# Study on the role of artificial intelligence and block chain in segments of the financial sector

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**Abstract:** Researchers have aimed at the question "Whether the demand for a growing financial sector is created by economic development that influences economic growth" for centuries. An economy section made up of firms and institutions that provide Financial Services (FS) to commercial and retail customers is termed the financial sector. A broad range of industries,namely banks, investment companies, insurance companies, and real estate firms is encompassed in this sector. The technology called Artificial Intelligence (AI) will transform the financial sector; thus, the chance for improved and more tailor-made services, cost reduction, and the enhancement of novel business systems will be offered. Block Chain (BC) is a technology that generates an impact in the financial industry by facilitating faster payments at lower fees than banks. With augmented security and efficiency, the BC could digitize the entire trade finance lifecycle. Thus, the financial sector, decentralized finance, the role of AI in enormous segments of decentralized finance, and the role of BC in various segments of Decentralized Finance (DeFI) are elucidated here. The AI application cases in the FSs industry are analysed in this paper from 2020 and the BC technologies in the financial sector (USD million) at a compound annual growth rate (CAGR) from 2015 to 2024.

**Keywords: 1.**Financial sector, 2.Artificial intelligence, 3.Blockchain, 4.Investment, 5. Banking

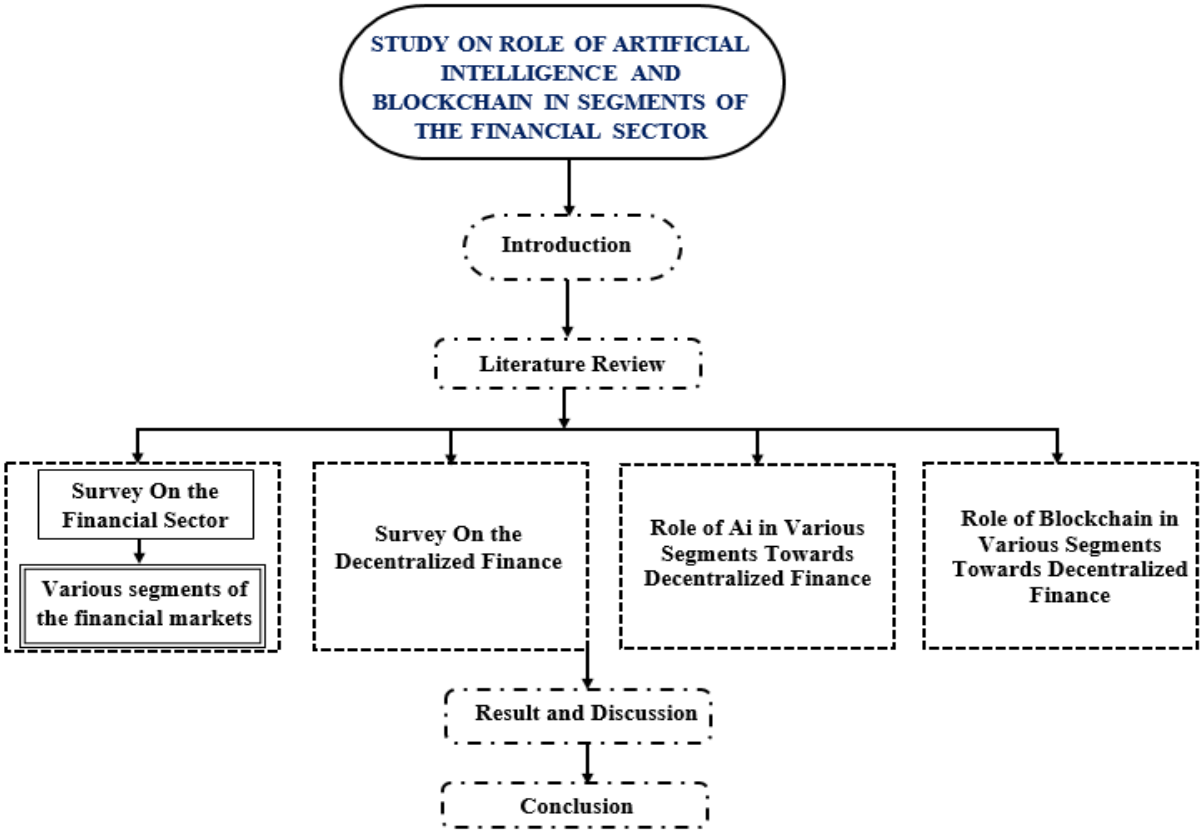


