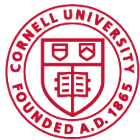


**Report as of January 30, 2025 of the  
Cornell Convenes 2024 Roundtable Forum:  
Tokenization of Real-World Assets**  
9:00 am - 12:00 pm March 8, 2024 | New York, NY

**FINTECH AT CORNELL and CORNELL CONVENES**

Initiatives of the **Cornell SC Johnson College of Business**



**Cornell**  
**SC Johnson College of Business**

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**II | GREETINGS****FROM ANDREW KAROLYI**

HAROLD BIERMAN, JR., PROFESSOR OF MANAGEMENT  
CHARLES FIELD KNIGHT DEAN  
CORNELL SC JOHNSON COLLEGE OF BUSINESS

Dear Readers,

The Fintech at Cornell Initiative of the Cornell SC Johnson College was launched by the SC Johnson College of Business four years ago to deploy scholarly and industry expertise in this rapidly evolving space. Engaging academic fellows and industry collaborators at the forefront of the field, the Initiative has examined the advancing capabilities of Decentralized Finance (DeFi), CBDCs, stablecoins, and digital assets, and now the tokenization of real-world assets.

*Cornell Convenes: Tokenization of Real-World Assets*, our third consecutive annual critical dialogue, invited a select group of participants to envision a fully tokenized financial system and its associated challenges and opportunities for business and society. This resulting *Cornell Convenes* white paper will prove constructive to a broader understanding of the concerns surrounding a fully tokenized financial system, offering responsible insight from a community of experts into the priorities and potential approaches to appropriate regulation.

The Cornell SC Johnson College of Business is dedicated to engagement and collaboration, and we will continue to support groundbreaking conversations like this one. I am proud that Fintech at Cornell hosts such purposeful high-level convenings, and I am grateful to Will Cong and Susan Joseph for their masterful steering of this powerful cohort.

Sincerely yours,



Andrew Karolyi

FROM **SUSAN JOSEPH**

EXECUTIVE DIRECTOR  
FINTECH AT CORNELL

Hello, and thank you for your interest in this conversation!

The future of finance promises an internet potentially more accountable to individuals. To address this transformation, we held *Cornell Convenes: Tokenization of Real-World Assets* on March 8, 2024. This event followed the structure of our inaugural event in 2022 that discussed digital assets and second annual event in 2023 that discussed stablecoins and CBDC. To capture the thoughts of industry and academic leaders, we brought together professionals for an enthusiastic and confidential debate.

Tokenization of real-world assets has captured the imagination of institutional finance. This discussion focused beyond stablecoins (arguably the most popular tokenized RWAs) to more general tokenized RWAs, ranging from funds to real estate to art to private credit, and then to the potential to fractionalize assets, provide new offerings, streamline costs, and open more liquid markets. The roundtable followed Chatham House Rule to encourage free-flowing conversation and promote ungated opinions and input. Unsurprisingly, opinions differed. Our goal was not to achieve agreement on a concrete set of next steps. We aimed to identify and offer ways to consider the most salient issues. We achieved that. We were happy to take the first step in assembling these groups and intend to remain engaged in this dialogue.

I hope you'll read on and consider the varied perspectives and priorities expressed. I am eager to hear your thoughts on this conversation and the issues presented.

My sincere appreciation goes to SC Johnson College Dean Andrew Karolyi and Professor Lin William Cong, and to the Fintech at Cornell sponsors for their unflinching support of this work.

Sincerely Yours,



Susan Joseph

FROM **LIN WILLIAM CONG**

FOUNDING FACULTY DIRECTOR  
FINTECH AT CORNELL

Dear Reader:

For the past four years, Fintech at Cornell has been galvanized toward assembling the most comprehensive and engaged cohort of expert perspectives from Cornell and the global fintech community. **Our affiliated fellows have been awarded the Nobel Prize in Economics and the Sloan Fellowship this year as well.** That community continues growing and proving its commitment to lending cogent and discerning perspectives to this unique financial moment.

The Cornell Convenes group that assembled this year expressed seasoned perspectives from the academic and industry angles on the tokenization of real-world assets. Everyone involved can see the profound potential for benefit and harm with regards to a fully tokenized financial system. Responsible action, education, patience, and attentive collaboration will be top priorities if we are to make progress in this sphere. The conversation reported here suggests possibilities for balancing those priorities.

We are grateful for the generosity and dedication of our sponsors, Broadridge and Ripple. I am especially beholden to Executive Director Susan Joseph, who builds new bridges and networks seamlessly. All of this is made possible by the leadership of the Cornell SC Johnson College of Business and the **Fintech at Cornell faculty affiliates, research Fellows and students.**

We hope the report provides an informative anchor for more rigorous studies and continued discussion.

Yours Faithfully,



Lin William Cong

## II | THE CHALLENGE and BACKGROUND SUMMARY - by Susan Joseph

**The Challenge:** The Golden Age of real-world asset (RWA) tokenization is upon us. Excitement surrounding tokenization is palpable. Institutions are beginning to understand that liquid asset markets are the future. Growth estimates confirm this: The [current global market size](#), according to Binance Research, is \$12 billion. [Boston Consulting estimates](#) market growth to \$16 trillion by 2030, and [Standard Charter estimates](#) that global market size of tokenized RWAs will reach \$30 trillion by 2034.

In response, the FinTech Initiative of the Cornell SC Johnson College of Business held the roundtable *Cornell Convenes: Tokenization of Real-World Assets* in March 2024, reuniting industry leaders and academics to converse and offer undiluted insight on a fully tokenized financial system. Chatham House Rule was employed to promote unrestrained participation. Participants talked *with* each other, rather than *at* each other.

Given the broad global reach and rapidly evolving landscape of these vigorously debated subjects, frank conversations are essential across industry, regulation, and academia to foster understanding. Specific discussion topics included the impact on traditional finance, the current and near-future research landscape, and what the new financial system could look like. Where first principles emerged, the editors have noted them in this paper.

The discussion was divided into three chapters. The first was the *Tokenization of Real-World Assets*. The second was *DeFi in the Context of Real-World Assets and Smart Contracts*. The final session was focused around *Policy, Disclosure, Regulation, and Tax*. The group conversation is anonymously transcribed in this report, with the report authors offering summarized principles, questions, and comments where they emerged. Links to useful sources are used throughout; additional sources can be found in the Appendix at the end of the report.

## The Background Summary: Tokenization of Real-World Assets: Evolution and Trends in the Last 12 Months

### Institutional Interest Heralds the Golden Age of Tokenization

Tokenization of real-world assets (RWAs) involves using tokens to represent ownership of assets on a blockchain. Tokenization potentially reduces costs, enhances the liquidity and accessibility of these assets, and also introduces a new level of transparency and security in asset management. Once tokenized, RWAs that represent deposits, private credit, real estate, commodities, non-fungible tokens (NFTs), art, and tokenized securities (to name a few) can be easily transferred and traded 24/7. Also, stablecoins play a crucial role by providing an efficient and stable means to facilitate the on-chain transfers and trading of RWA. They bridge the gap between traditional financial systems and digital assets ecosystems.

Banks and fintechs have been, for some time, exploring and integrating private permissioned blockchain technology to tokenize a variety of assets. For instance, JPMorgan maintains a blockchain-based deposit account ledger and payment, [Kinexys Digital Payments](#), which is maintained on a private permissioned blockchain targeted to the wholesale and corporate market. The volume of transactions is on average \$2 billion a day. [Broadridge's Distributed Ledger Repo \(DLR\) offering tokenizes securities](#) which transacted \$50 billion a day at its outset in early 2023, has grown substantially since then, bringing velocity and capital efficiency to traditional US Treasury Repo workflows.

The larger story is the shift to trading on public blockchains with the integration of dollar equivalent stablecoins, which has attracted the interest of major financial institutions in addition to crypto-native firms. Alternative investment funds, pensions, family offices, and even sovereign wealth funds will not be far behind once there is a supportive regulatory environment. The new pro-crypto federal administration has already encouraged these new technologies - technologies which can transform how assets are accessed, managed, traded, and valued.

To be fair, many of the following developments in digital assets occurred under the Biden administration. This includes the on-chain tokenized treasury market which is

rapidly growing. Institutions in the US such as [Franklin Templeton](#) and [BlackRock](#) have issued and traded on-chain tokenized money market funds totaling over \$500 million, with BlackRock announcing daily dividends and intra-day redemptions in January 2025. In Asia, the largest tokenized T-bill issuer is [Open Eden](#) with \$150 million, and UBS expanded its [UBS Tokenize](#) services by offering an on-chain USD money market fund. Startups such as [Mountain](#) and [Ondo](#) have issued on-chain assets in the form of yield-bearing coins backed by US treasuries or tokenized treasuries, respectively, via public blockchains. Ondo and Mountain provide daily interest and their products are currently targeted to individual investors, while BlackRock and Franklin Templeton offer traditional fund yields, and are targeted toward institutional investors. Additionally, in a push to enter the yield market and tokenization race, on 1/21/25, [Circle announced the acquisition of Hashnote](#), the issuer of the \$1.3 billion tokenized money market fund USYC, and additionally will bring liquidity to the institutional market on the [Canton Network](#). Overall, tokenized treasury funds are currently estimated at over \$2 billion. That number is a small slice of the \$27 trillion dollar treasury market pie, so there is ample room for growth, and evidently a ravenous appetite among investors for this product.

Not to be left out, the NYSE applied in October 2024 to expand to [a 22-hour trading day](#) on the Arca Equities Exchange, pending SEC approval, with a target launch anticipated in 2025. The extended hours will continue to be cleared by DTCC which will also extend its hours to accommodate. NYSE seeks to compete with alternative trading sites that have extended hours. But it's fair to question whether this expanded trading is also the first step to transitioning to an on-chain world to extend NYSE's reach into anticipated highly liquid, always-on, tokenized on-chain equities.

Many believe these on-chain tokenized funds and/or coins could be used as [collateral for derivatives trading](#), which would provide significant increased mobility and instantaneous settlement. Others are imagining that some tokenized assets similar in nature to money market funds may also be used in part as [payment mechanisms](#). Could interest-bearing stablecoins, generally thought of as securities, supplant the very lucrative payments market that is currently captured by non-interest-bearing stablecoins?



What other on-chain RWA products can be imagined and brought to life? For instance, does an attention-based coin like the [\\$TRUMP coin](#) mean that attention itself is a real world asset that is being tokenized as a meme coin (and potentially adopted as a payment instrument)? These possibilities fuel the imagination and power the growth of real-world asset tokenization. As regulations are fully put in place across jurisdictions, the market should see significant innovation and growth. It is still early days, but the expectation is that deep and liquid markets for multitudinous 24/7 RWA will soon become a reality.

### **Regulatory Advancements**

The regulatory landscape for tokenized RWAs is complex and varies significantly across the globe. Issues regarding classification, securities laws, jurisdiction, investor protection, and diverse national and regional approaches have created a risky and uncertain regulatory environment that can also be very lucrative because of regulatory arbitrage.

A few examples of the complex and largely non-harmonious global regulatory environment follow.

Within the US, Biden administration regulators acted cautiously, or, in some cases, were aggressively hostile toward this topic. The Securities and Exchange Commission (SEC) in particular, guided by Gary Gensler, largely regulated by enforcement, which was only conducive to innovation being outsourced overseas. Additionally, the Fed and FDIC are alleged to have engaged in a clandestine effort to de-bank the crypto industry (sometimes referred to as [“Operation Chokepoint 2.0”](#)).

All was not negative during the Biden administration, though. The first positive milestone for digital assets came in January 2024 when the SEC’s hand was forced in a decision from a yearslong lawsuit, the result of which was that SEC approved a spot Bitcoin Exchange Traded Product, (“ETP”). These products are colloquially known as Bitcoin Exchange Traded Funds or Bitcoin ETFs. Additionally, a May 2024 [Congressional Research Report](#) discussed various types of RWA that can be tokenized, as well as potential operational and systemic risks.

Now, the tone at the top of the Trump administration represents a wholesale change to a crypto friendly posture. The new administration's goal is clearly to provide timely regulatory clarity and promote innovation.

In a blizzard of activity spanning the first week after the inauguration, the SEC's acting Chair, Mark Uyeda, an advocate for digital assets, was appointed until the nominated permanent head, Paul Atkins, also digital asset friendly, can take the position. Acting Chair Uyeda immediately created a [Crypto Task Force](#) that is headed by SEC Commissioner Hester Peirce, colloquially known as "Crypto Mom", to start working on regulations that make sense for the industry - something the industry has asked for repeatedly over the past four years. The SEC also eliminated its accounting statement from the prior administration that effectively required holding reserves against crypto assets held in custody. This move now paves the way for an explosion of banks and public companies to custody tokenized RWA. Additionally, both chambers of Congress are investigating de-banking claims targeted at crypto participants. The House Oversight Committee has asked certain crypto participants to provide information about their experiences, and the Senate Banking Committee will hold a hearing on this subject on February 5.

Finally, President Trump announced to the world at the World Economic Forum at Davos that the US will become the "World Capital of Artificial Intelligence and Crypto" and backed this up by issuing an Executive Order entitled [Strengthening American Leadership in Digital Financial Technology](#). The Executive Order provides, among other things, the creation of a Working Group on Digital Asset Markets to be chaired by the White House AI & Crypto Czar, David Sacks. Since the US is to a degree playing "catch up" with other countries, this Working Group has 60 days to identify existing rules, regulations, and guidance and to recommend to the Chair whether they should be rescinded, modified, or even adopted as regulations.

Additionally, this group has six months to submit to the President its recommendations on regulatory and legislative proposals, and will be developing a federal regulatory framework for digital assets including stablecoins (which in many cases can be considered a type of tokenized RWAs), as they can strengthen and further the reach of the US Dollar. The group will also evaluate the potential creation, and propose criteria and maintenance for, a national digital asset stockpile. Finally, the Working Group will consult with the National Security Council.

Other jurisdictions currently provide regulatory frameworks that offer certainty, which lowers the risk for both entrepreneurs and traditional financial participants. These environments are welcoming to entrepreneurs, and capital and talent have migrated to those jurisdictions. The European Union enacted comprehensive regulations, [Markets in Crypto-Assets \(MiCA\)](#), to provide clarity and ensure consumer protection in the digital asset space. (Some say that, though clear, these regulations are too restrictive.) [Singapore MAS](#) provides clear regulations and supports innovation through regulatory sandboxes. [Switzerland](#) also offers a well-defined regulatory environment, and classifies tokens into payment, utility, and asset tokens. [Hong Kong](#) is proactive in exploring tokenization of RWA, and [Japan](#) has shown interest as well; these two jurisdictions are actively working towards creating robust regulatory frameworks to support the growth of tokenized real-world assets.

### **Technological Innovations**

The technological infrastructure supporting asset tokenization has advanced considerably. Blockchain platforms like Ethereum and Solana have introduced improvements to scalability and security, which are crucial for the widespread adoption of tokenized RWAs. Ethereum Layer 2 solutions and advancements in smart contract technology have made it feasible to handle larger volumes of transactions with lower fees and faster processing, and themselves compete for business. Moreover, new blockchain protocols specifically designed for RWA tokenization have emerged, providing more specialized solutions for issuers and investors. Finally, stablecoins have developed as a critical interface for translating these RWA into digital dollar equivalents.

### **Market Expansion and Use Cases**

The scope of assets being tokenized has broadened significantly. While both tokenized [treasury funds](#) and real estate remain a strong focus, with platforms enabling [tokenized fractional ownership of properties](#), there are other financial focused projects that have taken root. For instance, Broadridge's Distributed Ledger Repo (DLR) platform tokenizes real-world securities to unlock more efficient workflows, transforming critical capital markets infrastructure globally. With more than \$1.5 trillion in monthly volume, the platform provides increased liquidity and capital efficiency via digitization of collateral and smart contracts that mutualize a transaction's workflow. Front-to-back digitization

of the repo trades transaction allows for shorter and more flexible settlement cycles and increased collateral velocity. Intraday Repo and Sponsored Repo are key examples of use cases where DLR empowers incumbent and new workflows to be executed much more efficiently. As one of the major technology players in the US fixed-income market, Broadridge builds on top of its existing connectivity with central securities depositories (CSDs) and custodian banks to offer a simpler path to DLT adoption. Other sectors are rapidly catching up. The art world, for instance, has seen a [surge in tokenized art pieces](#). Commodities such as [gold](#) and diamonds are also being tokenized, offering investors a digital means to trade these traditionally illiquid assets. Tokenized private credit is a rapidly growing market per the S&P's October 2024 [Tokenized Private Credit article](#).

Additionally, tokenization has expanded into niche areas such as intellectual property and sports. For example, [Chiliz](#), a blockchain fintech provider for sports and entertainment, has created fan tokens that represent a share in the governance of sports teams, allowing fans to have a say in certain club decisions. There is also the potential for market growth in crypto-native real-world assets such as yield stablecoins and other yet-to-be-invented applications.

Beyond niche areas, the big push to tokenize equities came most recently at Davos when [Larry Fink, the CEO of BlackRock stated](#): “I want the SEC to rapidly approve the tokenization of bonds and stocks that will simplify things, make things easier.” If this happens, it will be a major transformation of the equities market. Finally, markets themselves are also potentially being disrupted. [Figure Markets](#), currently involved [in a reorganization](#) to provide more transparency and address governance concerns, states that they are “building the exchange for everything - a decentralized custody marketplace for crypto, stocks, bonds, credit, and more.”

