



Block Chain Integration to Enhance Transparency and Security in U.S. Treasury and Forex Markets 2025

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Abstract: This research paper aims to explore how the integration of Blockchain technology can enhance transparency and security in the treasury and Forex market in the Current Era. An explanatory research design will be utilized in this paper to evaluate the benefits of block chain integration in enhancing the transparency and security in the US treasury and Forex by ensuring secured and transparent transaction that perfectly aligns with the regulatory standards of requirements. The decentralization of the system along with the immutability feature of block chain technology can further contribute to the enhanced security of the US Forex and Treasury market. This paper will focus on highlighting how block chain technology can eliminate numerous challenges faced by this market starting from the delays in final settlement and problems related to transactional transparency to the prevention of fraudulent activities and so on. This research paper will also portray some of the real-life case studies and use both secondary qualitative and quantitative data to show the application of block chain technology in enhancing the security and transparency in the Forex and Treasury markets. It would also recommend the future scopes in integrating Block chain technology to foster deep trust and faith of the consumers in this market in 2025.

Keywords: US Forex Market, Blockchain, transparency, Decentralization, Automated settlement, Fraud elimination

I. INTRODUCTION

A. Background of the Study

Block chain technology has a wide range of application areas starting from the finance and banking sector to the supply chain operations, healthcare sector, government entities and the functioning and so on. Apart from that, the Forex and treasury segment can benefit immensely through the integration of block chain technology since it can eliminate fraudulent activities and ensure savings of costs. The US treasury market helps to fund the US government and it is considered one of the largest and most liquid markets in the world. It is also responsible for implementing the monetary policies related to the interest rates, and inflation along with maintaining the liquidity and stability of the US financial market. The Foreign exchange market



of the USA is responsible for the safe exchange and trading of foreign currencies, value is assigned to the currencies against each other along with the facilitation of global trade functions. The modernization of these market activities with the help of the Block Chain technology would result in streamlining and smooth execution of these market operations while ensuring adherence to regulations.

B. Overview

Block chain technology is one of the emerging technological advancements that offer security, transparency and immutability in the traditional ledger system which is used for registering data and transactions across multiple networks. The prime advantages of the Block chain technology are portrayed below:

Transparency:

Block chain ensures that the source and details of all the transactions are visible within a network to sustain the consumers' trust and increase the accountability and responsibilities among the parties involved in the transaction.

Immutability

The integrity and accuracy of the transactional data are ensured in the block chain by making it unchangeable or unalterable and maintaining a connection with the previous block of transactional data.

Decentralization

Block chain technology is not centralized and can be accessed by multiple networks at a time which reduces the risk of data theft.

Smart contracts

The automation of the process and self-execution can enhance the effectiveness and smoothness of transaction-related operations.

C. Aim and Objectives

This research would aim to explore the benefits of integrating block chain technology in the treasury and Forex market of the USA. The objective of this paper would revolve around evaluating the extent to which block chain technology integration can enhance security and reduce fraud in these markets. It would also aim at identifying the challenges of problems associated with the integration process along with the benefits and implications of the technology in the context of the US treasury and Forex market.



D. Problem Statement

Several incidents are advocating for the lack of security assurance in the US treasury and Forex market. The US treasury department workstations and systems were recently hacked by the Chinese hackers through a third-party application which resulted in a huge financial loss for this market. On the other hand, insider trading, breach of data along over-reliance on the traditional mode of transaction security provisions is creating serious concerns in the US foreign exchange market.

E. Scope and Significance

The scope of this research extends beyond exploring the impacts of block chain technology integration into the US foreign exchange and the treasury market in terms of mitigating the fraud in the transactions, decentralizing the process and preventing data theft or alteration. It would evaluate the challenges related to security, regulatory and ethical concerns along with the components of block chain technology such as decentralized networks, smart contracts, and cryptographic security and so on. The significance of this research revolves around ensuring the utmost transparency of security of the transactions in the US treasury and Forex market while exploring the challenges and feasibility related to the framework in 2025.

