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Evolution of Blockchain Technology in the Financial Sector: An Empirical Analysis

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Abstract— This study investigated the impact of blockchain technology in the financial sector. 20 countries from the Sub SaharanAfrica for a time periodfrom 2011 to 2021 was used. The study employed component analysis to represent the financial development variable, and a Generalized Method of Moments (GMM) was used to evaluate the link between the dependent and independent variables, including blockchain technology and macroeconomic variables. The findings indicatedthat blockchain technology has positive and significant relationship with the financial development. This indicates that the existence of blockchain innovation promotes financial growth. The findings also specified that macroeconomic factors such as lagged financial development, GDP, GDP per capita, FDI, trade openness and Rule of Law have significant and positive relationship with financial development. The institutional variable, government effectiveness has an insignificant relationship.

Index terms— *Financial Development, Blockchain Technology, Component analysis*

I. Introduction

Several new technologies are developing in various areas of the global economy in the recent technological age. As a result, blockchain technology is one of the top main emerging technologies extensively used in financial institutions, with blockchain technology having a critical role in securing financial institutions' transactions. Blockchain technology is without any doubt the most significant invention to emerge from late 2008, with blockchain-based cryptocurrencies such as Bitcoin and Ethereum dominating the financial world. With the various applications of blockchain in various sectors, the financial services sector needed much more direction and regulated integration models before jumping on the new technology (Ali et al. 2020).

Blockchain is also a secure transaction record blockchain that is shared by both parties through a distributed network, capturing and preserving any transaction that occurs in the network and giving an irrevocable and auditable timeline of transactions (Feng et al., 2020 and Hardjono and Smith, 2019). By potentially providing a popular, ubiquitous ledger technology, blockchain could reduce the complexity produced in financial networks where multiple intermediaries use various technology platforms. The blockchain's hierarchical architecture (also known as the distributed database) may, in theory, remove the need for financial transaction verification intermediaries. The potential of streamlining facilities and/or removing superfluous intermediaries from the operation provides the ability to achieve significant efficiency gains (Hilary, 2018; Sanka et al. 2021).

According to Beth Shah, the head of Corporate Growth at blockchain start-up Digital Asset Holdings, there are numerous areas that can have a positive impact on distributed ledger technologies. If you can share infrastructure and record significant financial records on a replicated, protected transaction history primary record, you can avoid costly reconciliation processes by using separate but different versions of the same records. Distributed ledger technology has the potential to remove reconciliation, reduce error rates, and encourage quicker settling. In return, faster settlement means less danger in the financial system and reduced money requirements.

Businesses are interested in adopting blockchain technology because of the potential benefits, which include increased security, availability, credibility, cost savings, improved transparency and openness, and improved sustainability (Kouhizadeh et al., 2021). Blockchain technology has the potential to supplant traditional financial applications as well as other uses such as industry process development, transactions, health data sharing, self-propelled ownership, and voting (Woodside et al., 2017). Blockchain technology has the unique and distinct capability of enabling operations without the use of a centralized organization (Sadhya&Sadhya, 2018). Blockchain managers use variable-free controls to protect their anonymity by stopping tracking (Dorri et al., 2019).

1.1 Research Problem

Blockchain technology is thought to have transformed the way businesses operate, and we should be able to capitalize on its true value (Davis, 2011; Nakamoto, 2008). Not only can blockchain encourage the opportunities it will offer, but it also has the potential to add to an economy. A large number of businesses depend on financial middlemen such as banks, and their operations are likely to be disrupted. As a result, it is critical to maintain blockchain's continuing growth in the Sub-Saharan African economy.

1.2 Research Objectives

1) Expounding on the evolution of blockchain, focusing on the financial sector in different countries.

The research questions that related to this research objective are:

- To investigate the relationship between Blockchain Technology and financial development
- To investigate the benefits and drawbacks of blockchain technology in the financial sector.
- To investigate the impact of blockchain technology in the financial sector.

The rest of this paper is structured as follows. In Section 2, we describe the fundamentals of blockchain technology, the blockchain revolution, and blockchain applications in the financial sector. In Section 2, we explain the literature review including the benefits and challenges of blockchain, financial development and economic variables and empirical review, section 3 depicts the methodology of this study.Section 4present the findingsand section 5 outlines the conclusions.