**Figure 1: Flowchart for the paper**

## 1. Introduction

In enabling growth and supporting poverty reduction, technologies have attained the arrival of a consensus on the key significance of financial sector enhancement in the past '2' decades. The financial sector engenders huge data namely customer data, logs as of financial products, and transaction data, which could be deployed for supporting decision-making, and external data, including social media data together with data as of websites [1]. In 1992, the financial sector's current reform was started grounded on the suggestions of the Committee on Financial System. Primarily, financial sector reforms were done as part of overall economic reform. Moreover, financial sector reforms were undertaken early in the reform cycle while the reform process itself commenced undertook reform in India after several developing countries [2]. In the end, regarding the prevailing circumstances, those were built orderly by a higher-level committee [3]. The banking sector offered several indicators of financial development, especially private credit, which was considered as outcome variables [4]. Globally, to strengthen financial systems and minimize the potential for systemic risk events, the overall effect is broadly positive [5]. The promotion of digital banking along with financial inclusion to the population's previously unbanked or else underbanked segments is one significant consequence of such reforms [6]. In making the finance sector segments, the technologies like AI and BC play a key role [7]. In the finance sector, AI is deployed by detecting and assessing loan risks in a better way [7]. With the confidence of the transaction being secure and reliable, the transfer of currency was enabled by the BC [8]. The application of AI and BC in the finance sector is elucidated in figure 2.

