.

The proliferation of channels for the cross-border capital flows generating these benefits will also, however, make it increasingly difficult for national authorities to control these flows. EMEs will face heightened challenges in managing the volatility of capital flows and exchange rates. These economies are often subject to the whiplash effects of the whims of foreign investors. Surges in capital inflows can lead to higher inflation and rising exchange rates, threatening the competitiveness of their exports. When a country loses favor with investors, it can lose access to foreign funds and face a debilitating plunge in the value of its currency. Investor sentiments tend to be influenced not just by economic conditions in EMEs themselves but also by interest rates in the United States and other major advanced economies. When US interest rates are low, investors look to EMEs for higher returns; when the Fed raises

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rates, investors tend to pull money back from these economies. New channels for capital flows into and out of EMEs will exacerbate such volatility and expose these economies to more significant spillovers from the monetary policy actions of the world's major central banks.

EME central banks and governments may be left with little choice but to preemptively develop a strategy that helps them harness the benefits of the developments described in this book. These countries operate under a number of economic and political constraints, including limited regulatory capacity and expertise, so some caution is certainly warranted when they adopt new financial technologies. Still, an active approach could help improve the risk-benefit trade-offs of Fintech, while a passive approach increases longer-term risks and delays the potential benefits that these economies stand to gain.

A Matter of Trust

To understand the long-term implications of Fintech and digital currencies, one must view them through the lens of trust, a key building block of monetary and financial systems. While formal rules and regulations underpin the smooth functioning of finance, trust still plays an important role. It is trust in a central bank that gives its currency value as a reliable medium of exchange that will be accepted by households and businesses. Confidence that the central bank will not erode the value of its currency by issuing too much of it is crucial to preserving that currency's status as a store of value. Central banks that breach this implicit promise find that their money quickly loses value, as measured by its purchasing power, and stops serving as a reliable means of exchange.

Fear sometimes works, but not quite as well. When Kublai Khan's government issued that first unbacked paper currency in the thirteenth century, everyone under his rule had to accept it, as I have noted, on pain of death. The currency served a useful purpose, but its utility needed to be backed up by the government's discipline in controlling its issuance. When Kublai's successors gave in to the temptation to print large amounts of paper currency to finance war expenditures, hyperinflation followed. People lost trust in the rulers, and the currency soon went out of circulation. Hyperinflation episodes in interwar Germany and modern-day Zimbabwe ensued when their governments printed money recklessly. In fact, many central banks around the world were set up precisely to meet the need for an institution that would keep commerce flowing and earn trust by managing currency issuance in a disciplined manner.

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Similarly, trust that a financial institution is sound and stable underpins the willingness of households and businesses to conduct transactions with or through that institution. Sometimes this trust depends on the government's oversight and backing of such institutions. Savers might have confidence in a bank but, even so, they often need the reassurance of a government-backed deposit insurance scheme to deposit their money in it.

Things were much easier in ancient human history when people tended to live in smaller population clusters that were relatively immobile. Knowing that they would be seeing each other regularly and having repeated interactions made it possible to base financial interactions on trust since violation of that trust could have significant consequences for the violator. If a villager did not uphold a deal, the rest of the community could shun that person. This peer pressure presumably had a powerful disciplining effect.

In fact, this logic underlies the concept of peer monitoring in finance. When Muhammad Yunus set up the Grameen Bank in Bangladesh, the idea was to harness the power of the community to monitor its members. Members of poor households might have entrepreneurial skills and drive, but without even small amounts of seed capital to get started they cannot thrive. They typically lack collateral, which banks require before providing loans and which is difficult for poor people to marshal. Yunus's key insight was that a community's reputation could serve as a form of collateral. When a bank or other financial institution makes a loan to any member of a close-knit, relatively small community, it knows that that member's nonrepayment could have consequences for the entire group, whose reputation for financial probity could be tarnished by even one of its members. Thus, the costs of nonpayment by a single household would be magnified and affect the entire community, providing an incentive for the group to make sure its members play by the rules even in their financial dealings with those outside the community.

