

Article

# Government Bonds Tokenization Could Pave a Wide Way to Asset Tokenization in the Republic of Uzbekistan in General

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**Abstract:** With the advent of tokenization term, many organizations around the globe, have launched own tokenized assets, even nowadays Real-World Assets (RWAs) have been converted their ownership rights in the form of tokens on the Distributed Ledger Technology (DLT). And there is no exception for bond markets, several countries have deployed DLT to attract capital by means of G-bonds tokenization such as US Treasuries, Tokenized Green Bonds of the Hong Kong Special Administrative Region, and others. Consequently, the crux of this work is to develop asset tokenization in the region via tokenizing government bonds at the Tashkent Stock Exchange.

**Keywords:** Asset tokenization, Government Bonds, Distributed Ledger Technology, the Republic of Uzbekistan, Tashkent Stock Exchange.

**Citation:** Alisher o'g'li A. A. Government Bonds Tokenization Could Pave a Wide Way to Asset Tokenization in the Republic of Uzbekistan in General. Web of Semantic: Universal Journal on Innovative Education 2026, 5(3), 208-214.

Received: 10<sup>th</sup> Jan 2026

Revised: 21<sup>th</sup> Feb 2026

Accepted: 09<sup>th</sup> Mar 2026

Published: 21<sup>th</sup> Apr 2026



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## Introduction

Thanks to Blockchain Technology, a peer-to-peer payment system has been facilitated, and now it has contributed to the development of asset tokenization. In other words, retail investors could be able to invest into g-bonds directly without any financial intermediaries. Initially, let us disclose the essence of the blockchain, according to the Internet source: "Blockchain is a decentralized digital ledger that securely stores records across a network of computers in a way that is transparent, immutable, and resistant to tampering. Each "block" contains data, and blocks are linked in a chronological "chain."". To put it simply, it is a chain of blocks which stores and records data (in our case it would be bonds' maturity dates, coupon payments, prices and other related information), as mentioned above each block would contain transaction details and would be connected through chains. Once a bond issuer has placed bonds on the blockchain the first block called "genesis block" would be created. In respect of the distributed ledger technology, it refers to a digital system that records transactions related to assets. The transactions and other details are simultaneously recorded at numerous places. The database recorded through distributed ledger technology does not include an administration facility or central data storage. Instead, the database exists among several participants or across different geographical locations. In other words, all transaction details at the same time would be recorded at various places so as to secure data, and this would lead to reduce the transaction costs as well as the third-party involvement. For instance, when a bond issuer sells out a piece of corporate bond to an investor, a new block would be created and chained back with a genesis block, certainly the new created block would consist of all transaction details. Last but not least, there would not be financial intermediaries like brokerage firms, investment companies and others, meaning no intermediary costs.

And this entire process would be run based on smart contracts, in greater detail, smart contracts are typically used to automate the execution of an agreement so that all participants can be immediately certain of the outcome, without any intermediary's involvement or time loss. They can also automate a workflow, triggering the next action when predetermined conditions are met. Similarly, smart contracts would conduct the same operations related to bond selling as well as redemption processes, that is to say, all transactions would be automated and predetermined by the issuer so as to provide transparency and security[1].

