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The Impact of Blockchains on Financial Sector

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Abstract

This research looks at how blockchain technology has affected the growth of the American and Chinese banking sectors. Financial markets could be radically altered by blockchain technology, a secure and decentralized digital ledger system, that increases efficiency, decreases transaction costs, and increases transparency. As blockchain adoption grows globally, understanding its implications for financial systems in different economic and institutional settings becomes crucial. This research uses econometric methods, including "Fully Modified Ordinary Least Squares (FM-OLS)" and "Toda-Yamamoto causality tests", to analyze the relationship between blockchain adoption and financial development indicators such as financial market efficiency, liquidity, and accessibility. By comparing the US, with its well-established financial infrastructure, and China, a leader in blockchain research and development, the study offers valuable insights into the varying effects of blockchain in diverse institutional contexts. It is clear from the results that blockchain can improve financial systems and boost economic growth, but the effect on these two economies has been quite different. Insightful politicians, financial institutions, and tech developers can benefit from this study's practical consequences as it adds to the expanding corpus of literature on blockchain and financial development.

***Keywords*:-** *Blockchain Technology, Financial Development, United States, China, Econometrics, Financial Market Efficiency, Digital Ledger, Financial Systems.*

I. INTRODUCTION

The immutability of recording transactions in a distributed digital ledger in near real-time is what blockchain technology provides. By having the nodes in the network needing to agree on a new transaction before adding it to the ledger, we can guarantee that our data is always free of manipulation, errors, and bad quality. In layman's terms, Blockchain is a protocol that ensures a decentralized online financial transaction.

The distributed ledgers for Bitcoin were the original inspiration for blockchain technology, a subset of FinTech. For a while, the bitcoin craze stole the show from blockchain technology. However, in recent years, blockchain has begun to garner attention independently and is quickly becoming an essential technology within the FinTech family. (Du et al., 2019). The effects of blockchain technology are not limited to the cryptocurrency market; in fact, many professionals and academics have concluded that this technology will propel transformation in a wide range of industries. (Ølnes, Ubacht and Janssen, 2017). All things considered, blockchain technology is among the most exciting developments in the realm of financial technology. (Du et al., 2019). Blockchain has several uses beyond its original intent as a distributed ledger to record Bitcoin transactions. The financial sector and other commercial spheres are not immune to its potential to alter several business processes. (Underwood, 2016; Kshetri, 2018). The term "blockchain" refers to a system that records transactions by creating a series of data blocks. Data about transactions, a timestamp, and a cryptographic hash of the prior block are all included in each block. Although blockchain technology is now driving the Fintech revolution and is playing a major role in financial innovations, its primary use case has been in payments. The ever-increasing expectations of consumers, coupled with new developments in technology and changes in corporate operations, have been driving the development and evolution of payment instruments and systems. The primary goal of any payment system should be to facilitate secure and intelligent transactions. (Ali et al., 2018; Kshetri, 2018). A new paradigm shift in the field of money transfers has recently occurred with the advent of blockchain-based digital currencies, sometimes known as cryptocurrencies. Cryptocurrencies are based on "cryptography, encryption, decentralized peer-to-peer (P2P) networks, and a public key infrastructure (PKI)" wherein private and public keys are used to protect data transfers. (Abramova and Böhme, 2016). The autonomous infrastructure that is meant to enable a dispersed independent organization is another area where blockchain technology finds use. (Peters and Panayi, 2015; Chapron, 2017) These decentralized autonomous organizations are the model of distributed organizing. When fully operational, they will be digital and dynamic, free from centralized strategic agendas, offices, managers, contracts, policies, and payrolls. (Barrett, Oborn and Orlikowski, 2016).

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Blockchain technology allows for the simultaneous recording of transactions on numerous computers using a distributed ledger system. The majority of digital currencies keep track of financial transactions using blockchain technology. As its foundation, the Bitcoin network was built on top of blockchain technology (Abramova and Böhme, 2016). A lot of new terms and components have emerged with the blockchain, which can make it hard to keep track of everything that's being said about it and how to put it into practice. There are details about how transactions are aggregated and made public in separate data structures called blocks. These blocks are then distributed in a decentralized network and encrypted in a way that prevents tampering with earlier transactions (Beck, Müller-Bloch and King, 2018). Nodes (miners) validate transactions added to blocks, and consensus models decide which node gets to publish the next block. Additionally, blocks can facilitate native smart contract capabilities—like "Ethereum's smart contracts" or "Hyperledger Fabric's chain code"—by storing and deploying data and code on the blockchain network through cryptographically signed transactions.

A. Types of Blockchain

➢ *Public Blockchain*

All of these blockchains are amenable to the decentralization principle. There are no limitations; everyone with access to a computer and the internet can join the network. (Ferdous, Chowdhury and Hoque, 2021). With their proof-of-work or proof-of-stake security mechanisms, public blockchains could one day replace traditional financial systems. (Bischoff and Seuring, 2021; Tan, Mahula and Crompvoets, 2022). This blockchain's smart contract, which allowed it to support decentralization, is its more sophisticated side. Digital currencies like Bitcoin and Ethereum use public blockchains.

