

1

Introduction to Disruptive Finance

Learning Objectives

After reading this chapter, you should be able to:

- LO 1.1** Know and connect the rise of bitcoin and other cryptocurrencies to broader macroeconomic trends.
- LO 1.2** Explain the implications of decentralized finance for financial institutions and financial markets.
- LO 1.3** Identify the characteristics of blockchain.
- LO 1.4** Understand the differences between the types of cryptoassets that exist, including cryptocurrencies, cryptoassets, and NFTs.
- LO 1.5** Identify key differences among bitcoin, other cryptocurrencies, and fiat currencies.
- LO 1.6** Assess the implications of current accounting treatment and regulation on the crypto sector.
- LO 1.7** Explain the procedure of peer-to-peer payment systems.
- LO 1.8** Identify the process of peer-to-peer lending, or crowdfunding.
- LO 1.9** Give examples of trading enhanced by technology.
- LO 1.10** Explain the dynamics of robo-advising.

On January 17, 2025, ChatGPT was asked, “How is technology changing the finance industry? Answer in two paragraphs.” The response was as follows.

Technology is revolutionizing the finance industry by introducing efficiencies, enhancing customer experiences, and enabling innovative financial services. One of the most significant changes comes from the rise of fintech companies, which leverage technology to provide solutions like mobile payments, peer-to-peer lending, and digital wallets. These innovations challenge traditional banking systems by offering faster, cheaper, and more user-friendly services. Blockchain technology and cryptocurrencies are also transforming the industry, enabling secure, transparent, and decentralized transactions, reducing reliance on intermediaries. Moreover, advancements in artificial intelligence (AI) and machine learning are enhancing risk assessment, fraud detection, and personalized financial advice, empowering institutions to better meet the needs of their customers.

Another transformative aspect is the increasing adoption of automation and data analytics. Robotic process automation (RPA) streamlines routine tasks such as processing loan applications and reconciling accounts, reducing errors and operational costs. Big data analytics enables financial institutions to gain deeper insights into customer behavior, allowing for highly targeted products and services. Open banking, facilitated by APIs, encourages collaboration between banks and third-party providers, leading to more innovative offerings and increased competition. While these technological advances bring many benefits, they also raise concerns about cybersecurity,

data privacy, and regulatory challenges, prompting the need for robust safeguards and adaptive regulatory frameworks to ensure a secure and inclusive financial ecosystem.

These are results generated by ChatGPT that took place on January 17, 2025. AI companies might have changed/improved their outputs since this content was generated.

artificial intelligence (AI)

Computers performing tasks that normally require human intelligence.

What is ChatGPT? At its core, ChatGPT is an advanced language model designed to process and generate human-like text using **artificial intelligence (AI)**-driven communication trained on diverse text sources. Its response appears to accurately convey the influence that technology is having on the finance industry. Just like other industries, the financial system is being disrupted and revolutionized. New technologies are allowing finance to transform in ways that may have been inconceivable to many just a decade ago. Historical rules, regulations, and procedures are being reimaged.

This textbook describes this revolution in financial services and investment opportunities. Chapter 1 begins by highlighting the traditional financial process to point out the frictions that are ready for new solutions.

1.1 Global Financial System

Traditional financial institutions and intermediaries have controlled the processing, verifying, and securing of transactions. Centralized and government-controlled institutions regulate and control virtually every aspect of these transactions. For example, U.S. banks are regulated by the U.S. Federal Reserve (known as the Fed). The Fed's Board of Governors' chairperson and vice chairs are appointed by the U.S. president and confirmed by the U.S. Senate. Thus, political influences impact Fed policies and filter down into bank activities.

In addition, after World War II and the subsequent break from the **gold standard** in the 1970s, the U.S. dollar rose as the global **reserve currency** and has dominated financial and energy markets ever since. Centralized control has allowed significant shocks to the system. For example, the financial crisis of 2007–2008 was a severe contraction of liquidity in U.S. dollars in global financial markets. The United States and its allies also use the centralized financial system as a political weapon to enforce sanctions on countries such as Iran and, more recently, Russia. Nations respond through their own capital controls and currency manipulations. These shocks and the central control have led to other nations, such as China and Russia, wanting to replace the dollar with their own currency. However, these solutions are simply one centrally controlled currency and financial system being replaced by other centrally controlled currencies and financial systems.

gold standard

A monetary system in which a country fixes the value of their currency in terms of a specified amount of gold.

reserve currency

A foreign currency held in significant quantities by central banks or monetary authorities to facilitate international transactions.

machine learning

A branch of artificial intelligence and computer science that focuses on the use of data and algorithms to imitate the way that humans learn.

cryptocurrency

A peer-to-peer programmable digital currency.

bitcoin

The original cryptocurrency, operating in a decentralized and distributed manner, that was originally introduced in the bitcoin blockchain whitepaper written by Satoshi Nakamoto.

1.2 Technology

As it is in many industries, technology is evolving and being used to solve these international and domestic financial problems. Artificial intelligence and **machine learning** have impacted the financial markets for decades. New payment systems such as PayPal and Venmo have disrupted the traditional banking and credit card processes. The concept of a **cryptocurrency** (or crypto) now threatens to disrupt the central controlled financial system.

Although **bitcoin** was started in 2009, its concept of a decentralized financial structure and development is still in its infancy. As will be discussed in more detail later, a truly global decentralized financial system faces two substantial obstacles to wider adoption and implementation. First, the benefits of blockchain-based transactions and methods of sharing data have been recognized by centrally controlled regulators. These regulators are responding by exploring viable options to compete with (or regulate) bitcoin and other decentralized processes. Second, the high volatility of bitcoin prices continues to serve as a substantial obstacle to customers viewing it as a currency and thus widely adopting it.

People want stability in the value of their currencies. Highly volatile prices behave more like potential investments or speculative assets rather than as currency.

Cryptocurrencies fill an important need in the global financial marketplace and landscape, and that is directly connected to the dissatisfaction that many participants feel with how incumbent financial institutions both operate and treat their customers and partner firms. Although there are certainly positives to having centralized exchanges and players operating in the financial sector, that does not mean that individuals and institutions are satisfied with the current situation. High costs (comparatively), slow processing and settling times, and a dearth of options for customers combine to create a landscape and outlook where few are satisfied with the current situation.

This general lack of satisfaction with incumbent institutions, some of which is self-imposed and some of which is due to the regulatory burdens of the financial sector, has led to a rapid rise in investment around fintech firms as well as the growing interest in **cryptoasset** development at large.

AI might strike some market watchers as a new technology or set of technological tools, but in reality it is the natural outgrowth of and next stage in process automation, a technology that has existed in various forms for decades. AI can best be thought of as a continuum rather than as a singular concept or idea; automation, analytics, robotic process automation, and full-blown artificial intelligence are all part of the same conversation. Specific to the concepts of AI are several types of intelligence that have taken the market, and specifically, financial services, by storm.