II. LITERATURE REVIEW

A. Enhancing transparency and security, immutability

The integration of block chain technology in the Forex and Treasury markets of the USA can significantly contribute to the enhancement of transparency and security. Firstly, the transparency of the transactions and the immutability of the information are ensured by block chain technology and it can effectively manage intellectual property rights. The transparency and security features of block chain technology are significantly transforming the banking, finance and insurance sectors positively [2]. As a result, Elon Musk has recently proposed to move the US treasury operations to block chain technology to safeguard the transactional data, manage the end-to-end encryption in the payment gateway and track federal spending or investments [1]. On the other hand, the integration of Block chain technology can ensure decentralization and also ensures that the data is not altered or tampered which is an active measure to prevent data theft [3]. The centralization of transaction-related data can ensure data security and connectivity among the members associated with the process by expanding the accessibility and traceability of the transactional data. It can also help the entities to improve the process efficiency and quality of the process [4].



Security and Immutability in Blockchain

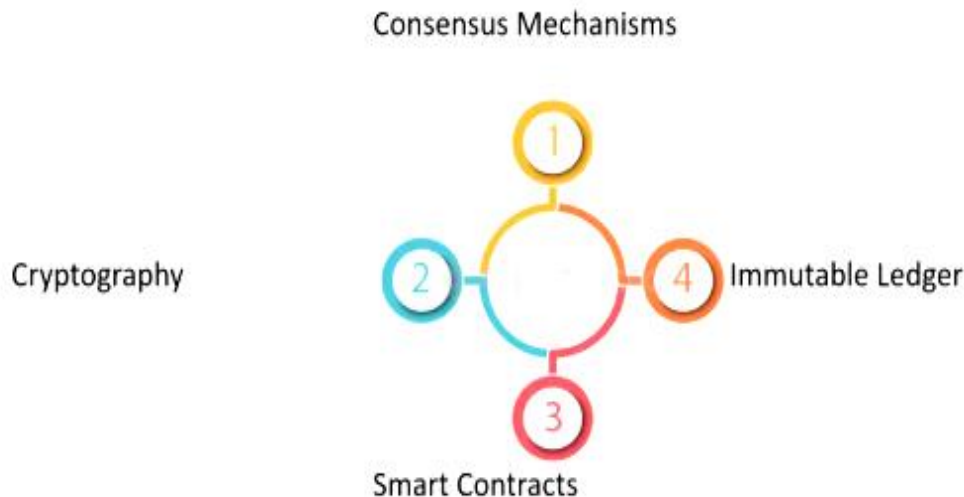


Figure-1: Security and Immutability of Block chain

Source- [19]

B. Benefits of Integration in the Forex and Treasury Market

There are several benefits of integrating Block chain technology in the foreign exchange and treasury market of the US or any other country. Firstly, block chain technology can track or monitor important transactions and improve transparency among the parties involved in the transactions [5]. It can also result in a significant reduction in the operational costs and credit or transactional costs for the payments. The integration of the block chain system can also result in improved network capacity and streamline the transactional process while integrating automation and eliminating manual errors in data recording [6]. On the other hand, the integration of block chain technology in the foreign exchange market and treasury market in the USA can help this deal with the deep-rooted problems of hacking and malware attacks along with protection from data theft or privacy breach issues. Another major benefit of integrating block chain technology into the treasury and the foreign exchange market of the USA is the reduction or mitigation of fraudulent or suspicious activities which can result in huge financial losses for the companies operating in the same market [14].



How Blockchain Help Mitigate Financial Crimes



Figure-2: Block chain mitigating financial crimes

Source- [20]

C. Regulatory issues and challenges related to block chain integration

Block chain integration in the US Forex and treasury market involves strict regulatory compliance and the elimination of various challenges related to the operation. The process of integration is still at the elementary phase in the major developing countries and it is further creating huge barriers to complete integration due to several regulatory challenges. Firstly, the major regulatory bodies which regulate the financial exchange market of the USA are the SEC or Securities and Exchange Commission and the CFTC or Commodity Futures Trading Commission [15]. The regulations and standards relevant to those organizations should be abided by all the organizations operating in this same industry. With the increasing concerns related to anti-money laundering incidents, the regulations in the US treasury and foreign market have become more stringent. It further creates a barrier to the integration of Block chain technology. Data privacy and data security concerns have become a major challenge in the US financial services and banking market. The integration of block chain technology further aggravates that risk. It can also lead to implementation resistance and challenges. Lastly, the volatile situation of crypto currencies and stable coins is leading to instability in the market and creating confusion regarding the feasibility of block chain integration in the given situation.