### **Challenges and Future Prospects**

The tokenization of real-world assets faces several challenges. The most formidable obstacle – or arbitrage, depending on how you look at it – is regulatory uncertainty and lack of harmonization. For example, inconsistent regulations across different jurisdictions can impact cross-border transactions. Technical challenges, including blockchain interoperability and security concerns, also need to be addressed to ensure seamless integration and trust in tokenized systems. Finally, education and awareness

about the benefits and risks associated with tokenized assets will also play a vital role in driving adoption.

### Summary

The past twelve months have been a period of remarkable growth and development, and now we are heading toward the golden age of tokenization of RWA. Deep liquid markets available 24/7 will be something quite different than the landscape we know today. With increased institutional involvement, regulatory advancements, and technological innovations, the foundation for a more inclusive and efficient financial ecosystem is being laid. As the industry continues to evolve, it will transform how assets are owned, traded, and valued, making financial markets more accessible and dynamic.



Susan Joseph

Executive Director

FinTech at Cornell Initiative

January 30, 2025

### III | KEY TERMS

#### **AML (Anti-Money Laundering)**

Regulations and procedures intended to prevent criminals from disguising illegally obtained funds as legitimate income. In the context of digital assets, AML efforts aim to identify and stop the movement of illicit funds through cryptocurrencies and other digital financial instruments.

#### **AMMs (Automated Market Makers)**

Protocol used by decentralized exchanges to facilitate trading without a traditional order book. Instead of matching buy and sell orders, AMMs use liquidity pools and a mathematical formula to price assets. Software determines prices algorithmically based on supply and demand within a liquidity pool. Users trade directly against the liquidity in these pools.

#### **Bearer Form**

A type of digital asset ownership where the possession of the asset itself constitutes ownership, similar to holding a physical bearer bond or cash. Ownership is transferred simply by transferring the asset.

#### **Blockchain Infrastructure**

Underlying technology stack composed of multiple layers including hardware, data, network, consensus, and applications that work together in a blockchain network.

#### **CBDC (Central Bank Digital Currency)**

A digital form of central bank money, CBDCs are issued and regulated by central banks and can serve as a stable digital alternative to physical cash. Depending on its design, privacy and programmability can be incorporated.

#### **CFTC (Commodity Futures Trading Commission)**

A U.S. federal agency that regulates the derivatives markets, including futures, swaps, and certain kinds of options. In the context of digital assets, the CFTC oversees trading practices and enforces regulations to protect market integrity and prevent fraud.

**Decentralized Exchanges (DEXs)**

Decentralized exchanges (DEXs) are peer-to-peer marketplaces which use AMMs to facilitate trading.

**Fractional Ownership**

A type of ownership where investors including small investors own a portion of an asset.

**KYC (Know Your Customer)**

A process used by financial institutions and other regulated companies to verify the identity of their clients. KYC procedures are intended to help prevent money laundering, fraud, and identity theft by ensuring that users are who they claim to be.

**Layer 2**

Secondary protocol that sits on the foundational blockchain. It is designed to improve speed and efficiency, and is flexible to scale transactions processing and network throughput.

**Limit Orders**

A type of order to buy or sell a digital asset at a specified price or better. Limit orders allow traders to control the price they are willing to pay or accept, unlike market orders which execute immediately at the current market price.

**LP Token (Liquidity Provider Token)**

Tokens given to users who provide liquidity to a decentralized exchange or liquidity pool. These tokens represent a share of the pool and can often be staked or used to earn a portion of the trading fees generated by the pool.

**Liquidity Pool**

A liquidity pool is a collection of funds locked in a smart contract that provides liquidity for decentralized exchanges (DEXs).

**Market Orders**

An order to buy or sell a digital asset immediately at the current market price. Market orders prioritize speed and execution over price, making them useful for quickly entering or exiting positions.

**MiCA (Markets in Crypto-Assets)**

A regulatory framework by the European Union aimed at creating a harmonized and comprehensive regulatory regime for cryptocurrencies and digital assets across member states.

**Netting**

A process in which multiple financial obligations or positions are consolidated to produce a single net obligation or position.

**NFTs (Non-Fungible Tokens)**

Unique digital certificate associated with a particular asset.

**On-chain**

Activities, data, or transactions that directly occur within a blockchain network. These are considered to be native transactions.

**OFAC (Office of Foreign Assets Control)**

A U.S. Department of the Treasury office that enforces economic and trade sanctions against targeted foreign countries and individuals.

**Off-chain**

Transactions or activities that occur outside of a blockchain network. They are processed separately from the main blockchain and can later be recorded on the blockchain.

**SEC (Securities and Exchange Commission)**

A U.S. federal agency responsible for enforcing federal securities laws and regulating the securities industry. The SEC oversees the issuance and trading of digital assets that qualify as securities.

**Slippage Tolerance**

The acceptable difference between the expected price of a trade and the actual price at which it is executed.



**Stablecoins**

A type of cryptocurrency designed to maintain a stable value. They are generally categorized as fiat pegged or algorithmic. Typically, fiat and commodity-backed stablecoins are overcollateralized to mitigate the risk of not being able to redeem the coin as promised. Examples of popular fiat stablecoins include USDC and USDT, both of which are pegged to the US dollar, making them function like digital dollars within blockchain ecosystems.

**ZK Proofs (Zero-Knowledge Proofs)**

Cryptographic methods that allow one party to prove to another that they know a value without revealing the value itself. In digital assets, ZK proofs can enhance privacy and security by enabling transactions to be verified without disclosing sensitive information.

## IV | DISCUSSION SCOPE

The discussion was divided into three chapters of inquiry:

**Chapter One: TOKENIZATION OF REAL-WORLD ASSETS**

**Chapter Two: DeFi IN THE CONTEXT OF REAL-WORLD ASSETS AND SMART CONTRACTS**

**Chapter Three: POLICY, DISCLOSURE, REGULATION, AND TAX**

Each section contains the following:

- Discussion Highlights and Editors' Notes
- Data Visualization Analysis of Strongly-Identified Topics
- Key Takeaways
- Editor Conclusion

Links to useful preparatory readings can be found in the [Appendix](#) at the end of this report.

## V | ACKNOWLEDGEMENTS

On behalf of Fintech at Cornell, the editors wish to thank the participants for their unabated collaboration in what was a productive discussion.

We wish to thank our sponsor Broadridge for their generous and full-throated support and warm welcome as the host for this event. We additionally thank our sponsor Ripple.

We also thank the Cornell SC Johnson College of Business, dedicated to responsible and innovative finance at all levels. We hope this work will prove useful in developing an appropriate understanding and regulation of these dynamic financial events.

Authors and Editors: Susan Joseph, Will Cong, Natassja Aleksy, Mary Lorson, Mohammadreza (Reza) Ahmadnejadsaein (PhD candidate)

## VI | PARTICIPANTS

38 people participated. Those who wished to be identified are named below.

Carlos Arena  
Horacio Barakat  
Kevin Barr  
Colin Butler  
Agostino Capponi  
Lewis Cohen  
Sahil Duggal  
Suellen Galish  
Gagan Jain  
Susan Joseph  
Prashant K. Kher  
Patrik Kohli  
Sarah Kreps  
Rob Krugman  
Morgan Krupetsky  
John Liu  
Ryan Louvar  
Kelly Mathieson  
Prakash Neelakantan  
John Palmer, attending in my personal capacity  
Chris Perkins  
Sydney Rice  
Jason Schwartz, attending in my personal capacity  
Donghwa Shin  
Thomas Sullivan  
Gary Weinstein  
Xiaonan Zou, attending in my personal capacity

Fintech at Cornell Executive Director: Susan Joseph  
Facilitator: Prashant K. Kher | Senior Director | EYP-Strategy  
Scribe: Natassja Aleksy

## VII | TARGET FIRST PRINCIPLES

1. **Collaboration and Standardization** are required between academics, regulators, and industry participants to develop consistent standards and regulatory frameworks.
2. **Comprehensive Approach** includes security, environmental impact, legal considerations, and the impact on existing institutions.
3. **Valuation and Security** are essential for the integrity and stability of tokenized markets.
4. **Taxation and Legal Frameworks** that are clear and harmonized are necessary to remove barriers to adoption.
5. **Public Education and Social Inclusion** is crucial for building trust and adoption.

## VIII | ROUNDTABLE TRANSCRIPT - Introduction

“Welcome, I appreciate everybody coming out. I'm **Susan Joseph**. I am the Executive Director of [Fintech at Cornell](#) and this is the third of the Cornell Convenes programs we have hosted over the years. Today, we will be looking at the Tokenization of Real World Assets. Prior Cornell Convenes have looked at Digital Assets in 2022 ([Report found here](#)), and Stablecoins and CBDC in 2023 ([Report found here](#)).

As with prior Roundtables, we will publish a report that contains the anonymized transcript and our analysis. Before we publish it, participants will have the opportunity to read through and approve it.

Participants can decide whether they want their name included, and can choose to put their names *in their personal capacity*.”

*Susan explains the housekeeping rules.*

“I also want to thank our very generous sponsors, [Broadridge Financial Solutions](#) and [Ripple](#).

Fintech at Cornell does more than just these events. For instance, we're having a [Payments Innovation Hackathon](#) in two weeks on the Ithaca campus, for which I've gathered together the graduate and undergraduate students across the university — engineering school, business, arts and science, etcetera. We have a broad reach!”

*Susan introduces the notetakers.*

“Let’s kick this off and have a great discussion!

The purpose of the event is to assemble academics and industry, and often regulators, but on this occasion not the latter so as not to narrow the discussion. The idea is to discuss the issues presented, but not necessarily agree or come to some conclusion. The point is to get all of these issues out and to think about them in different ways.

My background is as an attorney, JD/MBA, but none of what I say is legal advice or investment advice!

As I was walking here today, I was thinking about data and the challenge of mapping on-chain and off-chain data balanced against privacy. I don't think we've solved that, and I wonder if we can come up with first principles that can lead to a regulatory scheme and industry standards that would be applicable.

I also wonder if we are trying to recreate the old system in digital form, and then sort of brute-force it so it works in a fashion? Or are we taking advantage of new technologies, systems, new product forms, and seeking the opportunity to tailor reasonable rules that support an innovative environment?”

*Susan introduces the moderator, who thanks Cornell Convenes and the sponsors.*

**Moderator:** “Welcome to all on this Friday morning. The topic today, as Susan mentioned, is the *Tokenization of Real World Assets*, and we have three exciting sessions planned for this morning.

The first one will be covering an overview of the tokenization of real world assets, where we'll have a top academic in tokenization give an introduction, and then we'll spend roughly 30 to 45 minutes talking perspectives. I have some guiding questions to keep us on track, but I’m sure everyone will have a good discussion.

We’ll follow Chatham House Rule, and if you’d like to speak, stand your name card vertically to signal that, and we will try to get to everybody in order.

The second session will be on *Decentralized Finance — DeFi in the Context of Real World Assets and Smart Contracts*, where we'll hear insights from other academic experts in areas of DeFi, innovation, and operations. Then we'll spend 30 to 45 minutes in discussion.

Our last discussion will be around *Policy, Disclosure, Regulation, and Tax*.

Once the session ends at 12 pm, there'll be a discussion on the book [The Oracle](#) by Weill Family Foundation and Joan and Sanford I. Weill Professor and author [Ari Juels](#), which everyone received in their welcome pack.”

## **IX | CHAPTER ONE TRANSCRIPT: TOKENIZATION OF REAL-WORLD ASSETS**

An **academic researcher** opened this section.

### **The Benefits of Tokenization**

“Thanks for the opportunity to share my thoughts about the tokenization of real world assets from an academic perspective. As many of you already know, this market is expected to grow. One of the consulting companies conducted its own research, projecting that it will become a multi-trillion dollar market in about 10 years, and therefore it is important to understand the implications of tokenization.

We have many problems in traditional financial markets like corporate bonds or real estate. These markets are quite illiquid and are accessible by only limited investors with large amounts of capital. Also, these two markets especially are known to have very high transaction costs. So, what are the potential benefits of tokenization?

Fractional ownership allows the participation of small investors who are currently excluded, and blockchain infrastructure allows fast, low cost, and transparent transactions. Although it's an empirical question, tokenization may increase liquidity and price efficiency.

Then, what are the potential costs of tokenization? The biggest concern at this moment is regulatory uncertainty. Different jurisdictions have different policies and different expectations about tokenization. Another challenge is that even within the same country, there is a lack of standardization across platforms.

Two companies specialized in real estate tokenization won't necessarily have the same approach. One company may use non-fungible tokens (NFTs) for tokenization, and another may use a different tokenization process. This is very frustrating because in order to understand what's going on, we have to read every single company's very long documents to understand how they accomplished their tokenization.

The market can be fragmented and that alone may also increase in price instability. One of the most fundamental research questions in financial economics is this: *What is the impact of financial innovation on financial markets?*

**Editor Note:** We need to understand how to compare tokenized items. Were the same standards used for tokenizing? How does the lack of standards impact the ease of trading and disclosure provided to the investors?

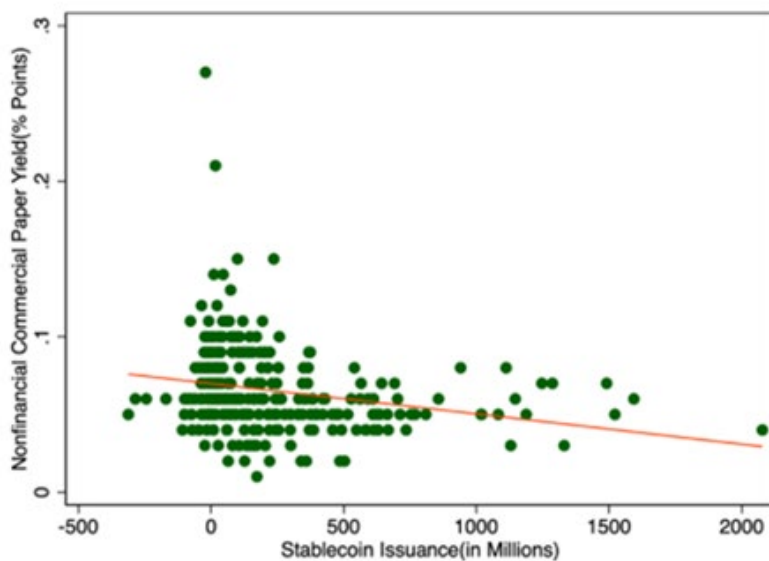
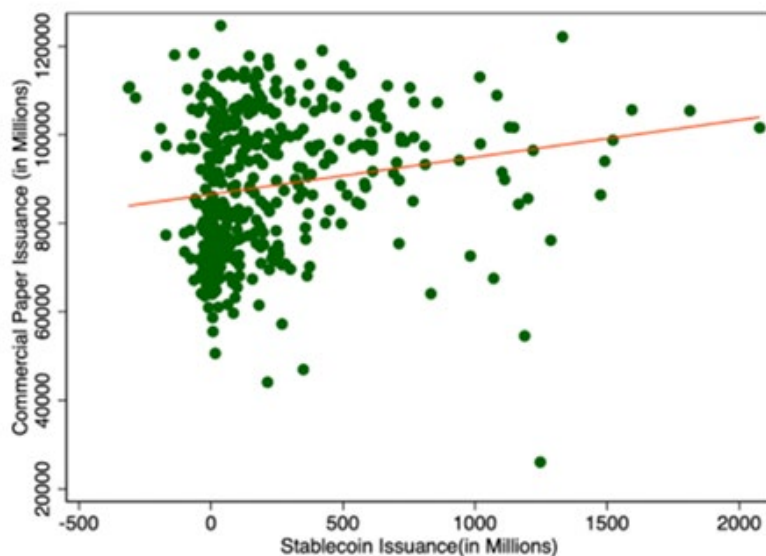
The **academic researcher** added: “I will try to answer this question in the context of financial derivatives. I find that the introduction of Bitcoin Futures makes the Bitcoin Spot market more efficient, as you can see in this feature. (*The academic shows a slide*). After its introduction in 2017, the efficiency of Bitcoin increased substantially, coming from reduced financial frictions and risk.”

### Tokenization of Fiat Currencies

“The current research on the innovation on tokenization is quite skimpy, so I’ll show you what a small group of people have done regarding this topic.

The first example is of the tokenization of fiat currencies, basically stablecoins. One of the working papers shows that the issuance of stablecoins can affect the traditional money market. The business model of stablecoin issuers like Tether, is that when there is demand for stablecoins from customers, they accept fiat currencies and issue stablecoins. Using the customers’ fiat currency, the issuers typically buy safe assets such as treasury bills or Commercial Paper. Therefore, if the demand for stablecoins is large, the issuers should purchase a significant amount of safe assets, which can increase the prices of safe assets, and the increased prices mechanically lower the yields.”

The **academic** showed these graphs:



**Graph explanation:** This author finds this X axis is the Issuance Volume of Stablecoins and the Y axis is CP issuance volume. As you can see, they are positively correlated. Yield and stablecoin issuance is negatively correlated. This was quite surprising because this suggests that any idiosyncratic shock in the demand for stablecoins can propagate to money markets through this mechanism.



## Corporate Bonds

The **academic researcher** continued: “Then what about corporate bonds? As you already know, there are not many similar cases for the tokenization of corporate bonds. However, there is a small interesting study on this topic. The Hong Kong Monetary Authority (HKMA) used a relatively small sample to tackle this question, and their hypotheses are quite intuitive. First, operational costs of bond issuance will be reduced through tokenization because we can get rid of intermediaries and save underwriting fees.

