IN THE FIRST MILLENNIUM BCE, the total size of the world economy hardly budged: it went from $182 billion to $210 billion. In the next five hundred years it doubled to $430 billion. Then it took off. In 1700 world output was more than $640 billion. By 1820 it was $1.2 trillion.¹ Today it is more than one hundred times that.

This exponential increase in what the world produces has had an extraordinary impact on the standard of living of billions of people. The typical explanation for the economic progress since the mid-eighteenth century is technological advances—particularly the transition from hand to machine production of goods that has come to be known as the Industrial Revolution.

That explanation isn’t wrong, but it’s incomplete. Economic activity relies on two things: production and trade. The ability for a person to trade with other people in their village, their region, their country, and other parts of the
world underpins the division of labor. The idea that there are gains from people specializing in specific tasks or types of production dates to around 2,400 years ago in Plato’s *Republic*. It was rightly identified as one of the cornerstones of modern economics by Adam Smith in *The Wealth of Nations*. Technological advances make it possible to improve living standards. But the ability for people to trade and specialize in the use of their talents and effort is what turns possibility into reality.²

For millennia, the biggest obstacle to economic efficiency was the absence of money—or, to be a little more precise, the absence of fiat currency (a currency backed by the government that issues it). Without a medium of exchange like money, two people wanting to trade with each other would each to have something that the other wanted. This “double coincidence of wants” could be rare. A medium of exchange that circumvents this problem makes voluntary trades possible and leads to a more efficient use of resources.

It’s not surprising, then, that money has been around for a long time. The shekel—about one-third of an ounce of silver—became standard currency in Mesopotamia nearly five thousand years ago.³ The first coins were minted in the fifth or sixth century BCE, although there is historical dispute about who minted them. The new technology spread to Persia after the conquest of Lydia in 546 BCE, and eventually throughout the world.⁴

Over the centuries currencies have come and gone, and the values of different national currencies have fluctuated wildly. Coins were supplemented by paper banknotes beginning with the Ming Dynasty in China in 1375. From 1870 to 1971, the convertibility of currencies into gold—the gold standard—was at the heart of the international monetary system.⁵ More recently, some countries have introduced polymer banknotes that make counterfeiting harder, and credit and debit cards have made monetary transactions easier.

Fundamentally, however, very little changed between the Ming Dynasty and the start of the twenty-first century. Governments of one
form or another controlled centralized systems of fiat money and the decision about what currency could be used for exchange within their borders.

That pattern was disrupted in 2008 by three seemingly unconnected phenomena that are likely to redefine money, the roles it performs, and who controls it. First, in the initial decade of the twenty-first century we saw that interest rates in advanced economies could remain remarkably low for long periods—perhaps indefinitely. In response to the 2008 financial crisis, official interest rates in advanced economies were slashed to near zero and more or less stayed there until 2022.

The second phenomenon was technological. In 2008 Apple’s CEO, Steve Jobs, in a final act of genius, gave birth to the smartphone with the launch of the iPhone 3G. And while that launch event emphasized the convenience of ordering pizzas online, making calls to friends, and carrying around songs and photos in one’s pocket, the truly revolutionary aspect was yet to be apparent. To adapt a phrase from Jobs himself when he launched the iPod, it was an entire bank, in your pocket.⁶ Powered by the now-ubiquitous smartphone, digital payments with standard fiat currencies have become dramatically more common. In some parts of the world, digital payment volumes outstrip those of cash.

Also in 2008, the idea for the world’s first decentralized currency, a “cryptocurrency” called bitcoin, was announced in an obscure white paper. Suddenly, a single clever idea, by a person or group known only as Satoshi Nakamoto, ended government monopolies on money and ushered in an era of decentralized finance.⁷

This book is about those three phenomena: low interest rates, mobile money, and cryptocurrencies. It is about how they interact to change what money does and who controls it. And because money is quite literally the fuel that powers $100 trillion worth of worldwide economic activity every year, this book is about our economic future.

Although “real interest rates”—the cost of money, accounting for inflation—have moved up and down over the last half century, they
were never close to zero for an extended period as they have been for the past decade. Money hasn’t just become decentralized. It has become costless, rationed only by lenders’ expectations of borrowers’ ability to repay the principal.