D. Smart contracts and cryptographic security

The smart contract and cryptographic security can be facilitated through the integration of Block chain technology in the US Forex and treasury market. The Smart contracts revolve around automation of the financial transactions through the self-execution process in the block chain [17]. Apart from that, the need for any middle agent of intermediate is also eliminated



through the usage of smart contracts. The major benefit of smart contracts is the reduced cost of operations or transactions along with the saving of time. The smart contract can be a major leap towards enhancing transparency and reducing the fraudulent activities related to block chain technology integration in the Foreign exchange and treasury market of the USA. It enables the participants to have the common code and access to all the data related to the transactions. On the other hand, crypto graphics security strengthens the immutability or integrity of financial transactions by using digital signatures and hashing [18]. It also involves the prevention of the alteration or making any changes to the financial data to prevent fraudulent activities or risks. The financial data are sensitive and confidential and the integration of crypto security plays a key role. On the other hand, the combined impact of both the crypto security and the smart contract can be the most effective in this context.

III. METHODOLOGY

A. Research design

An explanatory research design is used in this paper to portray how the integration of blockchain technology in the Foreign exchange and treasury market of the USA enhances overall transparency and security. Explanatory research allows the researchers to get a brief insight into the subject matter while analyzing the cause-and-effect relationship along with the evaluation of complex issues. This research has specifically mentioned the various benefits of integration of block chain technology in the US context including decentralization, immutability, and security, transparency in the financial transaction or related data and so on. Apart from that, the aspect of data security and resistance were also highlighted as the major challenges in integrating block chain technology and the usage of explanatory research emphasized their impacts. The explanatory research design further ensures that the research proceeds towards exploring the impacts of block chain technology in enhancing transactional operations and increasing their security and transparency in the US foreign exchange and treasury market.

B. Data collection

The data was collected from both the secondary qualitative and secondary quantitative sources. The secondary data collection process has saved both time and cost in the research process and provided access to a huge range of credible and relevant data. The usage of block chain technology in the financial services and security market was the major area of collecting the qualitative data. The cases from the contemporary business and reports were also integrated and evaluated in this research paper. On the other hand, the quantitative data was collected from the official statistics sources along with the charts, and graphs available in the credible sources. It also highlighted the overall block chain technology market growth along with the extent to which block chain technology is being integrated into the financial and Forex markets.



Apart from that, the uses of block chain technology and its benefits for this specific industry are portrayed through the quantitative data too.

C. Case studies and example

HSBC:

HSBC is a major banking and financial organization which is popular for its strategy of integrating block chain technology into its foreign exchange operations. The FX Everywhere platform is a major example of this integration where the approved ledger is used to improve the transparency and efficiency of foreign investments and transactions in addition to increasing the transaction speed and security. It has also eliminated the need to use paper documents and fraudulent activities at HSBC [7].

Black Box Company

On the other hand, the integration of Block chain technology by the Black Box Company resulted in the tokenization of real-world assets to enhance the process and decentralize the financial framework [8]. The public framework has been used by this brand to extend the block chain enabled services to the public and consumers.

D. Evaluation metrics

A few evaluation metrics have been used in this context to measure the results and impact of block chain technology on the treasury and foreign exchange market of the USA. Firstly, the transparency index is used to analyze the visibility and accessibility of the transaction-related data against the traditional framework. On the other hand, the evaluation of the number of cyber or malware attacks, data theft attempts along with fraudulent or suspicious transactions before and after the block chain integration is used as a major evaluation metric. On the other hand, the evaluation of the regulatory standards and compliance with the AML and KYC regulations have also been used as major evaluation metrics to measure the impact of this integration.

