Tokenization of ABS Underlying Assets

Jie Cui

The University of Sydney, NSW 2006, Australia

`jcui6376@uni.sydney.edu.au`

Abstract. This study proposes a potential blockchain-based solution to address informational inefficiencies in traditional ABS (asset-backed securities) markets, including, lack of transparency, illiquidity and information asymmetry. By dividing ABS assets into small tradable units on a blockchain network, peer-to-peer trading via smart contracts is enabled, which lowers costs while improving liquidity, transparency, and security over conventional ABS issuance. Based on an analysis of the cryptocurrency issuance on the blockchain network, this paper explores technical principles and potential applications of smart contracts that are capable to ensure the security and efficiency of ABS primary-market issuance and subsequent secondary-market transactions. I also discuss the potential risks such as global regulatory uncertainties, restrictions, and potential technological concerns regarding asset tokenization and cross-border transactions. Overall, while ABS tokenization may address some persistent challenges in traditional ABS markets, expanded analysis and further study are warranted to assess the economic impacts and address regulatory challenges across borders to realize blockchain's transformational promise in capital markets.

Keywords: ABS, tokenization, tokenomics, smart contracts, blockchain, cryptocurrency

1   Introduction

Traditional ABS issuance and subsequent transactions face certain challenges, including lack of asset transparency, illiquidity in the market, and information asymmetry between transacting parties. In contrast, blockchain technology offers several advantages such as decentralization of record-keeping, data immutability, high market transparency, and facilitating efficient transactions using smart contracts (Chen et al., 2023) [10]. This article explores the potential application of blockchain technology for implementing ABS issuance and secondary market trading, specifically how tokenization of the underlying assets could facilitate the issuance and the transactions of asset-backed securities.

Tokenized through an initial coin offering (hereafter, ICO), the assets can be divided into small tradable units, i.e., "tokens" with lower denomination and increased liquidity. An refers to a process of crowdfunding for startup companies by issuing digital tokens in exchange for funding. With tokenized ABS, investors would receive

interchangeable tokens representing fractional ownership of the asset pool. This reduced minimum investment threshold attracts more market participants, improving trading liquidity.

Furthermore, smart contract allows secondary market transactions of ABS to be credibly executed and recorded on the blockchain without third parties. A smart contract is a computer protocol designed to digitally facilitate, verify, or enforce the negotiation or performance of a contract. On the blockchain, smart contracts can credibly execute and record ABS token transfers and payments in an automated, decentralized manner. This provides a public, immutable record of transactions that builds confidence for investors. In summary, tokenization and smart contracts offer advantages for streamlining ABS issuance and improving secondary market liquidity.

My study suggests that through asset tokenization, which transforms the underlying assets of ABS into digital tokens, could facilitate the ABS issuance by reducing reliance on intermediaries in the traditional financial system. While existing literature primarily discusses the technical process of tokenizing certain assets (Tarhini, 2021) [27], this paper proposes a novel application of tokenization in the ABS markets. Tokenization enables peer-to-peer transactions through smart contracts, improving transaction efficiency and market transparency, and therefore it alleviates information asymmetry problems in traditional ABS issuance. Tokenization could also boost asset liquidity and ABS performance by allowing fractional ownership and continuous trading of tokenized assets.

While ABS tokenization may address some persistent challenges in traditional ABS markets, expanded analysis and further study are warranted to assess the economic impacts and address regulatory challenges across borders to realize blockchain's transformational promise in capital markets.   Ensuring adherence to existing financial regulations is crucial as ABS tokenization connects different regulatory domains. ABS play an important role in traditional financial markets, and the issuance of ABS through asset tokenization may attract regulatory scrutiny as it involves the traditional financial market, blockchain cryptocurrency market, and cross-border transactions. Regulatory compliance is a major challenge for applying blockchain technology in ABS issuance, thus requiring special attention.