II. Literature Review

2.1 Blockchain Technology

Blockchain systems have existed since late 1979, when previous authors proposed the main method for them (Ometov et al., 2020). According to Lumineau et al. (2021) the concept of a cryptographically positioned only chain of blocks; however, it was not until the October 2008 introduction of Bitcoin that the idea of a decentralized digital system received significant traction Nakamoto (2008) sent a document to a few encryption experts, explaining that Bitcoin was a cryptocurrency that allowed two parties to trade value tokens without disclosing any transaction details. (Dimitrova, 2019). Furthermore, on November 1, 2008, Nakamoto released news demonstrating the origins of Bitcoin and introducing people to the Blockchain (Yang et al., 2019)

As a consequence, Satoshi Nakamoto, the officially recognized inventor of Bitcoin and the fundamental blockchain knowledge, created Bitcoin as the first actual application of blockchain knowledge (Smith & Dhillon, 2017). Blockchain is a distributed ledger system that is autonomous, repeatable, and underpins many incremental and revolutionary breakthroughs. Blockchain technology is based on algorithmic blocks holding transaction information that are linked and verified in sequential order to create a network of records that are permanent, unchangeable, visible, and tamper-proof (Barenji et al., 2019).

Blockchain was defined as a distributed system by Zhang, Xue, and Liu (2019). Unlike a single node transaction cash book, blockchain allows for numerous nodes to keep data integration. Each blockchain node gets a copy of the freshly recorded transaction. The new transactions are combined into a single block, and the consensus process decides which server gets to transmit their block. Other servers decide whether or not each transaction in this block is genuine. The block following this one will relate to approved blocks. At the end of this procedure, each node will have a copy of the blockchain and will agree on the sequence in which the blocks should be handled (Shrestha et al., 2020).

2.2 Blockchain Evolution

Since 2008, blockchain has changed four phases, the first of which is cryptocurrencies, especially Bitcoin. The introduction of Bitcoin has raised the appeal of blockchain. The second period witnessed the introduction of monetary exchanges as well as smart contracts in mortgages, loans, and other monitory bonds, which are automated computer programs that run automatically. It has grown in the third period of digital society by improving the features of smart contracts. The fourth period is concerned with industrial decentralized ledger systems in a variety of sectors, including government, healthcare, supply management, education, energy, and banking. (Trivedi et al. 2021; Mukherjee et al. 2021). Blockchain technology has evolved from a framework for digital currencies to smart contracts to decentralized applications with high-speed and expandable decentralized storage and decentralised communication to Industry 4.0 infrastructure (Gorkhali 2022; Karnik et al. 2022; Li 2020; Li & Zhou, 2021; Sigov et al. 2022; Xu 2020)

2.3 Blockchain In Financial Sector

Blockchain has increased in popularity in the financial industry. The application of blockchain technology in finance for money transactions, cross-border payments, identity validation, contractual agreements, trade finance, insurance, smart contracts, bidding, and currency dealing has resulted in its rapid development. Western countries, such as the United States, Australia, Canada, South Korea, Russia, and Israel, have been encouraged to engage in blockchain-based application development (Zhang et al. 2020). Cryptocurrencies and their trading platforms, digital asset registries and administration, and cross-border transfers are among the most prominent blockchain uses in finance. Blockchain apps, according to Deloitte (2019), can be used to change financial processes such as "intercompany transfers, procure-to-pay, order-to-cash, refunds, guarantees, and trade financing."

2.3.1 Cryptocurrencies

Cryptocurrency is a digital payment system that doesn’t rely on banks to verify transactions. It’s a peer-to-peer system that can enable anyone anywhere to send and receive payments. Cryptocurrency payments exist purely as digital entries to an online database describing specific transactions. When you transfer cryptocurrency funds, the transactions are recorded in a public ledger. Cryptocurrency is stored in digital wallets. Cryptocurrency got its name from the use of encryption to verify transactions. This means advanced coding is involved in storing and transmitting cryptocurrency data between wallets and to public ledgers. The aim of encryption is to provide security and safety (Fisch 2019, Levasseur et al., 2021; Belitski and Boreiko, 2021).

