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Role of Blockchain in Finance

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ABSTRACT

Blockchain has matured from being mainly linked with cryptocurrencies to being a central technology with revolutionary potential for financial systems globally. By allowing safe, decentralized, and tamper-resistant ledgers, blockchain can cut down on the cost of transactions, enhance transparency, and raise efficiency in many areas of finance. This paper discusses the applications of blockchain in payments, cross-border remittances, capital markets, trade finance, and compliance. It includes fresh data from international organizations, central banks, and private industry reports to note both Indian and global developments. For example, close to 91% of the central banks surveyed are now investigating central bank digital currencies (CBDCs), and India's pilot retail digital rupee has already signed up millions of customers. Concurrently, the World Bank also points out that the global remittance average cost still exceeds 4%, a far cry from policy levels, indicating that blockchain is able to bridge this gap. While the technology has potential for efficiency and financial inclusion, there are issues around interoperability, privacy, cyber threats, and regulatory clarity. The report concludes that the contribution of blockchain to finance will most likely be characterized not by substituting current systems, but by integrating programmability and transparency into the mainstream financial infrastructure.

Keywords: Blockchain, Digital Currency, Tokenisation, Cross-Border Payments, Financial Inclusion

1. INTRODUCTION

In the past decade, blockchain has transitioned from a hype cycle to a carefully measured experimentation within financial systems. In fact, cryptocurrency, unlike traditional centralized database solutions, blockchain has (or, distributed ledger technology (DLT)) establishes a shared record accounted for across multiple parties making fraud and double spending tremendously difficult. While it emerged first as a “decentralized rely” via Bitcoin, blockchain is beginning to be examined and implemented within already regulated use cases such as central bank digital currencies, securities settlement, and cross border trade finance.In January 2024, the Bank for International Settlements (BIS) reported that 91% of surveyed central banks are researching or piloting a central bank digital currency (CBDC). This suggests that policymakers are looking at blockchain as not just a niche innovation but as an infrastructure model that could support financial systems of the future. India is also getting into this space: the Reserve Bank of India (RBI) has launched pilots for both wholesale and retail versions of a CBDC and has integrated the digital rupee into some banks and payment platforms. Meanwhile, squeezing into this is the global cross border payment market, which is estimated to be nearly one quadrillion US dollars in 2024, continues to be plagued by high costs and slow settlement speeds that support the case being made for rails based on blockchain.

RELEVANCE OF BLOCKCHAIN IN FINANCE

Transparency and Trust: One of the primary benefits of blockchain is the concept of a shared ledger; multiple institutions can access a ledger simultaneously. As a result, reconciliation efforts are diminished, real-time audits can be performed, and trust in the underlying transaction is reinforced.

Programmability: One factor to note regarding blockchain, through smart contracts, is that financial obligations can be satisfied and executed automatically, such as delivery-versus-payment (DvP), or payment-versus-payment (PvP). As a result, settlement risk is reduced, and liquidity can be utilized more efficiently.

Interoperability Potential: When blockchain is also combined with common tech and regulatory standards, it could enable tokenised assets and tokenised money to operate and transact on the same platform, meaning instant and conditional transfers in one transaction.

KEY APPLICATIONS

1. Central Bank Digital Currency (CBDCs): Central banks worldwide, including in Switzerland and China, are testing blockchain based digital currencies. For example, the BIS's Project mBridge has been a multi-CBDC platform allowing participating banks to make instantaneous settlements of cross border payments on a common ledger. For retail use, India's e-rupee pilot programme has onboarded over 6 million users across 17 banks as of early 2025, and the e-rupee that is in circulation is more than ₹10 billion.

2. Payments and Remittances: In early 2025, the World Bank reported that the global average cost of sending US$500 stood at a cost of 4.26% (well above the UN Sustainable Development Goal of 3%). Blockchain-based remittance channels have the potential to reduce costs by avoiding multiple intermediaries.