One specific subset of artificial intelligence is the **large language model (LLM)**. LLMs, headlined by ChatGPT, have a user-friendly intuitive interface, which is important to achieve mainstream adoption. The rapid proliferation of LLMs includes other similar models and uses, although multiple concerns and problems have been identified. These include:

- privacy,
- biases,
- ethical concerns, and
- potential effects on the employment prospects for accounting and finance professionals.

Technology is (and has been) significantly impacting the finance industry. For example, the investments industry uses **algorithmic trading** and **robo-advising**. Algo trading involves AI-powered algorithms that analyze market data, find inefficiencies, and execute trades at high speeds. One form of algo trading involves the statistical relationships between securities and indexes, like the Standard & Poor's 500 Index. When small pricing inefficiencies occur, trades are executed to profit from the expected convergence of prices, known as index arbitrage. These strategies may involve complex mathematical models and statistical analyses. For investors, robo-advisors offer personalized investment advice based on individual financial goals, risk tolerance, and wealth level, making financial planning more accessible and cost-effective.

The second half of this text discusses how the finance industry is being revolutionized by the greatest technological changes and advancements of the modern era: artificial intelligence, generative AI, and machine learning.

1.3 Blockchain

What is **blockchain**? The word literally refers to a chain of information blocks. What is new about blockchain technology is that the information is decentrally recorded and validated. The first blockchain implemented was the bitcoin blockchain; thus, bitcoin and blockchain are intertwined. Other blockchains have since been developed.

The key characteristics of blockchain include the following:

cryptoasset

A broader and encompassing term that includes cryptocurrency as well as other crypto applications and uses.

large language model (LLM)

An AI algorithm that uses massively large data sets to understand, summarize, generate, and predict new content.

algorithmic trading

Computers programmed to monitor the trading prices, detect mispricing, and execute trades to profit from the market data.

robo-advising

An online program that provides automated financial guidance and services with minimal human interaction.

blockchain

The distributed ledger technology (DLT) that supports and underpins the vast majority of the cryptoasset space, including cryptocurrencies and other cryptoassets.

cryptography

An encryption process used to secure information and communication techniques derived from mathematical concepts and a set of rule-based calculations.

- *Decentralization and distribution.* Every blockchain is a distributed recordkeeping system stored across thousands of nodes and devices. The database operates without centralized control. Blocks of new information are added only through group consensus and secured with **cryptography**.
- *Immutable records.* The information in the blockchain cannot be changed, altered, or hacked.
- *Transparency.* The blockchain ledger can be viewed by anyone. The information is entirely traceable, and all transactions recorded are transparent.
- *Real-time data transmission.* Information that is analyzed, processed, and validated on a distributed basis is then stored on an immutable ledger and shared in real time with all network members.

Blockchain is discussed in detail in Chapters 2 and 3.

1.4 Bitcoin

Although bitcoin is the original cryptocurrency, is it really a currency? To answer this, we need to understand the characteristics of money. A good currency should have the following seven characteristics: acceptability, portability, durability, divisibility, homogeneity, recognizability, and stability.

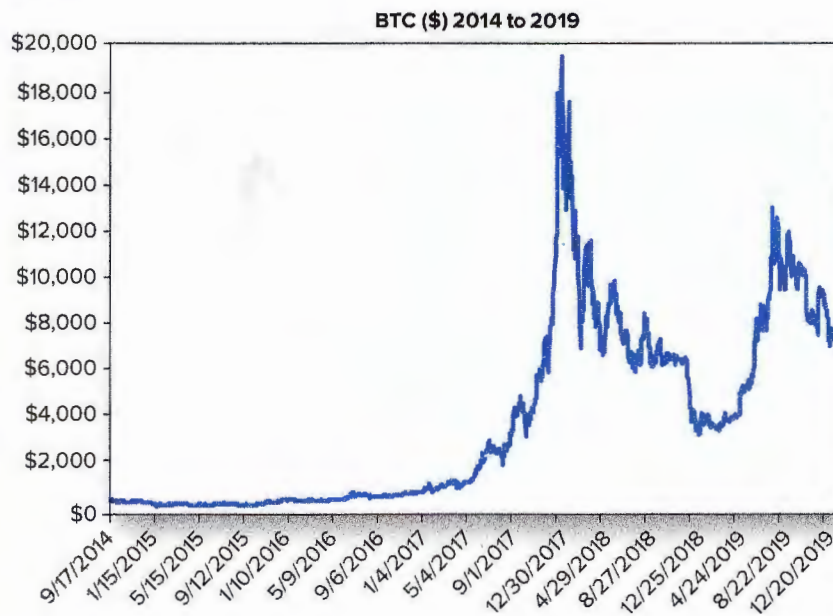
- *Acceptability.* Currency should be accepted without question. However, at this time, although a few large companies have accepted bitcoin, it is not universally accepted by retailers. Instead, people use workarounds. For example, PayPal allows you to hold crypto in their wallet and use it to make payments, but PayPal simply sells the crypto and pays the retailer in the U.S. dollar proceeds. Interestingly, in August 2023, PayPal introduced a native (self-developed) cryptoasset that is available for both retail and institutional investors.
- *Portability.* People need to be able to carry or transfer money. Bitcoin is electronically portable only.
- *Durability.* Money needs to last for a long time; for example, fruit does not make for a good currency. Bitcoin does not decay and theoretically should persist over time.
- *Divisibility.* Money needs to be dividable into small amounts. Dollars can be divided into hundredths, that is, pennies. Bitcoin is also very divisible.
- *Homogeneity.* Each dollar is the same, just as each General Electric stock is the same. Also, each bitcoin is the same. *Fungible* is also a term used to describe this attribute.
- *Recognizability.* People need to recognize and validate the currency for a transaction. While fraudulent processes likely exist, bitcoin does have verification processes to validate its authenticity.
- *Stability.* A currency should have a consistent value compared to other assets. Bitcoin's value versus the U.S. dollar has varied widely. Panel A of Figure 1.1 shows the price of bitcoin during the early years of its existence. Note that for a couple of years, the price was relatively stable, but then the price spiked 20 times in value in one year and plummeted most of the way back. The high volatility shown in Panel A and Panel B is not consistent with the stability of a currency.