This paper has potential contributions the literature as follows. First, while existing research on blockchain technology and asset tokenization mainly focuses on the tokenization of cryptocurrencies (Chiu, 2019) [12], this study analyzes the process and existing problems of traditional ABS issuance and proposes a method for applying blockchain technology to tokenize the underlying assets of ABS to address the research problem. Second, this study discusses the regulatory uncertainties and risks that may arise during transactions on blockchain networks, specifically focusing on transactions of the tokenized ABS. It examines both cryptocurrency transactions and traditional ABS market transactions to identify potential regulatory challenges and risk. Third, this study also contributes to the theoretical understanding of the technical risks involved in asset tokenization, by highlighting the challenges related to asset security and smart contract functionality.

This paper has 6 sections, and the remainder is organized as follows. Section 2 introduces the challenges of traditional ABS issuance and application of Blockchain

technology. Section 3 reviews the literature regarding cryptocurrency markets, traditional ABS offerings, and asset tokenization. In Section 4, I propose a process for tokenizing the underlying assets of an ABS offering based on blockchain technology. Section 5 investigates international regulatory issues. Section 6 concludes.

2 Challenges of Traditional ABS Issuance and Application of Blockchain Technology

Traditional ABS issuance faces challenges including lack of asset transparency, illiquidity in the market, and information asymmetry between transacting parties. (Beltran et al., 2017) [3]. While being influenced by core enterprise ratings and financing volatility, SMEs' underlying asset transparency and liquidity are weaker than those of core firms, making them more vulnerable to market sentiment (Pan and Qiu, 2020) [24]. The 2007-2009 global financial crisis highlighted longstanding issues with the opaqueness of the assets that underlies ABS (Scott and Taylor, 2009) [26]. The relatively high minimum investment thresholds required for traditional ABS contribute to illiquidity in the markets by restricting trading activity to larger institutional investors. Additionally, information asymmetries pose particular challenges for ABS issued by small- and medium-sized enterprises (SMEs). The disclosure of information and prospectuses from the credit rating agencies of their upstream core firms is more crucial to the ABS issuance by SMEs and is more impacted by information asymmetry.

Blockchain technology is a type of distributed ledger technology that uses a Peer-to-Peer (P2P) network model consisting of immutable and time-stamped records of data. Blockchain (distributed ledger technology) is most disruptive technology that is expected to cause landscape changes in financial market. It is a cryptographically secure ledger using a Peer-to-Peer (P2P) network model. With an append-only data structure, data is recorded in an immutable and time-stamped manner (Gupta et al., 2020; Chen et al. 2023) [21][10].

Blockchain technology has the potential to alleviate some of the issues plaguing ABS. As a distributed and tamper-evident ledger technology, blockchain enhances transparency of asset details and lower transaction costs by decentralizing the record-keeping process. For instance, credit rating agencies are traditionally responsible for assessing the credit risk of ABS. However, these agencies are subject to information asymmetry and conflicts of interest. Blockchain technology can provide a decentralized credit rating mechanism for ABS by enabling participants to rate ABS based on publicly verifiable data. Overall, this decentralized rating approach can improve the credibility of credit ratings through improved transparency.

Tokenomics, or the tokenization of assets, is a core blockchain application of and provides the technical foundation for exploring the asset tokenization in this article (Au & Power, 2018) [2]. First, the underlying assets can be diverse. The most common underlying assets of the tokenomics are cryptocurrencies, such as Bitcoin and Ethereum. These digital currencies can be used as a medium of value in the pass-through economy to exchange and store value. In addition, in the gaming and virtual reality space, virtual goods and landscapes can be tokenized as assets supporting