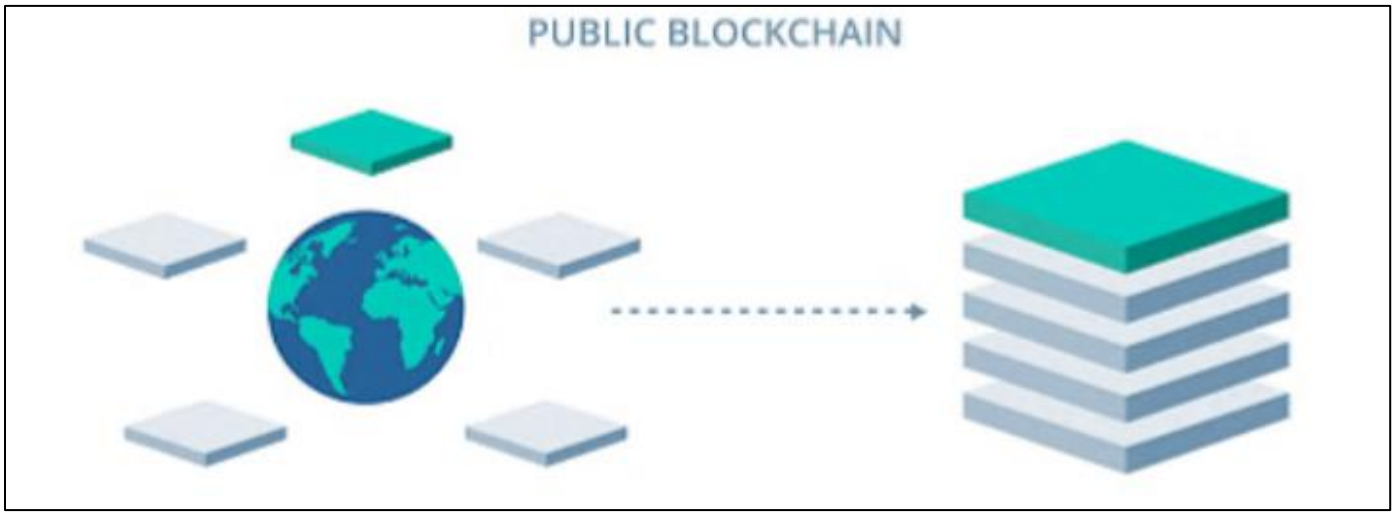

Fig 1 Public Blockchain
Source : (Jha, 2023)

➢ *Private Blockchain*

These blockchains aren't as distributed as the public blockchain, but they're still more secure because only approved nodes may join in. (Ismailisufi et al., 2020). This blockchain is likely to be an important tool for keeping sensitive data out of the hands of prying eyes provided it is properly protected and regularly maintained. So, businesses utilize them for managing assets, conducting internal audits, and casting votes. (Jánoky, Levendovszky and Ekler, 2020; Chen et al., 2021). An example of private blockchains is Hyperledger, Corda.

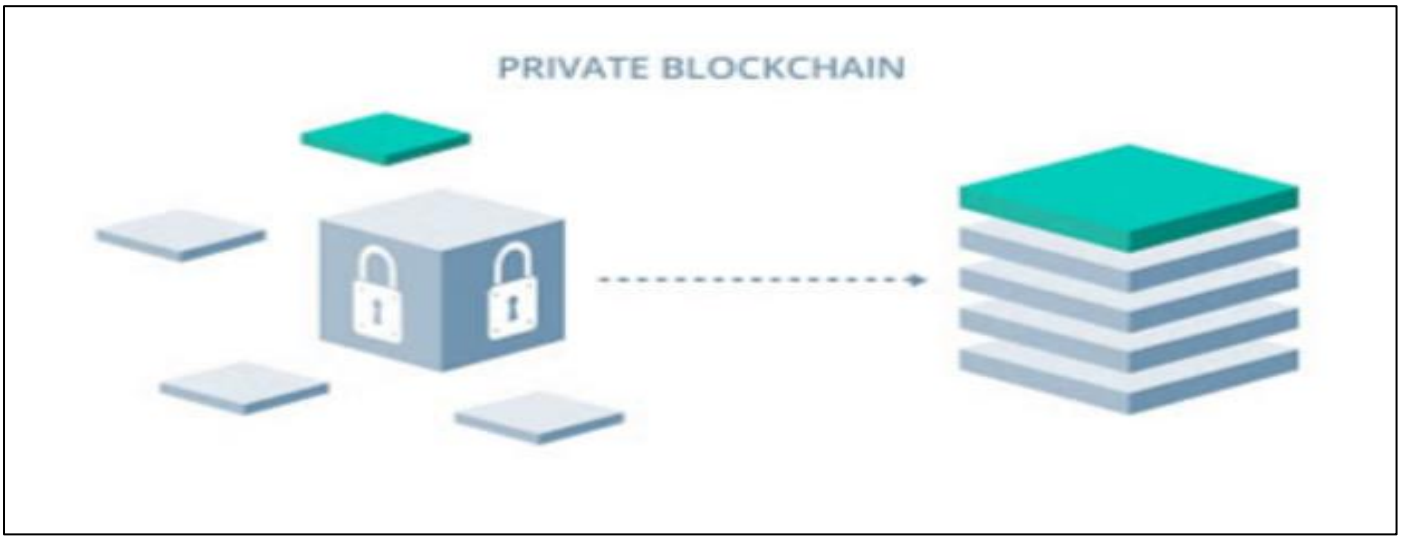

Fig 2 Private Blockchain
Source: (Jha, 2023)