Given these characteristics of a currency, bitcoin appears to fail in the two areas of acceptability and stability. However, cryptocurrency advocates believe that a good currency should be limited in amount. In such a case, central banks would not be able to

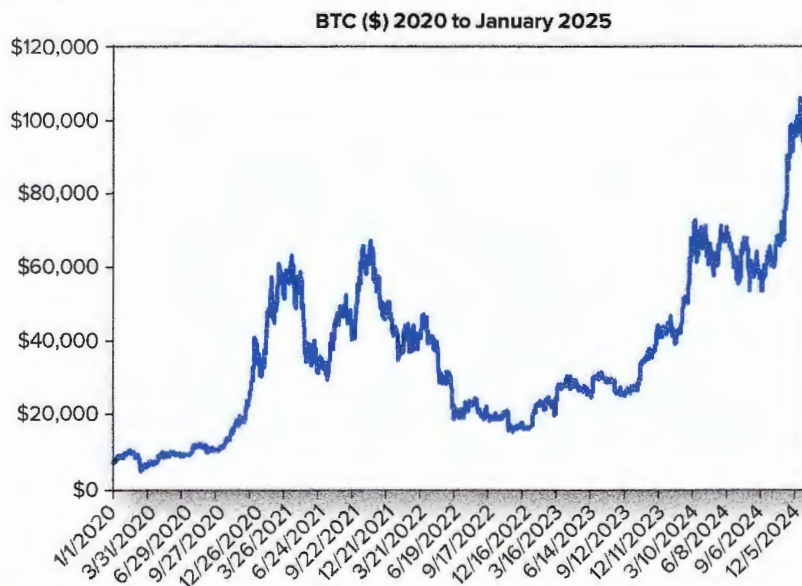
FIGURE 1.1**Bitcoin price over time**

Yahoo! Finance.

Panel A



Panel B

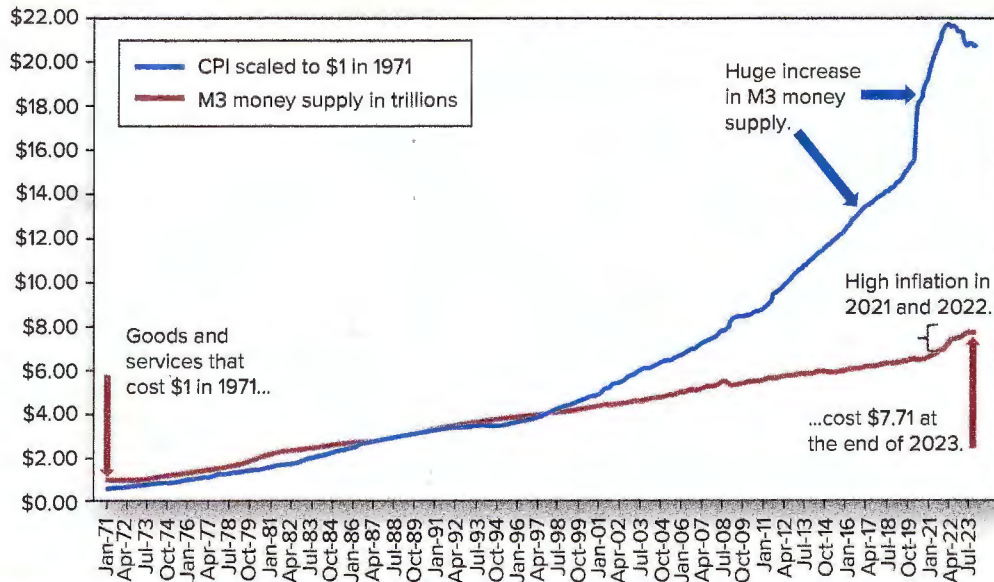


devalue a currency by increasing money supply. For example, Figure 1.2 shows the U.S. M3 money supply in trillions of dollars since 1971, the year the United States went off the gold standard. Note the huge increase in the supply of dollars over time, from \$0.6 trillion to nearly \$22 trillion, with large increases occurring recently. Also note that the goods and services that could be purchased in 1971 for \$1 now cost \$7.45. That is what happens when a currency is devalued. The recent large increase in money supply was a source of the high inflation in 2021 and 2022. A fixed supply of a currency prevents this behavior. Bitcoin is designed to end with a fixed number. Thus, theoretically, the bitcoin price should increase over time as inflation occurs.

If bitcoin currently does not qualify as a currency, then what is it? To many it is a payment system and to others it is a speculative asset or an investment. We explore its payment and investment characteristics in Chapter 4.

FIGURE 1.2

M3 money supply and consumer price index (CPI; scaled to 1971) since 1971



proof of work (PoW)

Protocol in which the probability of a miner being selected to validate the next block on the blockchain is based on the amount of computing power.

proof of stake (PoS)

Protocol for which the probability of a miner being selected to validate the next block to be added onto the blockchain is determined by the token ownership percentage.

smart contracts

Computer protocols that automatically execute, control, or document events and actions when the terms of a contract are met.

decentralized autonomous organization (DAO)

A legal structure with no central governing body whose members act in the best interest of the entity.

non-fungible tokens (NFTs)

Blockchain tokens that represent a unique asset like a piece of art, digital content, or media.

altcoin

Any cryptocurrency other than bitcoin and ether.

1.5 Ethereum and Altcoins

1.5.1 Ethereum Blockchain

Ethereum is a blockchain that produces ether tokens, the second largest cryptocurrency by market capitalization. Ether is also the cryptocurrency that most often serves as the base layer for multiple other blockchain-based applications. This is enabled in large part due to the cryptography that underpins tokens and other assets that run on blockchains. Smart contracts, non-fungible tokens, decentralized autonomous organizations, and decentralized finance run almost exclusively on the Ethereum blockchain and use the ether token. Additionally, the Ethereum blockchain community pivoted away from a **proof of work (PoW)** consensus methodology in September 2022 to a **proof of stake (PoS)** methodology. Implications from this initial merge and the coming upgrades to the Ethereum blockchain are still being worked through, but they hold significant implications for the crypto industry.

The PoW method requires ever-increasing computational power to earn the right to sponsor the next block. Miners in PoW consensus blockchains use enormous computer networks. The right to sponsor the block in a PoS blockchain is derived from the amount of the underlying cryptocurrency owned (the stake). No serious computational power is needed for the PoS method. Thus, the most direct result of the pivot from PoW to PoS is a reduction in energy demands. The requirements for creating ether coins and processing blocks on the Ethereum blockchain will drop by as much as 99 percent. One result of this dramatic reduction in energy consumption is that the Ethereum blockchain and ether token will increasingly form the foundation for many of the next level blockchain and crypto applications. **Smart contracts, decentralized autonomous organizations (DAOs), non-fungible tokens (NFTs),** and many decentralized finance use cases run on Ethereum and use the ether token to some extent. The pivot to PoS will only amplify this trend as the cost and complexity of running more complicated transactions and applications will continue to decrease.

