

Digital Currencies

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Blockchain and Cryptocurrencies

Lecture 4



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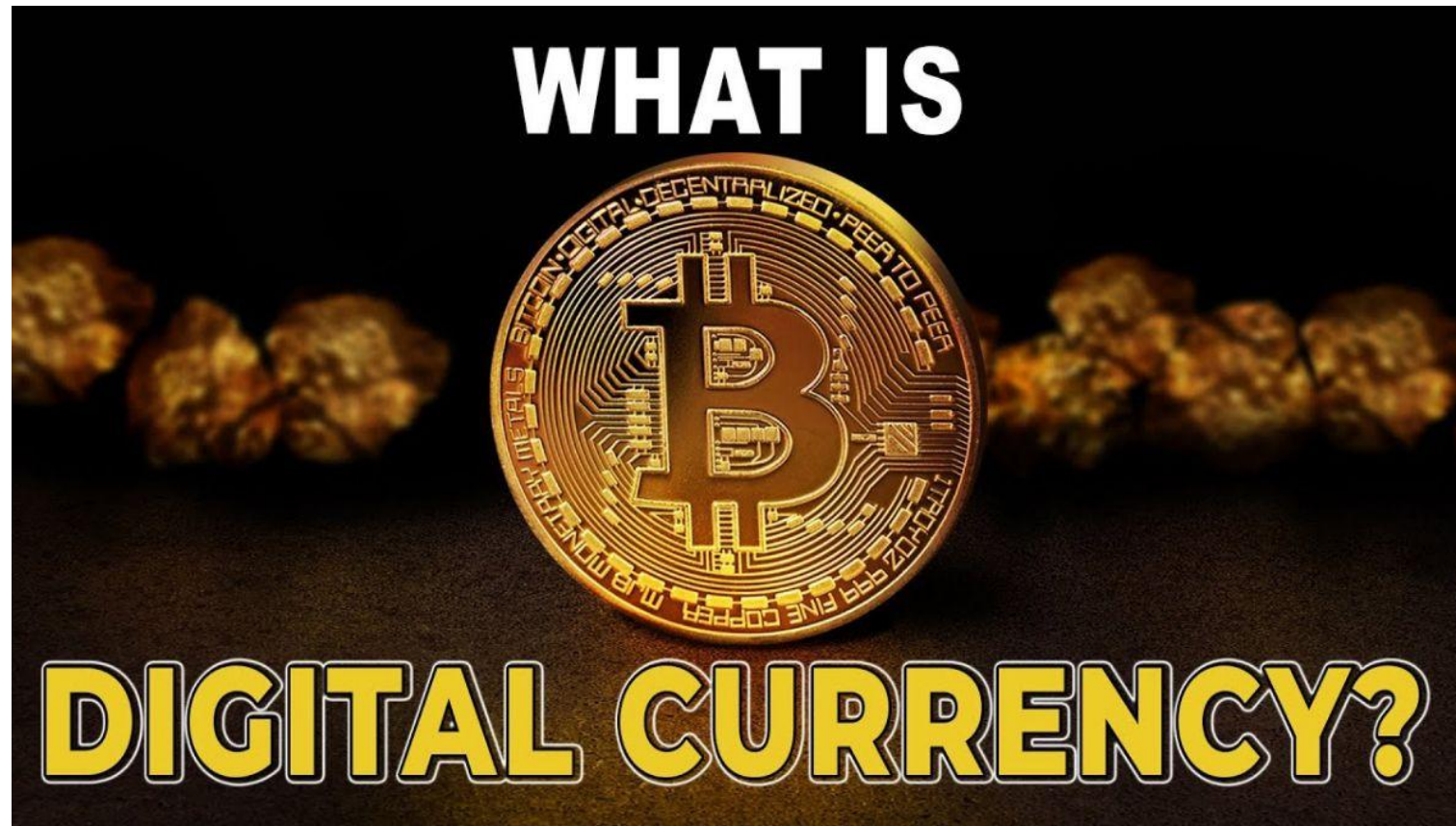
Lecture

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Digital Currencies

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Conceptual Foundations of Digital Currencies

Before we can debate whether digital currencies threaten monetary sovereignty, enhance efficiency, destabilize banks, or democratize finance, we must first ask a deceptively simple question: what exactly is a digital currency?

The answer is not merely technical. It is ontological, economic, and institutional.

A digital currency is not simply “money on the internet.” If that were the case, your online bank balance would qualify. Yet it does not. When you log into your bank’s mobile application and see numbers on a screen, those numbers represent claims on a traditional banking institution. They are digital representations of fiat money that ultimately depend on central bank reserves and legal tender laws. That is electronic money not a new monetary system.