➢ *Hybrid Blockchain*

This hybrid blockchain combines elements of both the private and public sectors, with certain parts held by private organizations and others made publicly available. (Marar and Marar, 2020). Government agencies, healthcare providers, real estate agents, and banks all benefit from this improved solution. (Alkhateeb et al., 2022; Mu et al., 2023). It offers a solution for situations where data needs to be accessible publically but securely protected. (Ge et al., 2022). Examples of Hybrid Blockchain are the Ripple network and XRP token.

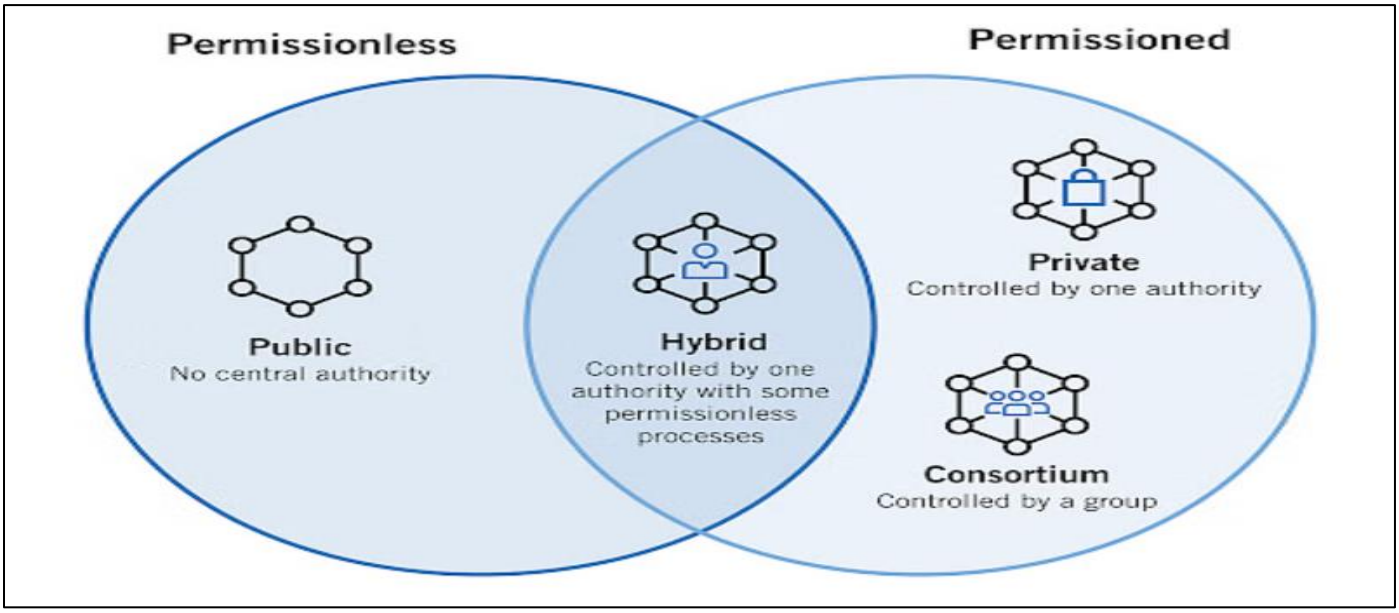

Fig 3 Permissionless Permissioned
Source: (Jha, 2023)

➢ *Consortium Blockchain*

This method finds innovative solutions to the problems faced by the company. This ledger system not only verifies the transaction but also sends and receives payments. (Zhao et al., 2019; Zhang, Xu and Xie, 2022; Peng et al., 2023). Many financial institutions, including banks, see great promise in it. A federated solution, food monitoring is perfect for organizations because it often works with their sectors.