1.5.2 Altcoins

One type of cryptoasset created from blockchains is called an **altcoin**, which comes from “alternative coin.” Bitcoin was the original cryptoasset, so to some, all coins created afterward are called altcoins. However, the ether coin from the Ethereum blockchain is often considered to be on the same level as bitcoin and thus is not considered an

TABLE 1.1 | Largest Altcoins, January 17, 2025

Altcoin	Ticker	Price (\$)	Capitalization (\$, in billions)
XRP	XRP	3.21	184.6
Tether	USDT	1.00	137.5
Solana	SOL	216.89	105.5
BNB	BNB	723.71	104.3
Dogecoin	DOGE	0.41	61.0
USDC	USDC	1.00	46.9
Cardano	ADA	1.12	39.5
TRON	TRX	0.25	21.3
Avalanche	AVAX	40.79	16.8
Chainlink	LINK	24.54	15.6
Stellar Lumens	XLM	0.48	14.6
SUI	SUI	4.80	14.8
SHIBA INU	SHIB	0.000024	14.2
Hedera	HBAR	0.37	14.1

Source: Coinbase.com.

altcoin by many. Most cryptocurrencies or coins are forked from either the bitcoin or Ethereum blockchains. A fork occurs when the developer community disagrees on the technical direction of a particular token, leading to different versions of an underlying token. Each altcoin was invented with different consensus mechanisms to either validate transactions or provide new or additional capabilities or purposes to distinguish between them. For example, Bitcoin Cash is the result of an August 2017 bitcoin blockchain **hard fork**. The purpose of Bitcoin Cash was to allow more transactions in a single block, thereby decreasing the fees and transaction times and making it more useful as a payment system. Interestingly, Bitcoin Cash underwent its own fork in November 2018 and split into Bitcoin Cash ABC and Bitcoin Cash SV. Bitcoin Cash ABC changed its name to eCash in 2021.

Table 1.1 shows the largest altcoins by market capitalization. As a reference, on this same day, bitcoin's price was \$104,665.67 and its market capitalization was \$2.1 trillion. Ether was priced at \$3,419.33 and its market capitalization was \$412.04 billion. Notice that some altcoins are priced at \$1.00, like Tether and USD Coin. These are called **stablecoins**, which were developed to avoid the price volatility of bitcoin and others. XRP is the largest stablecoin by market capitalization.

The Ethereum blockchain, ether tokens, and altcoins are detailed in Chapter 5.

1.6 Non-fungible Tokens and Initial Coin Offerings

1.6.1 Non-fungible Tokens

Non-fungible tokens (NFTs) represent a unique type of cryptoasset and are distinct from other types of crypto in a number of significant ways. NFTs are non-fungible in nature, which means that each one is unique. While other cryptoassets are almost always intended to be used as a medium of exchange or an easily tradable asset, NFTs are not intended to be used in this manner. NFTs are unique, differentiated, and able to be connected and/or traced back to either a virtual asset or a physical asset. Many of the primary use cases that have been discussed in the mainstream media are related to artwork. For example, early popular NFTs were CryptoKitties. The CryptoKitties website (cryptokitties.co) states, "CryptoKitties is a game centered around breedable, collectible, and oh-so-adorable creatures we call CryptoKitties! Each cat is one-of-a-kind and 100% owned by you; it cannot be replicated, taken away, or destroyed." The ownership of the individual kitty is through an NFT. More recently, the Bored Ape Yacht Club (BAYC) has become popular and gained attention for its high prices. The mid-January 2025 price was about 15 ether, or

hard fork

The blockchain network splits into two separate versions: one that follows the new rules and one that follows the old rules.

stablecoins

Cryptocurrencies whose values are pegged to a reference asset, like a fiat money, exchange-traded commodity, or another cryptocurrency.

\$51,000 per BAYC. What is BAYC? It is an exclusive social organization for which owning one of the NFTs enables membership. Members, including celebrities, hang out and chat. Gaming characters are a popular use for NFTs, but NFT uses are rapidly expanding. If 15 ETH is too expensive, there is now a Mutant Ape Yacht Club for which the NFTs sell for about 2.5 ether.

Original artists can create an NFT for each creation, even physical art, that will authenticate ownership of the piece and provide a transaction history when sold. This process could reduce counterfeit artwork. For example, on CryptoPunks there are a fixed 10,000 “punks,” each of which is a 24 × 24-pixel image. “Punks” are considered an art form and have been sold at Sotheby’s and Christie’s auction houses. In mid-May of 2024 they were selling for just under 40 ether. Another angle is the National Football League, which sells ownership of its videos and collectibles through NFTs. Through NFL ALL DAY (nflallday.com), collectors can buy, own, and trade officially licensed digital video highlights via NFTs called Moments.

A society-wide application of NFTs can be for the safekeeping, ownership, and control of important records. The NFTs are minted, stored, and accessed in a blockchain. Examples of these types of documents are

- Birth certificates
- Medical records
- Social Security cards
- University transcripts
- Patents, and more.

These NFTs are not traded but are accessed by the owner when verification is needed.

1.6.2 Initial Coin Offerings

In the blockchain and crypto industry, a company may raise capital through an **initial coin offering (ICO)**. This is the crypto version of an initial public offering (IPO) that is used when companies raise capital by issuing stock directly to investors. The cash from the IPO stock sale goes to the company for capital investment or operations and the stock represents ownership of the company for the investors. Blockchain and token-based organizations use ICOs to raise money to create a new coin, app, or service. The original ICO terminology has grown to now include **initial exchange offerings (IEOs)** and a more preferred method of **initial DEX offerings (IDOs)**. The IEO refers to raising capital through a crypto exchange, while the IDO refers to a crowdfunding method for launching a native token or coin through a decentralized exchange (DEX).

ICO examples include Cardano and Tezos. In January 2017, Cardano’s ICO raised \$62.2 million. In July 2017, Tezos raised \$232 million. However, there were numerous delays in distributing the tokens sold through the ICO. This led to a class action lawsuit for which Tezos reached a \$25 million settlement in 2020. Still, that net capital raised was substantial. ICOs are used for a wide variety of purposes. Table 1.2 shows a sampling of the ICOs planned for late February and March 2024. Many crypto exchanges, industry websites, and digital wallets list upcoming ICOs. Some examples that do are Coinbase, Gemini, CryptoTotem, CoinGecko, and CoinMarketCap. Note the wide range of industries for these applications.

On the surface, the ICO process closely resembles the traditional IPO process. However, there are important fundamental differences between an ICO and an IPO.

- ICOs do not necessarily represent an ownership stake in the issuing organization. Investors must be clear about what the coin represents.
- Most ICOs require investors to pay using another cryptocurrency, like bitcoin or ether.

initial coin offering (ICO)

Occurs when a crypto company sells a new cryptocurrency to raise capital.

initial exchange offerings (IEOs)

Cryptocurrency capital raising conducted on a well-known digital exchange’s fundraising platform.

initial DEX offerings (IDOs)

A crowdfunding method that allows projects to launch a native coin through a decentralized exchange.

TABLE 1.2 Recent and Upcoming Initial Coin Offerings, May 2024

Project Name	Description	Industry
ivendPay (IVPAY)	Crypto payment system for retail, e-commerce, and vending machines.	Financial Services and Banking
MarAI (MAR3)	A cutting-edge technology platform that provides a wide range of generative artificial intelligence (AI) tools to support Web3 Marketing.	AI and Neural Networks
BoundlessPay (BPAY)	A global digital banking app that provides affordable, fast, and easy-to-use payment services for cross-border collections, payments, and settlements.	Financial Services and Banking
JuicyBet (JSP)	An innovative GambleFi Ecosystem Decentralized Project. Its platform stands at the confluence of gambling and web3 technologies, integrating the advantages of both sectors.	Gambling and Betting
CutKitts (CUT)	A next-generation project that fuses MeMe, NFTs, and EarnTo-Play to shape the future of gaming.	Gaming and VR
Saakuru (SKR)	A consumer-centric Layer-2 protocol with zero transaction fees and unique multi-purpose tokenomics.	Blockchain Infrastructure/ Optimism Ecosystem
eTukTuk (TUK)	An AI-powered, sustainable transport solution that will revolutionize transportation in developing nations and ultimately worldwide.	Transport/Ecology

Source: CryptoTotem.