You can also use smart contracts and similar technology to reduce the other types of operational costs, and it can also increase the liquidity of the bonds through the influx of new investors that were initially excluded. This improved liquidity can increase the price of the bond and eventually lower the yield, therefore lowering the cost of capital.

The bond methodology is quite intuitive as well. In this research they first identified around 28 tokenized bonds. This is a small sample, admittedly. Then they found a control group by finding some similar bonds that were not tokenized but similar in terms of characteristics before tokenization. The result is quite striking. Tokenized bonds have lower underwriting fees, and lower bid/ask spread and this effect is mostly pronounced with the bonds that are accessible by retail investors.

This is a very compelling study. However, we should be careful in interpreting these results, because they are based on a small sample and there could be some endogeneity issues regarding selection. The results may reflect the effect of selection rather than tokenization.”

**Editor note:** The Editors asked for clarification on this section with the following response: “The issuers can pick specific bonds based on their own criteria. Therefore, the effect can be driven by the certain criteria that issuers use rather than tokenization. This is what I mean by ‘the effect of selection.’”

### Tokenization of Real Estate

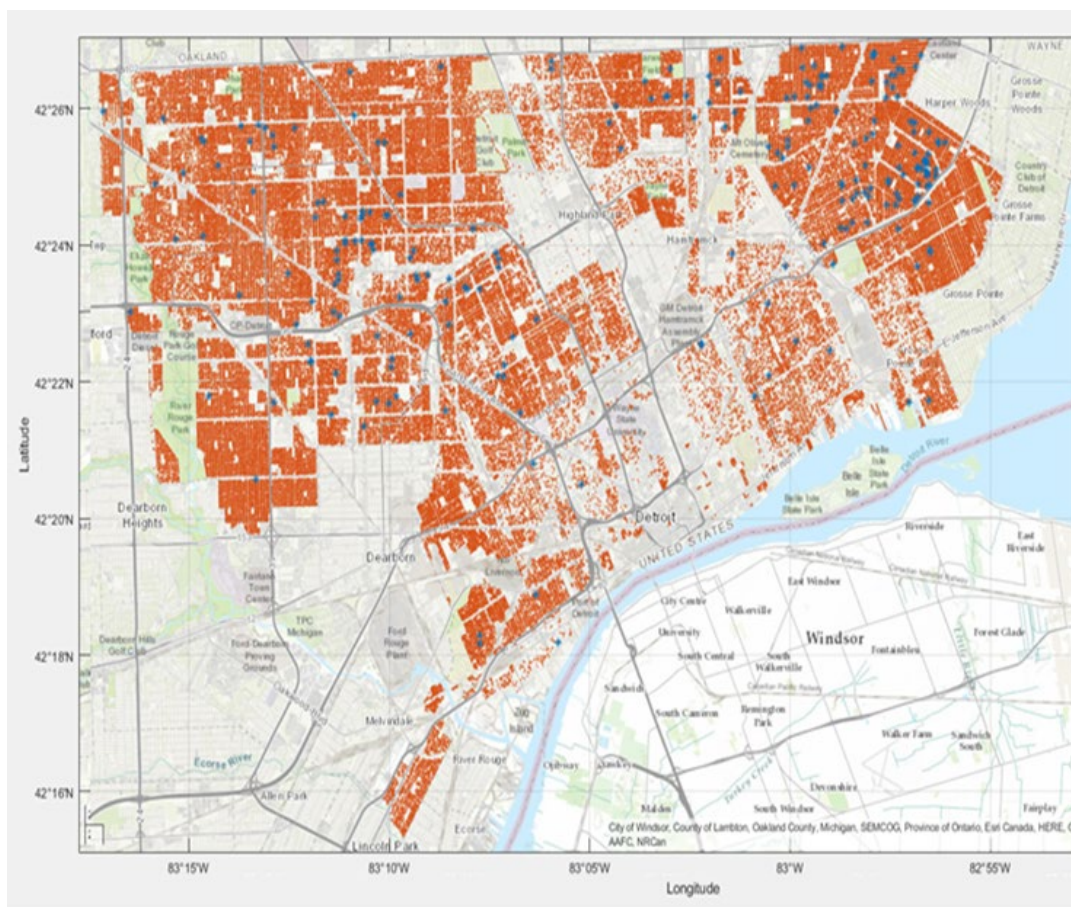
The **academic researcher** proceeded: “Regarding the tokenization of residential real estate, there is unfortunately no academic work on this topic. So with my coauthor, an expert in real estate at the UNC, we constructed the data set by merging data sets of tokenized residential real estate and real estate transactions.”

### Tokenization of Real Estate Case Study

The **academic researcher** added: “Our sample period is about four years and the number of tokenized houses in the United States is about 400. The total market cap at this moment is about \$100 million. The number of market participants is huge — 17,000 (total number of wallets) — and the number of token transfers is also large — 1.1 million transactions so far. Also interesting: the 75th percentile is only \$50.00, meaning even very small investors have participated in this real estate market through tokenization — quite actively, so far.”

**Editor Note:** Even though this is a small study, there appears to be evidence that small players are participating, which is one of the benefits of tokenization.

The **academic** showed a new slide. “This is the map of Detroit, where each red dot represents a residential real estate property, and blue dots are all “tokenized” residential properties.”



The **academic researcher** continued: “Interestingly, we found that 0.2 to 0.3% of all residential real estate properties have been tokenized in Detroit. This is only 400 properties, but that is actually concentrated in a small area - like Detroit - and some other cities in the United States, so it offers an excellent empirical setting. First, the tokenized houses are very well scattered. They’re quite well dispersed around all of the Detroit area. If it were concentrated in only one corner, then it’s a big problem. This data offers an opportunity to identify the treatment effect of tokenization of a house; and various characteristics are observable at both the deed and local economy level.”

**Editor Note:** A key area for further research is the impact of tokenization on the local economy, token, and deed transferability.

The **academic researcher** advanced to say: “This is extremely useful as well to find a proper control, meaning we not only see the housing characteristics of the treated house, which is a tokenized house. We can also see all other houses’ characteristics and find the right match. This allows us not only to study the impact of financial outcomes like price level, volatility, or liquidity, but we can also study the real effect, like the local economy, the inequality and ownership of the houses and so on.”

**Editor Question:** Another area to research is whether putting housing titles or deeds on the blockchain would create a fundamental backbone for this market, leading to the potential for better trading. If titles and deeds were uniformly digitized, would this provide a baseline for a robust market in tokenized trading of houses?

The **academic researcher** proceeded: “Several researchers in real estate have studied the impact of institutional ownership on local housing markets. One of the studies has identified very negative impacts. High ownership of residential real estate by institutions makes the maintenance quite poor and the environment around that area quite dirty, and it lowered the prices of the real estate, as well as lowering homeownership in a minority community.

However, this is different from tokenization. Although tokenization shares some characteristics in a sense that, if we think of the fintech company that tokenized real estate as another type of institution, we may be able to find a similar effect. But even if we find a similar effect, we have different characteristics with tokenization because it can also improve liquidity and, therefore, increase prices.”

**Editor Note:** The market is nascent, so more data is required in order to do more research and more fully understand real estate tokenization impacts.

The **academic researcher** added: “Not only that, as a consequence of these 1,000,000 transactions in the case study, we can look at pricing because people set the order and take the order. Through this process, we can generate real-time pricing which can be informative for people who are interested in the local housing market. If there are no transactions, people do not have a good idea of what is the right price of the real estate.

However, even if that is the case, if tokenized real estate properties are actively traded, we can actually see what's going on in the housing market in terms of price, and we can also improve the price discovery due to advanced technologies through decentralized finance.”

**Editor Note:** Price transparency in real world assets could be improved with blockchain technology, and this is one example of that.

### Scarce Research

The **academic researcher** ended with: “My conclusion is that the research on this topic is quite skimpy at this moment, and my future work is to understand the impact of tokenization and financial markets based on mostly financial outcomes like price level or liquidity. However, ultimately I want to understand its real effect. For example, corporate bonds and private credit may lower the cost of capital, but I want to understand its downstream effect such as whether it increases corporate investment. What about real estate tokenization? We can understand more than the price level or volatility. It will be very interesting to understand whether it has any implication on equality in local economies, and based on that, I aim to study the policy implications. Thank you for your time and I'll be very happy to take any questions.”

**The moderator** invited the group to ask the professor questions, and confirmed that it is interesting to see some of the correlation and hypotheses.

### Title Insurance and Federally-Backed Mortgages

**A participant** suggested that “the timing is interesting because one of the things the President announced on *State of the Union* last night was the elimination of title insurance for federally-backed mortgages. From the perspective of real estate, this is interesting because it's been one of the biggest blockers. The fact that so many mortgages will no longer require that enables the tokenization of assets and putting them on blockchains. How would the elimination of title insurance happen? There is a lot of pushback from the industry and others.”

## Incentivize Investors

**Another participant** directed a question to the academic: “On the interesting point about lower underwriting fees and lower yields: lower underwriting fees make sense as we look to lower costs in terms of issuance. One of our theses is that the lower cost will be passed on to the investor by the means of higher yields. This is to incentivize the investors and could eliminate the barriers to entry. What are your thoughts about that?”

**The academic** responded: “While participants may decrease underwriting fees, what would they do with them? Would they create better margins for themselves or pass along savings to investors? The increase in participation by small investors is possible, but the benefit from this may be an increase in liquidity. If there is enough competition between the industry and also large participation from investors, then it will drive up the price.”

**The academic** continued: “If we think about all these things together, then it can lower the yield. But it really depends on the market structure. Maybe some companies will use their huge market power to recoup all these benefits. Therefore, I think the competition could be one of the most important things in this regard, not increasing the yield, but actually decreasing the yield.”

**Another participant** offered a recommendation: “You mentioned you're going to spend some more time doing research on this. I recommend you have a conversation with an existing company “x” (*name removed for anonymity*). They created one of the industry's first solutions. In this case, for syndicated loans, they are experiencing exactly what a previous participant said.”

**The participant** continued: “Now they have eight of the world's leading syndicated banks that are part of that. They're highly competitive with each other and inside the first year of this company getting launched, they have about 75% of the US market on that platform. This is due to the return. The lower underwriting and the lower fees that an issuer is experiencing are helping bring that loan to fruition, and that yield is what is attracting investors to it. So I don't think it's the fractionalization impact, yet. They haven't quite gotten to that point. It's really just the lower operating cost. I'd recommend looking into them and if you want an introduction, I'll be happy to make it.”

## Behavioral Differences Between Individual and Institutional Investors

**Another participant** explained how their company ran two surveys last summer that tested tokenization with both accredited investors as well as asset owners. “Asset owners were more likely to expect those cost savings to be passed through to them in the form of yield, versus some of the retail or the accredited investors that were more willing to pay a higher price to get access. So there was a difference in behavior and expectations based on whether the investor was an individual versus an institutional investor like a pension or an endowment or family office.”

## Corporate Bonds and High-Quality Issuers

**Another participant** reminded the group that the sample is still very small: “It was corporate bonds or bonds that have been issued in this manner. Most of the bonds that have been issued have been by supernationals and others which tend to have very tight yields. I don't necessarily know what that comparison is, but for those who have access to tokenized securities so far, it has been the highest quality issuer possible. It's been a little orchestrated in terms of issuance. This type of situation is not something that happens naturally in the market when you can have it based on rates going down, for example. This is something that has been well-orchestrated and synchronized before the actual issues. So I wouldn't say that would be the way normal issuers would be able to access the market. I would just advise caution regarding the lower yield.”

**Editor Note:** Tokenization examples to date have potentially been cherry-picked and the effects of tokenization on the broader market are yet to be discovered.

## Selection Issues as One of the Challenges

**The academic** leading the session agreed that this is why this is still an open question: “This is not just about 28 bonds that were tokenized, but, as you said, there can be a huge selection issue. Why would they choose these 28 bonds? The bond yield can be mechanically reduced after tokenization, but it's not because of tokenization, but rather selection. What we can do as economists is think about better matching techniques.



Currently, people use many multivariate or nonparametric methods to match so many characteristics of the companies to find the best match. I don't think this study did this carefully because it's a small sample and it's multinational. It involved 10 countries, meaning two to three bonds in each country. There are challenges to the study at this point, but it is still very interesting and we need to develop this much more."

**Another participant** offered two points for thought: interoperability and regulatory clarity. "One, I want to come back to a previous point about title insurance and the second one is about what role rates play and how they can actually help tokenization. With interoperability the title insurance thing helps. It's one other piece that we don't have to bring into the equation and adjust it as we wait for this new technology. What has been holding us back has been general understanding of blockchain technology, interoperability, and considering how to use this technology, which the financial industry has figured out to a good extent over the last three to four years. We're starting to see building on chains that are now interoperable, and not siloed. That's a key part that's coming in, interoperability understanding.

The second one is regulatory. Regulations have been more clearly defined now. There are at least guardrails of where financial institutions can operate and where they cannot. These are the two macro drivers that are putting us into the next step of tokenization and why there's so much interest in the last six months. Within this second part comes the interest rate which is another driver for why tokenization has picked up. While it's true in general for the past tokenization projects, you can't really rely on why they showed these bonds because they had to be controlled by the financial industries. Now, with low interest rates in the US for example, there's an actual economic incentive to tokenize treasury bonds — getting this money to me in real time at 4 to 5% interest rate in an instrument that I trust has its benefits."

### Nomenclature

**A participant** agreed. "The first point around nomenclature and literacy is a huge one. It's one of the biggest challenges the industry has. It's the area of maturity that's happened over the last two years. Talking about tokenomics and networking platform activity had a big effect on crypto. We've started talking about the benefits and the value propositions versus talking about the underlying technology and using weird terms. We often forget that we know what's happening and how these things work,



whereas a lot of people don't. Putting it into plain English, or whatever language we're actually speaking in, is really important.”

**Editor Note:** The focus should be on explaining what people are purchasing and providing disclosures.

### Primary versus Secondary Markets

**A participant** advised trading carefully on the analysis because we are only looking at the primary issuance of debt. “I would agree in that sense that you potentially could see higher yields due to the cost efficiency. But what happens in the secondary market, the actual trading of those tokenized assets? The interest after, price impact, the yield, the duration, the risk...how does this change because it's now tokenized? Or does it change? It's an interesting area of study, and we can see a lot of potential benefits but we haven't yet studied the secondary market, and the differences between the two will be interesting.”

### Liquidity, Settlement, and Netting

**Another participant** added, “in the primary market, I can understand that liquidity is increasing because the number of investors are increasing. But in the secondary market where we are getting the benefit of netting, I almost see netting like liquidity... We need to see how the liquidity changes in the secondary market as well, particularly if we're talking about settling in real-time. Will we be reducing liquidity in the secondary marketplace?”

### Lack of Secondary Marketplace Data

**A participant** agreed. “This technology offers clear benefits for workflow operations and savings. When it comes to the secondary marketplace perspective, there's not an authentic marketplace that's readily available for native work or digital or tokenized securities to be trained on. The intent is that with this technology, you have more mobility and velocity. It's a question of time and seeing what happens down the line, for now the issuance will be in a primary setting which is what most of these supernationals have been doing, as compared to authentic marketplace, where these funds are issued and properly played like a traditional security.”

**Editor Note:** After this discussion, [BlackRock issued a tokenized fund on Ethereum](#), a public chain, so this type of authentic marketplace is starting to emerge.

### Service Tokenized Assets from a Lifecycle Perspective

**Another participant** looked at the previous thought a little differently. “It’s one thing to look at the primary issuance, and it's necessary to do that because ultimately, I've worked on a gazillion new financial products and I’ve never seen them create it, leave it on the shelf, and admire it. We also have to look at the post-trade market. Products are to be serviced from a lifecycle perspective.

Are you going to use the product in securities lending or are you going to use it to mean onward obligations and collateral or margin or put it in a fund structure? The research currently is incomplete. I might submit the more interesting area is when you start to look at what you do with that asset. When “X” (*name removed*) company created “Y” (*name removed*) product, lower operating costs were expected. The surprise is that it improved the capital, and those are the things that don't come out until you poke around afterward.”

### Lack of Data

**A participant** agreed that liquidity fractionalization did not necessarily damage liquidity. “We don’t know whether the tokenization of real-world assets and real-time settlement makes sense for all products. Maybe it doesn't. We have to let the market structure evolve over many years from this current native model. This is all evolving and unless you have markets where you can study the data, you won't be able to make any conclusions.”

### SEC Registration

**A participant** posed a question for the group. “I likewise worked on many debt capital markets offerings as a lawyer. A significant number of debt issuances, at least here in the US, are registered with the SEC. Then immediately, after one year of reporting, they deregister. The remainder issue with the 144A market, and are not reporting companies. So none are registrants from the debt capital market side. Section 12G of the Exchange Act requires any issuer with more than 500 holders to be a registrant. Are we imagining that more people will want to go through the SEC registration process?

Because zero is that number. Or do we imagine that the SEC is going to change the rules?”

### Analysis of Data

**A participant** expressed surprise that there's not an analysis of these tokenized assets. “How much data is available for these assets? How uniform is it, and how widely available is it? That seems to be the key here, data leading to the standardization of these contracts. Having assets with rich data being provided in a standardized contract would have a lot more effect on liquidity than just tokenizing. Tokenizing is obviously a way to achieve that, but unless you're analyzing the quality and the availability of the data, I'm not sure I see all the direct lines from this technology to liquidity. It's a little bit of a cart-before-the-horse in a way, because tokenization has just started getting traction in the primary market in the last two years. That's why you don't see much traffic in the secondary market. People are buying and then they hold it.”