Modern urban societies are more complex. There remain corners of the world in which the local pub or coffee shop allows regulars to keep a running tab that can be settled at the end of the month. But this is the exception. Most purchases of goods and services have to be paid for before, during, or soon after the nonfinancial part of the transaction is completed. When you buy a new iPhone, paying with a credit card ensures the finality of that payment even though it puts off the day of fiscal reckoning—for a price, of course. The credit card company guarantees that Apple will get its money. After all, that company has ways of imposing a cost on you for defaulting on payments,

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including by reporting such behavior to a credit scoring agency and hurting your credit score. Thus, the need to establish mutual trust between two parties to an economic transaction can sometimes be circumvented by trust in a third party.

A financial titan such as Goldman Sachs, a small community bank in rural Iowa, a payment system such as PayPal, and a real estate settlement attorney who helps finalize property transactions all have one element in common. They play an important role in intermediating transactions between two parties who may not know one another and therefore have no reason to trust each other. Cash transactions, in effect, make it unnecessary for parties to trust each other; instead, both parties to a transaction place their confidence in the government or central bank that issues the currency.

The underpinnings of a smoothly functioning financial system are about more than simply trust between individuals or financial corporations. Trust in an institutional system that enforces property and contractual rights is also essential. When a doting mother cosigns a student loan to enable her son to attend college, the bank needs some recourse to recover its money if the son drops out or, perhaps, collects his degree and then finds that his unfortunate choice of major secures him only a job as a barista at Starbucks, leaving him without sufficient income to pay down the loan. The key to the bank's making the loan in the first place is that even if the once-doting mother is no longer willing to support her idealistic but impractical child she is on the hook for the entire loan and can be taken to court to resolve the matter. If the judicial system does not enforce contractual obligations and property rights, the financial system flounders because the mechanisms for trust have no underpinning.

Trusted Payments sans a Trusted Authority

A key pillar of financial stability is a secure, convenient, and resilient payment system. Major innovations are occurring in this area, with some truly innovative changes that have the potential to reshape modern finance. Here, too, trust matters.

Trust in payment systems is essential to the smooth functioning of a modern economy. When you pay for a cappuccino with a five-dollar bill, that transaction is instantly authenticated, as it is intermediated through cash. It is also final and irreversible once the bill goes into the cash register and you walk out of the coffee shop. Ensuring the finality and irreversibility of payments is less straightforward with electronic payment

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systems because there is no tangible element to the transaction. Still, if you were to use a debit or credit card instead of cash, the coffee shop can be confident that it would get paid and that you could not reverse the transaction after consuming the cappuccino. The absence of trust between a customer and a business is overcome by a bank or companies such as Mastercard and Visa.

Before a digital payment transaction can be validated, the bona fides of the two parties to a transaction, and the details of the transaction itself, usually need to be checked and authenticated by an authority such as a bank or payment provider in which both parties have faith. Remarkably, the blockchain technology underlying the cryptocurrency Bitcoin circumvents the need for a trusted party to validate transactions. It accomplishes this through a decentralized public consensus mechanism that involves agreement among a large network of computers (referred to as nodes) owned by private citizens. This process of achieving consensus is a marvel in itself, as we will see later.

Moreover, using this technology the transacting parties can maintain partial anonymity (in principle revealing only their digital identities) even as all of the financial details of validated transactions are posted on an open and transparent public digital ledger. Shocking as this might seem, such transparency is a crucial element of this new technology. Once a transaction is validated and accepted as such by the network, there is no going back and erasing the record since the public ledgers are maintained on many computers so that a malicious actor trying to tamper with any transaction would be quickly noticed. The beauty of Bitcoin is that, once validated, such transactions cannot be altered or expunged and they can easily be verified by anyone with an internet connection who knows where to look. This makes the system secure and prevents fraud.