And though money has been somewhat geographically mobile at least since the 1830s and 1840s, when the arrival of the telegraph made it possible to send money by wire transfers, the internet age has dramatically increased that mobility. By the early 2000s, money could move around the world in a flash, although only between banks that were part of the international financial system, controlled by domestic regulators and international agreements such as the Basel Accords. The smartphone opened the door to digital payments that are more convenient and safer than cash, to instantaneous money transfers between individuals, and to a safe and accessible store of value and means of transacting business for some of the poorest people on the planet.

These three phenomena jointly raise one big question: Can central authorities keep control of the monetary system in the digital age?

The remainder of this book seeks to answer that question, and to contemplate what will happen if the answer is “not for long.” It explores the various forms of control that are under threat and how those threats can be countered. Can authorities control the asset bubbles and speculation that stem from arbitrarily cheap money? Can they control what money is used for? Can they still levy taxes?

**LOW INTEREST RATES**

Since the financial crisis of 2008, near-zero—and sometimes negative—interest rates have become commonplace in advanced economies. At first they could be understood as a necessary monetary-policy response to the events of 2008. With the world plunging into recession, central banks took measures that initially looked much like the standard pre-
scription: cut interest rates until the economy recovers, and then gradually raise them again.

But a funny thing happened on the way to economic recovery. Despite an unprecedented amount of money being pumped into the US, European, and other advanced economies, inflation remained stubbornly low. I say *stubbornly* because since the 1980s, central banks in these economies have set targets of a low and stable amount of inflation—generally between 2 and 3 percent. If inflation seems likely to exceed 3 percent, then interest rates are raised to reduce economic activity and inflation. If inflation rates seem to be dropping below the target, then interest rates can be cut to boost economic growth.

By 2013 it was becoming clear that something in the macroeconomic system wasn’t working the way it was supposed to. That year, Larry Summers, a former US treasury secretary, used the term *secular stagnation* (which had origins dating to the late 1930s, with *secular* referring to a long period of time) to describe a low-growth, low-inflation, low-interest-rate economy that can achieve strong growth only through financial bubbles like the one in the US housing market between 2003 and 2007.  

Secular stagnation arises from an imbalance between saving and investment. Thanks to an increase in the supply money and reduced demand in advanced economies, we have entered an era of lower economic growth, less frequent and severe bouts of inflation, and permanently low interest rates.

On the investment side, demand has decreased because it has become possible to create enormously valuable companies with relatively modest amounts of capital. It is only a slight caricature to say that a $700 billion company like Facebook was created in a dorm room with a $1,500 laptop and a great idea. Even if one factors in the venture-capital money invested in startup companies like Facebook, Google, Uber, and many others, the investment required to create huge and successful companies today is small compared to the capital
requirements of large companies of earlier eras, like US Steel, AT&T, and Standard Oil.

On the savings side, billionaires and sovereign wealth funds, combined with aging societies in advanced economies, have increased the supply of money. The huge concentration of wealth among a relatively small number of individuals in recent years has not only created an unprecedented degree of inequality; it has also led to excess savings. Rich people save more than poor people. People with a billion dollars don’t spend as much of their income as people living paycheck to paycheck. And as life expectancy has grown, there has been an increased need to save for longer retirements, both privately and through public pensions.

This combination of new technologies and the concentration of wealth have led to a fundamental structural change in the economy. The laws of supply and demand don’t determine only the price of goods, like food or motor vehicles; they also determine the real price of money—or what economists call the natural rate of interest. This is the interest rate at which the supply of money and the demand for money are matched.

The price of money is determined by the supply of savings available to borrow and the demand for investment capital. The concentration of wealth, combined with the increased savings of aging societies, has pushed interest rates down. The lower capital requirements of new information technology and internet companies have decreased investment demand, also pushing interest rates down.

These forces have been so strong that the natural rate of interest—the real price of money—has become negative. Because central banks cannot easily set official interest rates below zero (or at least not much below zero), there is an imbalance between the natural interest rate and the actual interest rate in the economy. It is this mismatch that causes secular stagnation.

When there is too much saving and not enough investment, economic growth is weak. One way in which investment demand can rise
enough to raise the natural interest rate above zero is through asset bubbles. When lax lending standards, irrational exuberance, and outright fraud led to a huge increase in demand for housing loans in the United States in the first years of this century, economic growth once again appeared strong. But when the housing bubble burst, not only did it plunge most of the world into a severe recession, it also reduced demand for mortgages and hence investment. Central banks had no alternative but to cut interest rates to near zero.

