



PGIM
India Mutual Fund

MEGATRENDS

CRYPTOCURRENCY INVESTING

Powerful Diversifier or Portfolio Kryptonite?

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INTRODUCTION

Red dogs, stump tails and blue pups were just some of the creative names for the ultimately doomed currencies issued by poorly capitalized state-chartered banks during the wildcat banking era in U.S. monetary history from 1837 to 1863 – until Congress finally passed legislation that created a single centrally backed national U.S. currency.^{1,2}

History rarely repeats itself, but it often rhymes – and 150 years later we are in an era with thousands of unregulated cryptocurrencies and digital tokens with a collective market cap over \$1 trillion.³ These cryptocurrencies offer the promise of a frictionless, inclusive and decentralized network powered by blockchains and operated completely independently of central banks, which are increasingly seen as debasing fiat currencies by “printing money.”*

For institutional investors, cryptocurrencies also offer the allure of extraordinary and diversified returns in a market that is now of sufficient size and liquidity for meaningful institutional positions. Indeed, some market participants estimate that about 5% of total Bitcoin supply are now held by institutional investors via custodial intermediaries.⁴

To understand the investment implications of the evolving cryptocurrency landscape, we have drawn on the insights of more than 30 investment professionals across PGIM’s fixed income, equity and private alternatives managers – as well as leading economists, venture capitalists and crypto investors. Our resulting conclusions:

- While a few cryptocurrencies will endure on the fringes of the monetary system, **the broad replacement of fiat currencies globally by cryptocurrencies is unlikely to materialize. Functionally, cryptocurrencies are unable to meet the basic prerequisites of either a currency**

or a precious-metal substitute – shortcomings exacerbated by the powerful headwinds from increasing regulatory scrutiny and the growing likelihood of central bank digital currencies (CBDCs) which provide almost all the functional benefits of fiat-linked cryptocurrencies, but with no liquidity or credit risk.

- Beyond hedge funds exploiting inefficiencies to generate alpha on the other side of “FOMO”-driven, largely retail and speculative flows, there is currently no compelling case for direct ownership of cryptocurrencies as a meaningful share of an institutional portfolio. Theoretically, cryptocurrencies have no ex-ante foundational underpinnings for delivering robust risk-adjusted returns in the future. Empirically, after examining the brief historical data available on crypto, **we find little real-world evidence that cryptocurrencies deliver diversification vs. mainstream assets, are effective inflation hedges, possess the intrinsic characteristics of a safe-haven asset, or advance ESG objectives.** Of course, it goes without saying that bitcoin and many other cryptocurrencies have delivered awe-inspiring returns over the last decade – albeit with frequent and substantial drawdowns – and this speculative momentum could continue for some time.
- In contrast to direct cryptocurrency ownership, **there are attractive institutional investment opportunities in the broader crypto ecosystem and the incidental innovation that has flourished in the creation of bitcoin and other cryptocurrencies.** These include private applications of distributed ledger technology and smart contracts used in financial services (like clearing and settlement of securities and international payment systems) as well as

* To sharpen our focus, we limit our analysis to crypto assets intended as substitutes for fiat currencies, such as bitcoin, ether and sol, which collectively represent close to 60% of the sector’s market cap. Digital tokens specific to a particular application or sidechain are not our primary focus. We also explicitly exclude regulated central bank digital currencies (CBDCs) and non-fungible tokens (NFTs) from our analysis, except where they intersect with and influence our view on crypto opportunities and risks.

in logistics and supply-chain management. Tokenization could be a next-generation securitization mechanism for real assets. Additionally, the companies providing the essential infrastructure for crypto innovation will have a head start in underpinning CBDCs and other blockchain-powered applications. This collateral innovation has the potential to generate attractive returns for owners of the companies that provide these services but will not necessarily accrue to the owners of cryptocurrencies.