2.3.2 Crowdfunding And Venture Capital

Initial Coin Offerings (ICOs) are one of the most significant technologies that define the financial markets' digital revolution. They consist of a new method of collecting capital for early-stage enterprises by releasing digital assets, so they can be described as a blockchain-based option to more traditional financing sources for start-ups (e.g., business angels, venture capital, private equity, or crowdfunding). The use of tokens, the publishing of a white paper, and the fact that they are decentralized are the key features that differentiate ICOs from more traditional financing methods (Fisch et al., 2020; Howell et al., 2020; Schückes and Gutmann, 2021; Zhang et al., 2021)

2.3.3 Payments

Blockchain-based systems have the potential to significantly reduce transaction costs and transit time for international transactions (Swan, 2015). This is mainly due to the fact that the infrastructure used in international operations is outdated and disorganized (PwC, 2017). The financial industry is searching for answers to problems such as identity verification, high transaction costs, slow transaction processing, cross-border transactions, and asset management. The world's major financial sectors are exploring how to fix problems with blockchain technology, which has the ability to provide low-cost and high-speed real-time monitoring features. Some banking institutions are researching how to use blockchain to improve application security (Gui and Lang, 2016; Tandon et al. 2021; Gan et al. 2021; Kremenova, 2019).

Smart Contract

A rising utilisation of blockchain is smart contract (additionally alluded to as blockchain contracts, digital contract, self-executing agreements or smart property). With the announcement of cryptocurrencies, the idea of smart contracts began to have more significance and feasibility since they give a safe way of proving performance in decentralised structure. At the end of the day, a smart contract digitally encourages and implements transactions. For instance, agreements such as receiving or transferring money and products could be converted to codes, stored, replicated and regulated by the network of computers. Thus, a smart contract allows two anonymous people to conduct deals with one another without the need for an intermediary (Fairfield, 2014; Christidis and Devetsikiotis, 2016 and Kosba et al., 2016). As a result, blockchain technology enables direct safe trading and transactions without the need for a record keeper or an intermediary (Underwood, 2016; Hsiao, 2017 and Klaus, 2017, Zhang et al., 2021).

Trade Finance

In its most fundamental form, trade financing is an extensive illustration of multistage collateral management. As a result, most areas that require paper-intensive processes and multiple participants and are susceptible to errors and theft may benefit from DLT. According to Ketterer (2017), digitizing records and using an open distributed database that all parties can access will improve dependability and consistency, keep collateral tracking, reduce the risk of fraud, make operating resources more reliable, and lower costs. Banks play an important part in providing trade funding because they take liability on behalf of the exporter for goods security and the importer for goods payment. The application of trade finance Blockchain provides banks with greater insight into what they finance, makes it simpler for banks to ensure compliance with all laws, both governmental and otherwise, and gives banks greater control over their image as a stable investor (Rundell, 2018). In other terms, blockchain is said to enhance trade finance encryption and cost efficiency (Guo and Liang, 2016; McKinsey, 2016)

2.4 Benefits And Drawbacks Of Blockchain Technology In Financial Sector

2.4.1 Benefits

Exploring Blockchain technology's potential in the banking and finance sectors Distribution Ledger Technology, such as Bitcoin and other cryptocurrencies, provide financial organizations a variety of operational benefits, including enhanced security, cost savings, and immutability, among other things (Mendling et al., 2018). According to Park and Park (2017), keeping data on a blockchain is safer than storing data in a single database since database hacks are less prevalent than blockchain attacks. As a result, when blockchain technology is used in an area that demands information disclosures, customers benefit from data transparency. As a result, blockchain technology has the potential to be used in the financial services sector. Its wide range of uses is expected to increase in the near future. Cost reduction will always be a crucial point to consider when implementing blockchain technology (Hassani et al., 2018). Ngo (2017) and Zignuts (2020) found the potential application of Blockchain technology in significantly lowering infrastructure expenses, resulting in financial

savings in a given financial year. Hillsberg (2018) and Doshi (2021) praised Blockchain technology for its substantial role in lowering agency costs by eliminating the need for intermediaries in financial transactions.

Blockchain is a distributed database/ledger shared among peers in a peer-to-peer network that contains time-stamped transactions that are secure by public-key cryptography and verifiable by the network community (Hassani et al., 2018 and Ngo 2017) There is no regulatory authority in a distributed ledger, which is a consensus of duplicated and synchronized digital data shared across various places, countries, or organizations (Mendling et al., 2018). As a result, blockchain permits the creation of a system in which any online transaction involving digital assets may be validated at any moment without jeopardizing the privacy of the digital assets or the persons involved (Park and Park, 2017).