### **Literature Review**

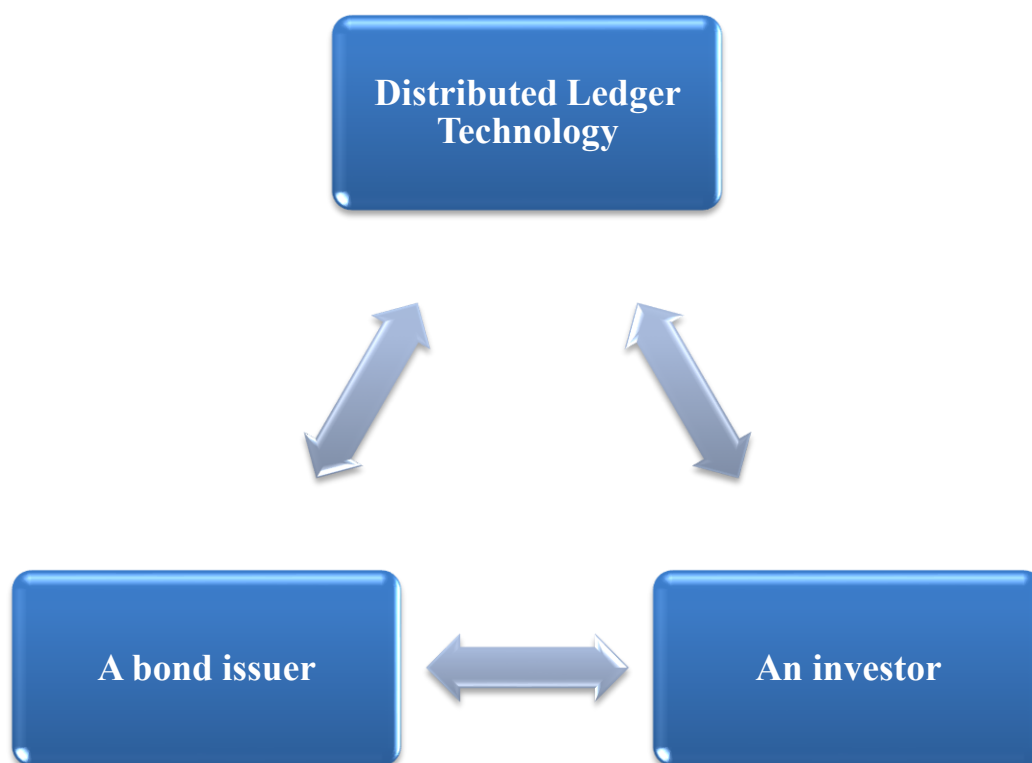
Blockchain provides the infrastructure for tokenization, offering a decentralized ledger that enables recording transactions through a computer's network. Once data is recorded, it cannot be modified or deleted, offering a reliable and tamper-proof record of transactions. Transparency is fundamental in blockchain, all transactions are visible in the network, which promotes trust and reduces the risk of fraud. This decentralization ensures that no single entity has control over the entire blockchain, thereby enhancing security and reducing the risk of fraud [2]. The immutable blockchain ledger allows to reduce the risk of fraud and boost investor trust by ensuring that all transactions are securely recorded and easily verifiable [3]. This helps to increase transparency and strengthens trust between stakeholders and facilitates compliance with regulatory requirements [4]. Traditional financial instruments reached their limits in raising the necessary capital, ensuring a stable and regular flow of investment, and managing financial risks. This compromises their ability to meet the growing demand for investment in several areas, particularly in the field of renewable energy . Tokenization is a solution that enables the creation of new financial instruments to stimulate fundraising and engage small investors through smaller shares, represented as tokens, which could facilitate reaching a larger number of investors nationwide [5]. Tokenization also promotes financial inclusion by making investment opportunities accessible to small investors and those excluded from the traditional financial system. It promotes broader participation by democratizing access and lowering barriers to entry and attracts a diverse range of investors [6]. Tokenization offers innovative financial mechanisms, enables fractional ownership, improves liquidity, increases transparency, and reduces costs through automation. All of this helps to reduce the cost of capital and promote financial inclusion. These advantages over the traditional financial system help to speed up settlement times and reduce costs thanks to a simpler but more flexible financial market infrastructure. Haahr et al. highlighted the impact of the blockchain implementation on the green bond's market. Actually, it states that investor confidence, capital flows facility and the cost of reporting are remarkably more affected by blockchain than issuance costs. According to multiple use cases such as Proof of Impact Tokens by UNDP's initiative, Clean Air LifeTokens and TreeCoin by Global Mangrove Trust, investor confidence increases significantly. In fact, these tokens use Internet of Things (IOT) technology, Artificial Intelligence (AI) monitoring or Global Positioning System (GPS) to track real-time green performance, ensuring transparency and enabling donors to see directly the impact of their contribution on the environment. Blockchain technology has the potential to revolutionize carbon markets by automating transactions, reducing costs, and improving transparency. It provides a secure, decentralized, and verifiable framework that not only improves the efficiency of carbon credit trading but also enhances the accountability of businesses and governments in combatting climate change [7]. One of the key areas in which blockchain has a significant impact is the issuance and management of green bonds. According to Ronaghi & Mosakhani , it provides a secure and tamper-proof digital ledger that prevents fraudulent transactions and builds trust in green financial instruments, thus promoting a more robust and responsible green financial ecosystem . Blockchain also enables the tokenization of energy assets. This involves representing energy in the form