We share analysis to support our hypotheses and unpack the critical investment implications of these conclusions in the rest of this report. Chapter 1 summarizes the cryptocurrency landscape, cutting through the breathless media hype. Chapter 2 explains why cryptocurrencies are deeply inadequate as

currencies. Chapter 3 lays out the empirical evidence for why cryptocurrencies fail to meet most institutional investor objectives around portfolio diversification, risk-adjusted returns, inflation protection and ESG. To “stress test” our conclusions, we also lay out the potential scenarios that would need to materialize for the extraordinary price trajectory of bitcoin and other cryptocurrencies to continue. Our base case is these scenarios are highly unlikely to materialize.

Finally, Chapter 4 argues that enduring value for long-term investors will be found not in cryptocurrency holdings themselves, but in the use cases and applications from the remarkable breakthroughs that are the accidental by-products of the heroic but potentially doomed quest to build a viable decentralized, unregulated peer-to-peer payment system.

About PGIM

PGIM, the investment management business of Prudential Financial, Inc. (PFI), has a history that dates back over 145 years and through more than 30 market cycles.* Built on a foundation of strength, stability and disciplined risk management, PGIM's more than 1,300 investment professionals are located in key financial centers around the world. Our firm is comprised of six autonomous asset management businesses, each specializing in a particular asset class with a focused investment approach. This gives our clients diversified solutions from a leading global asset manager with global depth and scale across public and private asset classes, including fixed income, equities, real estate, private credit and other alternatives. For more information, visit www.pgim.com.

* 30 market cycles represents PFI's asset management expertise through PGIM, its affiliates and its predecessors.

CHAPTER 4

INVESTMENT OPPORTUNITIES IN THE BROADER CRYPTO ECOSYSTEM

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CHAPTERS

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CHAPTER 4

INVESTMENT OPPORTUNITIES IN THE BROADER CRYPTO ECOSYSTEM

In many ways the cryptocurrency boom resembles the Dutch tulip mania of the 1630s and the internet stock bubble of the late 1990s. But savvy long-term investors willing to look beyond the breathless hype surrounding cryptocurrencies are likely to find enduring investment opportunities around tangible, real-world applications of distributed ledger technology that are likely to generate attractive risk-adjusted returns – even if crypto-mania itself fizzles.

We lay out four longer-term investment themes that CIOs will want to evaluate for their portfolios as they look beyond cryptocurrencies for sources of long-term value creation.

1. Private blockchains and smart contracts

The most powerful use cases for blockchain may be unrelated to the cryptocurrency payment networks. Indeed, blockchains are a highly secure and robust system for verifying and recording transactions. While there is hype around the “blockchain revolution,” investors would be wise to focus on blockchain use cases with well-defined practical applications that address real-world problems today, especially in the financial services sector.

While permissioned private blockchains still require central authorities to authenticate users initially, they can reduce the costs of routine financial transactions as they eliminate the need for counterparty and trade verification as well as transaction and record reconciliation. Because of the centralized authority verifying users, private blockchains can be easily scaled and will likely have the largest near-term impact on financial services firms.⁶²

Permissioned blockchains also offer efficiencies in the origination, servicing and trading of assets, especially those (like real estate) with many different participants across the value chain and incompatible legacy

systems. The complexity of the value chain around mortgage origination, securitization and servicing, for example, has led companies to push for a more efficient and real-time process using blockchains. For example, Figure Technologies is a company which originates home equity loans and mortgages as well as securitizes and services them on the Provenance blockchain. This distributed ledger platform is an early example of the greater transparency and efficiency potential of permissioned blockchains targeting specific challenges.^{63, 64}

When partnered with self-executing smart contracts, distributed ledger technology offers greater efficiency in the clearing and settlement of securities than current systems. Major global financial institutions are already utilizing private blockchains to enable real-time clearing and settlement of transactions today. In fact, private blockchains are already handling trades with almost no need for humans to verify counterparties, confirm trade instructions or settle transactions. In 2021, for example, JP Morgan launched Onyx, an Ethereum-based blockchain that uses smart contracts, to swap digitized Treasury collateral and digitized cash instantaneously and clears, settles and records billions in daily repo trading.⁶⁵

Furthermore, innovations in smart contracts and the rapidly evolving ecosystem of innovative Layer-2 technologies are rapidly expanding the functionality and creating new and important possibilities for applications in the conventional financial realm.