To understand digital currencies properly, we must separate three layers that are often confused: the unit of account, the settlement infrastructure, and the source of trust. Traditional money, such as the US dollar, operates as a unit of account defined by the state, cleared through centralized banking systems, and trusted because of sovereign authority and macroeconomic management. Digital currencies may replicate some of these features, alter others, or abandon them entirely.

The conceptual break begins with trust. For centuries, monetary systems have been built upon institutional legitimacy. Whether under a gold standard or a fiat regime, money has required belief in a centralized authority be it a sovereign mint or a central bank. Digital currencies introduce an alternative model: trust embedded in code.

Broadly, digital currencies can be divided into three analytical categories: private decentralized cryptocurrencies, privately issued asset-backed digital tokens, and state-issued digital currencies.

- * The first category includes systems such as Bitcoin. These operate without central authority. Supply is algorithmically determined. Transaction validation is performed through distributed consensus mechanisms.

- *The second category includes stablecoins digital tokens backed by reserves such as fiat currency, government securities, or other collateral.

- *The third category includes central bank digital currencies (CBDCs). These are sovereign digital liabilities issued directly by central banks.

Another foundational distinction must be drawn between digital currencies and digital payment systems. Many confuse the two. Visa, PayPal, and SWIFT are digital payment networks. They facilitate the transfer of existing fiat money. Digital currencies, by contrast, can represent new monetary units with independent issuance mechanisms. They are not merely rails; they are the asset itself.

The emergence of digital currencies also forces us to revisit classical monetary theory. What gives money value? Carl Menger argued that money emerges spontaneously from market exchange as the most saleable good. John Maynard Keynes emphasized state authority and legal frameworks. Milton Friedman focused on monetary control and supply stability.

This computational scarcity introduces a new dimension: credibility without coercion. In fiat systems, trust ultimately rests on the state's ability to enforce taxation and legal tender laws. In decentralized systems, enforcement is replaced by cryptographic impossibility. One cannot double-spend Bitcoin not because a court forbids it, but because the network protocol prevents it.

Yet trust in code does not eliminate social trust. Networks require participants, miners, validators, developers, and users. Governance decisions such as protocol upgrades are social processes, not purely mathematical ones. Thus, even decentralized digital currencies embed governance structures, albeit informal and distributed.

Another foundational element is programmability. Traditional money is passive; it moves according to human instruction. Digital currencies can be programmable, meaning that conditions can be embedded directly into transactions. Smart contracts allow automatic execution of agreements once predefined conditions are met. This feature transforms money from a static medium into an interactive instrument. Payment can be conditional, time-bound, or algorithmically restricted. At a deeper level, digital currencies represent a reconfiguration of monetary sovereignty. Historically, states monopolized currency issuance as a core element of political authority. Digital currencies introduce competitive monetary ecosystems operating beyond traditional borders. They challenge the assumption that money must be territorially bounded.

Digital Currencies and Monetary Policy Transformation

Modern monetary systems are structured around a hierarchy. At the apex stands the central bank, which controls base money and sets policy rates. Commercial banks intermediate between central banks and the public, creating credit through deposit expansion. Monetary policy influences economic activity primarily through interest rates, liquidity management, and expectations. This structure presumes that most economic transactions occur within the regulated banking system.

Digital currencies introduce parallel monetary channels. When households and firms hold value in decentralized cryptocurrencies or foreign-denominated stablecoins rather than domestic bank deposits, part of the effective money stock migrates beyond traditional policy reach. This does not immediately eliminate central bank authority, but it complicates its transmission mechanisms.

Consider the example of El Salvador's adoption of Bitcoin as legal tender in 2021. Regardless of one's evaluation of the policy, the experiment revealed a structural tension: when a non-sovereign digital currency becomes widely usable for payments and savings, domestic monetary authorities no longer have exclusive influence over liquidity conditions. If economic agents shift their transactional balances into Bitcoin, the domestic central bank cannot expand or contract its supply in response to inflation or recession. The monetary base becomes partially externalized.

The consequences extend to interest rate transmission. Central banks adjust policy rates to influence borrowing and spending decisions. However, if substantial liquidity circulates in digital ecosystems outside domestic banks, rate adjustments may have weaker effects. Commercial banks depend on deposits to fund loans. When deposits migrate to digital wallets holding stablecoins or cryptocurrencies, the lending capacity of banks can decline. A reduction in deposit funding constrains credit creation, potentially dampening the effectiveness of expansionary policy measures.