- *Examples of Consortium Blockchain are Tendermint and Multichain.*

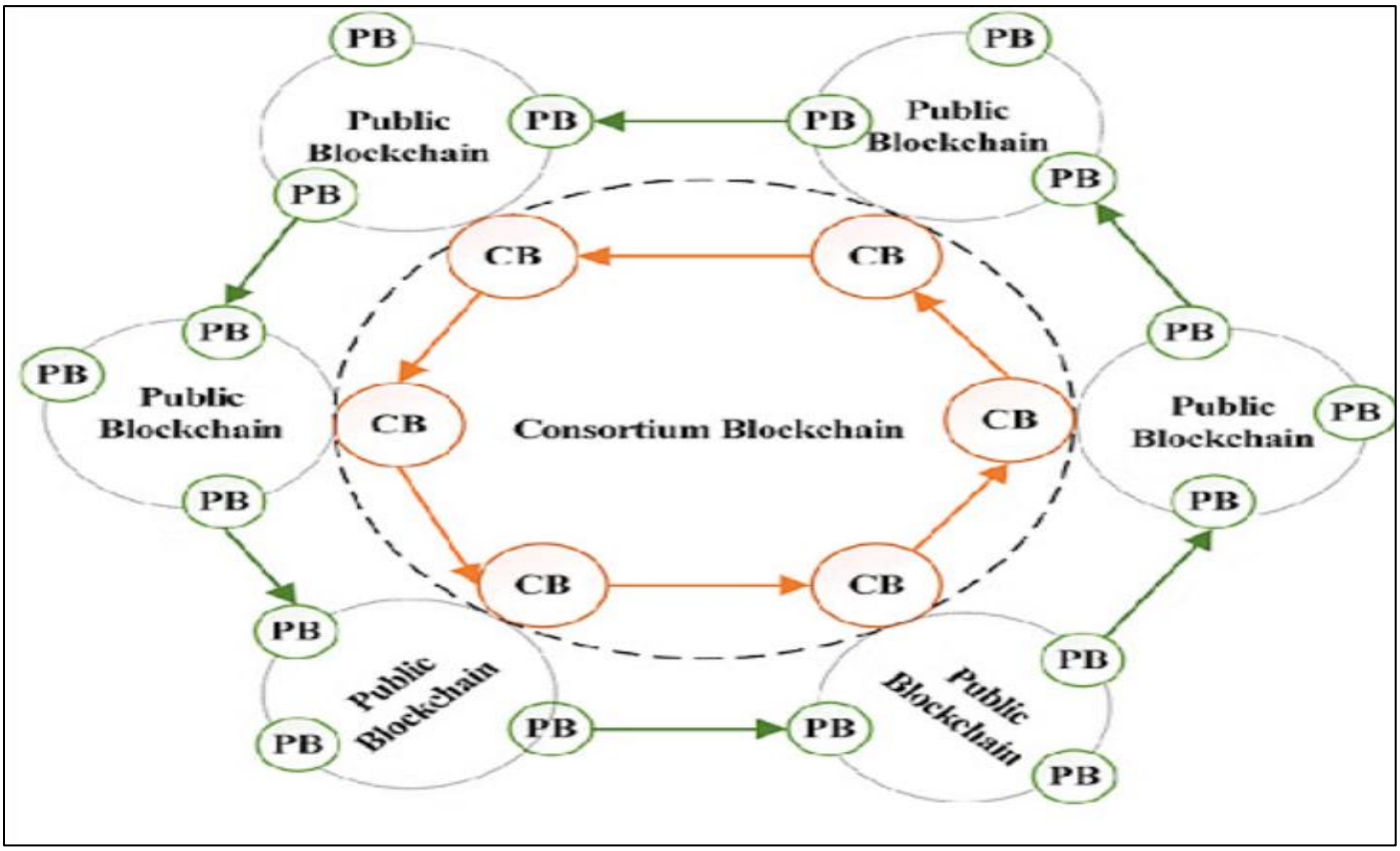

Fig 4 Consortium Blockchain are Tendermint and Multichain.
Source :(Jha, 2023)

Table 1 Comparative Analysis of Blockchain Types

Feature	Public Blockchain	Private Blockchain	Hybrid Blockchain	Consortium Blockchain
Access Control	Open to everyone	Restricted to specific participants	Limited to a group of organizations	Combination of public and private
Governance	Decentralized	Centralized	Semi-decentralized	Mixed governance structure
Transparency	High transparency	Low transparency	Moderate transparency	Variable transparency
Scalability	Limited scalability	High scalability	Moderate scalability	High scalability potential
Security	High due to decentralization	Lower due to centralization	Moderate security	Variable security
Transaction Speed	Slower due to consensus mechanisms	Faster transactions	Faster than public, slower than private	Variable speed
Use Cases	Cryptocurrencies, decentralized apps	Enterprise solutions, data privacy	Supply chain, banking, collaborations	Various applications need flexibility

II. BLOCKCHAIN INCLUSION IN THE BANKING SECTOR

Blockchain technology has generated a lot of buzz in the banking and financial industries since, at their core, all financial transactions are based on the promise to fulfill obligations. (Javaid et al., 2022). Financial markets are built to address trust and asymmetry in financial transactions through their risk management architecture. (Rella, 2019; Adegbite, 2024).

- The financial infrastructure places a heavy burden on the costs of identity verification, transaction authentication, trustworthy and accurate transactions, record support, and record storage security. Problems with trust, fraud, and mistakes are addressed by these actions.
- The financial system locks up substantial money and collateral as a safety net against the unpredictability and trustworthiness of potential outcomes.
- Due to the high cost of the risk infrastructure, small-sized transactions are out of reach for low-income individuals since they are economically prohibitive.