- An ICO is the sale of a cryptocurrency and has largely occurred outside the U.S. regulatory scope. This is still mostly true for the paperwork requirements submitted in the ICO process. However, U.S. regulators are getting involved after the fact when it appears fraud has occurred in the ICO.
- The lack of regulation results in more scams and mediocre projects.

The possible uses for NFTs altcoins are continuously expanding. More uses are discussed in Chapter 6.

FINTECH IN THE WORLD

The Securities and Exchange Commission Gets Involved with Crypto

The Securities and Exchange Commission (SEC) regulates all capital issuances offered to public citizens in the United States. The SEC first started to get involved in ICOs in 2017 with a report that warned that coins from ICOs may be securities and that those who offer and sell securities in the United States must comply with federal securities laws. In April 2018, the Commission filed a civil action against Centra's founders, alleging that the ICO was fraudulent and the U.S. Attorney's Office filed criminal charges. Ultimately, Sohrab Sharma, cofounder of the crypto firm Centra Tech, was sentenced to eight years in jail, fined \$200,000, and ordered to forfeit \$36 million for conducting an illegal ICO that fleeced investors of \$25 million.

In late 2018, the SEC announced they had settled charges with two celebrities, professional boxer Floyd Mayweather Jr. and music producer DJ Khaled, for failing to disclose payments they received for promoting Centra Tech's ICO. Mayweather failed to disclose a \$100,000 promotional payment and Khaled failed to disclose a \$50,000 payment. Mayweather promoted other ICOs as well. Mayweather agreed to pay a total of \$615,000 in disgorgement, penalty, and interest, while Khaled paid \$153,000.

The SEC warned that investors should be skeptical of investment advice posted to social media platforms. Social media influencers are often paid promoters, not investment professionals, and the securities they are touting could be scams.

1.7 Regulation and Accounting

The appeal of cryptocurrency for many people is that it is not controlled and regulated by a government. However, the collapse of several cryptoasset exchanges in 2022 illustrated that the institutions supporting cryptocurrency could benefit from oversight and regulation. The largest and most media-covered collapse was that of the FTX crypto exchange. Celebrities promoted the exchange, including former Tampa Bay Buccaneers quarterback Tom Brady, fashion model Gisele Bündchen, Golden State Warriors guard Stephen Curry, and businessman Kevin O’Leary. FTX functioned like the banks and brokers of traditional finance. That is, it maintained customer accounts, exchanged currencies, and made loans and investments with customer assets. But FTX and other crypto exchanges operate outside the traditional banking system and are not subject to the same type of traditional bank regulation, insurance, and disclosure rules that protect customers. While FTX has been the largest crypto firm to collapse thus far, it was preceded by crypto lenders Celsius Network and Voyager Digital, which filed for bankruptcy after they were unable to meet customer demands for withdrawals. The contagion of the FTX failure transmitted to other crypto firms, like BlockFi, which had to pause client withdrawals.

In December 2023, the Financial Accounting Standards Board (FASB) issued guidance regarding how cryptoassets will be accounted for at fair value. This is a significant step in clarifying how cryptoassets are treated for accounting purposes. Movement forward on this topic comes after years of lobbying from a wide array of industry actors and market participants, including trade associations, private corporations, and publicly traded firms seeking to allocate more capital to blockchain and crypto initiatives.

When a public company purchases an asset such as factory equipment, it records the price and installation as its value, known as its book value. That book value usually decreases as the company depreciates it in recognition that the equipment wears out over time. On the other hand, that same public company could buy real estate. The cost is recorded as its book value. Usually, real estate increases in value over time. However, that increase is not reflected in the book value of the real estate as reported in the financial statements. Traditional financial reporting categorizes this choice as highlighting the importance of **conservatism** in financial reporting, that is, presenting the most conservative and cautious view of financial conditions. That said, because an increasing percentage of the value of publicly traded firms consists of intangible assets versus tangible assets, the need for fair value accounting procedures has increased.

Fair value accounting aims to record the current market value as the basis for recognizing certain assets and liabilities. Publicly traded securities are the easiest to identify fair value because they trade frequently and have price quotes and actual transaction prices. However, other approaches are needed for assets that do not frequently trade. For assets like real estate or private equity ownership, a comparable approach might be used. In this case, transactions of similar, or comparable, assets provide guidance as to fair value. The cryptoasset market has both easy and difficult products to value. The cryptocurrencies trade through exchanges and thus have actual transaction prices, although products like NFTs may be unique and require different approaches to estimating fair value. Therefore, FASB guidance regarding fair value on these assets would be welcome.

Financial reporting for crypto organizations will improve over time as cryptoasset ownership and utilization continue to increase. Public firms in the United States use Generally Accepted Accounting Principles (GAAP) to report their financial status, while non-public firms do not need to follow GAAP. GAAP has not kept up with the needs of the fast-growing cryptoasset sector, and many crypto firms have not been using it. Unfortunately, it has been the Wild West of accounting for some crypto firms that used footnotes to report and disclose fair value data, maintained separate sets of records depending on the intended users, and employed other such workarounds.

After the 2022 and 2023 collapse of multiple centralized crypto exchanges and other organizations as a result of market forces, price declines, and potentially fraudulent

conservatism

The practice of reporting financial information at the most conservative valuation and reporting other financial data (cash flows, etc.) at the lowest permissible value.

activity, it is clear that more regulation is coming to the crypto industry. It is not clear whether the collapse of multiple centralized exchanges and other firms in the industry will lead to a shift in leadership from centralized to decentralized operators.

Accounting rules and regulations are discussed in Chapter 7.

1.8 The State of Decentralized Versus Centralized Finance

In the rapidly evolving landscape of finance, a prominent and dynamic debate surrounds the comparison between decentralized finance (DeFi) and traditional centralized finance (CeFi). Decentralized finance leverages blockchain technology to create an open and permissionless financial system that operates without the need for intermediaries like banks or brokers. This approach promises increased accessibility, as users have more control over their assets and can engage in financial activities directly through decentralized applications (DApps). The DeFi ecosystem encompasses lending, borrowing, trading, and yield farming, fostering a borderless and inclusive financial environment.