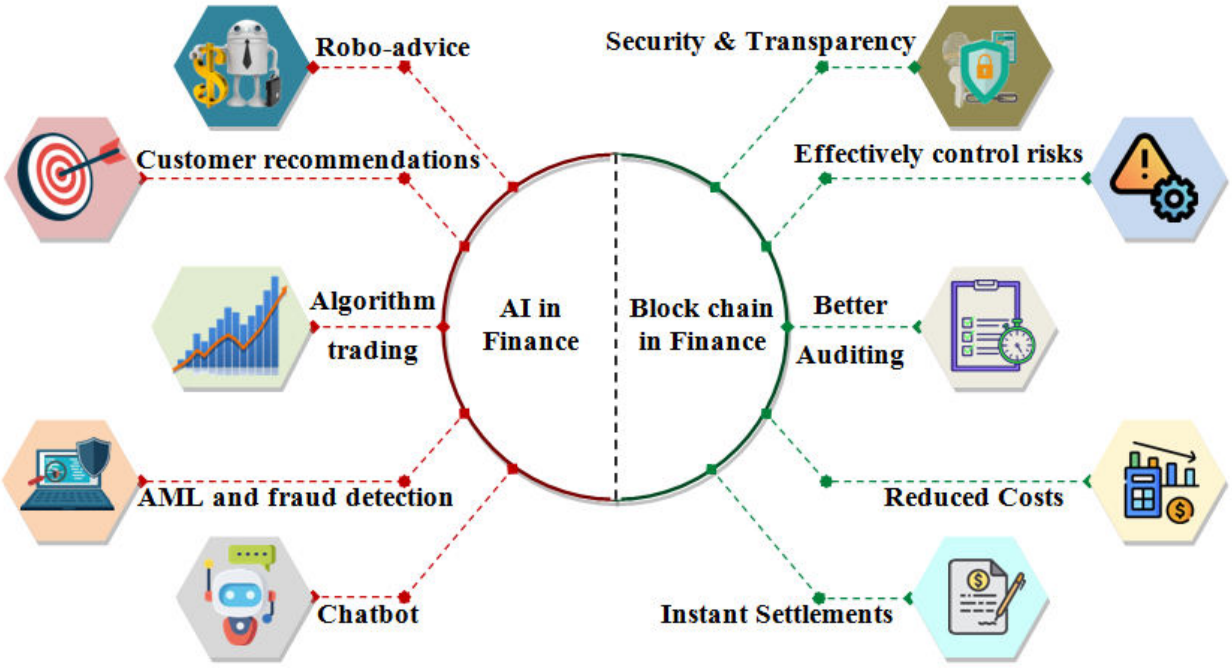


**Figure 2: Application of AI and BCtechnology in the finance sector**

BCand AI have the potential to transform how the FSs industry engages with the business and stakeholder community [9].There is some of the following assistance from both (AI and BC) for the finance sector [10]:

- BCassists to open an account for the individual
- AI plays the role of relationship manager
- BChelps during the currency risk
- AI assists to builda credit history
- Payments through BCdon't want to go via the national payments; thus, there is no necessity for physical branches
- AI could be deployed in the financial literacy attempts

A decentralized technology, which operates with open source, is termed the BC. A highly centralized service, which operates with private data, is termed AI [11]. However, the problem with using both in the finance sector was that the cost of AI will be more expensive, and in BC, it will be hard to correct any mistake or make any necessary adjustments [12, 13].

The survey paper is explained as follows: the survey on the role of AI and BC technology in different segments of the financial sector is elucidated in section 2; the evaluation is signified in section 3; the paper is concluded in section 4.

## 2. Literature Review

The financial industry landscape was modified by AI and BC. When analogized to humans, data could be processed exponentially by AI. For extracting more insights, automating repetitive tasks, and accelerating innovation, financial institutions were permitted for leveraging huge amounts of data. The survey on the financial sector is elucidated in section 2.1; the survey on DeFI is delineated in section 2.2; the role of AI in various segments towards DeFI is expounded in section 2.3; the role of BC technology towards DeFI is delineated in section 2.4.

### 2.1. Survey on the Financial Sector

An economy section that comprises firms along with institutions, which offer FSs to commercial and retail customers is termed the financial sector [14, 15]. In economic functioning, a key role is played by the financial sector via intermediation. Funda will be taken from savers if the financial sector sits betwixt savers and borrowers [16].

**Peterson, et al. [17]** elucidated thereview on financial inclusion research globally.Due to the process, assumptions, techniques, along with other unobservable criteria deployed for detecting the excluded members in the sample size, financial inclusion research were frequently complicated. As per the findings, by (A) financial innovation, (B) poverty levels, (C) financial sector stability, (D) economic state, (E) financial literacy, along with(F) regulatory systems, the financial inclusion effects were influenced.

**Md. Morshadul, et al. [18]** exploredChina's inclusive finance via digital finance services. In endorsing China's inclusive finance, a theoretical discussion was significant on digital finance services. As per the findings, in reducing transaction costs, augmenting the efficacy of risk-centric pricing together with management, minimizing information asymmetry, elaborating the sets of possible transactions, along with augmenting the institutions' transparency, a key role is played by digital finance services. However, the initiatives along with strategies weren't so scattered.

**Karolina, et al. [19]** elucidated thefinancial sector taxation. As per the European Commission, financial transaction tax is the suggested technique meant for European governments to implement in the financial systems. As per the outcomes, in Hungary, commercial banks favorfor rebuilding the balance or else shift assets amongstdiverse locations or else entities for minimizing the bank levy. Nevertheless, the financial sector's taxation wasn't a completely fresh concept.