Blockchain lowers transaction costs, saves time, and eliminates conflict (Zignuts (2020). Smart contracts, for example, can use blockchain to replace lawyers and banks involved in asset sales. The operations require time-consuming processes, complex procedures, high costs, and risk that might be reduced by the use of blockchain technology. Blockchain streamlines operations through automation and decentralization Doshi (2021). As smart contracts, digital assets such as contracts, shares, and stock options may be traded. Blockchain lowers transaction costs while also facilitating them. Since it allows speedier exchanges, security, trust, risk reduction, and transparency, blockchain has enormous promise for the financial sector (Beck and Müller-Bloch, 2017).

Wang et al. (2019) describe Blockchain as a revolutionary method that supports transparency in data storage. It is an immutable ledger that contributes to the development of trust in the data it contains. According to Queiroz and Wamba (2019), one of the primary reasons people want to use blockchain is the high level of transparency it provides to its users. They also claimed that Blockchain allows all network participants to stay up to date with useful info while conducting deals, which leads to increased trust. According to Clohessy and Acton (2019), the primary drivers of blockchain technology usage are cost reduction, increased data security, organizational and transactional efficiency, and openness in transactional procedures. According to Reinhardt, Oliveira, and Ring (2020), the features of blockchain technology will improve the efficiency and working quality of financial organizations. Berentsen and Schar (2018) used Blockchain to illustrate the openness of cryptocurrency transactions.

2.4.2challenges Associated With Blockchain

Blockchain opens up new possibilities in a many different sectors however, there are risks and difficulties associated with effective blockchain implementation. Researchers have found a variety of obstacles connected with blockchain in the banking and financial industry, including technological, organizational, and user-related, social, and regulatory issues (Barcelo, 2014; Bias et al. 2019; Lai, 2018; Marr,2018; Staples, 2017). Limited space, poor network performance, a dearth of universal protocols and standardizations, and high energy consumption are all technical obstacles (Anand and Hassan,2019). Some problems, such as scalability, security, privacy, and latency, can be addressed, but robust answers are still hard to find (Chang et al. 2020;)

- **Scalability**

The Blockchain grows in size as the number of operations increases (Zheng et al., 2018). According to Marr (2018), Blockchain transactions require time to execute due to their complexity, encryption, and distributed character. Ethereum is a well-known open-source, public, Blockchain-based processing platform, and Ether is also produced by the Ethereum platform (Biais et al., 2019). According to Chen et al. (2018), Ethereum hosts over one million smart contracts. Thousands of entrepreneurs and coders are currently developing new initiatives and start-ups on the Etherlane platform (Jackson, 2018; Biais et al., 2019).

- **Security**

Furthermore, the financial sector's difficulties in applying blockchain technology are defined as standardization and cost requirements, currency stability, high security, laws and legislations, and scalability (Hassani, Huang

and Silva, 2018). According to Zheng et al. (2018), Blockchain is vulnerable to collusive self-centered miner attacks, and many other attacks have demonstrated that Blockchain is not secure(Price, 2018; Werbach, 2018)

- **Privacy Leakage**

To prevent information leakage, the Blockchain can generate many addresses instead of actual identities for users, which is thought to be quite secure for users. However, because all information on transactions and funds is visible to the public, the Blockchain cannot avoid transactional information leakage (Meiklejohn et al., 2013; Kosba et al., 2016). Many examples illustrated these phenomena, such as Barcelo (2014), who demonstrated how his Bitcoin transaction can represent the user's profiles. The issue of data leakage is massive, threatening users' personal security. Despite the fact that numerous methods have been suggested to enhance Blockchain anonymity, the issue has yet to be adequately resolved (Cong and He, 2019).

2.5 Conceptual Framework

Venkatesh, Morris, Davis, and Davis proposed the Unified Theory of Adoption and Use of Technology (UTAUT) (2003). The theory was founded on eight well-known models in the field of information technology, including the Theory of Reasoned Action (Fishbein and Ajzen, 1975), the Social Cognitive Theory (Bandura, 1986), the Technology Acceptance Model (Davis, 1989), the Theory of Planned Behavior (Ajzen, 1991), the Model of PC Utilization (Thompson, Higgins, and Howell, 1991), the Motivational Model (Davis, Bagozzi, and Warshaw (Moore and Benbasat, 1991; Rogers, 1995). The UTAUT describes user intentions and subsequent usage behavior when using an information system. Some important categories include effort expectancy and performance expectancy as predictors of behavioral intentions to use information technology, while facilitating conditions have a direct effect on usage behavior (Evans, 2018a; Adeola and Evans, 2019). Venkatesh et al. (2003) observed that the UTAUT account for a significant 70% of the variance in behavioral intention to use and approximately 50% of the variance in real use. More subsequent studies have found significant support for the hypothesis as well (e.g., Williams, Rana and Dwivedi, 2015; Celik, 2016; El-Masri and Tarhini, 2017; Howard, Restrepo and Chang, 2017; Maruping, Bala, Venkatesh and Brown, 2017). The Diffusion Hypothesis (Moore and Benbasat, 1991; Rogers, 1995).