Blockchain solves the problems of trust, information asymmetry, and the economics of small transactions without the need for a risky infrastructure or a central intermediary. (Aspen Institute, 2021; Kayani and Hasan, 2024)

A. Alternative to Central Ledger

Nowadays, it's common practice in the financial sector to have a central ledger that stores all of this data. (Mills et al., 2017). Blockchain technology, on the other hand, eradicates the need for a trusted third party by securely storing all relevant transaction data in a decentralized database hosted in the cloud. (Renduchintala et al., 2022). The present mental and commercial models of conventional financial institutions are being disrupted by their decentralized nature. (Koens and Poll, 2018). The network verifies "blocks," or transactions, and adds them to the "chain" of computer code; this replaces a centralized authority (like a bank) in the blockchain. Cryptography is employed to ensure the security of transactions, and the dispersed nature of transaction approval further renders the system impenetrable. (Allen et al., 2016).

The long-term potential of this technology to ease cross-border financial transactions is being considered by Arvind Krishna, senior vice president of IBM Research. (Teichmann and Falker, 2020). The 3.2 billion people expected to become the middle class in the next fifteen years are his target audience for expanding banking services, he declared. Consequently, I require a reduction in the expense of maintaining a ledger. In that case, blockchain technology presents some interesting opportunities. He will not succeed with a bank that is either firm-centered or controlled from on high; instead, he can use blockchain technology to tap into a digitally enabled network. (Mills et al., 2016; Del Río, 2017).

B. International Adoption of Blockchain Technology

A multitude of commercial and central banks, stock exchanges, and other significant financial services institutions are keenly exploring the potential of blockchain technology. (Mohd Fairoh et al., 2024). As per a report published by the World Economic Forum in August 2016, 24+ countries and 90+ corporations are an inherent part of the blockchain consortia, with over 2500 patents. Moreover, 90+ central banks are actively discussing the inclusion of blockchain. (Schuetz and Venkatesh, 2020; Wu et al., 2024)

Among U.S. banks, JPMorgan Chase was the pioneer in introducing a digital currency based on the blockchain. (Bagai, 2017). Clients of JPMorgan Chase are the only ones allowed to use JPM Coin. With JPMorgan's approval and the blockchain, institutional accounts can send and receive funds nearly instantly. (Tan, 2025). Digital tokens representing any blockchain-based money exchange are called JPM coins, and one dollar is worth one coin. The bank should be able to save money, decrease risk, and enhance efficiency in business-to-business payments with digital currency. The bank's blockchain, Quorum, is where the coin runs, but it's compatible with any regular blockchain. (Partners, 2021).

C. Outline of the Paper

To address a knowledge vacuum, this research empirically evaluates how blockchain innovation has affected financial development in China and the United States. To better understand the wider implications of blockchain adoption for the development of the financial system, this study aims to

investigate the connection between blockchain innovation and the efficiency of financial markets.

In addition, the research intends to fill a crucial knowledge vacuum about blockchain's function in economic variables including GDP growth, FDI, and the efficacy of the government. Previous studies have highlighted the importance of these factors in shaping financial development, yet little has been done to examine how these traditional drivers interact with emerging technologies like blockchain. By examining both the technological and institutional drivers of financial development, this paper aims to provide a comprehensive understanding of how blockchain can facilitate financial system advancement.

Examining the effects of blockchain technology on two major economies throughout the world, this study aspires to add to the expanding corpus of scholarship on the subject. The results of this study will shed light on the potential of blockchain technology to enhance financial systems and fuel economic expansion, which is of great interest to lawmakers, financial institutions, and IT entrepreneurs.

III. LITERATURE REVIEW

(Zhang, 2024) Examined the effects and potential future developments of blockchain technology on the financial industry from an economic data analysis standpoint. With the help of econometrics, they thoroughly examine how blockchain technology has the potential to revolutionize financial market operations, leading to more efficient and transparent transactions with lower costs. The research shows that blockchain's decentralized structure can facilitate the democratization of financial services by removing obstacles from the conventional financial industry. Simplifying financial transactions and reducing the danger of human interference and fraud, smart contracts automate their execution. Furthermore, by making data more secure and traceable, blockchain technology has improved the financial markets' trust mechanism. When it comes to econometric analysis, they employ various methodologies such as regression models and time series analysis on massive amounts of financial data to evaluate the hypothesis that blockchain technology will affect the market's performance. The application of blockchain technology correlates positively with financial market efficiency, liquidity, and stability, according to the results. Blockchain technology is set to become increasingly more widely and deeply used in the financial market as it undergoes constant innovation and improvement in the future. There is hope that blockchain technology can help the financial industry become even more intelligent and computerized, as well as make financial services more convenient and tailored to each individual's needs. However, blockchain technology will also encourage financial market innovation and cross-border integration, which will provide new life to global economic development.