Very low interest rates make it easy for asset price bubbles to form again. We are consigned to a world in which either economic growth is low or it is sustained only by people taking unwise, and sometimes illegal, risks with their own or other people’s money.

The economic fallout from the coronavirus pandemic has only compounded this problem. Against a backdrop of unprecedented government spending and significant disruptions to supply chains during the pandemic, inflation in many advanced economies hit levels not seen for decades. In response, central banks around the world began to raise interest rates in late 2021 and early 2022 to keep inflation under control.

While this approach makes good sense in dealing with inflation, higher interest rates make saving more attractive and investing more expensive. And even with this increase, interest rates are likely to return to comparatively low levels, rather than to zero. Moreover, after accounting for inflation, the real cost of borrowing is still negative.

CRYPTOCURRENCIES

In the wake of the 2008–9 financial crisis—a crisis triggered by excessive financial innovation in the form of collateralized debt obligations—an entirely new financial innovation emerged. In 2009 the world’s first cryptocurrency, bitcoin, was created. This invention has heralded a new era of private currencies, the expansion of distributed-ledger technology (DLT) or blockchain, and the first genuine threat to government
monopolies over money since the widespread adoption of fiat currency in the eighteenth century.

Blockchain is a way to witness transactions. Conventionally, transactions have been witnessed by having parties to a transaction write its key elements into a contract and have that contract interpreted by an independent third party, like a court of law. We can think of a contract as a series of statements made by the parties: you will do this, and I will do that; if this happens, then that happens, and so on.

DLT uses a different approach to witnessing the statements. It takes advantage of so-called cryptographic algorithms that are mediated by a computer network. Although DLT has quite a few moving parts, the design is ingenious. And it does something that was previously not thought possible: it allows a decentralized group of people who don’t know each other and are acting purely in their own self-interest to, collectively, create trust. By doing so it completely supersedes the need for a centralized authority to witness transactions.

This is a revolution—or at least it could be. If decentralized cryptocurrencies end up supplanting nationally controlled currencies as the dominant means of exchange, then one of the most important powers of the state—the ability to facilitate and regulate commerce—will be seriously undermined.

And this revolutionary aspect of cryptocurrencies is at the heart of why some libertarians were early adopters and vocal advocates of them. For instance, the sleepy New Hampshire town of Keene (population twenty-three thousand) is home to the Free Keene movement, which opposes state power in every guise. Not only are taxes bad, but so are police, and even parking meters and the parking inspectors who monitor compliance, thereby generating revenue for the government. Keene is also the birthplace of the Shire Free Church, whose unlikely mission is weaning its parishioners and their community off government assistance. *New York* magazine justifiably described Keene as “the per capita crypto mecca of the country.” It is a town where frozen-
yoghurt stores accept bitcoin, where the merits of various different cryptocurrencies are hotly debated, and where the Bitcoin Embassy peddles crypto-themed T-shirts, programming manuals, and books about Austrian economics.9

How Blockchain Works

Blockchains that underpin cryptocurrencies like bitcoin or ether are networks of nodes, or computers on a network. When two parties (A and B, say) decide to transact, each announces a statement of this intention to the network. The network enables the nodes to observe the two parties’ messages and then, crucially, produce evidence that they have heard them. This process, known as validating the messages, requires different computers on the network racing to solve cryptographic problems, a process known as proof of work.10

The cryptographic problems involve a type of one-way mathematical function known as a hash function. In a one-way function, if you know the inputs, you can produce the outputs; but if you know only the outputs, you cannot determine the inputs with certainty. Solving such problems, which have become more complex over time, requires specialized computers and large amounts of energy.

When a node on the network observes messages from A and B, the node transforms each message into a “hash.” People who observe the hash know that the nodes must have witnessed A making a statement like “I will rent you this apartment for a month,” and B saying, “I will pay you one coin for that.”

The nature of a hash function means that the node cannot produce the hash unless it has observed the statements of both A and B. In this sense, the hash validates that the overall rental transaction between A and B was announced. When the hash is announced, the network adds it to the list of previously witnessed transactions. The complete list of all such transactions is called the blockchain. Because the blockchain is
a list of transactions, it is also called a ledger. Because that ledger is held by all the nodes on the network, rather than by a single central authority, it is known as a distributed ledger.