platforms. Blizzard Entertainment's World of Warcraft token provides an example of tokenized virtual assets. As analyzed by the female blogger "Da cheng", Blizzard has created two in-game tokens. One token can be purchased from Blizzard for an initial price of $20 per token, and the other can be sold to Blizzard to add 30 days of game time to your account. Beyond cryptocurrencies and virtual goods, decentralized lending, liquidity provisioning and stablecoins can also be used as the underlying assets for the tokenomics (Au & Power, 2018) [2]. Therefore, investors in the tokenomics can also be diverse, with traditional institutional investors and, through asset tokenization, individual investors can also become more involved. At the same time, entrepreneurs and project sponsors can also use the tokenomics as a means of financing by issuing tokens to raise capital. Network users and consumers can also acquire passes through corresponding activities in the corresponding communities (Au & Power, 2018) [2]. Overall, investors in the tokenomics depend on specific application scenarios and project goals, combining asset tokenization and blockchain technology for all parties involved.

More importantly, tokenized real-world assets can also support pass-through economies. For example, stocks, bonds and real estate. can be digitalized through tokenization and traded within the tokenomics framework. In fact, most ABS offerings use similar tangible, income-generating underlying assets, and I will discuss this in more detail in the following sections.

Taken together, we can conclude from the above analyses that tokenization has the following advantages:

First, tokenization provides greater market visibility and transparency through blockchain technology. All transactions and transfer records are recorded on a tamper-evident blockchain, which participants can access and verify in real time. This transparency increases the credibility and trust of transactions.

Second, tokenization allows assets to be divided into fungible units, while giving assets the divisible characteristics of tokens, making them more tradable and lowering the trading threshold. Each token can represent a specific value that can be traded and transferred in a pass-through economy. This fungibility increases the liquidity of the asset, making it easier to trade and manage.

Third, tokenization leverages smart contract technology to make tokens programmable. Smart contracts can dictate specific rules and conditions for tokens, such as automatically distributing earnings, executing voting rights, or making transfers according to set rules. This programmability provides more flexibility and automation in the management and trading of assets.

3   Literature Review

3.1   Cryptocurrency

It is investigated the evolution of Bitcoin transaction fees and develop a framework to understand why such fees are incurred and how they affect the dynamics of the Bitcoin blockchain (Easley et al., 2019) [18]. As one of the earliest and most established cryptocurrencies, Bitcoin's transaction model provides a useful reference for the asset

tokenization process. The endogenous development of transaction fees reflects an important evolutionary step of the Bitcoin blockchain from mining-based rules to a market-based system that adapts to changing economic conditions. Additionally, Chiu and Koeppl (2019) [13] developed a general equilibrium model for cryptocurrencies and use it to obtain conditions that exclude double spending. They also studied the optimal design of cryptocurrencies while quantifying the welfare costs of using cryptocurrencies as a payment instrument. Taken together, these studies lay a theoretical foundation for analyzing tokenized asset trading and its dynamics within blockchain-enabled economies.

3.2   Asset Tokenization

An asset is any resource that is used to generate positive economic value. Initially used for cryptocurrencies, blockchain technology has now expanded its reach and can gradually tokenize assets through its cryptocurrency features. (Dai & Vasarhelyi, 2017) [17] introduced blockchain into the accounting and auditing literature by exploring the token characteristics behind blockchain technology. Sazandrishvili (2020) [25] proposed that asset rights can be tokenized by converting them into digital assets that can be bought, sold, and traded on the blockchain. Asset tokenization is a novel application of blockchain technology, and the market's optimistic signals about the new technology demonstrate its embrace of blockchain. As analyzed by Zheng and Sandner (2022) [31], one of the significant benefits of tokenizing assets is increased liquidity, reduced minimum investment requirements, and attracting targeted retail investors. According to Gottschalk (2023) [19], the smart contracts created by Ethereum support the digitization of real assets, becoming Asset-Backed Tokens (ABTs). (Cong et al., 2022) [16] explained how tokens reduce the effective cost of holding to conduct platform transactions, providing an easily handled dynamic equilibrium model for token pricing and platform adoption. This accelerates the adoption of production platforms, while also reducing the volatility of the user base. However, it's important to note that blockchain technology is still widely associated with cryptocurrencies, and ABS issuance reflects the value of blockchain technology at this stage.