At the same time, digital currencies may also expand central bank capabilities, particularly through central bank digital currencies (CBDCs). A retail CBDC would allow individuals to hold digital claims directly on the central bank. Such an instrument could enhance policy transmission by enabling direct liquidity injections into households during crises. For example, in a severe recession, stimulus payments distributed via a CBDC platform could reach citizens instantly without relying on commercial banking channels. Monetary policy could become more direct and programmable.

China's pilot of the digital yuan (e-CNY) provides a real-world example of this possibility. The system allows programmable features, such as time-limited stimulus funds, which must be spent within a defined period.

Another dimension concerns cross-border capital flows. Digital currencies facilitate near-instantaneous international transfers, often outside traditional banking rails. In economies with capital controls, digital assets may provide channels for circumvention. This challenges the effectiveness of exchange rate management and capital flow restrictions. Monetary sovereignty becomes more difficult to enforce when value can be transmitted globally with minimal friction.

Ultimately, digital currencies reshape the environment in which monetary policy operates. They fragment liquidity across multiple platforms, alter deposit behavior, and introduce programmable instruments that expand policy possibilities while creating new risks.

If monetary policy concerns control, financial stability concerns survival. A monetary system can function imperfectly for years, but once stability is threatened, the consequences are immediate and systemic. Digital currencies introduce new channels of fragility not necessarily because they are inherently unstable, but because they interact with leverage, liquidity, and interconnected markets in unfamiliar ways.

Financial stability traditionally depends on three pillars: liquidity resilience, solvency confidence, and institutional trust. Digital currencies affect all three simultaneously.

Begin with liquidity. In traditional finance, liquidity stress emerges when institutions cannot meet short-term obligations. Central banks mitigate this through lender-of-last-resort facilities. In decentralized digital markets, however, there is no central liquidity backstop. Crypto exchanges, lending platforms, and decentralized finance (DeFi) protocols operate largely without deposit insurance or emergency funding mechanisms.

Unlike traditional bank runs, which involve deposit withdrawals from regulated institutions, digital runs occur at blockchain speed. Redemptions and asset sales can unfold within minutes. The absence of circuit breakers or coordinated intervention magnifies volatility. Stability, in this environment, depends heavily on market confidence and collateral transparency.

Another case is the failure of FTX in late 2022. Although not a decentralized protocol, FTX functioned as a major centralized exchange within the digital asset ecosystem. When concerns emerged about the solvency of affiliated entities and the adequacy of reserves, customers rushed to withdraw funds. The exchange collapsed rapidly, revealing weak governance and inadequate segregation of assets. The contagion spread across lending platforms and hedge funds exposed to FTX.

Interconnectedness is another dimension of instability. Digital asset markets are tightly linked through collateral chains. A decline in the price of a major cryptocurrency can trigger margin calls across multiple platforms. Liquidations cascade automatically through smart contracts or exchange mechanisms. This reflexive dynamic resembles the leverage cycles observed in traditional finance, but with faster execution and fewer institutional buffers.

Consider March 2020, when global markets reacted to the onset of the COVID-19 pandemic. Bitcoin experienced a sharp decline of over 40 percent in a single day. Automated liquidations on derivatives platforms intensified selling pressure.

Yet stability risks are not exclusively negative. Digital currencies may enhance resilience in certain contexts. In regions with fragile banking systems or capital controls, decentralized digital assets can provide alternative access to financial services. During geopolitical crises, individuals have used cryptocurrencies to transfer funds across borders when traditional banking channels were disrupted. In Ukraine, for example, digital asset donations played a visible role in mobilizing international support quickly.

The broader stability question, therefore, is not whether digital currencies are destabilizing by definition, but under what conditions they amplify or mitigate systemic risk. The answer depends on scale, leverage, regulatory integration, and institutional design.

Financial stability in the digital era requires rethinking traditional crisis management tools. In decentralized ecosystems, there is no central authority capable of emergency intervention. Governance mechanisms are often distributed and slow-moving. If digital asset markets continue to grow relative to traditional finance, policymakers may face new dilemmas regarding whether and how to provide backstops.

Ultimately, digital currencies introduce a dual dynamic. They decentralize risk but do not eliminate it. They increase transparency at the transaction level but may obscure governance weaknesses. They accelerate financial processes but compress reaction time during crises.