In connection to the UTAUT, blockchain technology has effort expectancy, performance expectancy, and facilitating conditions in the financial sector. Blockchain technology enables direct and safe trading and deals without the need for a record keeper or an intermediary. By automating and decentralizing financial processes, blockchain streamlines them. It facilitates quicker trades, as well as security, confidence, risk reduction, and openness. As a result, all aspects of financial markets can profit from blockchain's trustless and rapid transaction system (Beck and Müller-Bloch, 2017). Because blockchain technology supports the correct functioning of the financial sector, it is anticipated to have a significant effect on financial sector.

The positive impacts of a well-developed financial sector on economic growth and development have prompted a number of researches into the factors that contribute to a well-developed financial sector (e.g., Beck and Maimbo, 2012; Huang, 2011; Takyi and Obeng, 2013; Evans, 2015; Evans and Adeoye, 2016; Adeola and Evans, 2017). Political economy, institutions, and other related variables have been recognized as important factors for the financial system based on theoretical and empirical research (Voghouei, Azali and Jamali, 2011). The institutional conditions are one of the most researched drivers of a well-developed financial system. Many studies have shown that financial systems are stronger when organizations are present to safeguard and meet the requirements of investors (Demirgüç-Kunt and Levine, 2008; Evans, 2018b).

2.6 Financial Development And Macroeconomic Variables

The importance of the relationship between financial development and economic growth has received considerable attention in both growth and financial literature. To investigate the relationships between the two, writers combined endogenous growth theory and financial system economics. According to Afonso and Blanco-Arana (2018) and Ahmad et al. (2018), the financial sector has a substantial impact on growth through

improving the quality and quantity of financial sector. This finding suggested that, the degree of financial development has a vital impact in economic growth Durusu-Ciftci et al., 2016; Mhadhbi et al., 2020; Sharma, 2020; Bist, 2018). Higher inflation lowers real returns, increases likely debtors, and decreases likely lenders. According to some research, inflation causes financial problems. Almalki, Ozturk, and Karagoz (2015) (2012.). Takyi and Obeng (2013) demonstrated that inflation has both short and long-run negative and statistically significant impacts on financial growth. Ayadi et al. (2015) discovered that inflation stifles financial growth. Trade openness is needed to boost financial development because opening a country's borders to trade raises international competition in the local market. Foreign competition will lower incumbent profits and increase incumbent expenditure requirements to contend with foreign products (Hauner, Prati&Bircan, 2013). The sourcing and use of funds by these incumbents will stimulate the development of the financial sector, allowing other promising start-up firms to readily obtain funds for growth, resulting in the broader development of the financial sector (Abeka et al., 2021) and Government Effectiveness measures views of the character of public and civil service, policy development and execution quality, and the degree of freedom from political pressures.

2.7 Empirical Review

Adusei (2013) examined the effect of financial development in Africa using a dynamic GMM model for 24 African countries from 1981 to 2010 and observed a positive relationship between financial development and economic growth. They also backed the findings of bidirectional causality between finance development and economic growth using pairwise granger causality testing.

Biplab and Inder (2019) used the GMM Model to examine the impact of financial development on economic growth in the BRICS countries from 1993 to 2014. The dynamic one-step SYS-GMM estimates show that, in the presence of a turnover ratio, all of the chosen banking development variables, such as the number of financial institutions, CDR, and CPS, favorably influence economic growth.

Wen, J. et al. (2021) used the System GMM estimation method to examine the effect of financial development on economic indicators such as economic growth, inflation, and employment for a panel of 120 countries from 1997 to 2017. Private sector credit, liquid liabilities, money and quasi money, and bank credit are four different indicators of financial development. The findings revealed that financial development has a negative effect on economic growth. Furthermore, financial development has been found to be favorably related to inflation and employment growth.