of tradable digital tokens. These incentive models allow consumers who have reduced their energy consumption or carbon footprint to receive tokens or cash rebates [8].

### Methodology

In this part, we will explore how government bonds could be tokenized. To be more precise, the process of tokenization is disclosed by means of examples and with a detailed explanation on how to run G-bonds of the Republic of Uzbekistan on the Distributed Ledger Technology based on the author's PhD thesis. For instance, a bond issuer could fix all details about maturity date, coupon payments either annually or semi-annually, redemption and others before the creation of genesis block on distributed ledger technology, but it is crucial to mention that it would take to open a wallet on the distributed ledger technology for the purpose of moving transaction data from one wallet to another one automatically. Finally, the last term that will be discussed several times within this part of the PhD dissertation is a tokenization, referring to the process of creating a digital representation of a real thing. Tokenization can also be used to protect sensitive data or to efficiently process large amounts of data[9]. In our case, we would like to apply the tokenization to the fixed-income assets like corporate as well as government bonds, since many retail investors cannot afford to add bonds to their portfolios due to the high price requirements and unfortunately this might adversely affect the liquidity of bond market in Uzbekistan. Therefore, the tokenization of bonds could boost a liquidity by tokenizing each piece of bond so as to make them affordable to the public. Firstly, the Tashkent Stock Exchange should take measures to create a blockchain technology for bonds tokenization, in other words, a bond issuer could easily create a digital representation of its bond a blockchain system so that the digital bond could be traded by investors on a blockchain-based exchange via distributed ledger technology. Finally, coupon payments as well as bonds redemption might be made automatically by means of the smart contracts[10].

**Fig. 1** - The structure of the Blockchain-based Fixed-income Unit through Distributed Ledger Technology (DLT).



Certainly, the Tashkent Stock Exchange management should launch Distributed Ledger Technology project with an assistance of the National Agency of Perspective

Project (NAPP) via “Regulatory Sandbox” framework in order to apply this innovative system within Capital Market participants. But in the initial phase, government bonds would be necessary to be tokenized and placed on the Distributed Ledger Technology, to put it another way, as an experiment, government bonds should be tokenized in order to sell out them to the public in the fractional amount since many retail investors cannot afford to purchase bonds due to the high price of a single unit of a bond. Simultaneously, this might decrease dramatically money base in the shadow economy within Uzbekistan, afterwards it would lead to a significant growth in borrowing from local lenders, that is to say, nowadays according to the official report from the Ministry of Economy and Finance, in the first quarter of 2024, the country’s public debt amounted to \$35.3 billion. Of this, \$29.4 billion (83%) was external debt and \$5.9 billion (17%) was domestic debt. In the first quarter, the ratio of public debt to GDP stood at 31.7%. To be more precise, external debt accounts for 83% out of the entire country’s public debt and the rest of 17% was domestic debt. Consequently, the creation of Distributed Ledger Technology would be a promising choice to make retail local investors interested to invest into government or corporate bonds, in other words, the tokenization of fixed-income assets (bonds) could substantially decline external debt borrowing for all government and corporate entities of the Republic of Uzbekistan[11].