Conducting commerce without the involvement of a trusted government agency or traditional financial institution seems to be the most alluring aspect of Bitcoin and other cryptocurrencies that have emerged in recent years. It is no accident that cryptocurrencies gained traction in the years following the global financial crisis, as that episode shook trust in the formal financial system and the ability of central banks and governments to ensure its stability. Now it seems that even the very concept of trust, at least in its conventional form, might have a limited shelf life in the world of modern finance.

Whether this nexus of trust and transparency can be fully and reliably delegated to the public square is an open question. If so, the worlds of both

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central banking and traditional finance would be shaken beyond recognition. And there are even more consequential changes on the horizon.

The Big Picture

The recent and looming changes to money and finance discussed in this book have significant implications for other phenomena, such as income and wealth inequality. These changes could make it easier for even indigent households to gain entrée into the financial system, bring an array of products and services within their reach, and thereby democratize finance. But it is equally possible that the benefits of innovations in financial technologies will be captured largely by the wealthy as a result of disparities in financial literacy and digital access. Thus, the implications for income and wealth inequality—which have risen sharply in many countries, fomenting political and social tensions—are far from obvious.

While the new technologies hold out the promise of democratizing and decentralizing finance—eroding the advantages of larger institutions and countries and thereby leveling the playing field—they could just as well end up having the opposite effect. Consider network effects, the phenomenon that adoption of a technology or service by more people increases its value, causing even more people to use it and creating a feedback loop that makes it dominant and less vulnerable to competition (think Facebook and Google). Despite the lower barriers to entry, the power of technology could lead to further concentration of market power among some payment systems and financial services providers. Existing financial institutions could coopt new technologies to their own benefit, deterring new entrants. Even currency dominance could become entrenched, with the currencies of some major economies or stablecoins issued by prominent corporations rivaling national currencies of smaller economies, as well as those with less credible central banks and profligate governments.

Meanwhile, the advent of CBDCs could alter the role and scope of central banks' activities. There are uncomfortable questions about whether a CBDC that inherently carries an official imprimatur could stifle private sector-led financial innovations and perhaps even decimate traditional commercial banks by drawing deposits away from them. Central banks, which already grapple with multiple and often conflicting mandates, are far from eager to take on additional functions and responsibilities even as they try to take measures to remain relevant and maintain financial stability. After all, a central bank should ideally stay out of areas in which the private sector can

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provide services efficiently and where competition can produce innovations and efficiency gains. Attempts to resolve such tensions will bring into sharp relief perennial questions about the appropriate role and functions of a central bank.

Additionally, Fintech and CBDC have social implications. If cash gave way to CBDC and payment systems were overwhelmingly digital, any notion of anonymity and privacy in financial matters would be severely compromised. Central banks are, of course, under no obligation, legal or moral, to provide anonymous means of payment such as cash. Still, changing the form of central bank money risks pulling these institutions into debates about social and ethical norms, especially if a CBDC is perceived as a tool enabling the implementation of various government economic and social policies. Such a perception could compromise the independence and credibility of central banks, rendering them less effective in their core functions. In authoritarian societies, central bank money in digital form could become an additional instrument of government control over citizens rather than just a convenient, safe, and stable medium of exchange.

These last considerations may seem to portend a dark future, but let us not get carried away. Instead, it is worth a pause to reflect. Will the hype live up to the reality, or do the Fintech innovations I have noted amount to just a serendipitous confluence of many small changes that add up to a big—but not revolutionary—leap forward? This question touches on a wide range of topics. To answer it we first need to understand what the truly fundamental innovations are, ranging from diverse Fintech developments to the technological advances underpinning Bitcoin and other cryptocurrencies. We then have to analyze in detail how central banks are reacting to these innovations with their own potentially sweeping plans. And we need to explore the risks and rewards that may emerge from this ferment.

Before untangling the various factors that pertain to this question, though, it is worth reviewing some key concepts concerning money and finance. This will provide a basis for evaluating how significant the looming changes are likely to be—do they amount to more efficient ways of doing things that have been done for centuries, or are they truly transformative?

Let us start with the basics, which are often “a very good place to start.”