Conversely, centralized finance represents the traditional financial system where intermediaries, such as banks and financial institutions, facilitate transactions and manage financial services. While centralized systems offer familiarity and stability, they often come with limitations such as geographical restrictions, lengthy processing times, and dependency on intermediaries. The ongoing discourse revolves around the merits and challenges of each system, with advocates emphasizing the potential for financial inclusion in DeFi and critics expressing concerns about regulatory uncertainties, security risks, and the need for user-friendly interfaces. As the competition and collaboration between decentralized and centralized finance continues to shape the financial landscape, their coexistence prompts exploration to find a balance that maximizes the benefits of both approaches.

A recurring theme that began to emerge in the aftermath of the volatile years of 2022 and 2023 is whether or not the best future for crypto involves more centralization and centralized exchanges or more of a decentralized exchanges and format. The promise of blockchain, bitcoin, and many other cryptocurrencies has been that a decentralized financial future is possible. Specifically, this meant that a parallel financial structure, payment ecosystem, and financial backdrop for individuals and institutions would evolve. The reality of the situation has proven to not be straightforward. Rather, the very institutions and processes that blockchain was designed to disrupt—banks and centralized control—have moved rapidly to invest billions in projects, tokens, and other initiatives.

This is not to say that a mix of centralized and decentralized blockchain applications and options is a bad outcome. As with many new ideas and concepts, including technological ones, the fact is that the bulk of research, investment, and intellectual capital dedicated to building out the basic research and initial applications that eventually form the backbone of more advanced use cases tend to come from government, large institutions, and other centralized entities. Such an occurrence has happened with other technologies such as the internet, GPS, satellite technologies, and even RFID capacity. Fiber optics, which underpin the rapid rise of WiFi, high-speed internet at large, and future developments related to the Internet of Things, were laid by large, centralized institutions, many of which did not survive the initial investment and capital deployment cycle.

On the other hand, centralized institutions have proven to be prone to hacks, breaches, and other possible failures, including unethical actors. These events have occurred both in the traditional finance industry as well as in the cryptoasset space. Because many large centralized crypto operations failed in 2023 and 2024, the scrutiny and pressure on these entities is only increasing. Criticisms have also come from traditional financial institutions against the decentralized start-ups that have prospered in the sector. There are predictions that all cryptoassets will go to \$0, with calls for crypto to be regulated out of existence. There is also commentary that the entire sector consists of nothing but fraudsters.

Decentralized firms that have come to dominate many of the newer applications and developments in this space are not without their issues. Hacks, breaches, scams, and a whole host of other negative headlines have undermined investor confidence and focused a critical eye from regulators. Cryptoassets continue to exist in the midst of a bubble and burst cycle. However, this is also a period in which traditional finance has seen inflation rise to levels not seen in the last 30 to 40 years. This devaluation of fiat currency is one driver of cryptocurrency creation.

1.9 Artificial Intelligence and Finance

In the context of finance, AI encompasses a wide range of technologies, including machine learning, natural language processing, and data analytics. One of the primary impacts of AI on finance is the transformation of decision-making processes. AI algorithms can analyze vast amounts of financial data with speed and precision, enabling more informed and data-driven decisions. This is particularly evident in algorithmic trading, where AI-powered systems can execute complex trading strategies, analyze market trends, and manage risks in real time. The result is increased efficiency, improved accuracy, and the ability to capitalize on market opportunities swiftly.

1.9.1 Introduction to Artificial Intelligence and Machine Learning

AI involves the development of algorithms and models that enable machines to learn from data, recognize patterns, compute complex calculations, make decisions, and perform tasks that traditionally require human intelligence. The field encompasses a spectrum of technologies, from rule-based systems to more advanced machine learning and deep learning approaches. How do these models work? Chapters 8 and 9 will discuss the basics of artificial intelligence, including a discussion of how large language models (LLMs) are being used in the financial services profession. An AI simulator is available with this chapter to help students better understand the dynamics of AI processes.

1.9.2 Peer-to-Peer Lending and Crowdfunding

peer-to-peer (P2P) lending

The practice of people or businesses borrowing money through online platforms from lenders outside the banking industry.

crowdfunding

Borrowing money from many people through an online platform, cutting out traditional financial institutions like banks.

Peer-to-peer (P2P) lending, also known as **crowdfunding**, is a financial model that connects borrowers directly with individual lenders, cutting out traditional financial institutions like banks. This concept has existed in various forms and markets for decades. Popular crowdfunding platforms are Upstart, Prosper, and LendingClub, among others. As Chapter 10 illustrates, a typical loan matching process for borrowers and lenders includes these steps:

1. Borrowers provide information about their loan requirements, purpose, and financial background. They submit loan applications to the platform, specifying the amount they need and the interest rate they are willing to pay. Depending on what the capital will be used for, average loan sizes range from thousands to tens of thousands of dollars.
2. The platform assesses the creditworthiness of the borrower using various criteria, including credit scores and financial history.
3. Lenders create profiles indicating their willingness to lend and their risk tolerance.
4. The P2P platform matches borrowers with lenders based on their profiles, loan requirements, and risk preferences.
5. Once a match is made, multiple lenders contribute small amounts to fund the borrower's loan.

6. Borrowers repay the loan in installments according to the agreed-upon terms through the P2P platform. Principal and interest payments are distributed among the lenders based on their respective contributions.

P2P lending platforms typically charge fees (typically 1 to 6 percent) for their services. It is important to note that P2P lending carries risks, including the potential for loan defaults and the lack of traditional regulatory safeguards.

Microfinance is a subcategory of crowdfunding. Its primary goal is to empower people in underserved communities, especially in developing countries, by offering them small loans to improve their livelihoods, and to start or expand small businesses. Microfinance, or **microcredit**, was made popular by economics professor Muhammad Yunus in Bangladesh. He is the founder of the Grameen Bank, which provides small loans to low-income entry-level and subsistence entrepreneurs. He won the 2006 Nobel Peace Prize for developing social and economic improvements through microcredit operations.

microfinance

Financial services, usually in the form of loans, provided to low-income individuals or groups who are typically excluded from traditional banking.

microcredit

A form of microfinance in which small amounts of money are lent to new entrepreneurs or businesses in the developing world.

peer-to-peer (P2P) payment

Electronic money transfers made from one person to another.

1.9.3 Open Banking and Payment Systems

The open banking and payment system evolution has developed along two different paths. One path is through online technology processes and the other is through bitcoin and other blockchain processes. **Peer-to-peer (P2P) payment** systems facilitate the transfer of funds directly between people. Two early innovators in the online processing world were Venmo and PayPal (PayPal subsequently bought Venmo). Banks have responded by developing Zelle. Other popular platforms are Cash App, Google Pay, and Apple Pay.

One application of blockchain technology is a globally decentralized and distributed payment system, providing such benefits as enhanced security, transparency, and efficiency. Blockchain-based payments may be especially fast and cost-effective for cross-border payments. International money transfers are traditionally slow and involve multiple intermediaries, which include fees. Blockchain-based payment systems enable direct and secure transactions between parties in different countries, reducing the reliance on correspondent banks. Firms and governments around the world are rapidly adopting and investing in tokenized payment systems. Interestingly, when governments adopt these systems, they are attempting to pivot the control back toward centralization. These topics are discussed in Chapter 11.