First and foremost, it is necessary to create e-wallet on the Public Ledger Technology for every single public institution in Uzbekistan so initially all public organizations should be involved in this process of creation e-wallets, after that private companies could be welcomed to take part in. Finally, retail investors or ordinary people would get access to the Public Ledger Technology. Regarding investment products, the tokenization of government bonds should be selected in the experimental phase since they are considered to be risk-free assets, and as a type of bond it is worth to select pure discount debt instruments like zero-coupon bonds. Then, zero-coupon bonds should be tokenized on the Public Ledger Technology, of course, they should be affordable for all types of investors regardless of their budgets and that is a reason behind a bond tokenization, in other words, making fixed-income assets available for all investors in terms of price. Consequently, it would be necessary to issue tokenized short-term zero-coupon government bonds with a maturity of 30 days certainly a face value should be adjusted to a monthly inflation rate. To be more precise, an investor could purchase tokenized bonds at discount price and those tokenized bonds would mature at a face value, nothing is unusual here only there are several benefits: the first is bonds would be tokenized, the second is no financial intermediary in the transaction processes, meaning there is no transaction cost which could save investors as well as bond issuers returns, the third is an enhanced liquidity of bonds, the forth is the ease of settlement, in other words, settlement process might take a few minutes not days as it is accepted with a transaction of traditional bonds. And last but not least, the fifth is a transparency and security, that is to say, every transaction would be displayed for each member of Distributed Ledger Technology in order to take under control all processes and of course every user would be given two types of keys like private and public ones[12].

For instance, a 30-day zero-coupon bond with a face value of 45 000 UZS and YTD (yield to maturity) of 10.2% which is annual inflation rate by October 2024. Surely, all processes would be accomplished via the Distributed Ledger Technology, to put it another way, those zero-coupon bonds would be tokenized and placed at the Distributed Ledger Technology. There is a clear explanation with the exploitation of the Future Value formula (FV) in order to define pre-determined Future Value (FV) of the given sample

**Face Value or (PV) – 45 000 UZS**

**Yield to maturity (r) – 10.2%**

**t – 30 days**

**$FV = PV(1+r)^t$**

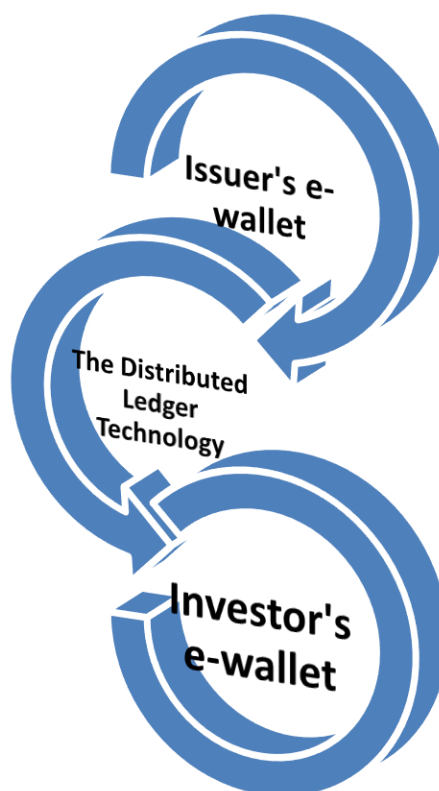
**Answer:**

$$FV = 45\,000(1 + 0.102)$$

$$FV = 49\,590 \text{ UZS}$$

Thus, based on the calculation above, a net return would be 4 590 UZS, of course, in 30 days a tokenized bond holder would receive principal plus profit, smart contracts would automatically transfer the funds to the investor's e-wallet. This is how it works theoretically and similarly issuer, in our case, government authorities being responsible to issue bonds would have to place all functions or let's say fix up necessary algorithms related to tokenized bonds to their e-wallets at the Distributed Ledger Technology, consequently smart-contracts would be liable to accomplish all pre-determined tasks by the issuer and as it can be mentioned above there would be no third-party interactions in the settlement processes which means all transactions would be done automatically through the smart-contracts[13].