**Esmael, et al. [20]** delineated thefinancial sectors' Financial Distress (FD) situation in Ethiopia. Detecting the financial sectors' determinants, opportunities, challenges, along withthe limitations of FD in Ethiopia was the goal. As per the regression results, (A) profitability, (B) firm size, (C) leverage, together with(D) company age was negatively associated withFD, which has a robust negative impact on financial distress. But, the sector can't be secured as of FD; also, has faced several issues.

**Majdi, et al. [21]** examined thefinancial sector enhancement, external debt, along with turkey's renewable Energy Consumption (EC). For analyzing the coefficients amongst the chosen variables, ARDL (bootstrap) testing system was deployed. As per the results as of the ARDL calculations, a positive relationship betwixt real income along with renewable EC in Turkey was depicted. Yet, the chosen data might be attributed to that a few data weren'tpresent after 2016.

**Svitlana, et al. [22]** surveyed innovation management as the fundamental of the financial sector's digitalization trends along with security.Substantiating the requirement for the enhancement of financial sector

digitalization, digitalization together with security trends evaluation, and identifying areas for more management of financial products and services were the goal. There was a lack of standardization of environmental, social, and corporate governance (ESG) investment practices.

### 2.1.1. Various segments of the financial markets

The stock market, the bond market, forex, commodities, along with the real estate market, among several others, issome instances of Financial Markets (FM) together with their roles [23].(A) Capital, (B) money, (C) primary vs. secondary, along with(D) listed vs. OTC markets were the divisions of FMs [24]. The list of several segments of FMs with their findings and disadvantages are elucidated in table 1.

**Table 1: List of various segments of FMs with their findings and limitations**

| Author Name | Segments | Findings | Limitations |
|---|---|---|---|
| **Hana Anis, et al. [25]** | Capital market | As per the outcomes, betwixt the growth rate along with the debt market depicted by credit distributions to the government along with credit allocations to the private sector, there was a considerable relationship and statistical causality. | Any statistical relation was not detected betwixt the bond market and GDP. |
| **GjergjiCici, et al. [26]** | Investment | As per the outcomes from the reported regressions, tenure was positively associated with the experience portfolio's performance. | Outcomes did not support literacy in the hypothesis |
| **Lei Pan, et al. [27]** | Stock market | As per the findings, a long-run negative relation was available in the Shanghai A-share market with the real sector economy; nevertheless, the impact's magnitude was tiny and could be ignored. | The relation betwixt the stock market and the real economy wasn'tevaluated. |
| **Katarína, et al. [28]** | Investment | As per the optimistic sign of $PRO_{2010,}$ the availability of financing limitation was depicted. The degree of financing limitations varies across companies, which includes diverse features. | The empirical literature has detected it challenging to predict the channel |

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|---|---|---|---|
| **Sepideh, et al. [29]** | Banking and Insurance | As per the outcomes, when the operations fused with the offered quality of the services, enhanced insights were acquired; also, the bank's profitability was proven best instead separately. | Without resorting to quantitative techniques, it was tedious for conducting a usual review. |
| **Charles, et al. [30]** | Stock market | As per the outcomes, GFCF, LEGFRWK, INF, CRPINDX, and RINTR attained 23% of market capitalization forecast error in the $10^{th}$ quarter of the $10^{th}$ period, which depicted a weak long-run effect. | Owing to macroeconomic instability, volatility, and arbitrariness, long-run economic growth were not caused by stock market. |

**Jacek, et al. [31]**elucidated theinformation and communication technologies (ICTs) on the Over The Counter (OTC) in enterprises in European Union.Experimentation was done on the usage of ICTs by those companies. As per the outcomes, the market was characterized by a comparatively elevated shares turnover (EUR 1047 million), while low liquidity (2%). However, since it could be unpredictable with the complete system's intervening purpose, this system was not suitable for networking.

**Liqing, et al. [32]**expounded on thefinancial sector opening along with financial constraints as an empirical study centered on China's experiences. For measuring china's firm-level financial limitations, 4 indices were estimated centered on listed firms' panel dataas of 2010 to 2015. As per the outcomes, the interaction term's every coefficientwas positive and significant. A company with much collateral couldease its financial constraints with the financial sector opening.