1.9.4 Digital Wealth Management

Digital wealth management, often referred to as robo-advisory, is a revolutionary approach to financial advisory services that leverages technology and algorithms to automate and optimize investment strategies. This form of wealth management, discussed in Chapter 12, democratizes access to professional financial advice by providing cost-effective and user-friendly platforms. Investors can input their financial goals, risk tolerance, and preferences into the digital platform, which then employs algorithms to create a diversified investment portfolio tailored to the individual's needs. Automation not only reduces costs associated with traditional wealth management but also provides a more efficient and transparent way to manage investments.

The rise of digital wealth management is reshaping the financial industry, making investment advice more accessible to a broader audience. Investors can benefit from lower fees, portfolio customization, and real-time monitoring of their investments. Additionally, the use of technology allows for quicker decision-making, automated rebalancing, and continuous optimization of investment strategies. While traditional wealth management firms still play a crucial role in the industry, digital wealth management platforms are increasing in popularity, reflecting the ongoing shift toward tech-driven solutions in the financial sector.

Replacing human financial advisors with an AI algorithm would make affordable advice accessible to the many who need it but cannot afford it. But can we trust AI

robo-advice to be an ethical resource for good? Is the advice even viable? Also, how should robo-advisors be regulated? Issues explored include, but are not limited to, (1) the potential legal liability for automated or AI-driven wealth management practices; (2) best practices to classify and report the results of a digitized or AI-managed wealth fund; and (3) what types of information and data need to be disclosed from a compliance and investor perspective. Real-world examples as well as the opportunities and challenges of AI-controlled wealth management are presented.

1.9.5 Asset Investing and Trading

Technology has been revolutionizing trading for decades, from the way trades are executed to the tools available for analysis and decision-making. Examples include the following:

- Stock exchanges used to operate through broker-to-broker systems on trading floors but now often operate through electronic trading platforms where buyers and sellers can execute trades electronically.
- High-frequency trading uses computer algorithms to execute many trades in fractions of a second. The computers look for small price discrepancies and market inefficiencies. An example comes from detecting the buy and sell orders of traders and placing the fastest orders to profit from the bid–ask spread (the difference between the highest price a buyer is willing to pay and the lowest price a seller is willing to accept).
- Computers do not just try to take advantage of individual investor trading; they also try to detect large institutional orders entering the market and quickly **front-run** those orders to profit from anticipated price movements, a process called *sniffing*.
- Algorithmic trading involves the statistical relationships between securities and indexes, like the Standard & Poor's 500. When small pricing inefficiencies occur, trades are executed to profit from the expected convergence of prices, known as *index arbitrage*.
- The development of mobile trading applications, like Robinhood, has allowed investors to trade securities using their smartphones or tablets.
- Robo-advisors provide automated and algorithm-driven financial planning and investment advice.
- More recently, trading securities via blockchain is a concept known as **tokenization**. This process involves representing ownership of real-world assets through digital tokens on a blockchain.

front-run

Trading on advance information provided by clients, brokers, and investment analysts before others have been given the information.

tokenization

The process of issuing a digital representation of an asset on a blockchain.

Chapter 13 discusses both the current state of automated and AI-driven trading as well as the array of opportunities and challenges that such programmatic trading can create.

1.9.6 Fintech: Risk, Regulation, and AI Ethics

Chapter 14 discusses risk and regulation in the fintech space. Fintech firms face various risks, including cybersecurity risks, compliance and regulatory risks, operational risks, and data protection risks. Handling sensitive financial data makes fintech platforms prime targets for cyberattacks such as data breaches, ransomware, phishing, and insider threats. To mitigate these risks, firms must implement robust cybersecurity measures like encryption, multifactor authentication, and intrusion detection systems. Additionally, they must identify and assess risks, implementing measures such as enhanced cybersecurity protocols, stronger internal controls, and operational diversification to reduce their likelihood and impact. Regular monitoring and refinement of these controls are vital for maintaining their efficacy. Data security is another critical concern, as breaches or unauthorized access can expose sensitive information. High-profile incidents, such as

the Equifax data breach in 2017 that exposed sensitive information of over 140 million people, the Experian data breach in 2020 affecting 24 million customers, and the 2019 First American Financial Corp breach that exposed 885 million credit card applications, underscore the vulnerability of stored data and the devastating consequences of inadequate security measures.

As technology continues to shape various aspects of society, addressing their ethical challenges has become crucial. A multipronged approach that integrates ethical principles, regulatory frameworks, technical solutions, and proactive design practices is necessary to ensure these technologies are developed and deployed responsibly.

Summary

New technologies are allowing finance to transform in ways that may have been inconceivable to many just a decade ago. Blockchain is one such technology. A blockchain is a decentralized ledger of all transactions across a peer-to-peer network. Transactions are confirmed without a need for a central clearing authority. Potential applications can include fund transfers, settling trades, keeping records, and much more. The bitcoin blockchain may be the best known blockchain. However, cryptocurrency's ideal role—whether a payment system, currency, or investment—has yet to be determined. The Ethereum blockchain seems to be expanding the quickest with applications, cryptoassets, and NFTs. Regulation and accounting policies are quickly trying to catch up to

this industry. It is unclear how additional oversight will impact the entrepreneurial nature of the space.

In addition, other technologies such as AI and machine learning have transformed many areas of the finance industry. AI algorithms can analyze vast amounts of financial data with speed and precision, enabling more informed and data-driven decisions. This efficiency is particularly evident in algorithmic trading, where AI-powered systems can execute complex trading strategies, analyze market trends, and manage risks in real time. The result is increased efficiency, improved accuracy, and the ability to capitalize on market opportunities swiftly. Regulating these developments has proved challenging.

Keywords

algorithmic trading - Computers programmed to monitor the trading prices, detect mispricing, and execute trades to profit from the market data. *p. 3*

altcoin - Any cryptocurrency other than bitcoin and ether. *p. 6*

artificial intelligence (AI) - Computers performing tasks that normally require human intelligence. *p. 2*

bitcoin - The original cryptocurrency, operating in a decentralized and distributed manner, that was originally introduced in the bitcoin blockchain whitepaper written by Satoshi Nakamoto. *p. 2*

blockchain - The distributed ledger technology (DLT) that supports and underpins the vast majority of the cryptoasset space, including cryptocurrencies and other cryptoassets. *p. 3*

conservatism - The practice of reporting financial information at the most conservative valuation and reporting

other financial data (cash flows, etc.) at the lowest permissible value. *p. 10*

crowdfunding - Borrowing money from many people through an online platform, cutting out traditional financial institutions like banks. *p. 12*

cryptoasset - A broader and encompassing term that includes cryptocurrency as well as other crypto applications and uses. *p. 3*

cryptocurrency - A peer-to-peer programmable digital currency. *p. 2*

cryptography - An encryption process used to secure information and communication techniques derived from mathematical concepts and a set of rule-based calculations. *p. 4*