Due to its efficacy as an intermediary-free platform, blockchain has lately grown in popularity as an information system technology. The development of Internet-enabled "distributed databases" is being facilitated by blockchain technology in many different industries, including energy consumption, supply chains, healthcare, education, and finance. However, there is a lack of exploratory studies that can shed light on the state of the field. Consequently, it is critical to investigate the current state of blockchain technology in the financial industry, with a focus on how blockchain designs might help the industry acquire a competitive edge. A study conducted by (Weerawarna, Miah and Shao, 2023) examines academic literature in the field of finance from 2008 to 2022, specifically looking at the top 50 research papers and reports, to draw out several potential characteristics of blockchain study in this area. This study outlined the many facets of blockchain technology, its applications in finance, the benefits it offers over competing systems, the state of finance today, and the obstacles that have so far prevented the widespread adoption of blockchain-based financial information systems. For blockchain technology to mature into the "next-generation networks" that would radically alter the banking industry, they pinpointed three key areas that necessitate further study.

The shift from the industrial to the silicon age has been accelerated by technological advancements, prompting the widespread use of the term "FinTech" to describe the extensive use of technology in the financial sector. Along with Industry 4.0 has come powerful technology like blockchain. Blockchain technology allows network nodes to trace every data transfer by storing it in decentralized databases made up of blocks. Data encrypted with digital signatures can be stored in a distributed ledger called a blockchain. Better and safer transactions are made possible by blockchain qualities including decentralization, consistency, accountability, and openness. Beyond Bitcoin, blockchain technology has found applications in healthcare, risk management, and financial services. (Sharma, 2023) Laid out the many pros and cons of using blockchain technology in the banking industry. Additionally, this research helps fill in certain gaps in our understanding of blockchain technology by illuminating some of the possibilities and threats it poses to the financial services industry. Within the chapter, you will find three main divisions: First, the Fourth Industrial Revolution and blockchain technology; second, the impact of technology on the banking industry and financial services; and third, forthcoming technological challenges and issues.

Modern technological developments and shifting customer tastes are the main forces causing widespread upheaval in the banking sector. As a distributed ledger system that is both safe and transparent, blockchain has attracted a lot of interest as a potentially game-changing new technology. The potential for quicker, more secure, and cheaper transactions is a major selling point of blockchain technology, which has already shown its usefulness across several sectors. One such industry is finance. It also improves financial ecosystem openness and deals with fraud threats. (Duan, Pang and Lin, 2023).

(Evans, 2019) Explores the connection between cryptocurrency and the stock market. According to the estimations, the association between blockchain technology and the US and Chinese financial markets is positive and statistically significant. That is to say, these nations' financial markets reflect the degree to which they innovate using blockchain technology. It can be inferred that the introduction of BCT into financial markets promotes growth in the financial sector. For mature financial markets, blockchain innovation is thus a major plus. Financial development in the two nations is positively and significantly correlated with macroeconomic variables like “GDP per capita, the growth rate of GDP, foreign direct investment (FDI), and trade openness”, according to the results. The United States is the only country where the institutional variable of government efficacy has a positive and statistically significant impact. (Ezekiel Onyekachukwu Udeh et al., 2024).

Overall, the study underscores blockchain technology's capacity to revolutionize the banking industry by improving operational efficiency, reducing costs, enhancing transparency, and fostering trust. Nevertheless, for banks to fully realize these advantages, it is essential to gain a nuanced understanding of blockchain's features, assess its feasibility and impact, and navigate the challenges associated with its implementation.

IV. METHODOLOGY

They use regression analysis to analyze the impact of blockchains on the financial sector as they are analyzing a one-way causal-effect relationship.

A. Techniques Employed

For statistical purposes, regression establishes a relationship between a dependent variable and one or more independent variables; consequently, a regression model reveals whether or not changes in the dependent variable can be accounted for by changes in the explanatory variables. Such a model, once created, helps to predict the regress and (dependant variable) based upon the changes in regressors (independent variables)

To gauge the market's overall performance over some time, investors sometimes look to composites, which are a collection of shares or indexes. The social and natural sciences can also make use of composite indices to summarise redundant or complicated data with several dimensions.

An often-used method for studying big datasets with many dimensions/features per observation, principal component analysis (PCA) allows for the display of multidimensional data, improves data interpretability, and preserves as much information as possible.

B. Method of Data Analysis

In this case, we use the "fully modified ordinary least square (FM-OLS) approach" to analyze the data, which is a semi-parametric approach. The estimations are steady and accurate because the approach is resistant to serial correlation and endogeneity. (Breitung and Pesaran, 2008; Adeola and Evans, 2017; Evans, 2019; Evans and Kelikume, 2019)

The connection between an independent variable and its own delayed version over different time intervals is called serial correlation. The term "endogeneity" is used interchangeably in econometrics to describe instances where the error term is associated with an explanatory component. And it doesn't matter if the variables are completely I(0), completely I(1), or a combination of the two; "FM-OLS" can be implemented to them all. (Phillips and Hansen, 1990)

The "Toda-Yamamoto approach" to the causality technique is employed to assess the relationship between blockchain technology and advancements in the financial sector. Superior to previous methods of causation is the Toda-Yamamoto approach. As an alternative to the more traditional Granger causality test, this method takes advantage of vector autoregression (VAR). Nothing says that the variables must be cointegrated, that they must be in the same order of integration, or that they must be stationary. (Toda and Yamamoto, 1995).

