

Portfolio Perspective

from the Investment Advisory Group

Blockchain primer: Technology for real and digital economies

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Key takeaways

- As digital assets continue to gain investor attention, the foundational blockchain technology underpinning digital assets has become synonymous with cryptocurrencies. However, blockchain has multiple use cases for both the real economies of today and the digital economies of tomorrow beyond just the crypto applications.
- Though cryptocurrencies could be considered blockchain “power users”, that understates the degree to which blockchain is increasingly being used in commercial use cases.
- Blockchain’s potential benefits are varied and significant. While its adoption is still building and growing, the various applications (as listed below) may portend a future of transformational change in our daily lives, similar to the advent of the internet. Some cryptocurrencies and digital assets may come and go, but the underlying technology of the blockchain is here to stay.

What is blockchain?

- A blockchain is simply a database of information shared across a peer to peer decentralized network of connected computers, the “data” is hashed and represented either as a value or a computer code. In other words, it is to digital assets what HTML is to the internet – the foundational technology upon which applications can be built. Blockchain technology comes in many shapes and sizes but is not a singular “one-size-fits-all” technology solution.
- At the core of any blockchain application is understanding the concept of a ledger. Put simply, a typical ledger records economic activity (transactions) between two or more trusted parties. Unlike current methods, blockchain allows applications to “decentralize” the recording of those financial transactions by removing the intermediary, instead preferring a solution, such as using an algorithm, that is not subject to manipulation or error.
- The concept of **decentralization is critical** to understanding the underlying premise of blockchain not just for cryptocurrencies but also for real economy business applications. The intent of a decentralized ledger is to gain **accuracy, speed** and

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- May Lose Value

data integrity with a time-stamped auditable data base from a broad community of participants.

- To date, one of the most notable uses of blockchain has been Bitcoin. It was launched on October 31, 2008, six weeks after Lehman Brothers went bankrupt during the height of the Great Financial Crisis that threatened the survival of the global banking system. Its proponents argued central banking systems, such as the Federal Reserve, contributed to financial instability in times of economic turbulence. Bitcoin was proposed as a **decentralized** alternative to central banks offering a peer-to-peer payment solution cutting out intermediaries. Thousands of cryptocurrencies have followed in Bitcoin's footsteps since then. However, we expect there will be significant variability in the potential for long-term value, and many of them will not have viable use cases.

Common elements of blockchain technology

Blockchain technology is best thought of as software. Each application or protocol has its own purpose and process whereby each individual transaction is requested to be added to the next block. Once recorded, each transaction is broadcast to the community for cryptographically protected digital signatures, then validated by the protocol's community, and finally added to the blockchain to be recorded as part of its linked history. Each verified block that is added to the chain is permanently preserved with the rest of the chain's history. Key components of this process for any blockchain include:

- Each record/transaction has its date and time **permanently recorded** and added to the prior history of records without the ability to amend it in the future.
- Records can only be added to the prior history or chain but **never deleted** to preserve the integrity of the blockchain.
- This log is **immutable**, anonymous and tamper resistant.
- The ongoing chained data base is **auditable** and can be retrieved by anyone on the network at any point in time.
- Each transaction between parties requires a unique and traceable digital signature – like fingerprints
- Verification is required for each successive block of records by members of its network community.
- Membership is represented through tokens. Owning a token of a digital asset is similar to owning a stock – the difference being a token provides membership of that digital asset community, not ownership.

Two broad types of blockchains

For purposes of this paper we'll broadly categorize blockchains into two different types.

- **Public** – These blockchains are best compared to the **internet** where access is publicly available to all participants. They're open to all, free to use, permissionless and decentralized. Bitcoin is perhaps the best example of a public blockchain.
- **Private** – These blockchains are best compared to a corporate **intranet** where access is limited to participants who have been granted permission. In this instance, private businesses often have legitimate needs for confidential communication internally or business-to-business. Many private blockchains are executed through the use of smart contracts which can be programmed conditionally depending on the types of records and transactions that are being recorded.

Blockchain potential use cases

The list of potential use cases for blockchain technology is expansive and promising. A narrow list of possibilities across just a few economic sectors includes:

- **Cryptocurrency**
 - Bitcoin and other cryptocurrencies
- **Financial**
 - Payments
 - Anti-money laundering
 - Lending
 - Settlements
- **Insurance**
 - Claims filings & processing
 - Ratings
- **Supply chain**
 - Logistics management
 - Pharmaceutical tracking
- **Medical**
 - Records sharing
 - DNA sequencing
- **Media**
 - Game monetization
 - Ticket purchasing
 - Digital rights management
- **Asset titles**
 - Digital asset records
 - Car leasing and sales
 - Land title ownership
- **Payments**
 - B2B
 - Tax filing
- **Government**
 - Voting
 - Vehicle registration

Bottom line

Digital assets such as cryptocurrencies or smart contract tokens are built using blockchain technology. Digital asset platforms can be viewed as being similar to software companies, utilizing blockchain to provide digital solutions to everyday needs. Many large U.S. public companies already utilize blockchain technology to gain efficiencies, and many more are generating new revenue streams by developing internal capabilities to grow their businesses. This is occurring across all sectors of the economy.

We believe that blockchain technology represents a long runway for future transformational opportunities and potential disruptions for both the current and emerging digital economies.

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