**Fernando, et al. [33]**elucidated (A)investor size, (B) liquidity, along with(C) prime money market fund stress. The above outcomes (Box A) were quantified by the panel regression analysis. As per evaluation, funds with greater investors had 1.7% advanced daily outflows, which were 26% superior cumulative run outflows over the stress period. Moreover, for tuning of 0.8% higher daily outflows, small investors couldremoveconvincinglyas of lower-liquidity funds.

**Dev Shah, et al. [34]**detected the impacts ofnews sentiments on the stock market. To retrieve thorough intraday (thirty-minute gap) pricing data for every stock, Investing.com[2] was wielded as the source. In detectingeveryday stock movement direction, the sentiment analysis achieved 70.59% accuracy. There was dictionary enhancement leveraging a fine-exhibited lexicon system, which might be scalable as domain-specific sentiment lexicon can't be scaled manually.

**Fenghua, et al. [35]**explained theasymmetric relation betwixt the Carbon Emission Trading Market (CETM) along with the stock market from the evidence of china. For studying asymmetric relationships, NARDL was a well-known technique. As per the outcomes, the price positive change effects are stronger when analogized to the negative change effects. Moreover, for the overall stock market and some sector stock markets, the limitation was the considerable long-run asymmetric effects of the CETM.

### 2.2. Survey on the Decentralized Finance

A system powered by BC along with cryptocurrency technology generating a substitute to the prevailing financial system is termed DeFI[36, 37]. By constructing a whole digital alternative to Wall Street, consumes the fundamentalevidence of bitcoin digital money; in addition, elaborates on it; however, devoid ofevery related cost (think (A) office towers, (B) trading floors, and (C) banker salaries) [38, 39].

**Kaihua, et al. [40]** analogizedcentralized (CeFI) to decentralized (DeFI) finance For differentiating betwixt a CeFi and a DeFi service, a structured technique was offered. As per the results, particular DeFi assets like USDC or USDT stablecoins didn't purposely categorize as DeFi assets; in addition, might expose the intertwined DeFi protocols' economic security. Nevertheless, in constructing resilient, user-friendly, and efficient financial ecosystems, there were a few mistakes.

**Oksana, et al. [41]** examined the effectof decentralization on regional development financial support. Engendering recommendations to enhance the regions' financial support was the goal. For recognizing the asymmetries of regional development, the cluster was performed regarding financial capacity. Similarly, local budget revenues' volume relies on a huge extent (75%) on the 1st component's indicators; while, the 2ndone had a small (13%) impact on it.

**Viktorija, et al. [42]**elucidated theDeFI applications and their total value locked. Providing the (A) opportunities, (B) merits, and demerits for the 12 famous DeFI applications was the aim. As per the outcomes, in the Uniswapcryptocurrency exchange, a huge amount of funds was invested at the beginning of October 2020. The merits weren't adequate to deploy DeFi solutions hugely.

**Andrei, et al. [43]** delineated thetransitions along with concepts within the DeFI space. Enhancing a more open together witha transparent financial system for providing fresh financial products was the goal. As per the evaluation, by employing DeFi for unlocking capital, enterprising DeFi users have been augmenting their COMP yield that is "yield farming"; in addition, lending/borrowing on the compound.

**Peterson, et al. [44]** described theDeFI and enhancements globally. Regarding DeFI, a conceptual background was developed. As per the findings, several advantages like (A) lengthening financial inclusion, (B) reassuring permission-less innovation, (C) removing the requirement for intermediaries, (D) guaranteeing the transaction immutability, (E) censorship resistance, together with (F) making cross-border transactions low-cost were presented by the DeFI.