Abeka et al. (2021) investigated the effect of financial development on economic variables in Sub-Saharan Africa. Their research was founded on empirical data collected from Sub-Saharan African countries from 1996 to 2017. To determine the models, the system generalised method of moment was used. According to their results, trade openness has a positive effect on financial development, while government effectiveness has a negative impact.

Methodology

Primary and secondary data will be used to examine the development of Blockchain Technology in the financial services sector in Sub-Saharan Africa. Such information will be gathered from the World Bank's database of global growth metrics. A panel data analysis will be used in this research to provide a clear image of the development of blockchain and its implications for the financial industry as a whole. The research will be conducted over a ten-year span, from 2011 to 2021. This research will consider 20 countries.

3.1 Model Speccification

$$FDit = \alpha i + \beta_1 Blockchain_{it} + \beta_2 GDPi_t + \beta_3 GDPPC_{it} + \beta_4 INF_{it} + \beta_5 TRADE_{it} + \beta_6 FDI_{it} + \beta_7 GOVT_{it} + \beta_8 LAW_{it} + \epsilon it$$

Where FD is financial development, Blockchain is Blockchain technology, GDP is the Growth Domestic Product; GDPPC is the Growth Domestic Product per Capita; INF is the inflation rate; Trade is trade Openness;

FDI is the foreign direct investment and GOVT is government effectiveness.LAW Rule of Law. ε denotes the error term. The subscript i is the country and t is the time period.

In order to form a composite index of the financial development, broad money, bank credit and financial Sector credit are combined through principal component analysis (Dogan andTurkekul, Olufemi and Eric (2022))

The number of Bitcoin users is used as the proxy for blockchain. The number of Bitcoin users are defined as persons who accessed Bitcoins in the last 24 hours. It is used as a measure of blockchain in the same manner that number of internet users is used to measure internet usage in the literature (Vu, 2011; Evans and Adeoye, 2016; Evans, 2018c). Bitcoin is a decentralized peer-to-peer digital currency and is the most popular example using blockchain technology (Crosby et al, 2016).

The macroeconomic variables such as GDP per capita, GDP growth, inflation, and FDI and trade openness are important factors for financial development.

Analysis

To estimate the model, the fixed effect estimation approach was used first to account for country heterogeneity. This technique, however, is based on the strong assumption of exogeneity and cannot address the endogeneity problem that is widespread in empirical models. Endogeneity is frequently caused by simultaneity, measurement errors, and omitted variable bias (Roberts and Whited, 2013). The generalized method of moments (GMM) estimate approach was used to tackle this potential endogeneity concern. By including the lag dependent variable on the right side of the equation, the difficulty can be reduced. This will not only alleviate the problem of serial correlation and heteroskedasticity. With the inclusion of the lagged FD as an independent variable, the model specification has changed to a dynamic panel, and the fixed effect model has been eliminated.

4.1 Results From Generalised Method Of Moments Estimation

The dynamic model equation is now as follows:

$$FD_{it} = \alpha_i + \beta_1 FD_{t-1} + \beta_2 Blockchain_{it} + \beta_3 GDP_{it} + \beta 4 GDPPC_{it} + \beta_5 INF_{it} + \beta_6 TRADE_{it} + \beta_7 FDI_{it} + \beta_8 GOVT_{it} + \beta_9 LAW_{it} + \epsilon_{it}$$

It should be noted:

1. In this study, the system GMM technique in dynamic panel data estimation was used because it is more efficient than the difference GMM since it takes into consideration two moment conditions - the model in levels and the differenced equation
2. As well, the GMM-type instruments are at lag 2, but the exogenous instruments are all at first difference.

	GMM first step	
Variables	**Coefficient**	**Sig.**
β_0	3.867	0.072
LFD	0.355	0.092*
Blockchain	0.355	0.010***
GDP	0.871	0.051**
GDPPC	1.970	0.048**
INF	-0.792	0.021**

TRADE	0.185	0.075*
FDI	0.152	0.039**
GOVT	0.506	0.921
LAW	0.420	0.081*
	AR (1) (P-value) = 0.660 AR (2) (P-value) = 0.695 Sargan test (P-value) = 0.944	

*** 1% level of significance ** 5% level of significance * 10% level of significance

Source: Author's Computed

Gmm 1st Step Test:

There is no association between the residuals and the instrument used because the p-value for the Sargan test is 0.994. Since the P-values of AR (1) (0.660) and AR (2) (0.695) from the Arellano-Bond test are higher than 0.05, it can be inferred that there is no first order and second order autocorrelation in the model, confirming the validity used. According to the GMM test, the first lag of Financial Development has a positive (coefficient: 0.355) and substantial (p-value: 0.092) association. It is determined that the FD for the current year is dependent on the FD for prior years.