3.3   ABS Issuance

In a traditional ABS issuance process, originator first decides to securitize a pool of assets by issuing ABS at a discount in exchange for cash. A special purpose vehicle (SPV) is established as the legal issuer of the issuer. ABS investors receive interest and principal backed cash flow assets of the underlying assets, such as a pool of accounts receivable or loans. This traditional ABS issuance has faced challenges including lack of asset transparency, illiquidity in the market, and information asymmetry between transacting parties, although new regulations and oversight have addressed some difficulties. The 2007-2009 financial crisis highlighted the importance of reducing information asymmetry and ensuring transparency in ABS issuance (Cerrato, 2010) [8]. The liquidity of ABS has also been impacted by external factors, such as the COVID-19 pandemic (Caviness et al., 2022) [7].

ABS issuance can benefit from the implementation of blockchain technology. Cai (2021) [5] explained that within a blockchain ecosystem, triple-entry bookkeeping can address trust and transparency issues by including a new layer of entries in the accounts to explain revenue changes. Chen et al. (2023) [10] found that blockchain-based ABS exhibit reduced yield spreads and decreased reliance on credit enhancement mechanisms. The reduced cost of information validation and information asymmetry are cited by Catalini and Gans (2016) [6] as reasons for the improved performance of ABS with blockchain technology. Neilson et al. (2022) [23] examined the impact of asset-level disclosures on the evaluation of ABS by investors and credit rating agencies, highlighting the role of improved transparency. With the transparency and liquidity provided by blockchain-powered ABS, it is crucial to remain vigilant in the face of positive credit trends and potential risks (Yalamanchili, 2012) [30].

3.4   ABS and Tokenization

Cong et al. (2022) [16] analyzed the equilibrium dynamics of token-based communities and provide insights into the economics of tokens and platforms. Tokens are optimally rewarded to platform owners when the token supply is low, and tokens are destroyed to increase franchise value when the supply is high. Real estate, a tangible asset, can effectively reduce the risk of information asymmetry in ABS and provide stable income through rent. Blockchain technology can create security tokens to increase the liquidity of real estate assets (Gupta et al., 2020) [21]. Adeyemi et al. (2020) [1] explored how blockchain technology improves transaction validation efficiency and storage, making it a reference application for ABS issuance. Chang and Wang (2021) [9] noted that fund products and securities themselves often have large investment units, contributing to the market's low liquidity. Information asymmetry between buyers and sellers and risk factors related to credit crises also impact liquidity. Blockchain technology can effectively address these problems and reduce costs. Cong and He (2019) [15] analyzed the economic outcomes of smart contract participation and how blockchain features reshape the competitive landscape, providing theoretical support for asset tokenization in ABS issuance. Bitcoin, as a classic cryptocurrency, holds significant modeling value for both asset tokenization and ABS issuance. Finally, they find that using the revenue created by the currency, rather than transaction fees, is a better way to finance the expensive mining process. They estimate that Bitcoin generates a large welfare loss, approximately 500 times larger than in a monetary economy with 2% inflation.

3.5   Summary

Existing literature demonstrates that traditional ABS issuance faces challenges lack of asset transparency, illiquidity in the market, and information asymmetry between transacting parties, especially among SMEs in the supply chain. Information asymmetry between ABS issuers, sell-side participants, and investors is a significant concern, relying on costly information disclosure from rating agencies and corporate prospectuses.

In contrast, blockchain technology offers security, data immutability, decentralization, and transparency that may alleviate these issues. With the digital issuance of

blockchain tokens representing tradable assets, token trading on the secondary market can be automated through smart contracts, speeding up transactions and significantly reducing costs. Overall, a blockchain-based system could enhance ABS performance by building confidence through shared, validated asset data accessible for all participants.