**Johannes, et al. [45]** developed the fundamentalof the DeFI finance sector by deploying diverse technologies.For potential stakeholders, the key categories and utilization of cases were analyzed with the detection of 'four'key risk groups for DeFI applications. As per the evaluation, to transform consumer-facing FSs, a radical potential was presented by the DeFi applications that were deployed onpermission-less BCs.

### 2.3. Role of AL in Various Segments Towards Decentralized Finance

The recreation of human intelligence processes by machines, chiefly computer systems is termed AI. (A) Expert systems, (B) natural language processing, together with (C) machine vision are encompassed in the particular applications of AI [46, 47]. For enormous factors, faster and more precise calculation of a probable borrower at less cost along with accounts were offered by the AI; thus, better-informed and data-backed

decisions were caused [48, 49]. The works for the role of AI in various segments of DeFI are elucidated in table 2.

**Table 2: Works for the role of AI in various segments toward decentralized finance**

| Author Name | Segments | Findings | Limitations |
|---|---|---|---|
| **Nafiz, et al. [50]** | Banking and investment | As per the evaluation, one or more functions of DeFi could be aided by AI; in addition, the gap in security disquiets of DeFi could be bridged. | Interoperability problems engendera barrier to entry to revolute technologies. |
| **Tom, et al. [51]** | Banking | As per the outcomes, for (A) executives, (B) policymakers, (C) scholars, together with(D) other stakeholders working in law, it was one among the daunting along with consequential endeavors; also, finance was proven for constructing enhanced financial artificial intelligence. | Due to the incapability of programming, financial artificial intelligence was constrained. |
| **Thien, et al. [52]** | Investment | As per the evaluation, with augmenting(a) end-user confidence, (b) model audit ability, and operative efficiency, AI was proven to be the best in finance. | At times, AI decision-making processes could not be entirely recognized by the metaverse developers, virtual world designers, and users. |
| **Rippa Maria, et al. [53]** | Investment | As per the evaluation, the Toolbox of FT4SD was a triad of AI together, offering a synergistic impact of decentralized finance, engendering a virtually unlimited investment resource meant forhi-tech innovation. | The technology speed in the fintech was comparatively less |
| **Naoyuki, et al. [54]** | Banking and investment | As per the outcomes, AI banks enhanced the user interface and user experience along with lower their fees to entice customers to internet banking. | It was clear that fintech was not changing Japanese finance in any significant way |

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| **Frederic, et al. [55]** | Banking, investing, and capital markets | Analysis showed that AI, authorship, and privacy at the same time contributed to restoring trust amongst members of a future decentralized finance | Unnecessary validators were not required |
| **Sergey, et al. [56]** | Banking and investment | There was a positive result of supporting the "decentralized finance" shows with the use of neurogenetic tools for Fintechthatwas able to ensure optimal decision-making | There were over unlimited sources in the fintech. Sometimes it may be a risk |

**NYDIA, et al. [57]** elucidatedDeFI with the implications of the disintermediation of FSs. For (A) consumers, (B) financial institutions, (C) fresh competitors, together with(D) financial regulators, the opportunities and challenges of DeFi were elucidated. As per the evaluation, since DeFi was a hugely deployed innovation, it was essential to recognize what it was about to address the potential risks to which the financial system and consumers of such services might be exposed.

**Anna, et al. [58]**explained the advantagesof DeFI with the assistance of AI. DeFI had a Renaissance in which Bitcoin, USDCoin, and ether were emerging as payment techniques. As per the evaluation, the banks along with fintech platforms were trying to placate this necessity; however, the prevailing techniques didn't mesh well for business servicing. Immediate relief was offered by the AI and general digitization platforms.

**Nafiz, et al. [59]**described therole of AI in DeFI as a literary analysis. In Defi, a systematic utility of AI was developed regarding impact, reliability, security, and exhaustive analysis. As per the evaluation, given the DeFI's prior records of scams along with thefts, it was yet to be trusted by governments; while, AI was yet to attain complete interpretability for the common people.