The next step for settlements could be more complex transactions like OTC derivative contracts and other kinds of bespoke, highly customized transactions.⁶⁶

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2. The infrastructure and ecosystem supporting blockchain applications and CBDCs

A range of surrounding technology and services will be required to support permissioned blockchains and smart contracts – and many will also play a pivotal role in supporting the adoption and growth of CBDCs. Specifically, investors should focus on two areas which are likely to be especially attractive: (1) blockchain enablers and (2) fraud prevention and regulatory compliance services.

Key blockchain enablers

The internet didn't really take off and gain widespread adoption until its broad infrastructure had matured and was able to overcome initial challenges. Similarly, the landscape for innovation in blockchain infrastructure is wide open and there is tremendous potential for key enablers to reduce current challenges and barriers.

One such area for blockchain is interoperability. While there already exists a diverse ecosystem of blockchains, these different blockchain networks do not interact with each other in a meaningful way. Their ability to “talk” and transact with each other seamlessly is referred to as interoperability and this innovation will enable a wide range of blockchain-enabled products and services.⁶⁷ This innovation could make interoperable smart contracts possible and open up new possibilities for record and document management in healthcare, law and real estate by

allowing important business information to be securely sent back and forth between private and public networks in a customizable and controlled manner.⁶⁸ VC-funded platforms like Polkadot and Cosmos are major enablers of interoperability.

Another infrastructure area that has drawn VC investment is Layer 2 technologies that enhance performance and scalability on popular platforms like Ethereum. Polygon, for example, is a company which provides software that lowers the cost and friction of transacting on Ethereum.⁶⁹ Another area of innovation in crypto infrastructure is the growth of companies that support the development of decentralized applications, or dApps. For example, Alchemy is software to create cryptocurrency apps that communicate with Ethereum and several other blockchains.⁷⁰

Fraud prevention, security and regulatory compliance

Given the complicated regulatory environment for cryptocurrencies and concerns raised by decentralized and anonymous transactions, there is a growing field of AML risk assessment and management. A whole slew of PE and VC-funded software firms like Fireblocks and Chainalysis in the US, and Coinfirm and Elliptic in the UK, currently provide services to exchanges, payment providers and custodians to help them conduct due diligence on customers, track transactions and manage these risks. Firms like Simplex in Israel utilize AI to provide crypto and fraud prevention solutions to merchants. Meanwhile Merkle Science in Singapore offers businesses, banks and government agencies tools for crypto threat detection and risk management. As the world of digital assets and CBDCs matures and intersects further with conventional finance and other firms, the need for these services will grow.

3. Tokenization: Next-generation securitization of real assets

Tokenization of real assets – essentially fractionalizing ownership into digital tokens on a distributed ledger – represents a potentially game-changing future

application that opens up simpler, more cost-efficient ways to issue, manage, and transact assets and investments.

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In theory, any real asset – precious metals, real estate, artwork or infrastructure – could be tokenized and substantially reduce frictional costs from transactions and servicing. This would increase liquidity, simplify transactions, enhance price transparency, and allow more granular portfolio construction. It also allows investors to potentially benefit from increased liquidity, shorter and more flexible lock-up periods, and easier proof of ownership.

It is important to note, however, this application remains at a very early stage and significant challenges need to be resolved. First, the lack of clear regulatory, legal and tax guidelines around tokenized assets leads to compliance uncertainties. Second, while distributed ledger technology is already being employed by banks in their clearing and settling operations, it needs to be further refined to work across private assets and at efficient scale under real-world conditions. Third, market participants need to build trust in the new operational mechanisms and governance frameworks and adapt their internal systems to them.