4   Applying Blockchain Based Tokenization to ABS Issuance

In this section, I use an example that describes the process of uploading an ABS issued based on the blockchain. It is divided into the following 4 steps.

Step 1: Subdivision of underlying assets into smaller units with lower denomination. Dividing the ABS underlying assets into the smaller tradable units in the form of asset splits facilitates subsequent tokenization. This process enhances the liquidity of the underlying assets during trading, by lowering the trading threshold. Moreover, the smaller trading unit can be used as the base token unit after tokenization, providing the token with a par value.

Step 2: Tokenization

The second step is to convert each token into a digital representation. Each token is backed by a selected asset, such as a farmer's crop in agriculture or a minimally divided property in the real estate industry, with a defined number of issues, circulation rules, etc. Once the asset and tokenization parameters are determined, a blockchain platform suitable for that asset type is selected to create the issuance tokens. To deploy the token issuance to the selected blockchain network, a well-designed smart contract is written. The smart contract will govern the rules and behavior of the tokens, ensure transparency, security, and enforceability by defining functions such as token creation, transfer, and redemption, as well as any other specific functionalities required for the asset type.

Step 3: Initial coin offering (token issuance)

The supply of tokens is determined within the smart contract, and the allocation is planned through pre-sales and crowdfunding. The ICO of the underlying assets takes place in parallel with the issuance of ABS. Every transaction is executed through a smart contract, and all transactions can be verified on the blockchain network.

Step 4: Peer-to-peer transactions (secondary markets)

Tokens can be traded on the secondary market once they are issued on the platform that utilizes smart contracts. Wang et al. (2019) [29] highlight that the smart contracts, being computer-based digital protocol, can be programmed to meet the needs of different assets such as real estate, crops, metals, etc. Platforms equipped with necessary technology can customize smart contracts based on the type of underlying assets of different ABS, the necessity for segmentation, and the compliance with the regulatory authorities (Bragagnolo et al., 2018) [4].

I provide a real-world example of tokenization as follows: JD.com is a leading online shopping e-commerce platform in China and a pioneer in adopting blockchain technologies. JD.com offers consumer credit services called JD Baitiao, where users consent to make timely and full payments for goods, service fees, and other obligations on the JD online shopping mall. The underlying assets of this credit service is corporate

accounts receivable generated from the sale and purchase contracts. JD.com's IOU ABS are issued and transacted through a securities company, with a bank acting as the custodian and JD Financial (a JD.com subsidiary) acting as the asset servicing institution.

The ABS has a significant volume of asset data and complex duration management, mainly due to its low average customer unit price and daily recurring purchases. To ensure market transparency and data integrity of the underlying assets, a Consortium Blockchain has been established by the three institutions as shown in figure 1. The blockchain network is capable of providing real-time data for interested parties. By leveraging the distributed bookkeeping and smart contracts, blockchain eliminates the need to process transactions through intermediaries, thus reducing the related time delays and costs. Smart contracts, in contrast, enables immediate execution once predetermined conditions are met, thereby enhancing operational efficiency.
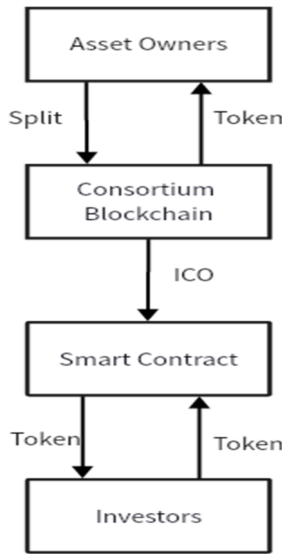

Fig. 1. Tokenization of ABS Assets

5   Potential challenges applying tokenization

5.1   Cryptocurrency Regulation Worldwide and Warnings Regarding Real Asset Tokenization

SEC of the US.