### 2.4. Role of Blockchain in Various Segments Toward Decentralized Finance

In public and private sector computing applications, BC technology promises to be enormously disruptive along with empowering [60]. By enabling companies of any size, the equation is modified by the BC for raising money in a peer-to-peer way via internationally distributed share offerings [61]. The works for the role of BC in various segments of decentralized finance are elucidated in table 3.

**Table 3: Works for the role of BCin various segments toward decentralized finance**

| Author Name | Segments | Findings | Limitations |
|---|---|---|---|
| **Justin, et al. [62]** | Banking | As per the findings, the acala team will be permitted by the BC for enhancing extra financial applications on platform top. | For assessing the validity of engendering HyFi solutions, extra research was essential. |

| | | | |
|---|---|---|---|
| **Mahmoud, et al. [63]** | Investment | A DeFi service globally with a promising market was becoming an important aspect of the revolutionary new BCtechnology and the monetization of the network was becoming a reality. | Parameters in the BCcannot be easily executed promptly without wasting time |
| **Daniel, et al. [64]** | Traditional markets and Banks | As per the evaluation, as the tokens, which hold value in the DeFi market still behave as normal cryptocurrencies, the similarities were obvious. | The key aim was not passive revenue generation. |
| **Tobias, et al. [65]** | Bank and Insurances | As per the outcomes, in insurance processes, financial inclusion, minimized costs, and automated processes were offered by the BC and smart contracts. | Central authority was not required for the BC-centric solution; in addition, provides the capability to minimize costs. |
| **Andrei, et al. [66]** | Bank and Investment | As per the evaluation, in usability and liquidity-signaling, the DeFI had huge enhancements since they are ready to compete with their goliath counterparts. | Due to a lack of interoperability, the transaction cannot be easily done |
| **Usman, et al. [67]** | Bank and Investment | Analysis indicated that it was important that BCswere basically very naturally immutable and therefore cannot be reversed without a larger intervention in DeFI | Managers will struggle even more with the task of dealing with DeFI than with more mainstream elements |

**ZIQIAO, et al. [68]** elucidated theAAVE protocol's social network analysis on the Ethereum BC in decentralized finance. AAVE token's usual economic variables from Coinmetrics, TVL in Aave as of DeFi Pulse, and AAVE's BC transaction records were encompassed in the data source. As per the principal component evaluation, a higher degree of decentralization was related to higher volatility. In DeFI, the indicators might not include predictive power.

**Sarika, et al. [69]** explainedDeFI and centralized finance apology. From (A) legal, (B) economic, (C) security, (D) privacy, along with (D) market manipulation standpoint, variations betwixt centralized and DeFi were analysed. As per the evaluation, DeFi assets like USDC and USDT stablecoins haven't qualified as DeFi assets; thus, the interwoven DeFi protocols' economic security was put at risk.

## 3. Results and Discussion

Here, the utilization of AI cases in the FSs industry as of 2020 and the BC technologies in the financial sector (USD million) at a CAGR as of 2015 to 2024 are explained. In economic functioning, a significant role is played by the financial sector, which is betwixt savers and borrowers, via intermediation; in addition, it takes funds from savers [70]. TheFSs versus the share of the respondents are elucidated in table 4.

**Table 4: AI cases in FSs versus the share of the respondents**

| Financial Services | Share of Respondents |
|---|---|
| Fraud Detection | 58% |
| Financial Process and Analysis | 41% |
| Personalization of Products and Services | 33% |
| Customer Care | 31% |
| Asset Maintainance | 25% |

(A) Fraud detection, (B) financial process, and analysis, (C) personalization of products and services, (D) customer care, and (E) asset maintenance are encompassed in the FSs. in finance, and in areas like (a) asset management, (b) algorithmic trading, and (c) credit underwriting, AI methodologies are hugely employed, which were permitted by huge available data and by reasonable computing capacity [71]. The graphical representation of the employment of AI cases in the FSs as of 2020 is elucidated in figure 3.