IV. RESULTS

Data Presentation



Figure-5- Block chain integration in banking and financial services

Source- [9]



According to figure 5, block chain integration is going to result into revenue and market size growth of the banking and financial sector. The market size is expected to reach from 6.98 billion USD to the 40.9 billion USD by the end of 2029. It would be a direct result of the block chain integration since it enhances the process efficiency and improves the cost saving in the transactions.

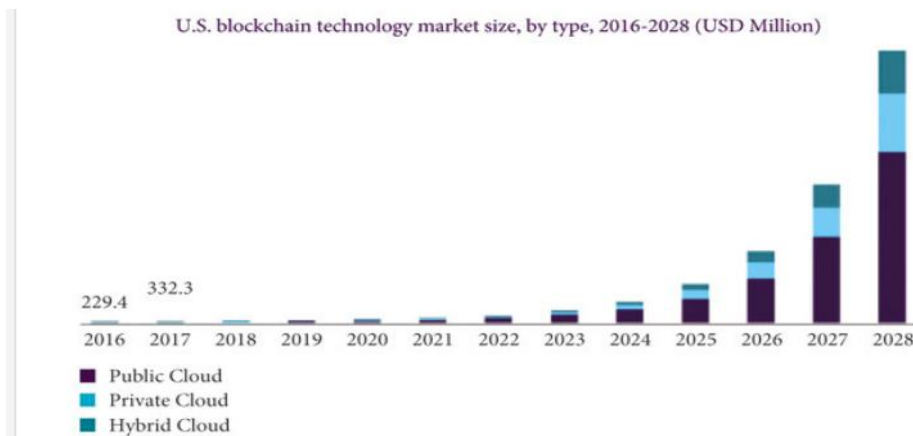


Figure-6: US block chain technology market size, by type 2016-2028

Source- [10]

Figure 10, shows the situation of the US block chain technology market and the size it is expected to reach by the year of 2028. The increasing scope of block chain integration is facilitated by the increasing market size by the end of year 2028. Apart from that, it signifies that the integration of block chain technology in the USA is much more feasible than any other country given the flourishing market condition and size of the block chain technology.

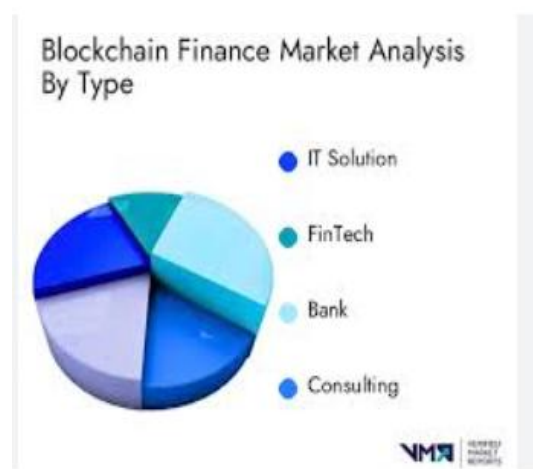


Fig-7: Block chain finance market (Size, share, scope and trends)

Source- [11]



This above representation shows that the block chain technology is used the most in the technology driven financial sector or Fintech sector. It also shows that, the foundation of this technology is quite strong in that particular sector making its implementation easier in the US Forex and treasury market.

B. Findings

The results obtained from this research report shows that the integration of block chain technology would be immensely beneficial for the Forex and treasury market of USA in enhancing the transparency and security of transactions and related data. The given example of the Black box and HSBC Company also advocates for the similar conclusion o statement. The net profit after tax for HSBC has increased by almost 0.4 billion USD in 2024 to 25 billion USD [12]. It was a direct impact of integration of the block chain technology in the transaction and business process. On the other hand, Black Box Company has also reported a huge increase in its profit by almost 40.87 crores in the financial year of 2024-25