decentralized autonomous organization (DAO) - A legal structure with no central governing body whose members act in the best interest of the entity. *p. 6*

front-run - Trading on advance information provided by clients, brokers, and investment analysts before others have been given the information. *p. 14*

gold standard - A monetary system in which a country fixes the value of their currency in terms of a specified amount of gold. *p. 2*

hard fork - The blockchain network splits into two separate versions: one that follows the new rules and one that follows the old rules. *p. 7*

initial coin offering (ICO) - Occurs when a crypto company sells a new cryptocurrency to raise capital. *p. 8*

initial DEX offerings (IDOs) - A crowdfunding method that allows projects to launch a native coin through a decentralized exchange. *p. 8*

initial exchange offerings (IEOs) - Cryptocurrency capital raising conducted on a well-known digital exchange's fundraising platform. *p. 8*

large language model (LLM) - An AI algorithm that uses massively large data sets to understand, summarize, generate, and predict new content. *p. 3*

machine learning - A branch of artificial intelligence and computer science that focuses on the use of data and algorithms to imitate the way that humans learn. *p. 2*

microcredit - A form of microfinance in which small amounts of money are lent to new entrepreneurs or businesses in the developing world. *p. 13*

microfinance - Financial services, usually in the form of loans, provided to low-income individuals or groups who are typically excluded from traditional banking. *p. 13*

non-fungible tokens (NFTs) - Blockchain tokens that represent a unique asset like a piece of art, digital content, or media. *p. 6*

peer-to-peer (P2P) lending - The practice of people or businesses borrowing money through online platforms from lenders outside the banking industry. *p. 12*

peer-to-peer (P2P) payment - Electronic money transfers made from one person to another. *p. 13*

proof of stake (PoS) - Protocol for which the probability of a miner being selected to validate the next block to be added onto the blockchain is determined by the token ownership percentage. *p. 6*

proof of work (PoW) - Protocol in which the probability of a miner being selected to validate the next block on the blockchain is based on the amount of computing power. *p. 6*

reserve currency - A foreign currency held in significant quantities by central banks or monetary authorities to facilitate international transactions. *p. 2*

robo-advising - An online program that provides automated financial guidance and services with minimal human interaction. *p. 3*

smart contracts - Computer protocols that automatically execute, control, or document events and actions when the terms of a contract are met. *p. 6*

stablecoins - Cryptocurrencies whose values are pegged to a reference asset, like a fiat money, exchange-traded commodity, or another cryptocurrency. *p. 7*

tokenization - The process of issuing a digital representation of an asset on a blockchain. *p. 14*

Questions and Activities

1. Identify the characteristics of blockchain.
2. What are the characteristics of a good currency? Does bitcoin share these characteristics? Why or why not?
3. Investigate the price and volume of bitcoin on Yahoo! Finance (<https://finance.yahoo.com/quote/BTC-USD?p=BTC-USD>). Examine the 1- and 6-month charts. Comment on the trend and volatility of bitcoin's price during this time period.
4. Go to NFT trading exchange OpenSea (<https://opensea.io/>) and search for the trading of "Bored Ape Yacht Club" NFTs. What is the current price for a Bored Ape Yacht Club non-fungible token?
5. Examine the statistics for Ethereum at <https://www.blockchain.com/explorer/assets/eth>.
 - a. What is the current price?
 - b. How many are circulating?
 - c. Examine the rapidly occurring transactions. What is a common range of transaction values?
6. Use the U.S. inflation calculator at <https://www.usinflationcalculator.com/> to compute the inflation since the United States went off the gold standard in 1971 to 2022.
7. What are some non-finance applications of NFTs?
8. What have been the ramifications to date of the crypto sector receiving only light or no regulation?
9. What is the typical crowdfunding loan matching process for borrowers and lenders?
10. Discuss how artificial intelligence is being used to advise people on investment and portfolio decisions.

Academic Analysis

Yan Chen and Cristiano Bellavitis, "Blockchain Disruption and Decentralized Finance: The Rise of Decentralized Business Models," *Journal of Business Venturing Insights*, vol. 13 (2020): e00151.

This article assesses the benefits of decentralized finance, identifies existing business models, and evaluates potential challenges and limits. Blockchain technology allows for the rise of decentralized financial services, which tend to be more innovative, interoperable, borderless, and transparent. Decentralized financial services have the potential to broaden financial inclusion, facilitate open access, encourage permissionless innovation, and create new opportunities for entrepreneurs and innovators.

Questions

1. Discuss the five promises of decentralized finance.
2. Explain the four new business models emerging with blockchain technology.
3. What are the limits to decentralized finance?

Franklin Allen, Xian Gu, and Julapa Jagtiani, "A Survey of Fintech Research and Policy Discussion," *Review of Corporate Finance* 1, no. 3–4 (2021): 259–339.

Blockchain has the potential to be disruptive to financial systems and intermediation. This paper provides a comprehensive fintech literature survey with relevant research studies and policy discussion around the various aspects of fintech.

Questions

1. Describe the three main types of blockchain.

2. What are the potential negative features around blockchain technology?
3. What are initial coin offerings (ICOs) and how have they been financing start-ups?
4. Discuss ICO scams and how they can be curtailed.

Helen Bollaert, Florencio Lopez-de-Silanes, and Armin Schwienbacher, "Fintech and Access to Finance," *Journal of Corporate Finance*, vol. 68 (2021): 101941.

This paper discusses how fintech affects access to finance for firms and investors. It focuses on fintech technologies, fintech lending, crowdfunding, and ICOs. Regulatory challenges are proposed.

Questions

1. Describe how the digitalization of finance provides new opportunities for funding for firms.
2. Explain how digital finance has the potential to expand the range of investment opportunities to new asset classes or securities.

Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008). Available at <https://bitcoin.org/en/bitcoin-paper>.

Questions

1. Has the original promise of bitcoin been recognized as the crypto space has evolved?
2. Do you think Satoshi would be happy with the focus on price that dominates bitcoin conversations?
3. Should institutions, payment processors, and other intermediaries be involved in buying and using bitcoin?

Case Study

Fintech Skepticism and Acceptance in the 21st Century

The acceptance of fintech since 2000 has been characterized by a dynamic push-and-pull between innovative potential and inherent risks. While digital payments, mobile banking, and robo-advisors have largely moved into the mainstream and gained broad societal acceptance due to their convenience and efficiency, the acceptance of blockchain, AI, and machine learning remains more nuanced. Their transformative power is recognized by both innovators and incumbents, leading to increased investment and integration. However, the persistent criticisms around volatility, regulatory uncertainty, ethical bias, and explainability underscore the ongoing challenges.

The future of fintech acceptance will largely depend on its ability to demonstrate tangible benefits while effectively addressing these legitimate concerns, ultimately building greater trust and confidence across all segments of society.

Connect provides

- A brief history of the development of fintech
- Criticisms and skepticism about fintech
- Additional readings from the World Bank, Federal Reserve, and BIS

Question

Would you trust AI to make your financial decisions for you?