According to the table above, there is a significant and positive connection between blockchain technology and financial development, which means that the higher the levels of blockchain innovation in these countries, the more developed the financial sector. According to studies such as Beck et al (2016), Broby and Paul (2017), and Hofmann et al (2018), the existence of blockchain innovation can spur financial growth. As a result, blockchain innovation is a major positive factor for the proper functioning of the financial industry. This result is aligned with the findings of Buitenhek (2016), who demonstrated that blockchain has the potential to have a major impact on the financial sector in terms of payments and identification services, transactions, and smart contracts. Broby and Paul (2017) also demonstrated that blockchain has the ability to make processes cheaper, more efficient, and secure. Hofmann et al. (2018) demonstrated that blockchain allows faster and less expensive payment methods. Catalini and Gans (2016) demonstrated that blockchain enables costless verification, reduces the costs of auditing transaction information, and facilitates the emergence of new markets.

Furthermore, the research found that macroeconomic factors are essential for countries' financial development. GDP per capita, for example, has a positive and significant relationship with financial development, implying that greater GDP per capita levels are congruent with a well-developed financial sector. Likewise, the financial sector has a significant and positive relationship with GDP growth, FDI, and trade openness. Increased FDI will boost financial growth by facilitating direct access to external funding and tangentially supporting total economic activity. Governments who wish to help their companies internationalize and attract foreign multinational enterprises (MNEs) should consider measures to enhance or keep access to external finance during credit crises. Yeh and An (2021). Furthermore, international company investments typically generate employment for residents of the host country.

The increase of trade openness requires the monitoring of a wide range of products and commodities. In this regard, in today's economic conditions, the bureaucratic structure of governments should evaluate a large number of data and, based on market conditions, take advantage of foreign marketplaces. As a result, the government bureaucracy is anticipated to be in a structure that can use big data as a consequence of new technological developments and that can bring the findings of these data analyses into reality very rapidly.

These results are congruent with previous research (Beck and Maimbo, 2012; Huang, 2011; Voghouei et al, 2011; Takyi and Obeng, 2013).

An increase of 1 unit in inflation will decrease the financial development by 0.792 unit.A high inflation rate reduces the efficiency of financial sector performance. Therefore, with increased inflation rates, overall prices continue to rise, causing individuals to spend more money on fewer goods and services. Nevertheless, it reduces deposits to financial institutions and distorts production and investment, resulting in poorer financial development and a low loan provision tendency. This finding is consistent with the findings of other Almalki. (2015), Ozturk, and Karagoz (2012.)

Conclusion

This study investigated the impact of blockchain technology in the financial sector in the sub Saharan Africa over a time period of 2010 to 2020. The principal component analysis was used to construct the financial development indicatorsand the Generalized Method of Moments (GMM) estimation was employed to evaluate the link between the dependent and independent variables, including blockchain technology and macroeconomic variables. This research study has given more transparency in understanding this bond. The main objective was to find out whether blockchain technology had any impact on the financial sector and based upon the findings a positive and significant relationship between blockchain technology and the financial development. The findings also indicate that macroeconomic factors such as lagged financial development, GDP, GDP per capita, FDI and trade openness have significant and positive relationship with financial development. The studies are in line with the studies of (Čižo, Lavrinenko, &Ignatjeva, 2020; Mhadhbi et al., 2020; Sharma, 2020). Nevertheles Inflation and government effectiveness has failed to be in line with the expected outcome.

Blockchain technology is still relatively new, but it is getting popular in financial sector. However, it is clear from this research that technology has the ability to be empowering the financial sector. Since the technology is still in its early stages, a better grasp of how the potentials can be achieved in financial industry is required. More research is required to examine how blockchain technology can be applied to the real-world financial challenges that people experience, particularly in various political and cultural contexts. One blockchain may not be suitable for all applications. A strong beginning point would be to conduct additional study into the degree to which developing-country financial markets are adopting blockchain. In this setting, the possibility for blockchain use in promoting financial inclusion may be significant.

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