**Fig. 3.2.2** - The structure of the smart contracts.

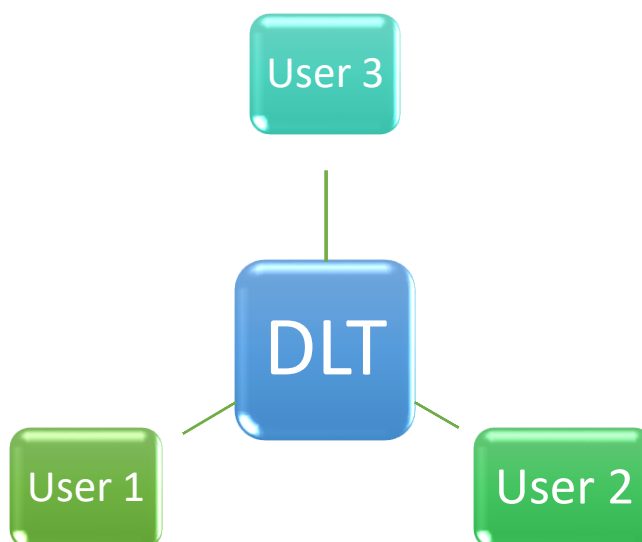


As it is visible from the structure all settlements are carried by means of the Distributed Ledger Technology, in other words, there is no financial intermediary involved in it. Thus, only smart contracts would accomplish automatically all transactions based on the pre-determined conditions fixed by the issuer of tokenized bonds.

### **Result and Discussion**

As was previously stated, first and foremost, in order to launch this project, the National Agency of Perspective Projects should take part in the creation of the distributed ledger technology software system, then it is necessary to involve certain public organizations such as state-owned banks or state-owned insurance companies to purchase government bonds[14].

**Fig. 3** - The shape of experimental launch.



Having launched a distributed ledger technology (DLT) by the Tashkent Stock Exchange with a help of the National Agency of Perspective Projects (NAPP), afterwards Ministry of Economy and Finance of the Republic of Uzbekistan should place tokenized bonds on the distributed ledger technology, for instance, a 30-day zero-coupon bond with a face value of 45 000 UZS and YTD (yield to maturity) of 10.2% which is annual inflation rate by October 2024. Surely, all processes would be accomplished via the Distributed Ledger Technology, to put it another way, those zero-coupon bonds would be tokenized and placed at the Distributed Ledger Technology. And state-owned organizations should open e-wallets, in particular, we are considering state-owned banks, state-owned insurance companies as well as other government-joint organizations as initial investors on the distributed ledger technology so as to purchase the first issued a token of bonds by the Ministry of Economy and Finance of the Republic of Uzbekistan. After, as long as this project succeeds in the initial experimental stage, then a second stage of project could be taken by attracting retail investors and other private entities within the country. Lastly, at the final round of this project other institutions would be allowed to issue their own corporate tokenized bonds on the distributed ledger technology[15].

### Conclusion

According to the author's research, the tokenization of the fixed income assets such as bonds, mainly G-bonds, should be tokenized first as an experiment by means of "Regulatory Sandbox" framework for the purpose of increasing the liquidity. Consequently, National Agency of Perspective Projects, Tashkent Stock Exchange are advisable to be involved in this process as it was emphasized within the work, there should be taken measures to engineer public DLT so as to provide access to it for the retail investors. Relied upon foreign expertise, many international financial institutions have solved the liquidity issue through the DLT as it is widely known traditional bonds are not suitable to retail investors due to the higher price floor.

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