**Editor Note:** Is this because markets are too thin to trade or that there are not enough trading venues yet? Who can trade and settle tokenized assets?

**This participant** continued. “The last six months with the institutional participants who tokenized the U.S. Treasuries serves as the model that we should be analyzing. We're seeing an example of how a centralized marketplace can look. That was mentioned before, we're in a centralized market. How can secondary markets behave as well? You see they're still doing KYC. They start monitoring these investors. I ask, if buying on this public chain, are they actually transferring those tokens or not? Are the banks themselves buying? The asset managers? You know, in their experiments and pilots, are they actually transferring anything in money market funds outside of just doing the one time proof of concept?”

### Tracking tokens

**This participant** continued: “We're going to start seeing that data come in especially as we start seeing the standardization come through. As mentioned, all these different datasets and types are stored on paper using different standards. What needs to happen is a way everyone can agree upon how you should track full tokens.”

**This participant** added: “Here's how you should track equity distributions. Tokenization is here; it is just immature. Then standards that build on top of token standards - these are driven a lot by financial institutions and they are now, as well, starting to come together. We just have to be a little more patient than we would like. There will be good areas of study for professors to really dig into.”

**One of the participants** said, “The realization is that we're talking about experimentation. Experimentation is so important because you can show DC that the market works differently. The reality is the entire regulatory framework needs to be enhanced to deal with 24/7 markets that are tokenized, and we're not ready. When it's available, we will need a new model.

There's been some resistance. Education is really important. Educating lawmakers, educating regulators, providing them with the information and showing them that there is a different way to think about this without losing transparency, but providing significantly more transparency in a timely manner.”

**One participant** agreed that “it's not regulatory uncertainty; the regulation is clear. It's a regulation change, and that requires a concerted effort among those stakeholders.”

#### **Similarities Between TradFi and DeFi as a Starting Point for Education**

**A participant** added a couple of points. “First, in terms of language and explaining things clearly, I fully agree. The industry agreeing on certain terms like what is centralization, what's crypto? There's a lot of terminology in the financial industry. ‘Bridging’ or showing equivalency in traditional finance is always an extremely good starting point. In terms of regulation, I will give an example from Europe, where lawmakers have put in place very clear guidelines about how a smart contract has to be set up to be legally considered as equivalent to a bond.

Now you can issue a fully-tokenized bond without an off-chain equivalent, but it has the same legal status, and that has spurred things on because people know what they need to actually know and how.”

**One participant** commented that “the tech is not that scary; people just have to understand that it's similar, but it works in a decentralized way.”

## The Cash Element

**Another participant** added that “when you think about the benefits of tokenization, everyone brings up operational efficiency and quality. When you talk about operational efficiency, you're really talking about having both the cash and securities on the same rails. Often when talking about securities, we forget about the cash. Why have a bond if you don't get interest? You want to be able to trade it. If it takes you three days to onboard and offboard your cash...It's interesting to focus on that cash element. Who will want to hold cash in the tokenized form if it doesn't pay interest? People need to see the benefits.

That's one of the impediments I see. How do you resolve this issue of cash so that you can pay interest, trade, and have the operational efficiency? That's a question that I haven't figured out. We have USDC and USDT, but for the likes of large financial institutions to hold millions or hundreds of millions of dollars of cash so that they can deploy it on a dime, are they going to be buying USDC?”

**Another participant** added: “That's part of the reason why we're seeing everyone and their mom launching and trying to address the issue of non-yield-bearing stablecoins. There are a lot of companies, whether individual startups or large asset managers, issuing and looking at microfunds and cash blends that are yield-bearing to be able to address that. To go back to what you were saying earlier about adoption, I do think that the regulations will probably have to change.

What we're seeing anecdotally, particularly as it relates to the tokenization of private market securities — so private equity, real estate, credit, and infrastructure — by putting more and more of the asset management life cycle on chain, you are able to recognize certain operational efficiencies that make smaller deal sizes and smaller investment minimums economically viable for asset issuers. Operational hurdles that currently relate to servicing 500 investors won't be as burdensome, and they will be able to take on a larger number of investors within the current confines of law.”

### Leveraging the Technology to Support Regulatory Efforts

**A participant** argued that “when talking about regulation, there are obviously ways of changing the regulation, but a lot of this technology does enable broader transparency through on-chain. You can grant permission to those who have the capability to own these and/or view these. One can determine which wallets can hold those assets as well. So some of these things are written into the regulation and we can build with the

technology to make transactions more transparent and more reportable. The hardest thing is to get the regulators to understand that the technology can enforce these standards, but there's definitely opportunity there along with all the operational efficiencies.”

### **Enforcement versus Innovation**

**Another participant** added that “we're focused on tokenized money market funds and then connecting those to the digital asset ecosystem, allowing the dollar stablecoin to interact seamlessly with tokenized regulated funds. Then you'll gain interest. One of the challenges, for example, is though tokenized gold can settle instantly, a tokenized fund holding tokenized gold could technologically settle instantly, but as a fund it cannot, due to regulations. This is a little head-scratching. At what point can we get the SEC comfortable with regulatory change? Under the current SEC regime, it's unfortunately more about enforcement than innovation. It's going to take years to have the regulation, at least in the US, and catch up with the innovation.”

### **Tax and Regulatory Complexities**

**A participant** added that “the tax laws also potentially create fragmented markets on-chain for similar reasons. Generally US issuers can't issue debt that's in so-called bearer form, and anything on-chain that is really transferable is, by definition, in bearer form. If you want to issue debt that is freely transferable, and USDC is arguably an example for that regarding taxes, you know the debt of Circle that you have, but you can't pay current interest.

If you don't have the current cash flows like many people want, that's something to deal with, and maybe the answer is to make that composable in DeFi format so people can then use that to earn yield in other ways, but obviously that raises other regulatory complexities.”

**This participant** continued: “Most money market funds would be set up as so-called passive foreign investment companies for tax purposes, which is annoying to deal with. Typical money market funds or cash flows would align with your inclusions, but it's still a layer most taxpayers aren't sophisticated enough to deal with. Perhaps not clarifications but modifications of the tax law are necessary as well.”

## Type of Blockchain Affecting Economic Outcome

**An academic** offered an additional point. “Reading the academic literature, something of significant consideration for any economic outcome would be knowing which chain we are tokenizing on. Is it permissioned or permissionless? Where are these tokens actually being tokenized? On which chains, and more generally, how would you see the financial market outcomes varying as a function of what chain they are deployed on and that chain’s specific characteristics?”

### Interoperability Essential if Tokenization is to be Beneficial

**The professor** leading the section answered that “in many cases of bond market tokenization, the tokens are tokenized on the large financial institutions’ own permissioned blockchains. Where the token is tokenized is important because if issued on a restricted blockchain, like a large financial institution’s own blockchain, then of course it will have the issue of broadening the customer base.

I know that many financial institutions are trying to make the tokenization process within their own blockchains. We need to understand whether this will be harmful. This will be a significant barrier because, as we all know, the interoperability across blockchains is very challenging.

If a tokenized bond or any tokenized securities are restricted in a specific blockchain made by a specific financial institution, in my opinion, that will limit the benefits of tokenization going forward. But this is also an empirical question, because we don’t know if having more investors is always good for improving the financial market efficiency. It’s a complicated issue, but my quick thought is if the securities are tokenized on a restricted blockchain, we will only see limited benefits of tokenization.”

**A previous participant** repeated an earlier mention on interoperability. “Some of the 2017 experiments were on Ethereum, but what you’re seeing now is everyone choosing blockchains and stressing the interoperability bridges because they’re thinking in the future. We don’t want to build other siloed situations, but make it easy to transfer these funds between whatever other blockchains there are out there, because that’s going to be a key benefit. It’s not going to be closed in the long term.”

**A participant** agreed and asked, “Why would you create a system where there’s less liquidity with siloed blockchains? It’s almost counterintuitive.”

## Digital Bonds: A Practical Perspective

**A participant** shared some practical experience. “We launched our own digital bond in 2022. We have also been purchasing digital bonds as well as assisting the issuers in the last couple of years. We have quite a lot of practical experience from the issuer perspective as well as the secondary trading perspective. It's very interesting to hear the academic debate about the digital bond market.

We're at the very early stage of the digital bonds market. The one that is really liquid is probably the one that was launched in 2022. The big reason our bond is very liquid is because we have an operational link with the traditional marketplace. So “X” (*name removed*) was the additional market we used to issue, and “Y” (*name removed*) was the traditional exchange.

In doing so, you guarantee all the investors, however tech-savvy they are, can access these bonds without being a member of a digital platform. This is important because otherwise you could call your digital bond a digital bond, but that may only be accessed by a group of syndicate banks or five investors who have access to your digital platform and you restrict the liquidity of your bond.

At this moment from the issuer and the investor perspective, what our focus really is, is to guarantee our bond is liquid, avoiding marketing hype when you launch a bond. We've already passed the stage where you see lots of bonds launched just for the marketing purpose or for experimental purposes.

Institutional digital assets and issuance are at the stage of really rolling out and finding the right network together. Someone also mentioned cash, which yes, is a very important component of any digital bond. Our digital bonds launched two years ago using the digital token issued by “X” (*name removed*). Obviously that was commercial entity cash, so you still have all the risk against the token issuer, but then fast forward two years to now in 2024.”

**This participant** continued: “The project I would draw everyone's attention to is Project Helvetia, the Swiss National Bank’s (SNB) wholesale CBDC project. The national bank piloted wholesale central bank digital currency in Project Helvetia phase 3, to allow real legal CBDC to facilitate settlement of primary bond issuance. SNB is one of the most advanced central banks in regards of exploring wholesale CBDC in the context of monetary policy. If you look globally, the speed of wholesale CBDC exploration is uneven.



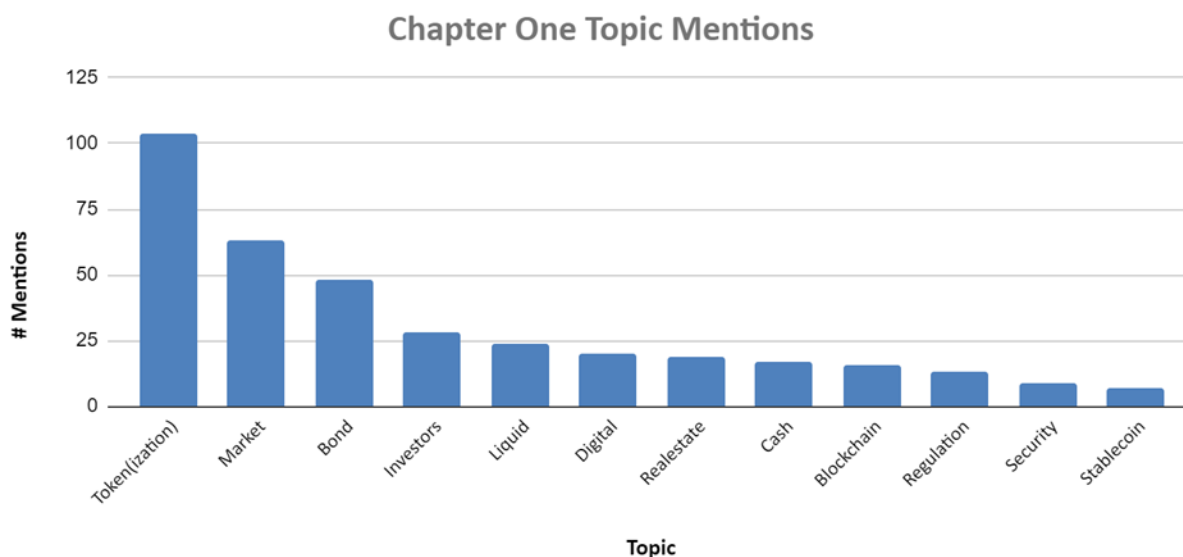
**Editor Note:** We also have to consider that not everyone will want to issue or work with a CBDC.

**This participant** proceeded: “We could end up with a situation where some bonds are settled through CBDC, some bonds through tokenized commercial bank money, and most importantly the life cycles of the bonds have to be really lined up. To someone's point earlier, atomic settlement has complicated implications when it comes to post-trade and liquidity management. When atomically settling the purchase of a digital bond, your liquidity goes down straight away. You will also want to have liquidity increase at your depository from upstream in atomic fashion when you sell digital bonds. It could be costly to have large liquidity gap as a result of settlement time mismatch.”

**The moderator** thanked the participants for their comments in this first section.

**END OF CHAPTER ONE DISCUSSION**

## CHAPTER ONE | ANALYSIS



**Graph explanation:** From the raw conversation, the editors extracted key ideas, classified them, and aggregated them by topic. Each word was first tokenized and reduced to its stem to ensure consistent analysis across variations of the same word. For topic extraction, we applied Latent Dirichlet Allocation (LDA), a probabilistic model commonly used in natural language processing. LDA assumes that documents (in this case, conversations) are mixtures of various topics, and each topic is a distribution of words. By leveraging this model, we were able to detect the important words in the top 12 topics within the discussions of each section. The table above shows the top 12 words across different sections by mention count.

**TOPICS STRONGLY IDENTIFIED:** Tokenization, Market, Bond, Investors, Liquidity, Digital, Real Estate, Cash, Blockchain, Regulation, Security, Stablecoin

## CHAPTER ONE | KEY TAKEAWAYS

**Research in early stages:** Tokenization of real-world assets is a new and growing market with the potential to increase efficiency and liquidity. There is much academic interest, but the research is still in its early stages.

**Regulatory uncertainty:** Different jurisdictions have different policies, and the rules are still evolving.

**Lack of standardization:** This makes it difficult for investors to understand and compare different tokenized assets.

**Benefits of tokenization:** Fractional ownership, faster and cheaper transactions, and increased price discovery.

**Effects on liquidity:** There is some debate about whether tokenization will actually increase liquidity. It may depend on the specific asset class and the regulatory environment.

**CBDCs:** CBDCs could provide a secure and efficient way to settle tokenized assets, but they are controversial to issue in some jurisdictions.

**Secondary market uncertainty:** The secondary market for tokenized assets is still in its early stages of development. It is unclear how this market will evolve and what the impact on liquidity will be.

## CHAPTER ONE | EDITOR CONCLUSIONS

**Transformation on the horizon:** Tokenization has the potential to fundamentally change the way financial markets operate and move them toward an always-available liquid asset marketplace. It could lead to a more efficient, inclusive, and innovative financial system. However, the path forward is not without hurdles, and the long-term impact remains to be seen.

**Tokenization disrupts traditional financial markets:** By fractionalizing assets and putting them on blockchains, tokenization has the potential to make financial markets more accessible, efficient, and transparent.

Collaboration and education are key: To unlock the full potential of tokenization, collaboration between academics, regulators, and industry players is crucial. Standardization, education, and a supportive regulatory framework are essential for this nascent technology to mature.

The potential benefits of tokenization are undeniable. Fractional ownership, faster transactions, and increased liquidity could revolutionize the way we invest and manage assets. The conversation around tokenization needs to be broadened to encompass critical topics not explicitly addressed in the text. Security, environmental impact, legal considerations, and the impact on existing institutions are all crucial to a holistic understanding of this technology.

## **END OF CHAPTER ONE**

## X | CHAPTER TWO TRANSCRIPT | DeFi IN THE CONTEXT OF REAL-WORLD ASSETS AND SMART CONTRACTS

**The moderator** introduced the chapter and introduced the next professor.

### Who Should Instigate Innovation?

**The professor** began with introductions. “I work on cryptocurrency. I work in AI, and as I was thinking about this conversation, and listening to what's been taking place, I thought a good place to start would be to touch on the question of who should be a first mover in an innovation? Should governments be early movers?

I’m writing a book about emerging technology over time and what you see in a lot of cases with successful technologies is that they end up scaling, and often have unexpected and sometimes disruptive consequences. There’s an initial move, and then there's a period of status quo, where often government actors are trying to figure out how to respond. There’s an expertise gap between the innovators who know a lot about technology and regulators who have to be a jack-of-all-trades.

When I've watched and read transcripts of congressional hearings, whether it's on quantum or AI or even social media, the common refrain from regulators or policymakers is, ‘Well, we understand about half of what you're saying, but we're trying to make sense of this, so we can figure out what to do to protect consumers.’ ”

### Regulation Requires Understanding

**The professor** continued. “Earlier this week we were working on a project, a classic case of multi stakeholders. We had policymakers. We had big tech, etc. The point is, that multi stakeholder conversation is really helpful and I am of the view that you need to understand the technology, and you need to understand the risks and the harms before just diving in because these technologies are complicated but also moving very quickly.

If you lean too far in today, that regulation might be anachronistic and out of date tomorrow, which is a real problem, but there is an additional concern that I've seen already. If regulators lean in too aggressively, there are dislocations because capital is mobile, it's fluid, it can move elsewhere. There are many goals government must keep in mind and it needs to assess the bigger picture. Protecting the consumer is one of them, but it has to think about the negative externalities of leaning in too aggressively. In the case of AI, for example, these models cost billions of dollars to generate. Those

companies might decide that the investment isn't worth it if they anticipate that they're not going to be able to make money from their technology in the US.

As I was making this point about understanding the technology and the bigger picture, one participant on the regulatory side said, 'I don't think we need to understand the harms and risks, we need to move in right away.'

I use that anonymously to make this broader point, which is that these technologies are complicated, they're moving quickly. I'm not suggesting recklessness on the part of policymakers, but more holistically thinking about the risks, the harms, and the trade offs of moving too quickly versus not moving at all and trying to balance those different goals."