The advent of digital currencies represents one of the most significant disruptions in the modern financial system, challenging the traditional role of banks as central intermediaries. For decades, banks have acted as the essential conduit between savers and borrowers, pooling deposits and transforming them into loans while managing liquidity, credit risk, and payment settlement. This intermediation function has positioned banks not only as financial facilitators but also as systemically important institutions, whose stability is critical for the broader economy. The introduction of digital currencies, beginning with Bitcoin in 2009, has fundamentally altered this dynamic by enabling decentralized, peer-to-peer transfers of value without the need for a central authority.

As digital currencies gain adoption, the traditional bank's role in deposit-taking, lending, and liquidity provision faces increasing pressure. Stablecoins and central bank digital currencies (CBDCs) further accentuate this trend by offering digital forms of money that can be used for everyday transactions with minimal friction, potentially bypassing commercial banks. This process, often referred to as banking disintermediation, has profound implications for financial stability. When households and businesses shift deposits from bank accounts to digital wallets, banks may experience a reduction in funding, which could limit their capacity to extend credit and manage liquidity efficiently. Moreover, in times of financial stress, rapid migration to digital assets could amplify systemic risk by creating sudden outflows from the banking system.

The emergence of digital currencies has introduced a profound structural shift in the mechanisms through which capital moves across borders. For centuries, global capital flows were mediated primarily by traditional financial institutions, including commercial banks, investment banks, and multinational financial intermediaries. These entities not only provided liquidity but also monitored risk, enforced regulatory compliance, and maintained cross-border payment systems. The established framework of international finance relied on the stability, transparency, and institutional trust of these intermediaries.

One of the most illustrative cases of this reconfiguration is Venezuela. Facing hyperinflation and severe currency controls in the mid-2010s, Venezuelan citizens and firms increasingly turned to Bitcoin and other cryptocurrencies as a means of preserving wealth and facilitating international trade. According to Chainalysis reports, cryptocurrency activity in Venezuela surged between 2017 and 2020, with local traders using peer-to-peer Bitcoin platforms such as LocalBitcoins to send remittances, pay for imports, and access global capital markets. In a context where the official exchange rate for the Venezuelan bolívar was heavily restricted, cryptocurrencies provided a viable mechanism for accessing US dollars and other foreign currencies.

The reconfiguration of global capital flows via digital currencies also introduces complex interactions with monetary sovereignty, regulatory frameworks, and financial stability. Central banks have historically relied on capital controls, reserve requirements, and interest rate policies to manage inflows and outflows of foreign capital. Digital currencies, particularly decentralized cryptocurrencies and cross-border stablecoins, complicate these traditional tools because they operate independently of national regulatory oversight.

The impact of digital currencies on global capital flows is further amplified by the rise of decentralized finance (DeFi). DeFi platforms facilitate lending, borrowing, and asset exchange without traditional financial intermediaries. Global capital can now be allocated directly to projects or borrowers worldwide, bypassing banks, investment funds, and even rating agencies. This has democratized access to capital but also introduced new risks, such as smart contract vulnerabilities, liquidity fragmentation, and regulatory arbitrage.

From a regulatory perspective, the reconfiguration of capital flows by digital currencies necessitates new frameworks for monitoring, taxation, and anti-money laundering enforcement. Traditional international banking networks provide regulators with a degree of visibility into cross-border capital movements, enabling monitoring for illicit activity, tax compliance, and macroeconomic oversight. In contrast, decentralized digital currencies create opacity in certain transaction flows, particularly when peer-to-peer platforms or privacy coins are involved. This shift challenges the ability of policymakers to influence global capital allocation directly, potentially reducing the effectiveness of capital controls and macroprudential interventions.

Historically documented episodes illustrate the transformative effect of digital currencies on global capital allocation. The 2020–2021 COVID-19 pandemic, for instance, accelerated capital flow through digital currency channels. Travel restrictions, disrupted banking operations, and heightened demand for rapid cross-border payments led to increased use of stablecoins for remittances, corporate treasury management, and cryptocurrency trading. According to Chainalysis data, global stablecoin transaction volumes exceeded \$1 trillion in 2021, much of it crossing national borders instantaneously. This real-world example underscores the role of digital currencies in reconfiguring both the scale and velocity of global capital flows, creating a parallel financial ecosystem that interacts with, but is increasingly independent from, traditional banking systems.

The implications of these trends are profound. First, digital currencies reduce the frictions historically imposed by national banking systems, enabling near-instantaneous allocation of capital on a global scale. Second, they challenge the capacity of policymakers to manage capital flows through conventional tools such as interest rate adjustments, reserve requirements, or capital controls. Third, while they offer increased efficiency and liquidity, they introduce new sources of systemic risk, including heightened volatility, regulatory arbitrage, and concentration of risk in unregulated or semi-regulated platforms. Fourth, the adoption of digital currencies facilitates financial inclusion in regions with underdeveloped banking systems, providing alternative channels for both domestic and international capital allocation.