However, when the legal, governance and regulatory frameworks become more settled, tokenization will lead to a more fractionalized ownership model for real assets. For example, institutional investors who are significant participants in real estate funds are accustomed to influencing the contours of the fund's investment strategy. A more fractionalized ownership model could potentially reduce the influence of anchor investors in the covenants or terms for large real estate transactions that could now be broadly syndicated with smaller institutional, high-net-worth

and even retail investors. Tokenization could also lower the transaction costs of holding a significantly more diversified portfolio of real assets as expensive intermediaries in the securitization marketplace are displaced by cheaper blockchain-powered technologies. Indeed, the prospect of fractionalized ownership and better liquidity under a tokenized real asset regime might allow investors and real estate managers to diversify or fine-tune portfolios with greater ease.

4. Monitor the metaverse as a leading indicator of crypto innovation

Metaverse platforms combine augmented reality (AR), virtual reality (VR), blockchain technology and digital tokens or currencies to create highly immersive digital worlds where people can gather to socialize, play, work, and trade digital goods.⁷¹ While it is unclear whether the metaverse will simply become a part of our entertainment allocation, or become something much more meaningful than that, we believe institutional investors should track new technologies, companies and platforms in the metaverse for three primary reasons.

First, the metaverse is big and will get bigger. Virtual gaming, entertainment (e.g., concerts by major bands) on virtual sites, and advertising in the metaverse generates roughly \$500 billion annually in revenue today – as large as the “real-world” global sports industry – and is growing rapidly.^{72, 73} In 2021, even putting aside NFTs, over \$60 billion was spent on purely cosmetic, nonfunctional virtual goods.⁷⁴ Given the degree of investment going into real-time 3-D rendered virtual universes, investors should observe how these platforms evolve.

Second, we are not quite there yet, but applications in the metaverse may start leading to tangible improvements in real-world industries. Johns Hopkins recently performed its first pair of surgeries on live patients using augmented reality displays.⁷⁵ In the defense sector, the U.S. military has discovered that you can accelerate the learning curve for new recruits looking to fly helicopters with VR goggles, effectively giving them a private helicopter to learn on.⁷⁶ And in industrials, BMW's new all-electric vehicle ran a VR simulation for six months before finalizing the actual

layout for the factory – changing 30% of the design from the original during those virtual experiments.⁷⁷ Perhaps even more importantly, these new uses of metaverse platforms are spawning innovative technologies, in holographic displays and speech recognition, for example. Investors will therefore want to evaluate opportunities both in metaverse applications – especially in education, training, healthcare and e-commerce – as well as the VR/AR hardware field.⁷⁸

Third, cryptocurrencies and digital tokens are *the* currency in the metaverse. This is a world where crypto natives have chosen to adopt digital currencies and tokens as the sole medium of exchange and unit of account to trade NFTs, buy digital assets in a multiplayer game, or attend a virtual concert. Investors looking to understand the future direction of the broad cryptocurrency and digital token landscape will need to monitor the transaction, payment and currency systems being developed for and in the metaverse.

Conclusion

It is clear cryptocurrency is not currently (and may never be) ready for prime time. Given its flip-flopping correlations with other assets, frequent stomach-churning drawdowns, a highly unsettled regulatory landscape, immature infrastructure and problematic ESG impact, investing directly in bitcoin and other cryptocurrencies is currently quite unattractive for institutional investors.

Of course, investors will want to monitor developments in the cryptocurrency space in the unlikely event that conditions arise for the mainstreaming of private cryptocurrencies. But regardless of how cryptocurrencies themselves endure, savvy long-term investors will certainly want to capture the emerging constellation of investment opportunities in the broader ecosystem of innovation surrounding cryptocurrencies – many of which will power new trading platforms, smart contracts, central bank digital currencies and next-generation securitization technologies in the years and decades ahead.

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