### Experimental Groups

**A participant** said, "given that the technologies are complicated and moving fast and that we don't think that regulators necessarily understand them, what's the value of authorized, experimental contained trials where you can use the technology but in a limited way to get hands-on experience? Training wheels, so to speak. I don't want to use the word sandbox because it has connotations, but I learned by being hands-on.

With these technologies, you need to touch them and try them out to anticipate what's coming next. So the question is, how do you get to a situation where you're not totally frustrated by the unaccommodating regulatory environment? Where is that middle ground that lets private capital experiment, enabling the regulators to understand that people need to touch and feel the technology, without getting an enforcement action? And further, if the regulators are legally not allowed to use the technology personally, how are they supposed to understand it and literally get a feel for it?"

### Dialogue For Understanding

**The professor** agreed. "That's a really important point, and it suggests that this isn't a binary situation where regulators either act or they don't. In the case of crypto, it's been more fraught because the regulatory environment has at times been very draconian and punitive. I recommend more dialogue and different stakeholders talking to each other. It's hard, because there tends to be this sense of an adversarial environment.

But it's an iterative process of learning and exchange to understand these perspectives. Another example: The Google Deep Brain CEO released one of their Gemini models and it went badly. He said: 'We just didn't test this very well. We just released it and the only

way to improve is to release it into the wild and see what happens.' I'm not so sure that's a good approach, but the mileage varies.

My view is that whether it's AI or crypto, try to anticipate the risk. Crypto is a different context because there's a bit more permissiveness in an AI model, where there may be some inaccuracy to the real world or history. That's less problematic. People can forgive that, versus losses of billions of dollars in markets. It's important to think about how to carve out that middle ground."

### **Longevity of Assets On-Chain**

**A participant** added to the point about sandboxes: "More activity in the primaries versus the secondaries is a symptom of that. In the primary market, you're using the blockchain for a limited period of time. If blockchain has problems in the future, that's more contingent. Maybe that's a useful observation. It also means our understanding of risk can be quite limited because of regulator action or inaction, and that is overall not helpful."

### **Globalized Standards**

**Another participant** commented that "globally, policymakers have different standards of how permissive they are, how much experimentation they allow with cryptocurrencies and digital assets. Look at Brazil or EU MiCA regulations. How do we get global dialogue going so it's more balanced and can encourage innovation in the US? Otherwise the capital will keep flowing into those regions and away from the US, whose regulators are not currently innovative in their approach to understand these assets and provide targeted regulations."

### **The Right Groups For Experimentation**

**A participant** argued that it's starting to happen. "I know the [IOSCO](#) is starting to look at this and other international groups. The CFTC is very active there. The SEC has been the enforcement instigator. And that is part of the challenge in our market which has a fragmented regulatory landscape. When it comes to experimentation, finding the right market is a starting point. You're not going to explain digital assets to a 70-year old senator for two hours. They're not going to do the research. You need to be able to demonstrate something in half an hour. That is the beauty of enabling an experimental approach. You have something to show them.

Maybe their teams will understand. Senators Lummis and Gillibrand are great examples of this. Their teams are up to speed on how these things function, but most others in the government are not. It's leading with examples that will help. If you think that they will take a lot of time understanding and evaluating these technologies, that's not what they do.

You have to show them what's possible — find small markets where you can do the experiments and come back with the proof. This is what happened in Dubai. This is what happened in Singapore. This is not what happened here. Then you can advise making movements to ensure the US doesn't fall behind. Many would argue that the US has already fallen behind.”

**Another participant** echoed the above. “Europe for example has developed sandbox environments which promote playing around with and building value propositions. We have some states trying to do that. But we are behind in this market compared with overseas in terms of the maturity of an environment where the value proposition can be subsequently implemented industrially.”

**A participant** stated: “We are falling behind because of the lack of a regulatory sandbox, but also an industry sandbox. Everyone can come together and experiment alongside each other instead of doing things separately. I'm optimistic on the regulatory side in the long term because regulations have changed as technologies have evolved. It's also up to the industry to show that the regulation can be maintained. Industry needs to show the regulator that it is possible to adhere to the spirit of the regulation.”

**A participant** reiterated, in regards to the tech: “Tech is not scary. Tech is actually evolving fast. There's so much financial innovation that's already available. We need to address specific regulations and requirements. There's a way to have the entire stack from infra to blockchain in a sandbox in a controlled manner to test it. So don't be scared of it!

Put one eth in your organization's balance sheet, it's not going to break the bank. You won't get in trouble if you let us know what compliance requirements and risk measures are needed, how to custody it, and why we need to keep it in a certain place. That's what we need to learn by experience before we go to a regulator and explain what the change is. It's a hands-on challenge.”

**This participant** continued. “There is also the tax side as a portion of the challenge, but there's been amazing innovation and amazing changes. We all need to walk the walk.



Put a tiny fraction into our books to truly understand what the changes are. It's an issue for your own internal audit department to evolve with changes.”

**A participant** offered an example, using the well-known large tech entity where they work: “It’s a public entity that has crypto. That was an important step in our own effort and journey to understand what was needed.”

**Editor Note:** Experiential learning is necessary for regulators, too. Currently regulators are not permitted to hold or transact in crypto, so they can’t experience it. This handicaps their ability to understand what they need to be regulating.

### Friction as a Feature

**A participant** added that “as a bank we do innovate as well, but it's a much different regulatory environment. I was in DC a few weeks ago at the OCC Real World Asset Tokenization event, and there were a number of regulators on panels. One of the things that was clear is that friction is a feature, not a bug. The message is they're open to learning and understanding, but entrenched in the view that friction in the system is a feature, not a bug. They are not thinking of how this can change. Friction can lessen, and perhaps enable even better oversight of markets in real time.”

**Editor Note:** When friction is a feature rather than a bug, maybe it’s time to think outside of the box and see how the technology can decrease both friction and risk.

### Periods of Normalcy Necessary

**A participant** asked, “Don't the intermediaries in third parties have a lot of clout in DC? There may be an element of self-preservation to resist improved efficiencies. From a brand perspective, the industry is going through reformation. As we distance ourselves from FTX, the regulators are going to start to become more comfortable once they see periods of normalcy and adoption. The institutional adoption of the technologies, and the accelerated rate of adoption over the last year, are really good indicators, and they should prompt the regulators to start coming around.”

### Regulators Prohibited from Using The Tech

**A participant** added that “there are a number of regulators who are interested in using the tech, but there are internal ethics rules preventing them from doing so. I've spoken with Treasury Department officials who have refused to use Testnet ETH because it has some value. That's a real problem too. Even regulators who are educated and want to take this really seriously cannot.”

### Focus on Issues in TradFi

**A participant** added that “from a practical and a policy perspective, we have a long road before we can hold eth on our balance sheet. These technologies can transform very plain, vanilla, post-trade operating systems. The tokenization of real-world assets doesn't need to be real estate, it can be corporate bonds. There's so much wood to chop in changing how post-trade capital markets work now to make them more efficient, and to make the capital usage more optimal.

It's a fair point from an educational perspective, but I feel like we're leaping over the entire system of capital markets activity that we all know and can relate to. Everybody knows where there's lower STP (straight through processing), risk, or control issues, and from a regulatory and practical perspective it would be more comfortable to focus on those first.”

### Improve The Current System

**Another participant** agreed. “The way to drive adoption in the near term is to use the technology to drive real-world outcomes, or simply to improve efficiencies in the market. Then go on that long journey towards a more open network in the public space.”

**This participant** continued. “To a previous point, give retail investors more access to assets that they don't have today, and have a conversation about whether or not that's a good thing. But that's separate to this. That's the conversation you can have with regulators and extract the outcomes that the technology drives for their constituents. As you build toward a more open and inclusive system, you will get the outcomes you want. But trying to fundamentally change market structure and implement new technologies — doing everything at once is really hard. It's not something regulators and policymakers have an appetite for.”

**Editor Note:** Is iterating the right approach? Are we making faster horses rather than automobiles because we are wary or downright scared and hostile to change? The examples we see happening are the rudimentary automobiles of the new financial system. They give consumers a new way to act, and the market then has a choice to behave differently with different options for consumers.

**The mediator** reminded the group that regulation would come up in Chapter Three and redirected the conversation.

**An academic** raised several questions and observed that “amongst economists and business school researchers it's hard to come to consensus on these issues. People still don't agree on the equity premium puzzle in financial economics in the field 50 years later; people don't agree on capital structure, etcetera. But as it pertains to this area, there's a surprising amount of agreement amongst academics on very core things. There's a lot of work in the area, but I am going to highlight two big things that I think where there's a fair amount of agreement at a high level.

### **AMMs**

The first is if you look at the mechanisms that have been produced in this space, for example, automated market makers (AMMs) used as a mechanism in a secondary market, and what will happen to trading cost or economic welfare more generally. It's clear from the literature that there are cases where they will reduce trading cost. It would be hard to find somebody who's a serious researcher in the area that would say: No, this wouldn't work under any relevant circumstance whatsoever.

### **Not The Developers' Responsibility**

Frequently people ask me when crypto will do something that's actually useful to the real world. It makes me want to pull my hair out because this is a dynamic environment. Developers will continue to innovate, but they have already added value. The gap is not something that developers have to fix. It's something that institutions have to embark on now that the tools and some use cases have been created.

You can trade wrapped Bitcoin, Ether, and USDC on the Ethereum blockchain using an AMM. You can't trade using actual cash dollars. The stablecoin is a cash equivalent. You can't trade equity, for example, but that's not because the developers didn't do their

part of it, they're not responsible for what is tokenized on the other end. They can't force somebody to tokenize on the Ethereum blockchain. This is where it falls on the market, and institutions specifically, to step up.

I'm not saying that all mechanisms that we've seen deployed are useful. But there are cases where some of these mechanisms are, and the ball is very much outside the court of the developers and even the economists, and more in the court of policymakers, regulators, and institutions.”

**Editor Note:** Developers are making tools and products. Institutions can decide if they want to try them, and if there is product market fit.

### Profit-Seeking Motives

**The academic** continued. “The second point to emphasize is about the literature so far. Despite the fact that there are these opportunities for very good things to happen, there are a lot of bad things happening in real time because this is a very unregulated environment. If you look at the microstructure of the space, you see pump-and-dump schemes, front running is pervasive, etcetera.

In the mind of a policymaker who does not care about crypto, they see that it's very easy to interact with a system and to have no idea what's happening on an interface. The consequence of that is probably going to be bad, but it's because those interacting don't know what they're doing. These systems are opaque to people who can't read code. There are lots of people who *do* know what's going on, who are basically seeking to profit from the people who don't know. There's a profit-seeking motive. This is what makes markets efficient in the first place.”

**Editor note:** Since we are presented with a marketplace where those who know code do not find the marketplace to be opaque, but those who do not know it find it opaque, what do we do? Do we brute-force this type of marketplace into current regulations that do not fit? Do we create a new scheme that offers enough transparency to all participants? It's an open question that is not theoretical, as this is happening in real time.

**The academic** continued. “You expect people to display profit-seeking behavior, but you also expect policymakers and regulators to step in. The technology in this space is valuable, but it's not necessarily having positive welfare implications right now. Again, I think the ball is no longer in the court of researchers and developers, it's in the court of policymakers, although that's not to say that the space won't continue to innovate and be dynamic.”

**Another academic expert** was introduced and offered commentary on the role of DeFi in the context of the tokenization of real-world assets.

“The first usage of DeFi in the context of decentralized exchange was to think about how to price digital assets, and then the AMM was designed as a mechanism to decide this. We have also seen some attempts at using AMMs or smart contracts to price financial losses moving from the traditional crypto space to the traditional finance space. For example, how to use smart contracts or AMMs to price exchange rates, to decide how many euros is a dollar worth, and so on.

The second step is moving from traditional finance to digital assets or crypto, but there is still a lot of experimentation on how to do that. There was the [Mariana project](#), BIS, the Singapore Monetary Authority, and so on. From crypto, can we go to real-world assets? Can we try to see how to price or manage real-world assets using AMMs to define the risks and benefits? We are already doing that to some extent with fiat-backed stablecoins, USDC or Tether, etcetera. I view them as tokenized assets because the owner of this asset can redeem them for fiat currency whenever they want.

We have also seen NFTs. These are another step towards tokenizing real-world assets. You can use them to establish ownership of digital assets, mostly intangible – think about pictures with songs, documents, etcetera – but they have value and are actively traded. They also have the proof of ownership included. You have certified ownership of that asset. This is similar to tokenizing real-world assets.”

**Editor Note:** Legal ownership of the NFT content (title) is generally decided off-chain unless it is coded into the asset. Proof of possession of that computer code array or NFT can be found on-chain. So, an NFT may or may not have legal ownership included on-chain when it trades, or the legal ownership may be governed externally to the chain.

## Tokenization Design For Real-World Assets

**The expert** continued. “The next step is to think about how to design the tokenization of more tangible assets, for example, real estate. There are several channels. One is, of course, to create infrastructure – that is, how to provide the blockchain technology with the necessary infrastructure and the on-chain management of these assets. Then, how can it help to bridge the gap between physical digital assets? What we want to do is to use blockchain to keep track of real-world assets, and I would argue that it doesn't have to be limited to real-world assets. It could also expand to services.

Tokenizing the transportation system, for example. Instead of using a centralized transportation system, moving this service to blockchain and on the supply and demand side, keeping track of all these requests via tokens is an interesting use. And, we might look at more traditional supply chain uses. One of the benefits is the ability to keep track of the entire life cycle of a product. If you're selling micro conductors or computer chips over a blockchain, you can keep track of which items might be defective. You can recall them promptly, benefitting both the supply and the demand side.

### **AI, Algorithms, Smart Contracts, and Blockchain for Fairer Systems**

These innovations can definitely improve the management of real-world assets. I can see some benefits of using AI or algorithms which can be implemented through smart contracts, and which are able to keep track of the history. We would have to make the blockchain somewhat accessible to supervising authorities so you can see what type of requests are being made, for example in a decentralized transport system by drivers, and push fairness in the process. Maybe they wouldn't want to drive in specific dangerous areas, which of course limits the transportation of the people living there. Blockchain would allow interventions and come up with a more fair system.

### **Exposure and Privacy**

There are questions that need to be solved, because when it comes down to organizing real-world assets, it also means you need to share information about your business strategy, which means exposing yourself to potential risk of being outcompeted by competitors. So, we also need to determine the privacy rules of blockchain. Who is going to access the information?

These are all questions that I think need to be thought about very carefully because the programming technology is there, but it's difficult to make it work. The overall question

is around privacy when it comes to real-world assets. How do you ensure that this is correctly supervised? How do you incentivize companies and retail to participate in these markets?”

**Editor Note:** One way to achieve privacy is by using zero-knowledge (ZK) proofs. With ZK proofs, individuals and corporations can provide certain data that proves they fall under a particular parameter without revealing explicit information publicly. Retail companies, for example, can provide the technology with comprehensive private information and the technology can publish simple YES/NO answers according to whether or not the retail company complies with a given rule.

**The moderator** invited the group to ask questions.

### **Leverage the Tech to Determine Privacy Levels**

**A participant** added commentary on what’s been done from the developer perspective. “It's not just the AMMs, but how they've evolved over time from very simple XY to where you can now select what limits you want to concentrate liquidity around. Also, a lot of the decentralized lending is enabling the leveraged place that we have seen for traditional finance. I want to tokenize and deposit it in a treasury somewhere. I can deposit that into decentralized lending and lend that out and earn an interest rate. It's very familiar to trading like hedge funds. The innovation is there from a financial standpoint, and innovation is also there from a privacy standpoint.

I think we kind of overlooked this bit. The emerging area of zero-knowledge proofs and what they're doing with identities — being able to secure not just my identity information, but also any sensitive information that you want off-chain, is already possible, and you have the opportunity to expose on the public blockchain only what you want.”

### **Superchains to Be Used for Good**

**Another participant** added that “the innovation which might concern regulators is that we also have the ability to create synthetic positions, starting from synthetics and then building from what they've done. If we don't end up having real-world assets on-chain, all that will be left to be traded on these massive superhighways that developers have built are essentially illegal assets, or synthetic positions that the CFTC doesn't want people trading, and so regulators have to come in and help.”

### Sufficient Investor Protection

**A participant** commented that “one of the reasons that US markets have been so successful is because the main mandate through the SEC is investor protection. We essentially have a sandbox. Operationally, it's demonstrated that you can track ownership, that it can be traded on DeFi. I don't believe that that trust and that investor protection is of a level that's sufficient to incentivize somebody to put a significant amount of their wealth in a digital asset. Would anybody around this table put 40-60% of their wealth in a digital asset?”

**A participant** added: “I wish I did in November.”

### Applications For TradFi

**A participant** commented that “on the other hand, one of the reasons that we are willing to put our money into US banks is because of that regulation. The reason stocks exist is regulation. How do we embed investor protections into digital assets so that we can feel comfortable investing?”

**Another participant** said, “it's easy to see the innovation, AMM models, etcetera. Take traditional markets. We're not working with better instruments, refunding settlement instantaneously in these markets. So what are the implications for our current markets if you move to that model? How do we study that? Let's experiment and do it, but there is no easy recourse to fall back right on some of these things. How do we take the best of what's evolving in this innovation and apply it in traditional models?”

**Another participant** added that “if you were to tokenize the assets, then they're settled on the blockchain and settlement is instantaneous, which is viewed as a good thing for most people in the crypto community. It's good for the crypto community. But in the equities market, for instance, how do you apply the same model here, because netting efficiencies were mentioned that you don't get in the AMM model. So how do you leverage what's best for traditional markets?”