C. Case study outcomes

Table 1: Case study outcomes

Case Study	Strategy	Impact of AI-Powered Shipping Tracking System for E-commerce Platforms	Key Outcome
HSBC	Strategy of integrating block chain technology into its foreign exchange operations by FX Everywhere platform.	It has also eliminated the need to use paper documents and fraudulent activities at HSBC	The net profit after tax for HSBC has increased by almost 0.4 billion USD in 2024 to 25 billion USD
Black box	Tokenization of real-world assets to enhance the process and decentralize the financial framework	Extending the block chain enabled services to the public and consumers	Increase in the profit by almost 40.87 crores in the financial year of 2024-25



(Source: Self-created)

D. Comparative Analysis

Table 2: Comparative Analysis

Aspect of Literature Review	Focus	Findings	Gap
[2]	Transparency and security through block chain integration	The transparency and security features of block chain technology are significantly transforming the banking, finance and insurance sectors positively [2].	The specific impacts are not explored.
[3]	Elon musk on benefit of this technology on finance services	Elon Musk has recently proposed to move the US treasury operations to block chain technology to safeguard the transactional data, manage the end-to-end encryption in the payment gateway and track federal spending or investments [1].	Statement is personalised and can be biased
[4]	Improving process efficiency and quality	It can also help the entities to improve the process efficiency and quality of the process [4].	Details are underexplored
[5]	Improvement of transparency among parties	Block chain technology can track or monitor important transactions and improve transparency among the parties involved in the transactions [5]	Tracking or monitoring parameters not mentioned
[6]	Elimination of manual errors and automation	The integration of the block chain system can also result in improved network capacity and streamline the transactional process while	Lack of direct connection to error making and automation



		integrating automation and eliminating manual errors in data recording [6]	
[14]	mitigation of fraudulent or suspicious activities	Major benefit of integrating block chain technology into the treasury and the foreign exchange market of the USA is the reduction or mitigation of fraudulent or suspicious activities which can result in huge financial losses for the companies operating in the same market [14].	Less focus on the type of fraudulent activities
[15]	The regulation by SEC or Securities and Exchange Commission and the CFTC or Commodity Futures Trading Commission should be adhered	The major regulatory bodies which regulate the financial exchange market of the USA are the SEC or Securities and Exchange Commission and the CFTC or Commodity Futures Trading Commission [15]	No focus on the exact regulations
[17]	Smart contracts	The Smart contracts revolve around automation of the financial transactions through the self-execution process in the block chain [17].	Lack of discussion regarding the specific applicability

(Source: Self-created).



V. DISCUSSION

A. Interpretation of results

This data analysis shows that Block chain technology has a direct positive impact on enhancing the security and transparency of the Treasury and Foreign exchange market. There are smart contracts and Crypto graphic security integrated into the block chain technology to improve the automation and transaction process along with transparency and security. The case study of the Black Box and HSBC shows that the business revenue is increased and improved as a direct result of Block chain technology integration in the tokenization of real-world assets to enhance the process and prevention of fraudulent activities.

B. Practical Implications

The practical implications of integrating Blockchain technology in the US Forex and the treasury market are huge in 2025. Firstly, it can enhance the transparency and security in the transaction process. Apart from that, the technology can also enhance the process effectiveness and eliminate manual errors in addition to the reduction of costs in 2025.

C. Challenges and Limitations

The prime challenge associated with the integration of Block chain technology is data privacy or data security issues. Block chain integration creates a huge risk in the context of data theft risk which can cause huge financial losses for the companies operating the Forex market or treasury market. On the other hand, compliance with the AML and KYC framework can create a huge barrier or difficulty.

D. Recommendations

The collaboration between the US government and the organizations operating in the Forex and Treasury department of USA should be ensured to make the maximum benefit out of the block chain technology integration. On the other hand, the privacy of the data should also be ensured while integrating block chain technology. The AI based end to end encryption is considered as one of the best methods of preventing data theft and cyber attacks in 2025.

VI. CONCLUSION AND FUTURE WORK

This research paper shows that the integration of the block chain technology can enhance the Transparency and Security in U.S. Treasury and Forex Markets in 2025. There is scope of further research to integrate the AI based end to end encryption to prevent the data privacy thefts and cyber attacks along with a framework to ensure compliance to AML and KYC regulations.



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