C. Model Specification

The data used in this analysis comes from the World Bank (2017) database and covers the years 2009–2016 in China and the US. The only variables that are different are the institutional factors, which come from the EIU (2017), and the individuals who use Bitcoin, which comes from quandl.com (Evans, 2019).

American and Chinese financial markets have built expertise in blockchain technology and have enthusiastically embraced it. Compared to the developed market in the US, China's market was only starting to take off at the time. The study's findings will have broad applicability in each of these areas.

D. The Model

The economic model is based on the work of Ayadi et al. (2015), Hauner (2009), and Chinn and Ito (2006). As the dependent or explanatory variable, blockchain technology—the variable of interest—is included in the model.

- *Model 1:*

Fdt=β0+β1Blockchaint+ut ; Fd ~ Financial Development Blockchain ~ Blockchain Technology t ~ Year Using principal component analysis, we may combine private sector credit as a percentage of GDP and stock trading as a percentage of GDP to create a composite index of financial market development, denoted as Fd. (Dogan and Turkekul, 2016; Adeola and Evans, 2017; Shahbaz, Bhattacharya and Mahalik, 2018).

As a stand-in for blockchain, it uses the amount of people who have accessed Bitcoins in the past 24 hours. This metric is used to measure blockchain in the same way that the number of internet users is used in scholarly works to measure internet usage. (Vu, 2011; Olaniyi Evans, 2016) Decentralized and operated between individual users, the blockchain technology underpins the most well-known digital money, Bitcoin. (Crosby et al., 2016)

- *Model 2:*

Given the significance of macroeconomic indicators for financial development, including "GDP per capita, GDP growth, inflation, FDI, remittances, and trade openness". Included in the first model are the macroeconomic variables: Fdt=β0+β1Blockchaint+β2Gdpc+β3Gdpgrowthdt1+β4Inflation t+β5Fdit+β6Remitt+ β7Tradet+ut.; "Gdpc ~ GDP per capita Gdpgrowth ~ growth rate of GDP Inflation ~ rate of inflation Fdi ~ FDI(Foreign Direct Investment) Remit ~ Remittances as % of GDP Trade ~ Trade Openness"

- *Model 3:*

Two institutional variables that have been incorporated into Model 2 due to their importance in the development of financial systems are the rule of law and the efficiency of government:Fdt=β0+β1Blockchaint+β1Blockchaint+β2Gdpc+ β3Gdpgrowthdt1+β4Inflationt+β5Fdit+β6Remitt+β7Tradet+β 8Govefft+β9Rulelawt+ut ; Goveff ~ Government effectiveness Rulelaw ~ Rule of Law

Previous research on the factors that influence financial development served as the basis for both the identification and replacement of the variables. (Chinn and Ito, 2005; Hauner, 2009; Ayadi et al., 2015) To account for wealth effects, GDP per capita is used. Financial innovation and stock market performance are affected by inflation. (Boyd, Levine and Smith, 2001; Evans, 2019) Among the factors cited as critical to

economic growth, foreign direct investment (FDI), remittances, and trade liberalization stand out. (Billmeier and Massa, 2009; Law and Habibullah, 2009; Seetanah, Durbarry and Ragodoo, 2010; Aggarwal et al., 2011; Takyi and Obeng, 2013) When it comes to building financial systems, institutions play a significant role as well. Rather than making decisions in a void, financial managers and investors must navigate vast and intricate financial ecosystems. (Demirgüç-Kunt and Levine, 2008)

V. DATA ANALYSIS AND FINDINGS

- *Empirical Analysis*

One significant feature of time series is stationarity. If the statistical characteristics of a time series remain constant throughout its lifetime, we say that it is stationary. The covariance remains constant over time, and the mean and variance remain constant as well.A large body of research suggests that time series data do not necessarily follow a normal distribution. Neglecting to account for nonstationarity in the estimate process can result in misleading regression.

Table 2 Elliott-Rothenberg-Stock Unit Root Test

	I(0)	I(1)
Fd	3.45	2.26
Blockchain	6.49	1.55
Gdpc	31.01	2.59
Gdpgrowth	80.41	2.21
Inflation	8.98	0.79
Fdi	7.34	0,40
Remit	10.71	1.42
Trade	7.1	1.67
Goveff	3.02	2.04
Rulelaw	3.37	1.41
	1%level	1.87
Test critical Value	*5% level*	2.97
	10%level	3.91

Hence, the "Elliot, Rothenberg, and Stock Point Optimal unit root test (ERS)" is employed to assess stationarity in this work. This test is more calculus as compared to the more conventional unit root tests, such as the "Augmented Dickey-Fuller and Phillips-Perron tests". The ERS test reveals that some variables are stationary at I(0) and some at I(1), as evidenced in Table. This suggests that the variables are mixed at I(0) and I(1), making them appropriate for the FM-OLS technique.