### Who Benefits?

**A participant** commented that “the netting efficiencies would have to be studied. It would be interesting to see what would/could happen if you were to flip the switch and tokenize equity assets through an AMM, for example. One of the key points that's emerged in the literature is that the liquidity pool is almost like a fund. It's almost like an Exchange Traded Fund (ETF). You have a balanced portfolio, a bunch of assets. So



people who want to buy an ETF or something like that, they could just be liquidity providers.

There's a massive cost reduction because you have all this passive capital that suddenly has a place to go and that turns out to be, at least it seems to be from the literature, a significant effect of cost reduction to the people who are trading. Now, it could be the case that this ends up being good for retail investors and bad for traditional institutions. Preliminary analysis suggests that this may be good for retail, but it doesn't necessarily mean that the most empowered entities are going to want to move forward in that direction.”

**A participant** added, “it’s interesting in the context of creating new business models, and enabling historically unproductive assets to start gaining productivity through this possible liquidity provision. There's a lot of concern around predatory practices within DeFi. I would also argue that a lot of those same things still exist in the traditional financial services markets today. It’s not black and white.”

### **Predatory Practices Were Centralized**

**Another participant** commented that “most of this predatory stuff that's occurred in crypto or in DeFi has happened to be on centralized exchanges. Those were the black boxes. They were needed to serve as an on-ramp here, but that's what FTX and several other downfalls or market failures were. We need investor protection against these types of incidents. If we just focus on the DeFi part of this, it's obviously going to take a lot more time to get the liquidity and folks operating in that system, but we have the transparency.”

**This participant** continued. “So yes, there is a big UI problem in DeFi. But if we have the right participants building out that ecosystem, we will have the ability to audit smart contracts together with the ability to monitor how those contracts and liquidity pools are actively processing.

And as I said, we have the ability to see all of the participants. It’s pseudo-anonymized. But we can still build those guardrails that will lead to investor protections, and then the profit-seeking behavior that can be attributed to security vulnerabilities and immature markets will decrease. These centralized exchanges in crypto have given us a bad example, and we have somewhat been lumped into the “crypto is bad” category due to them. This is a gross oversimplified view and throws the baby out with the bathwater. Crypto has many possibilities, and we need to figure out how to find good examples in

the decentralized ecosystem and promote the existence of positive tools and choices as the way forward.”

### AMMs

**A participant** responded: “I'm part of a committee for a regulated agency which put out a 70-page paper on DeFi. I'd encourage everyone to read it. If you haven't, it talks about a lot of things that we're not going to solve in this room.

With regard to AMMs, I like your point about finding assets that aren't very liquid and aren't already providing really great price transparency to customers and trying it there. It would be much harder going in the equity market and saying, let's try “XYZ name”.

What happens if there's a clearly erroneous trade? The retail customer doesn't know about that. Who is going to make the customer whole, the AMM? Who is the AMM? Who's the surveillance team and the regulatory team that's overseeing the AMM and all the flows that are coming in? We have to solve that for the regulators to get comfortable, because if not, then all that customer protection has just been wiped away. From a regulatory perspective, all these things solved in a shotgun approach is going to be really difficult.

So if you go to a place where you don't have all those things solved yet as (they are) in the more mature markets, do this (tokenize and trade with an AMM model), and then show the results, *then* we might be able to slowly move into other asset classes. But every time we talk about DeFi, everybody always wants to know where all the liquidity is, and I get it. But, I can buy a hundred shares in Apple with great protections and price discovery.

But the actual downstream piping and all the policies, all the procedures, all the governance, all the connectivity, all the price improvement, all the routing...the retail customer actually has no idea how complex that system is behind the scenes.”

### Right Time for Migration

**Another participant** added to the conversation: “Is there an opportunity though? The US markets are about to move to T+1. After that, it will be T+0 which is just real time. Is that the opportunity for the traditional markets to actually make that migration? They will have to rethink everything to get there if they want to do it properly. Then perhaps that's the way you solve that problem. Putting a deadline on it. It's going to require all the intermediaries that are playing to agree that this is the direction where we go.

If not, you end up with something like the Fed payment system that was recently released. It should have been released 20 years ago. Now, there's much better technology that facilitates the same thing. If the industry can come together and offer a solution like T+0, it can drive significant change.”

**Editor Note:** The notion of a golden opportunity to make change is one that can be discussed further. New tools like the ones discussed might help the legal mandate to reach T+0 easier to accomplish, provide better access, be more secure, and provide better fraud controls. It is not every day that you have the possibility of an industry overhaul mandated by law, where all the parties need to come together to accomplish it.

### Political and Consumer Benefits

**This participant** continued. “It's going to add benefits to consumers. I don't mean to come back to the title insurance thing, but the fact that there's not a governor in the United States that hasn't stood up and offered to save every single person in their state \$5,000 when they buy a home, or refinance a home, boggles my mind. Think about the political goodwill you could win by doing something like that.

It's just a matter of instead of trying to change *everything*; it's what are those use cases that show real impact to consumers? Because those become a lot easier to sell to politicians.”

**Editor Note:** Note that Iowa follows a different title system - provision of title coverage through a state entity. This system does indeed save consumers fees as compared to a traditional title insurance system.

### Slippage Tolerance

**An academic** added: “When I talk to people with policy or legal backgrounds, it feels like they're in different universes. For example, if you're creating a brokerage form, is it a limit order or a market order? It's called slippage tolerance. They don't call it a limit order, but you can put a slippage tolerance when you do the trade right. They thought about an incredible amount of things, but it seems like this is completely lost on the policy side. I find that a serious detachment. Then there are bad things happening in this

space as other people mentioned. But those bad mentions referred to what occurred on centralized exchanges, or centralized exchanges themselves like FTX — it's not DeFi.

Why do people get front-run in DeFi? It's not accidental. If you submit your transaction to the public mempool, there's now basically a fight amongst arbitrageurs to front-run you. This is how markets become efficient. I mean it in the sense that we rely on arbitrated motives in order for traditional markets to be efficient.

But that same motive is causing malfeasance because it's an unregulated environment. Every time I speak with a policy person, I bring up some of these points, they start talking about centralized exchanges, and I have to remind them that FTX is not the AMM."

**Editor Note:** A mempool is a location where transactions wait to be processed. Public mempools are accessible to anyone who wants to view the pending transactions. Miners or validators pick the transactions they want to process in the next block. Typically transactions with higher fees are prioritized.

### Discordance in Terminology

**The academic** continued. "One thing I'm hoping for in the future is that there's a better understanding from people on the policy and legal sides on all the things that the people in the crypto and developer communities have thought about. The communities basically learned economics and finance on their own, and so they name everything in their own ways, and it creates a sort of opacity, not to mention a barrier, because the terms are not well understood. But intellectually, they have an understanding of the economic aspects.

If you take the people on the policy side and financial institutions and you compare their understanding with people in the developer community, it's the same. Ethereum has a group called Research Incentives. It's an economics group, except that people know how to code. They're constantly thinking on a day-to-day basis about how they would adjust mechanisms in order to get better outcomes and so on.

They're speaking a different language that includes terms they created, but they're very advanced in terms of their understanding of economics. They thought about a lot of

issues that are being brought up here, but it has gotten lost on people in more centralized contexts and on the policy side.”

**A participant** added that “policymakers then have to get comfortable with this idea that the community or the users are going to figure this out. The market figures it out rather than policymakers. That's a foreign concept for a lot of policymakers.

**Editor Note:** Having standardized terms for both policy makers and developers would go a long way to fostering communication. While developers use specialized language they created to describe advanced economic concepts, policy and legal folks need to collaborate with developers and bridge the understanding gap, learning and agreeing upon technical fundamentals, DeFi economic models, decentralization principles, and the language and terminology, so they can understand the regulatory implications.

### **Machine ‘Entities’ Create Taxation Issue**

I'll add a point on tax. Providing liquidity to an automated market maker (AMM) — effectively, you're providing tokens to a machine, in exchange for a new token that represents a fractionalized interest in this machine, and the machine is doing dealer activity on your behalf. And from a US tax perspective, there's a serious risk that you are in fact creating a corporation. You're entering into a partnership with all of the other liquidity providers taking back an interest in this entity. Unfortunately, US tax law treats any joint venture for profit as an entity and we have to figure that out too. Either you look through LP token, but in that case, everyone is a dealer for US tax purposes, which is not what is supposed to happen. In that case, non-US people may be subject to US tax. If the AMM was designed from within the United States, they might be treated as a business engaged in the US.

Or, you can say we are not going to look through LP token. We're going to treat this as an interest in a corporation. But then there are profits being earned inside of a corporation that are not being taxed to anyone. Under current laws, it doesn't work. So, we really need to have a conversation about these regulations and come to some agreement the regulators can accept. At the moment I don't have a great solution.”

## Educate Those Drafting the Law

**Another participant** commented that “from an in-house counsel perspective and a financial institution, education on this is key because I've been to so many jurisdiction panels, and other conferences and panels where you have people from the Internal Revenue Service, from Treasury. These are the individuals that are drafting the law and it becomes very clear when you read some of the proposed rules and laws that they don't completely understand the subject of what they're drafting.

One of the big problems is that the regulators, I'm talking tax regulators, are not getting sufficient information from the developers to be able to take that information and actually draft laws around what's happening. There's a huge disconnect there. We should be trying to bridge the gap between the developers, the technology people, and the people that are actually drafting the laws around this stuff so that they can understand how these things work and write the laws in a way that makes sense.”

**Another participant** added that “the technology exists that can solve big regulatory problems, but we're focusing on other things. I'm just curious as to what the academic approach would be to try to identify the large regulatory issues that are well-paired to the technology. Can the industry work with regulators to solve these issues?”

**A participant** commented: “I have no legal background whatsoever, so I look at it from the perspective of a mechanism. The potential to add value to retail, for example. I understand that there are people who think if we turn the switch on, then there'll be bad actors who will also take advantage. So retail traders who don't put this slippage tolerance on will be front-run.

In the crypto community, there are plenty of players who are open to regulation and want to actually be regulated, but the question is, what exactly does that mean? Traditional forms of regulation like KYC and AML? I'm genuinely trying to figure out if this is even cost-feasible for the government — to regulate users on a permissionless blockchain?”

**An academic** commented, “There is some insane cost at which they would be able to. It's like saying, jaywalking is illegal in Manhattan, but how often is this actually enforced? I don't actually know what the trade-off is from the regular regulatory perspective. The cost of regulation here is much, much higher than the traditional amount of regulation that you would do in a centralized context because you have these issues around pseudonymous identities. Maybe you realize you can't regulate the users,

so you want to regulate the platform, which then gets into some of an aforementioned attorney's work, which is who exactly are you regulating?

If you're regulating UniSwap, it's code on a blockchain. Yes, there's something called UniSwap Labs, but if you kill UniSwap Labs, the code doesn't die. We think about regulation of an entity. Then there's a trade-off between innovation and malfeasance. If you over-regulate, you will destroy innovation, but you'll get rid of the malfeasance.

In this case, if you over-regulate, you'll increase the malfeasance because you'll take UniSwap Labs to stop some of the bad things happening, but if you over-regulate them out of existence, then there will be even more of these problems. So, as an economist, it's difficult for me to even understand what the potential options are, given the legal constraints.”

### **Ease of Analysis**

**The academic** continued. “The thing I'm interested in now is not the analysis of economics. Remember, this is code on a blockchain. It's much easier to analyze than traditional markets, where you have to make crazy assumptions because you don't know exactly what market participants are doing. It's a code block. We know how to analyze this. The question is what is actually tenable from policymakers, regulators, etcetera.

We're talking about tokenizing assets. Will the U.S. government ever consider tokenizing the US dollar on the Ethereum blockchain? I'm going to bet that that's a nonstarter. We're not going to put the US dollar token on a permissionless blockchain that could be taken control of by a foreign government. If policymakers and regulators want to get more useful research out of academia at this point, they have to define the parameters that we're working with: These are the things that we would consider, and these are the things that are completely off the table.”

### **The Technology Will Save on Regulation Costs**

**The academic** continued. “The problem is whether regulators are going to come to you with that request. The market has to come forward with that request. The previous chairman of CFTC's point is that KYC and AML are broken, they don't keep bad actors out. It keeps people trying to do the right thing from participating, and bad actors usually figure out a way around it. But we have technology now that can create a completely different model.

The prior Chairman's example, generally used, is: when you get on the highway, you're not asked for your driver's license. When you get pulled over, you're asked for it. We can do the same thing regarding pattern matching as an initial step. Forget about AI, just talk about machine learning.

Machine learning can detect massive amounts of patterns happening on a chain and detect anomalies. There could be a legal transaction or illegal transaction, and it can identify the transaction pattern which then gives the regulators the opportunity to research and call a timeout. This type of approach gives the participants a chance to prove themselves while overall maintaining the network and transactions.

This technology solution could be implemented tomorrow. The big question is: how do you tell that story in a way that's not political, but rather speaks to the benefit that it could actually deliver? Because it would save billions, if not trillions, of dollars in costs."

**A participant** observed: "This solution just described has no kill switch or pause button, but arguably those are not so important. With this solution there are many things happening for you to observe, which is both a challenge and opportunity."

**A participant** responded: "Technically, there is a kill switch if the US government bought all the Ether in circulation."

**The academic** further commented: "One important thing in the crypto community: some people on one extreme side say, 'Look, you can't regulate it, give up.' Then you hear some people on the various centralized sides saying, 'Look, we can regulate anything.' The truth is somewhere in the middle and from an economic perspective, what is really happening in this space is the cost of regulation is much higher. *How* much higher is what is going to affect the set of feasible policies."

**The moderator** invited the organizer to close this chapter.

**The organizer:** "I entitled this event **Imagine a Fully-Tokenized World**. When I first came into this industry in 2016, people were getting rug-pulled because the code was immature and exploitable, and people would ask on social media, 'Can somebody make me whole?' And people would, but that is not the way a scaled financial system works. It is the way a community experiments and believes in what it is doing. And that, in and of itself, is commendable.

The question becomes, how would you design a system with those assets that aren't fully liquid now? How would you design a new type of system that had some stocks in it



and do some economic analysis? Just wishing or brute-forcing everything into existing frameworks isn't really a good fit. It's better to say what works with this technology and imagine how to design economic incentives and some customer or consumer protection. There is a huge opportunity to build something better - something more resilient. It is not for the faint of heart, and it takes stamina to innovate.”

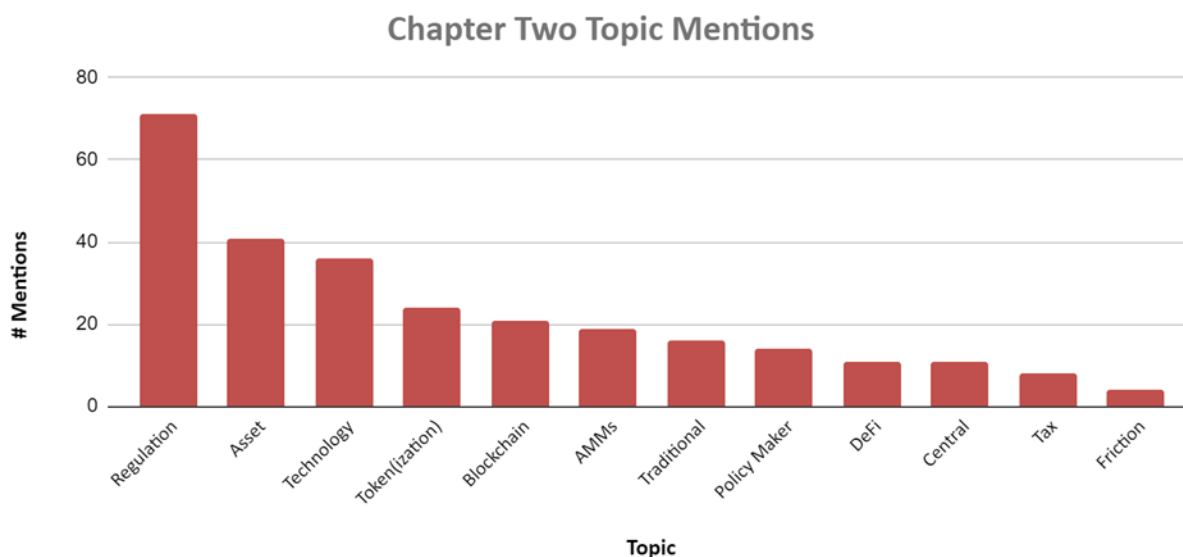
**The academic** added: “One of the key pieces is that there needs to be more clarity for researchers on what the preferences of regulators are. You alluded to a fat finger essentially, or a situation where the product is not fully baked and enables mistakes. Accidentally sending 10 million when you meant to send 100. Some people would say that’s tough, you made the mistake and learn to live with it. I imagine a regulator would say ‘no’, but I don’t know for sure what parameters they want, and that’s part of the problem.

Typically in economics, the difficulties come out because we disagree on the primitives of how the world behaves. In this case, a lot of the primitives are given to us because it's code on a blockchain. What are the preferences of the person, whether it’s Congress or an executive agency, involved? As academics, we tend not to know this, and it is something that needs to be provided to researchers if you want to make some progress in this space.

The fundamental analysis and tools are there. We know approximately what the welfare implications would be. What we don't know is what a regulator would consider tenable or not tenable, or how regulators would think about certain negative cases like the fat finger case that you alluded to. We can figure out what people in the community would think of it, but that is very different.”