3. Capital Markets and Tokenisation: Tokenisation is the representation of debt or equity account based financial instruments, including bonds, equities, and fund units, on blockchain. In 2024–25, the Financial Stability Board (FSB) and World Economic Forum (WEF) published reports that outlined the emergence of tokenisation as an improvement to fraud, inefficiency, and transparency in capital markets. However, each of these reports emphasized that tokenisation must be underpinned by established legal recognition of digital settlement.

4. Trade Finance: Trade finance is one of the most fraud-laden areas of finance. Blockchain strengthens trade finance significantly. By digitising traditional documents such as the bill of lading and invoices on a shared ledger, duplicate financing and additional fraud challenges can be eradicated. It also creates a more trusted environment, bringing domestic suppliers together with buyer facing commerce.

5. Compliance and Regulation: Blockchain provides regulators with new technological capabilities in the area of "real-time supervision." And because all transactions are permanently recorded, regulators could have access to verified data sets, which may lessen the reliance on replications of reporting.

DATA AND TRENDS

1. Central banks: 91% engaged in research or pilot CBDC (BIS, 2024).

2. India CBDC: Retail pilot reached 6 million users and ₹10 billion in circulation as of March 2025 (RBI, media report).

3. Cross-border flows: Estimated to be nearly US$1 quadrillion in 2024 (IMF).

4. Remittance costs: Average cost of sending US$500 was 4.26% in Q1 2025 (World Bank).

5. Tokenisation: Global regulators endorse efficiency gains but warned of risks around smart contract bugs and settlement finality (FSB, WEF, 2024–25).

INDIA'S POLICY AND MARKET CONTEXT

India is in a unique position with its digital public infrastructure such as the Aadhaar (identity management), UPI (payments), and eKYC (identity verification) are providing cheap payments. Blockchain can provide systems that allow for programmable settlement, give authority to and tokenise assets, and create new cross-border payments corridors.

In its 2020 report Blockchain: The India Strategy, NITI Aayog identified as a priority area for adoption, finance. Since this report appeared, the Reserve Bank of India (RBI) has slowly progressed, while ensuring that the digital rupee pilot is integrated into the banking system and not a way to circumvent the system.

BENEFITS AND CHALLENGES

Benefits:

1. Faster settlement: Same-day or even instant delivery versus payment (DvP) decreases counterparty risk.
2. Reduce cost: Especially in cross-border payments and associated compliance.

3. More transparency: Maintaining immutable records is a great help to regulators and auditors.

4. Inclusion: Possibility of reaching unbanked populations through digital wallets.

Challenges:

1. Cybersecurity: Losing money due to bugs in smart contracts or poor key management.

2. Privacy: Knowing that full transparency is at odds, we need to consider how sensitive data contained in financial transactions will be protected.

3. Legal: There is little specific legal clarity because many jurisdictions do not have laws which recognise finality of settlement on blockchain.

4. Interoperability: Fragmentation risks if multiple blockchains do not connect.

SUGGESTIONS AND FUTURE ROADMAP

1. Parallel development of money/assets: Tokenised government securities should settle against tokenised money to unlock actual atomic settlement.

2. Standardisation: Regulators and the industry must ensure agreement on technical and legal standards so there is interoperability.

3. Targeted adoption: Start with wholesale markets - repo, FX settlement, large-value transfers - before going to retail.

4. Legal frameworks: Update payment and securities legislation to cover blockchain settlement.

5. Risk management: Invest in cybersecurity; smart contracts should be audited by a formal audit firm and managed through proper contingency planning.

6. Consumer focus: For retail pilots, wallets should be easy to use, available offline, with popular integrations like UPI.

CONCLUSION

The finance sector's use of blockchain is no longer an experiment. Significant advancement is happening around the world, whether in CBDC pilots or security tokenisation. The progress on a category of technology required to establish blockchain in practical ways is very strong. This is evidenced by many countries rolling out or ramping up production in this area. India, armed with its reasonably robust digitalisation, is very well positioned to explore a selective way to adopt blockchain where it provides distinct value—programmable settlement, cross-border corridors, or automated trade finance. The evidence points to blockchain technology not replacing previous technology, but rather, amplifying it by embedding transparency, automation, and trust.

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