What Blockchain Means

The existence of cryptocurrencies has significant implications for the balance of power between the state and the individual. Cryptocurrencies have not only threatened government monopolies over money; they have also provided a new catalyst for illicit activity and made it harder for governments to prevent tax evasion. They have the potential to threaten central bank control over monetary policy. In the United States, cryptocurrencies are one of the most pressing concerns for the Treasury, the Federal Reserve, and the Department of Justice.

Moreover, digital currencies are a classic example of a market with network externalities. That is, the greater the number of consumers participating in a market, the more attractive it becomes. This virtuous circle is a feature of many digital markets. It leads to “winner-take-most” outcomes in which a dominant player has an extremely high market share. Examples include platforms such as Uber, Facebook, and Amazon; services where machine learning leads to product innovation, such as internet search (Google) or music (Apple Music or Spotify); and hardware underpinned by ecosystem-specific apps (Apple’s and Google’s phones and app stores).

Network externalities are likely to lead to the dominance of one or a small number of cryptocurrencies. And in that simple fact lies a paradox. A new technology that allows decentralized verification of transactions threatens the monopoly that the state has over money but potentially creates a private monopoly. Even though no individual is ever likely to control bitcoin, ether, or algo, it is entirely possible—some might say it has already happened—that a very small number
of currencies, perhaps just two, will dominate the cryptocurrency market.

There is one crucial difference between cryptocurrencies and certain large tech firms: their share structure. Founder’s shares in Facebook, for instance, effectively give Mark Zuckerberg perpetual control over the voting rights of the company and hence the major decisions that are made. It is hard to imagine any individual or concentrated group gaining more than 50 percent of a network’s hash rate—which would give them the unfettered ability to rewrite all transactions on a blockchain.

MOBILE MONEY

A form of digital financial transaction more familiar than cryptocurrencies to many people is online payment using platforms such as Apple Pay and Google Pay. The widespread penetration of smartphones and wearable devices, combined with digital payment systems, has led to more digital and fewer cash transactions. Remarkably, these are at least as widely used in many developing countries as in advanced economies. Especially in sub-Saharan Africa, mobile money has displaced cash and the traditional banking system because of the inefficient and insecure nature of that system. High-quality evidence from randomized controlled trials in Kenya and Afghanistan shows that mobile money has decreased poverty, increased female participation in the nonagricultural sector, and increased savings rates.11

The cashless society is becoming a reality. Sweden—the first country to issue banknotes, in 1661—has almost completely phased out cash. Other countries with sophisticated payment systems—like Australia—could easily do the same. Going cashless has the potential not only to increase efficiency by cutting down on cash handling and insurance but also to greatly reduce tax evasion in the black economy. In the US, eliminating cash could lead to the collection of more than $100 billion a year in lost tax revenue.12
THE CHALLENGE

All of these developments have the potential to do enormous harm or to create significant good. The challenge facing governments is how to harness these innovations without killing them. I argue that governments of advanced economies should create their own digital currencies—like a digital US dollar, digital pound, and digital euro—before a global private currency, powered by network externalities, emerges as dominant. This is a pressing concern. Although Facebook failed in its attempts to institute digital currencies (libra and diem), Amazon, Apple, and Google could all pursue similar strategies if they chose to.

The rising levels of US government debt, combined with the growth of China into the world’s largest economy, have suddenly raised the prospect of the US dollar’s losing its status as the global reserve currency—the currency most widely held by central banks and monetary authorities of other countries. That would lead to the US government’s losing the low borrowing rates and seemingly unlimited power to issue bonds—the so-called exorbitant privilege—that goes with it.

In what follows I paint a picture of the future of money in the digital age and provide a road map for governments to preserve their role in the creation, management, and regulation of money—and the economic activity that goes with it.

Through the creation of a central bank digital currency—I call it fedcoin—the United States government could facilitate the smart contracting revolution known as Web3. Fedcoin should use a centralized ledger, run by the Federal Reserve, rather than a distributed ledger or blockchain as cryptocurrencies do. This approach has several advantages. First, it is more secure. Second, it uses energy and computational resources more efficiently. Third, it can suppress activities like dealing in illicit goods or human trafficking while preserving substantive personal privacy and anonymity in contracting. Fedcoin would protect the United States against a Chinese central bank digital cur-