## **END OF CHAPTER TWO DISCUSSION**

## CHAPTER TWO | ANALYSIS



**Graph explanation:** From the raw conversation, the editors extracted key ideas, classified them, and aggregated them by topic. Each word was first tokenized and reduced to its stem to ensure consistent analysis across variations of the same word. For topic extraction, we applied Latent Dirichlet Allocation (LDA), a probabilistic model commonly used in natural language processing. LDA assumes that documents (in this case, conversations) are mixtures of various topics, and each topic is a distribution of words. By leveraging this model, we were able to detect the important words in top 12 topics within the discussions of each section. The table below shows the top 12 words across different sections by mention count.

**TOPICS STRONGLY IDENTIFIED:** Regulation, Asset, Technology, Tokenization, Blockchain, AMMs, Traditional, Policy Maker, DeFi, Central, Tax, Friction

## CHAPTER TWO | KEY TAKEAWAYS

**Balance between consumer protection and innovation:** Regulation of rapidly evolving technologies like DeFi is a major challenge. Finding the right balance between protecting consumers and fostering innovation is crucial.

**Collaboration:** There's a need for better communication and collaboration between policymakers, regulators, and the tech industry. All sides need a better understanding of these new technologies and economic models. Collaboration between academics and industry can help to develop research that is relevant to policymakers and regulators. This research should clearly define the parameters and goals for these new technologies.

**Sandboxes:** Regulatory sandboxes can be a useful tool for testing and experimenting with new technologies in a controlled environment. This can help regulators understand the risks and benefits before implementing broad regulations.

**Bad actor concerns:** TradFi is concerned about the lack of investor protection and the potential for misuse associated with DeFi, such as fraud and scams.

**Privacy and regulation:** Tokenization of real-world assets has the potential to improve efficiency and transparency in various markets. However, there are challenges related to privacy and regulation.

**Change in KYC and AML:** The current KYC/AML (Know Your Customer/Anti-Money Laundering) regulations may not be effective in the context of DeFi. New approaches are needed to combat illegal activity without stifling innovation.

## **CHAPTER TWO | EDITOR CONCLUSIONS**

### **Beyond DeFi and Regulation: A Holistic Look at Tokenization**

Discussions around tokenization often focus on DeFi and regulatory frameworks. A comprehensive understanding requires a broader perspective.

Valuing and securing the underlying real-world asset that a token represents are the essential tasks. Then, securing tokenized assets and the infrastructure that supports them becomes equally paramount.

AMMs offer a new way to trade assets, potentially reducing costs and increasing liquidity, but standardization of tokenization processes and interoperability is needed. The legal frameworks surrounding ownership rights and dispute resolution for tokenized assets need development and harmonization across jurisdictions. To build trust and

ensure responsible participation in this evolving market, clarified tax treatment of tokenized assets across jurisdictions is crucial, as is public education about tokenization. Collaboration between academics and industry can help develop research relevant to policymakers and regulators. Although not mentioned, exploring and adopting energy-efficient alternatives is vital as well.

## **END OF CHAPTER TWO**

## XI | CHAPTER THREE TRANSCRIPT | **POLICY, DISCLOSURE, REGULATION, AND TAX**

**The moderator** invited two participants to kick off Chapter Three.

### **Showcase Data**

**The first commenter** here described their company's role in this area. "We do a lot when it comes to shareholder disclosure, protecting investors, and delivering the information. We've been thinking about this in terms of digital assets for the last several years. We speak to regulators in the US, we speak to regulators globally, and we spend time with both the SEC and the CFTC understanding the challenges.

What we have found to be very effective is when we provide data - when we use data to actually demonstrate that change. I'll give you an example. We did a very robust survey of about 2,000 people participating in the markets and we asked them: 'How do they actually evaluate what they're buying now?'

The vast majority of people buying and participating in crypto markets had no idea how to evaluate what they were buying. So that started a conversation on how to educate and ensure that the information that's required is there.

People were thinking about these assets much like they think about traditional assets. They were talking about the importance of financial statements, of information that was akin to what you would see in a 10K or 10Q, versus network and platform activity and why that's important. Understanding what happens when technology changes or forks occur is important. There's a new language that needs to be created to convey information useful to purchasers. We decided we needed to create a taxonomy. We started to collect data.

### **Dissonance between TradFi and DeFi Systems**

The second part is when you speak to regulators, what becomes very apparent is that there's a strong desire to make things fit by brute force, and unfortunately that won't work. The biggest question in this space is the idea of an issuer. The issuer is the grounding concept in traditional finance. We talked about DeFi versus centralized finance, and we can think about our corporate position in the ecosystem, and some of our partners.

There is no one there that's going to take on the responsibility of filing a 10K or 10Q. I would argue that what you file on a 10K or 10Q has no relevance (to what is relevant) to

the crypto asset. There's more and other information, so there are some interesting learnings that we found.

The second thing that we started to see as we started to speak to people across the community two and a half years ago was the common refrain of, 'We don't need to provide any disclosure. Everything's on-chain.'"

**This speaker continued:** "Of course it's not. There is on-chain information but there is also a lot of other information that actually drives markets. In a decentralized world it doesn't make a difference which cryptocurrency you're talking about. Even if there is a tendency toward centralization with some cryptos, a lot happens outside of their control, and so in practical reality, almost all of this is truly decentralized.

We need to think about that model. April 2021, when the market imploded, marks the start of real recognition, by central parties that participate in this market, that they need to provide disclosures, and not because of regulation. It's because of three important letters: CYA.

### **First Movers**

It will take time for the US markets to move and to make decisions. Until the presidential election it does not seem that there will be much movement. There's a lot of interesting bills that have been written, but when you speak on the Hill, you recognize there's not a lot of movement actually occurring. That brings us to the question of: Should the market do something?

There are other regulatory regimes that have started to actually make significant movements. The Canadian market has created a set of rules. European markets have MiCA in effect, and there's starting to be a form of standardization. For the US market, it's up to the industry to start driving the storyline.

### **Varied Perceptions In DeFi**

The thing we've heard repeatedly is the fear that the information one person provides about an asset is different from the information that someone else provides about an asset. Think about that in traditional markets. A 10K, no matter where you look at it, is the same 10K. The information I get here in a DeFi world may be very different depending on the source, because nothing is standardized and disclosed.

There needs to be that standard basis of fundamental information. Once you have that, you can do all the analytics. But you need to have that basic set of truths that people could actually believe in. How you generate those truths is where the real problems exist, because it is a consensus-driven mechanism where you need to collect information, allow people to submit information, and allow people to vote on the accuracy of that information. And, the process needs to meet auditable standards to work with regulated industries. That is a mind-boggling change for many who think about the way corporate governance works.”

### **Governance versus Technology Failures**

**The speaker went on:** “FTX always comes up in conversations like this. I would make the argument that FTX has nothing to do with crypto; FTX has to do with corporate governance. There is no difference between FTX and Enron 20 years earlier. This is bad people doing bad things, and it should have been caught by existing rules that are already in place.”

The industry has to do itself a favor. The industry has to talk in those types of terms because if not, it's really easy to point the finger. (People say) ‘We're scared of this because look what happened over there and now you're talking about doing with corporate bonds, real estate and other things’ is a common refrain and knee-jerk reaction. What must be noted is the technology didn't fail; it was the underlying governance and the way the participants were acting – either enabled by or despite limited governance in place. In particular, how were the intermediaries acting? Would it be a stretch to say the intermediaries attempted to register with the regulators and were told ‘no’?

The choice of the industry to lead the charge versus waiting for regulation is important because it is realistically going to take maybe a year after the presidential election for new regulation to come out. Then how long for it to come into effect? We are maybe about four years away. Meanwhile other countries are leaping ahead and outcompeting us in these areas.

The industry can itself leapfrog all of that and instead of being combative, educate and partner. Combat is going to have to happen at some point, but the education part is important because this technology can be really difficult to understand. I'm a technologist and futurist in a lot of ways, and it's so frustrating that people can't see how easy this is to do.

We could do this, this, and this, and then, *voila!* Millions and millions of dollars in play and everything would work perfectly. But, unfortunately, that's not the way things work. The industry is so excited about where we can get to, but we have to do it in a mature way because that maturity will be what drives us forward.”

**The second panel participant** built on the previous comments. “I've already sprinkled the conversation with a bit of tax. Two things I wanted to mention looking forward: First, thinking about the headline of this discussion, *real-world assets*. It is a term that I dislike because tokenized financial systems might obviate the need for many real-world assets or what we often consider real-world assets. For example, partnership interests are real-world assets.

Partnerships are cumbersome to set up in the US, and include negotiation, agreement, and registering. By contrast, a DAO enables one-click creation of an on-chain investment vehicle directly from your social media feed. I can create an investment vehicle with one click, and everything is on-chain, to buy digital art or tokens. What’s fascinating is that the vehicle is governed by code instead of contracts.”

**Editor Note:** Today the vehicle would likely be governed by traditional law together with the aforementioned code.

### Rethinking Tax Laws

**The second speaker went on.** “The tax angle here is that these entities are not a tax client. There's no central figure to prepare tax returns or send K1s out, and to do withholding if needed. We need to rethink our tax laws to deal with this, and frankly, it might be like the proliferation of these mini-partnerships that are so easy to set up that pushes regulators to eventually accept that they need to rethink.

Another example is governance tokens, and these have come up. UNISwap and the UNI token effectively governs what few parameters there are on the UNISwap protocol and a token covers the lending protocol. Essentially, these tokens are like stock but in a software network and one of the things they can do is take fees. Recently, the UNISwap Foundation, which is a standalone 501c4, proposed that UNI holders vote to run self-executing scripts. That was an option built into the software to divert trading fees to themselves.



One non-tax angle is this could change the people's relationship with the software they use. Imagine instead of YouTube being owned and monetized by Google, it was owned and monetized by the actual users. That's effectively the idea behind these governance tokens, and behind Web3 itself.

The tax angle for these governance tokens under current tax law is that they are stock and a corporation, and you have corporations that are not paying taxes. We don't really know where they're organized or whether they're domestic or foreign. They're obviously not filing tax returns or paying taxes or anything because they can't, there's no central figure.

So we need to rethink our tax laws and think about what the appropriate answer is. Frankly, as a tax lawyer, I have some ideas, but I don't know what the community wants other than *I don't want to pay taxes*. That's NOT a good way to approach regulators.

One way is to impose a mark-to-market (MTM) regime, a snapshot on December 31st of each year of your UNI tokens and pay tax on any appreciation, but that could obviously result in problems for unwary users if there's a pump on prices and then a dump in January.

### **Capital Gains versus Collectibles**

Next let's look at digital art. Digital artists have long struggled to find an appropriate medium in which to sell their work. It can be copied and you can see the same pixels as anyone else, and it can't be signed. NFTs can serve as the official versions of digital works, which I think is really cool. The tax angle is that long-term gains on art sales and on works of art sales are taxed at a higher rate than long-term capital gains; they are taxed at the 28% collectibles rate.

In addition, they can't be held in an IRA. These may be minor points, but it's something to think about. The IRS tried to issue guidance to address the circumstances around NFTs or collectibles, and the guidance is frankly unintelligible. If you're interested, pull it up, because it gives you a sense of how behind in understanding tax authorities currently are on this.

### **Not Everyone — or Thing — Is a Broker**

One last thing is tokenization might also incentivize more businesses to move outside of the United States. The recent proposed rule that was alluded to earlier is the proposed broker reporting that came out in August. If finalized in their current form, these rules

effectively treat every website as a broker and that website/broker has to 1099 its users. This is impossible and portrays a lack of understanding by tax authorities.

They think that the websites are affecting the trades for people, when in fact, all they are doing is calling information from the blockchain, and providing it to you in a readable manner. Then if you want to effectuate a transaction, it's providing a code, a script, that if sent to a validator would effectuate the transaction you want to effectuate.

It's like doing a Google search to type in code. It's abstract, and frankly, it's insane to say that Google would be the broker. By the same token, it would be insane to say the UNISwap front-end would be a broker, but the IRS has an interest in ensuring that people are getting appropriate information, and they themselves are getting appropriate information. The IRS doesn't understand chain analysis. They have these 1099s which were created before cars were popular, and that's the system we've always used. That's what they're trying to fit crypto into.”

### **The Securities versus Commodities Debate**

**Another participant** added: “One point you just hit on: there has been this ongoing conversation around what digital assets are. It's one of the biggest problems that we're dealing with. I was recently in a meeting with someone at the CFTC and he said, ‘well, that's a security.’ I can look at every single cryptocurrency and give you a use case where it's security, a commodity, a currency, and now part of an ETF product.

The European Union has made huge strides here by suggesting that they are something new. The tax effect of that is important because they're saying this is not a security, it's not a currency, it's not a commodity, it is a digital asset and that requires a new set of rules around it.

For example, talking about the new exchange-traded products, they're actually under the 1933 Act versus the 1940 Act, so they're considered products, that are commodities that have been wrapped in exchange-traded products. Fascinating. There's no DISCLOSURE. There's disclosure at initial public offering, but there's not any type of ongoing information provided around the underlying asset.”

**Another participant** commented, “Our current disclosure regime doesn't actually address any of the information that's relevant to users.”

**A participant** responded: “Hence the 1933 Act and the 1940 Act.”

### The Problem with 'Issuer' Status

**A participant** called out the great work another participant has been doing, particularly one of the points made around the difference between a security, which has an issuer, and a crypto asset, which does not. "Personally, I think it's a major defect of the MiCA regime which imposes the status of an issuer, and I think will ultimately be to its undoing because it doesn't fundamentally work.

How do we aggregate information from all the available sources, and remunerate those who do that aggregation, and have some sifting process? That's what will get us somewhere further - a pool of information. I think it is best to try to have a top-down approach. There's a working group that basically wants all entities to file a Form 10 (registration) with the SEC so then we'll all be happy and have a security. It's just horribly misbegotten."

### Single versus Community Issuers

**A participant** added to an earlier point about bonds. "The idea that the issuing entity that creates the digital asset initially is going to be responsible on an ongoing basis for disclosure for that asset is just not real. When it first goes live? Yes. Someone can create a document with the initial offering information.

But after that, the community is driving the story in the ongoing changes. Try to explain forking to someone. I have to say the word 'proxy' every time I talk about something, but look at the governance process. Governance is happening on Reddit and Discord. It's completely unacceptable for the purpose of a regulated asset's disclosure. It has to happen in auditable locations where you can see what's going on.

Last year Ethereum had over 1,500 proposals presented and voted on. If you have a million people that hold Ethereum today, you cannot ask them to participate in 1,500 different proposals. Current regimes would suggest you need to inform them every time one of those proposals is brought up.

One of the things that has to be figured out is how to present information so that people don't just understand it, but they can consume it. As more and more assets are tokenized, the amount of information will grow exponentially."

**A participant** added, "Every ETF has that same governance regime and I do have that pile of mail that piles up, and I never do anything with it. It's not a new problem."

## 24/7/365

**A participant** added to the debate: “If I want to do something at the weekend or after hours, I can't. The asset is open to me in several forms and very active, and yet the disclosure from the regime doesn't really follow the activity of the asset. I would argue consumers who understand that they can trade several different ways, including 24/7/365, are going to expect that they're protected 24/7/365, and that expectation of how you disclose what's going on needs to be done in a technologically-sound way to accompany the asset.”

## Risk Management

**A participant** commented that “As accounts open up a financial institution’s perspective, this is one of the things that is in-house counsel’s role - to manage tax risk. I generally like certainty. Certainty allows you to manage that risk. Then the question becomes: how do you manage tax risk with respect to digital assets, where there's not a lot of law and guidance? We have to manage the business from a compliance perspective. It becomes really difficult from an in-house counsel's perspective.

I'll give one example, speaking from a third-grader level in terms of digital assets. The way I think of tokenization is that it is a digital representation of something else. You have the token and then you have something underlying that the token represents. Then, if you put your tax hat on, you have to think about the token versus the underlying asset. Do you have two separate sets of assets with two separate tax consequences? Do you have one underlying asset, and look through the token and it's one asset, here's the tax consequence? Does the token have a completely different set of tax rules and regimes from the underlying asset?

## Broker Reporting

As a consequence, different reporting issues come up. There are proposed rules the government came out with — a whole set of reporting rules around broker reporting. Financial institutions currently have an infrastructure around tax reporting. Now, however, you have a whole new kind of asset class, potentially. Do you take digital assets and incorporate them into your existing infrastructure of pipes, or do financial institutions now have to set up a completely separate set of pipes? Then, think about timing, about putting budgets in now to start figuring out what kind of pipes you need. But how do you budget for something that's not clear?

What kind of pipes do you even need to put in, since there is no clear guidance? There are all sorts of issues that need to be thought through in that space.”

**A participant** responded: “The broker reporting rules came out before we even had tax rules on the substance of transactions. People still don't know what transactions are affected by the rules. I helped a client write a comment letter in response to the rules. In the comment letter, we said: ‘We think you mean this, and if you mean this, then it's terrible.’”

### Assets As Payments

“Think about payments,” **another participant** suggested. “In the digital asset world, in theory, I should be able to pay with anything. That's not within the realm of possibility of the way people think today. You have to lead with those examples. Currency sitting here, a tokenized security sitting over here. I want to use these tokenized securities to make a down payment on a house. You have to walk people through the examples of how that works, because we're not used to assets all being real-time liquid assets.