It is reported that the US SEC's stance on digital tokens indicates that any public company engaging in ICOs should ensure transparency (Collomb et al., 2019) [14]. This implies that tokenized offerings of ABS underlying assets will also need to comply with SEC regulations.

Regulation in China.

Griffith and Clancey-Shang (2023) [20] indicated that China has implemented one of the most stringent cryptocurrency regulations, including a ban on the use of cryptocurrencies for payments, remittances, and other transactions. This ban also extends to market behavior following the tokenization of assets.

Regulation in Europe.

Hacker and Thomale (2018) [22] explained that in the European market, there are three types of digital tokens: pure investment tokens, pure currencies, and use tokens. Pure investment tokens are considered securities and must comply with EU securities legislation for ICOs. The regulation for the other two tokens remains uncertain in the EU. The European market is actively working towards an effective token regulation framework that balances innovation and investor protection, as well as exploring the development of an international token convention.

5.2   Limitations of Blockchain and Risks of Cryptocurrencies

Given China's support for blockchain technology development while imposing strict restrictions on cryptocurrency trading within its borders, it is crucial to define whether the tokenization of ABS underlying assets issued by securities companies falls under the scope of application of blockchain technology or blockchain-based virtual currency transactions. This classification will depend on subsequent laws and regulations. In 2023, the US SEC's indictment of Binance revealed allegations of commingling billions of customer funds into an independent trading company owned by its CEO (Chipolina and Palma, 2023) [11]. While blockchain technology offers immutable data and high transparency, its decentralization and anonymity can potentially conflict with existing legal frameworks. Governments must carefully evaluate and adapt existing regulations to ensure compliance with the unique characteristics of blockchain technology.

5.3   Technological Risks

Tokenizing the underlying assets of ABS poses inherent technical challenges and risks that differ from traditional financial. During the tokenization and blockchain issuance, secure token creation and management on the decentralized ledger present ongoing security challenges compared to centralized databases.

Since tokens often represent tangible assets, an attack on the tokenization platform could result in asset loss or data breaches (Tian et al., 2020) [28]. A prevalent technical risk is unauthorized access, as vulnerabilities or system misconfigurations may be exploited by attackers to access, alter, or steal assets without permission. Additionally, attackers might infiltrate the system through third-party providers or partners, jeopardizing asset security.

Smart contracts play pivotal role in the issuance process on blockchain platforms introduces a unique set of technical risks. First, smart contracts are code-based, indicating that coding errors can result in fund losses or other unintended consequences.

Second, the inherent irreversibility of smart contracts poses challenges. Once a smart contract is deployed on a blockchain without thorough review, verification, and testing, any discovered vulnerabilities or issues remain unrectifiable unless drastic actions are taken (Zheng et al., 2020) [32]. Furthermore, smart contracts might not always align with the legal or regulatory standards of specific regions or countries, potentially leading to legal disputes and complications.

6   Conclusion

This paper proposes a solution for ABS asset tokenization by analyzing the issues with traditional ABS issuance and the potential technological pathways of applying the blockchain technology. Asset tokenization using blockchain reduces intermediation in the traditional financial system by facilitating peer-to-peer transactions through smart contracts. This approach decreases transaction costs, improves efficiency via contract automation. By leveraging blockchain attributes including decentralization and data immutability, the blockchain-based solution enhances market visibility, transparency, and transaction trustworthiness. Furthermore, asset tokenization addresses liquidity and information asymmetry challenges that have historically plagued traditional ABS markets.

However, the scope of this paper is limited as it primarily focuses on commonly represented ABS assets. While conceptual analyses of tokenized ABS were presented with some, specific examples, a more rigorous empirical analysis was hindered by lack of publicly available data due to proprietary restriction. Despite these limitations, this paper outlines an early roadmap for future research on ABS issued with blockchain technology and asset tokenization. Particularly, it highlights the need for continued analysis on the economic impacts and regulatory challenges of across border activities. Continued research is required in order to realize blockchain's transformational promise in capital markets.

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