Establishing a cointegrating relation among the variables is the first step in using the FM-OLS technique for estimation. (Adeola and Evans, 2017; Evans, 2019). For this reason, we look for cointegrating correlations using the "Hansen Parameter Instability co-integration test". The cointegrating test failed to find any evidence of cointegration for all three models, as seen in the table that follows. This points to the existence of long-term correlations between the three models' variables.

Table 3 Cointegration test: Hansen Parameter Instability

		Cointegrating equation deterministics: C Lc statistic	Prob.[a]
Model 1	*Fd, Blockchain*	0.43	<0.03
Model 2	*Fd, Blockchain, Gdpc, Fdi, Remit, Trade*	0.88	<0.02
Model 3	*Fd, Blockchain, Gdpc, Fdi, Remit, Trade,*	1.59	<0.01
	Goveff, Rulelaw		

[Hansen] (1992b) Lc(m2=4, k=0) p-Values, Where m2=m-p2 is the Number of Stochastic Trends in the Asymptotic Distribution.

Having confirmed the presence of long run correlations among the variables, these tables report the results of estimating the models using FM-OLS. The most important point is: The more progress both the countries make in the financial field and blockchain technology, the stronger the relationship between the two countries. Therefore, the more innovative blockchain technology gets in both countries, the more advanced their financial markets will be.

The correlation between financial development and GDP per capita (Gdpc) is strong and positive. The expansion of financial markets is positively and significantly correlated with the expansion of gross domestic product. As a whole, inflation hinders economic growth, but its impact is negligible (Boyd, Levine and Smith, 2001; Demirgüç-kunt and Detragiache, 2005) FDI produces notable and beneficial outcomes. It has been found that trade openness has substantial and beneficial consequences. In contrast to their substantial and beneficial impacts in China,

remittances have little and no positive impacts on the United States. While the rule of law is positively related to financial development in the US, it is not statistically significant. The only institutional component that has a substantial and positive link is government effectiveness. Financial development in China is positively but insignificantly correlated with the efficiency of government and adherence to legal principles.

- *Dependent Variable: Fd*

Table 4 Relationship between Blockchain Technology and Financial development in the US

		I		II		III
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
Blockchain	0.78	0.17	0.82	0.37	0.17	0.08
Gdpc			1.21	0.37	1.72	0.86
Gdpgrowth			0.02	0.01	0.05	0.01
Inflation			-0.04	0.08	-0.03	0.28
Fdi			0.13	0.03	0.12	0.05
Remit			0.07	0.06	0.79	0.46
Trade			0.38	0.15	0.06	0.02
Goveff					0.23	0.05
Rulelaw					0.42	0.17
R^2	0.74		0.97		0.97	
Adjusted R^2	0.73		0.96		0.96	

Table 5 Relationship between Blockchain Technology and Financial development in China

		I		II		III
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
Blockchain	0.37	0.13	0.23	0.09	0.03	0.01
Gdpc			1.27	0.59	0.23	0.09
Gdpgrowth			0.16	0.04	0.11	0.05
Inflation			-0.13	0.17	-0.53	0.44
Fdi			0.19	0.09	0.15	0.06
Remit			0.46	0.03	0.33	0.16
Trade			0.18	0.06	0.02	0.01
Goveff					0.51	1.92
Rulelaw					0.53	1.33
R^2	0.74		0.82		0.87	
Adjusted R^2	0.73		0.81		0.79	

The second table shows that the variables are cointegrated, which implies that there is a causal relationship. The "Toda-Yamamoto tests" are summarised in the table below. The empirical findings validate a one-way causal relationship between the two nations' financial development and blockchain technology. In other words, financial development does not cause blockchain technology, but blockchain technology does cause financial development. The results demonstrate that the two nations' banking sectors benefit from blockchain technology. (Evans, 2019).

Table 6 Toda – Yamamoto Causality Tests

Toda-Yamamoto Causality Tests

Direction of Causality	The US	China Blockchain
technology=>Financial development	9.71	6.99
Financial development=>Blockchain technology	2.09	0.67

VI. CONCLUSION

This research looked at how blockchain technology has affected economic progress in two nations: China and the US. Using state-of-the-art econometric methodologies, such as "FM-OLS" and "Toda-Yamamoto causality" techniques, the study proves that blockchain innovation has a favorable and substantial impact on the growth of financial markets in both nations. Based on the findings, it appears that blockchain technology has the potential to improve the efficiency, liquidity, and stability of financial markets. This is because it can decrease transaction costs, increase security, and promote transparency.

Financial development is impacted not only by blockchain's function, but also by macroeconomic factors including “GDP growth, GDP per capita, and foreign direct investment (FDI)”. While the rule of law is important, it is not as influential as the study suggests it is in promoting financial prosperity, especially in the United States.

In sum, the outcomes reveal the revolutionary potential of blockchain technology to improve operational efficiency and confidence in the financial sector, hence causing a revolution. Nevertheless, institutional, economic, and regulatory considerations must be carefully considered before blockchain adoption can occur. New developments in blockchain technology hold great promise for expanding its use in both established and developing economies, and the technology already can significantly alter global financial systems.

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