We have to educate in this new world that every asset is the same, they just represent different things. Then you can start to create the use cases and the industry could do that. Figure out how to solve it, and then go back with a proposal. A lot of laws get written by industry. They don't get written by elected officials.

What happens if I was able to use my company stocks to go downstairs and buy (a cup of coffee at) Starbucks? Starbucks will have to be a 1099, so how do you solve that? Walk through those use cases. A lot of it would be ridiculous.”

### Disclosure

**A participant** added that in the meantime, you have financial institutions considering tokenizing assets, and they also have to consider what disclosure to provide to people, and do they have to provide disclosure relating to the asset that they're tokenizing?

It's inexorably linked to disclosure about the blockchain in which the asset is tokenized. We have no guidance on this. There might be a situation where there is a tokenized asset and then someone forks the blockchain and there is a mirror image of these tokenized assets on another chain.”

**A participant** built on his previous comment. “Let's say we tokenized this building. What information should be required about this building initially, and on an ongoing basis? I

can make the argument that appraisal should be done once a year or something. Smart contract. But, whose responsibility should it be to come up with those rules? With an eye towards transparency and investor protection, we need to ensure that people understand what it means to buy a token of this building.”

### Market-Made Rules

**Another participant** agreed. “That's a great example, because the SEC has one layer of rules for disclosure about REITs, but the REIT industry came up with another set of disclosures that they developed on their own. The SEC doesn't like it because it's not theirs, but the REIT industry put it together and they provide that disclosure. It's a great example of people getting what's really needed, not what the government says is needed. That could be applied across many different models.”

**A participant** added: “Outside the REIT industry, it's whatever the market will bear. Whatever contract you can raise money on is what is going to govern the disclosure. Yes, there would be great economic benefit to standardizing these things, but many would argue that we should let the market figure it out.

The more important piece is that when people buy that asset, they can see what the disclosure regime around it is, and that whoever committed to delivering that regime follows through, and that there's some way to protect yourself.

Also, not changing the audience. Qualified investor definition. The SEC's going to water it down a little bit more. If you're financially certified or knowledgeable, the investment threshold is different.”

**Another participant** affirmed, “The challenge is: a lot of the products that we're talking about have never been traded in retail markets. CFTC is a great example. CFTC does not regulate retail markets well. There are arguably some retail participants, but they tend not to know what they're doing.”

**A participant** added: “Europe created products that traded and actually absorbed retail, but not in the US.”

**A participant** commented, “In terms of moving forward, we spend a lot of time talking about crypto as it is today. This is misguided. If you think about it, if you look at the BCG studies, crypto will be a footnote in terms of what the tokenization will represent. We spend a lot of time speaking to policymakers about crypto (no offense to people who are full crypto in the house), but in some ways it does a disservice because it's a small

slice of the market now, and it will be likely a smaller slice in the future, as the markets for tokenization of assets mature.

### Understanding the Technology

The other thing that struck me is that we also tend to spend time talking about the technology from a technology standpoint, and not tools and processes. I'm not a technologist by trade and design. I'm an ops guy. I don't need to know how the DTCC Cobalt mainframe works. I just need to know that it works, and believe that it works. The same is true for policymakers and regulators. Understand what the process is, and that there's governance. You control those things, but without needing to understand the code behind the smart contract.”

**Another participant** responded that, “The reason you don't need to know how mainframes work is because there's a legal regime around them. They have been vetted by your organization, and you have a lot of history around what happens when trades fail, who does what. That's a significant part of why you don't do as much diligence on mainframes. There's very robust legal infrastructure in the mainframe example that doesn't exist for a lot of these assets, yet.”

**A participant** came back with, “It conflates the conversation around tokenized assets versus crypto and decentralization versus centralization. If DTCC ran entirely on blockchain, the same legal provisions would exist in a certain way. Do you really care what technology shows you the balance in your bank account?”

**A participant** said: “Because of FDIC, I don't.”

**Editor Note:** The [Federal Deposit Insurance Corporation \(FDIC\)](#) is an independent agency created by the Congress to maintain stability and public confidence in the nation's financial system. The FDIC insures deposits, examines and supervises financial institutions for safety, soundness, and consumer protection, makes large and complex financial institutions resolvable, and manages receiverships. FDIC insures bank accounts up to 250k.

### Crypto Necessary For Open Systems

**A participant** offered another perspective on the “crypto as a footnote to blockchain” comment. “Many of us were probably around in the 2016/17 period of the crypto-good-

blockchain-bad, crypto-bad-blockchain-good. A lot of consortia were formed. Where are they now? They're either completely gone or nearly gone.

Why? Because those are based on closed systems. Crypto is necessary for open systems. What financial institutions want is the benefits of open systems without the parts of the open systems they don't like, which is the crypto part. You won't have the open systems you want if you don't have crypto."

**The previous participant** responded: "I don't mean to say that it (crypto) won't be a functioning part of the tools. From an asset standpoint, the types of assets, the types of things that will be traded and used are not going to be crypto as we know it today."

**A participant** added, "We need to determine consensus and then that goes into the code. You look at assets and activities and then on the asset side, go into tokenized assets which are just traditional assets presented in a different way. Every regulation has a principle behind it, like investor protection.

What do you want to achieve with regulation? Protect investors. So maybe it's the same activity as we have on the traditional side, and we don't want to impose the full range of regulation on this, or overregulate."

### **Tokenized Assets Are Currency**

**A participant** added: "Going back to these proposed broker reporting regulations, they explicitly include NFTs. Those would have to be 1099, even though the equivalent is Pokémon cards. The rationale given in the preamble to those regs was that these are so financial in nature, because once everything is tokenized, they are effectively money."

**This participant** continued. "So, suddenly, things are so liquid that you can borrow and lend against them. They're composable in other systems, so we need to track them because they represent value. Otherwise you can essentially 'hide' value in something that purportedly is a club membership.

A very big conversation happening right now, as you have probably all seen, is ads around travel rewards. They're tokenized assets. It's essentially a currency, but it's locked in the system. Should they be taxable? There's no way not to have the conversation."



## Representation of Value

**A participant** commented that “There are some obvious groups that purport to represent crypto or digital assets. There are always constituencies that feel left out. Some regulation makes it very difficult to have conversations. For example, the definition of digital asset that is universally accepted is that a digital asset is a digital representation of value. However, Bitcoin and Ether do not actually represent value. They're not semiotic. They don't represent anything. An NFT is not a representation of value, it's a representation of a monkey or something.”

**A participant** recommended starting with a glossary of terms where people can agree. “The European Union may use one type of language, and the US may use another type of language. We need an industry standard.”

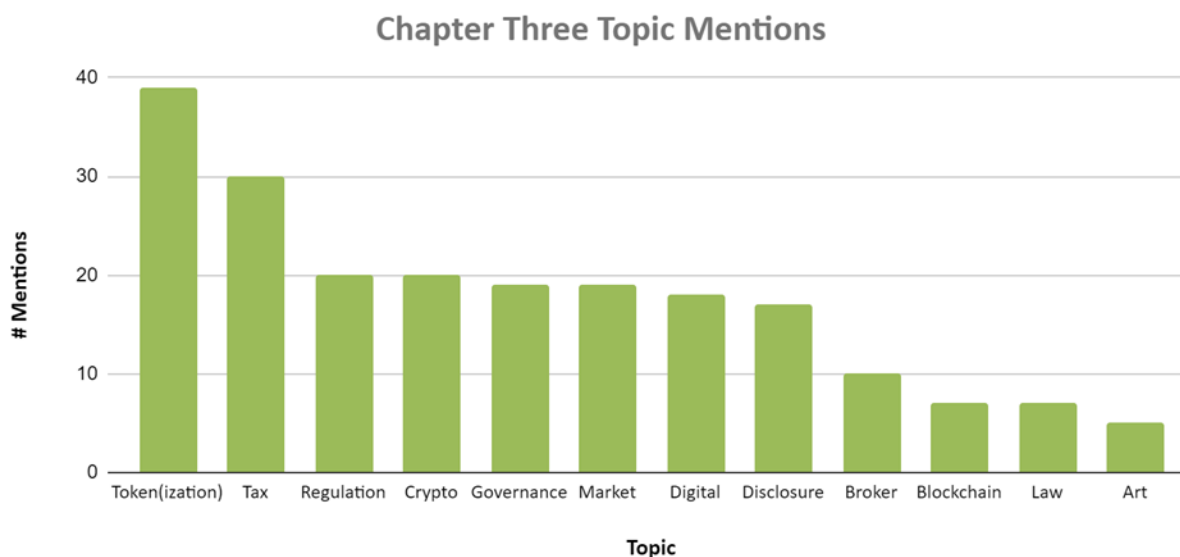
**Another participant** wondered, “How to decide what needs to be reported on these tokenized assets? No matter if they're tokenized real-world assets. This building has certain attributes that lead to its value, but we don't necessarily see those on-chain; the same way we don't see governance decisions for tokens that are happening in Discord.”

Finally, **a participant** said, “We have to figure out how these tie together. I specialize in on-chain data, extracting it and analyzing it. We can see who the holders are. We can see who supplies economic value, but we need to kind of tie those two pieces together if we're going to make this real-world asset token migration work.”

**The organizer** closes the session.

## END OF CHAPTER THREE DISCUSSION

## CHAPTER THREE | ANALYSIS



**Graph explanation:** From the raw conversation, the editors extracted key ideas, classified them, and aggregated them by topic. Each word was first tokenized and reduced to its stem to ensure consistent analysis across variations of the same word. For topic extraction, we applied Latent Dirichlet Allocation (LDA), a probabilistic model commonly used in natural language processing. LDA assumes that documents (in this case, conversations) are mixtures of various topics, and each topic is a distribution of words. By leveraging this model, we were able to detect the important words in top 12 topics within the discussions of each section. The table below shows the top 12 words across different sections by mention count.

**TOPICS STRONGLY IDENTIFIED:** Tokenization, Tax, Regulation, Crypto, Governance, Market, Digital, Disclosure, Broker, Blockchain, Law, Art

## CHAPTER THREE | KEY TAKEAWAYS

**Standardization:** There's a lack of global consensus on how to classify, regulate, and disclose information about digital assets. Decentralized governance models and fragmented data sources create challenges in information gathering and verification. The EU's MiCA framework offers one starting point. In evaluating this, we can work to

locate other starting points which make sense and which can be agreed upon. Current on-chain information is not enough. The concept of an *issuer* in traditional finance doesn't apply neatly to DeFi. Regulators are struggling to adapt existing frameworks to the unique features of digital assets, causing a wait-and-see approach from the industry. A standardized way to disclose information about digital assets is required.

**Industry First Movers:** Industry should take a proactive role in establishing standards and best practices for disclosure, rather than waiting for regulation.

**Regulator Education:** The current tax code is not equipped to handle the complexities of digital assets, leading to uncertainty and potential overreach by the IRS, which has happened and inhibits innovation. Consumers and regulators need better education on how digital assets work and the potential benefits and risks.

**Real-World Use Cases:** Discussions should center on the real-world use cases and implications of tokenization.

### **CHAPTER THREE | EDITOR CONCLUSIONS**

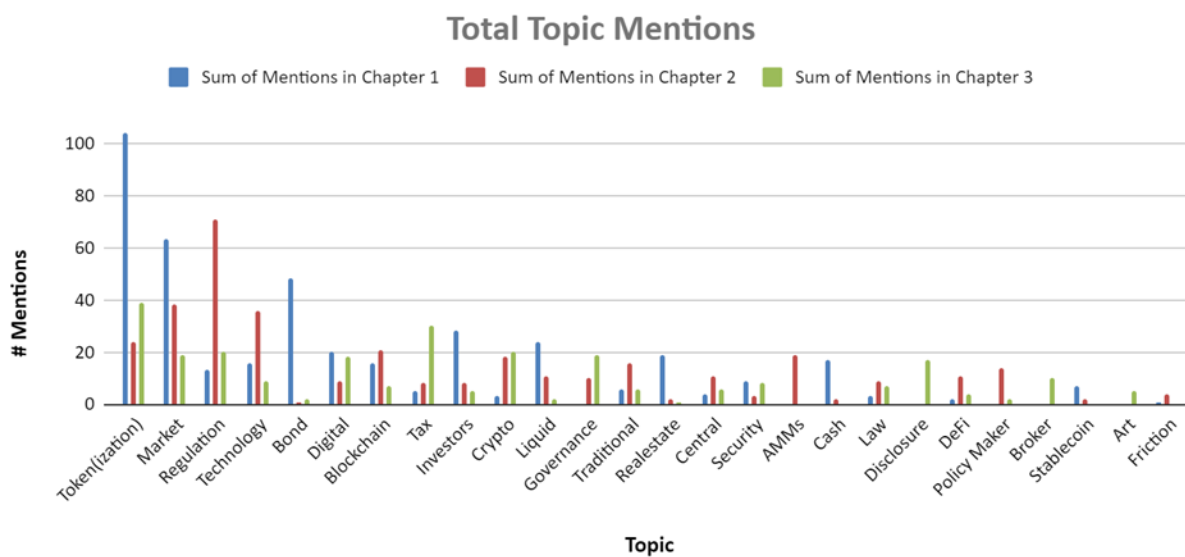
The conversation around digital assets reveals both a need for clarity and collaboration. Education is paramount, and data and use cases will help consumers, investors, and regulators understand how digital assets work, and the potential benefits and risks. Only then can investor protection take real form.

Lack of standardization in how and what information about digital assets is disclosed makes it difficult for investors to assess risks and opportunities. There's broad agreement on classifying these assets as something new and on standardizing disclosure. The issuer concept does not apply to decentralized systems; tax laws need to be developed in tandem with new disclosure models that take into account the unique features of digital assets. The industry can help here and come together to create these new standards.

Finding a way to integrate on-chain data with traditional financial information is crucial for a smooth transition to tokenized assets. Ultimately, navigating these complexities will require a collaborative effort between industry, regulators, and technologists. This will ensure a future where the benefits of digital assets can thrive and are harnessed responsibly.

### **END OF CHAPTER THREE**

### XIII | APPENDIX – TOPICS AND RESOURCES



**TOTAL TOPICS MENTIONED:** AMMs, Art, Blockchain, Bond, Broker, Cash, Central, Crypto, DeFi, Digital, Disclosure, Friction, Governance, Investors, Law, Liquid, Market, Policy Maker, Real Estate, Regulation, Security, Stablecoin, Tax, Technology, Token(ization), Traditional

## Industry Resources

November 2021: [Understanding the tokenisation of assets in financial markets | OECD](#)

June 2023: [First Mover Americas: Tokenization Might Be a \\$5T Opportunity: Bernstein](#)

July 2023: [Avalanche Foundation to invest \\$50M in asset tokenization on its blockchain](#)

August 2023: [TradFi, DeFi convergence continues through tokenizing real-world assets - Blockworks](#)

October 2023: [Tokenized RWAs Could Grow to a \\$10T Market by 2030 as Crypto Converges to TradFi: Report](#)

October 2023: [Tokenized RWA Platform Untangled Goes Live, Gets \\$13.5M Funding to Bring Private Credit On-Chain](#)

December 2023 [Tokenization of RWAs Gets Push in Europe as AXA, Generali Buys SocGen's Green Bonds on Ethereum](#)

December 2023: [Wall Street's New Blockchain Apps Face Real-World Test in 2024](#)

January 2024: [Investors pile in to 'real-world asset' token ONDO as volume tops \\$1bn – DL News](#)

February 2024: [Real World Asset tokenization and the future of financial markets: Part 2 | Kitco News](#)

May 2024: [BlackRock's BUIDL becomes the world's largest tokenized treasury fund](#)

May 2024: [The impact of tokenization on alternative assets markets](#)

May 2024: [Tokenized Assets](#)

June 2024: [Most RWAs today are tokenized nonsense - Blockworks](#)

June 2024: [Trade finance to play substantial role in USD 30.1 trillion tokenised real-world assets market by 2034 | Standard Chartered](#)

June 2024: [Why tokenized real-world assets are soaring](#)

August 2024: [\\$1.3T in tokenized RWAs by 2030 more likely than \\$30T — Analyst](#)

August 2024: [Tokenized Treasury Funds Pass \\$2B Market Cap Amid BlackRock's Explosive Growth](#)

October 2024: [Tokenized Private Credit:](#)

October 2024: [Tokenized Treasuries Like Blackrock's BUIDL Will Challenge Stablecoins But Won't Fully Replace Them: JPMorgan](#)

October 2024: [UK's Legal & General Eyeing Tokenization of Real-world Assets | Coinspeaker](#)

November 2024 [BlackRock is Betting Big on Real-World Assets: 4 RWA Tokens That Could Turn You Into a Millionaire in One Year](#)

November 2024 [Institutions are betting big on RWAs and expecting large returns](#)

2024 [Treasury Presentation to TBAC](#)

December 2023 <https://www.coindesk.com/consensus-magazine/2023/12/22/7-real-world-asset-trends-in-2024-that-will-unlock-the-future-of-finance/>

## **Academic Resources**

Pre-Reads Circulated

August 2020 [The Impact of Derivatives on Spot Markets: Evidence From the Introduction of Bitcoin Futures Contracts](#)

November 2023 [Smart Contracts and Decentralized Finance](#)

December 2023 [Decentralized Finance: Protocols, Risks, and Governance](#)

Additional Academic Resources

May 2022 [Tokenized Assets and Securities](#)

June 2023 [Tokenized Markets Using Blockchain Technology: Exploring Recent Developments and Opportunities](#)

January 2024 [Asset Tokenization in Real Estate: Theoretical Perspectives and Empirical Approaches | SpringerLink](#)