In conclusion, digital currencies are reshaping the architecture of global capital flows in ways that are both innovative and disruptive. By enabling faster, cheaper, and more decentralized movement of funds, they reduce the reliance on traditional banking intermediaries and challenge the effectiveness of conventional monetary and regulatory tools. Real-world examples, such as the cryptocurrency adoption in Venezuela and the surge of stablecoins in emerging markets during periods of financial stress, demonstrate the tangible impact of these technologies on cross-border capital allocation. While the integration of digital currencies into the global financial system offers substantial benefits in terms of efficiency, liquidity, and financial inclusion, it also necessitates new regulatory frameworks, risk management strategies, and macroprudential oversight.

The architecture of money is undergoing a profound transformation, one that is as much technological as it is financial. For centuries, money was defined by sovereign authority and intermediated through banks; the value, movement, and trust in currency were inseparable from centralized institutions. Today, this paradigm is being challenged. Cryptocurrencies, stablecoins, and central bank digital currencies (CBDCs) are not merely new instruments they are signals of a broader shift toward a digital, programmable, and borderless financial ecosystem. The implications of this transformation are vast, ranging from the mechanics of payments and liquidity distribution to the strategic leverage of monetary authorities in a world increasingly mediated by code.

At the heart of this shift is blockchain technology, which allows for secure, immutable, and decentralized record-keeping. Unlike traditional ledgers maintained by a bank or central authority, blockchain distributes verification across nodes, enabling peer-to-peer transactions without a single point of control. This technical innovation fundamentally changes the nature of money: it becomes simultaneously a unit of account, a medium of exchange, and a programmable asset. Smart contracts self-executing code embedded in blockchain protocols take this a step further, enabling automatic execution of financial agreements once predefined conditions are met. Payments, loan disbursements, derivatives settlement, and collateral management can all occur with minimal human intervention.

One tangible illustration of this dynamic is the rapid adoption of stablecoins in international settlements. Tether (USDT) and USD Coin (USDC) allow funds to move across borders in seconds, bypassing correspondent banking networks that historically slowed down cross-border transfers by days and added multiple layers of fees. For multinational corporations and fintech firms operating in emerging markets, this efficiency is transformative.

Central Bank Digital Currencies (CBDCs) represent a parallel trajectory that blends technological innovation with sovereign control. China's e-CNY pilot demonstrates how a central authority can retain monetary oversight while deploying a digital currency capable of near-instant settlement and programmable policy tools

Bitcoin and Ethereum-based financial networks demonstrate that programmable liquidity can exist independently of intermediaries, giving rise to a parallel financial architecture where cross-border flows, lending, and investment allocation occur algorithmically. This duality centralized programmable currency versus decentralized autonomous money creates a spectrum of future monetary scenarios. One scenario involves hybrid coexistence: CBDCs provide stability and regulatory oversight, while decentralized networks enable innovation, financial inclusion, and cross-border liquidity. Another scenario imagines a more radical shift, where decentralized protocols dominate, potentially reducing the influence of central banks and traditional financial intermediaries. In either case, the technology fundamentally reshapes the distribution and velocity of global liquidity.

Smart contracts embedded in digital assets allow for conditional execution of payments, collateralization, or automatic portfolio rebalancing. Consider a multinational corporation operating in a volatile economic environment: it could deploy stablecoins tied to multiple fiat currencies, programmed to rebalance automatically according to exchange rate movements or credit conditions. Similarly, decentralized lending platforms like Aave or Compound allow participants to deposit digital assets and earn interest or borrow instantly, without human intermediaries. In this sense, liquidity itself becomes an algorithmic, responsive, and globalized phenomenon, challenging conventional notions of capital allocation and financial intermediation.

This technological-financial shift is not limited to payment systems. It has cascading effects on monetary policy design, market structure, and investor behavior. The transparency and programmability of digital money allow central banks to observe aggregate flows in near-real time, offering unprecedented tools for macroeconomic analysis. At the same time, the rise of decentralized platforms forces policymakers to reconsider traditional levers of control, such as reserve requirements or capital controls, which may become partially ineffective in a world of borderless programmable money. Investors, for their part, face a new landscape in which liquidity, creditworthiness, and market access are determined as much by technological architecture as by conventional economic fundamentals.

Summary

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Thank You