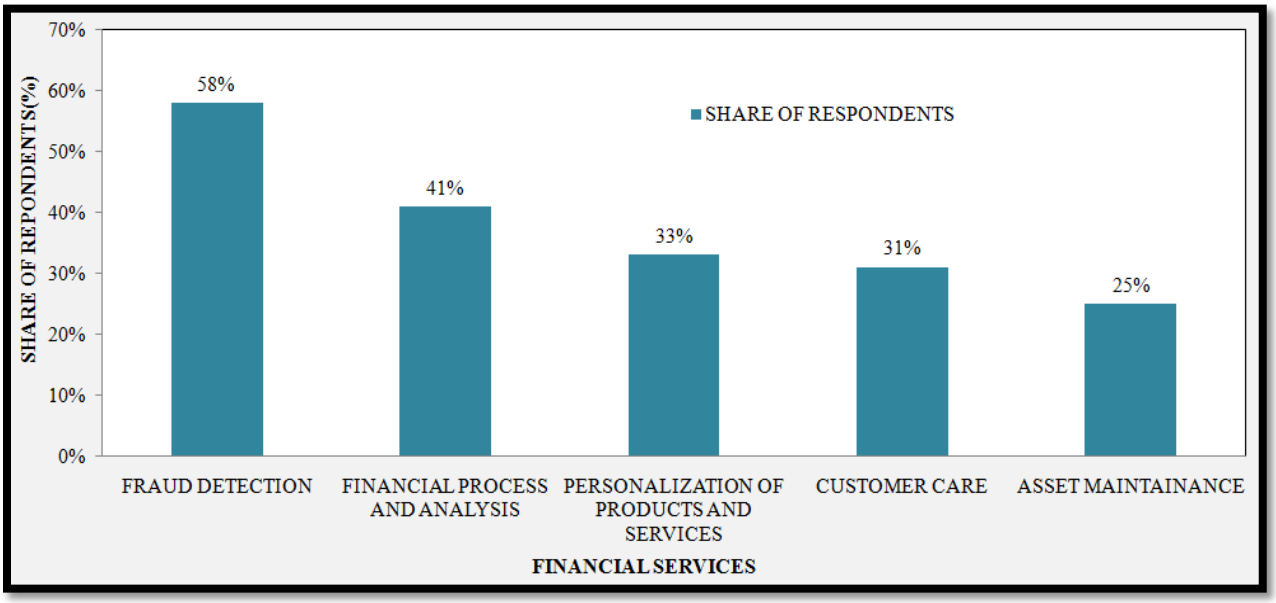


**Figure 3:**Graphical representation of the use of AI cases in the FSs industry as of 2020

From figure 3, it is clear that within the FSs industry, maximum respondents state that enhancementsaresignificant deployment case of AI in fraud detection. AI augments fraud detection by fusing supervised learning systems with unsupervised learning to the impact of attaininganenhancedrecognition of customers' behaviors [72]. In the financial sector (USD million), BC technologies at CAGR were evaluated from 2015 to 2024. Digital, immutable, and distributed ledger, which chronologically records transactions in near real-time, is termed the BC technologies [73]. The year versus the BC technologies in the financial sector at CAGR are evaluated in table 5.

**Table 5: Year versus the BCtechnologies in the financial sector at CAGR**

| YEAR | CAGR (USD MILLION) |
|---|---|
| 2015 | 250 |
| 2016 | 300 |
| 2017 | 500 |
| 2018 | 500 |
| 2019 | 700 |
| 2020 | 900 |
| 2021 | 1200 |
| 2022 | 2100 |
| 2023 | 3200 |
| 2024 | 5300 |

In the decentralized system, to develop the next step, BC technology is responsible to engender applications in the decentralized approach [74]. CAGR was analysed betwixt 2015 to 2024. The graphical representation of BC technologies in the financial sector (USD million) for CAGR from 2015 to 2024 is elucidated in figure 4.

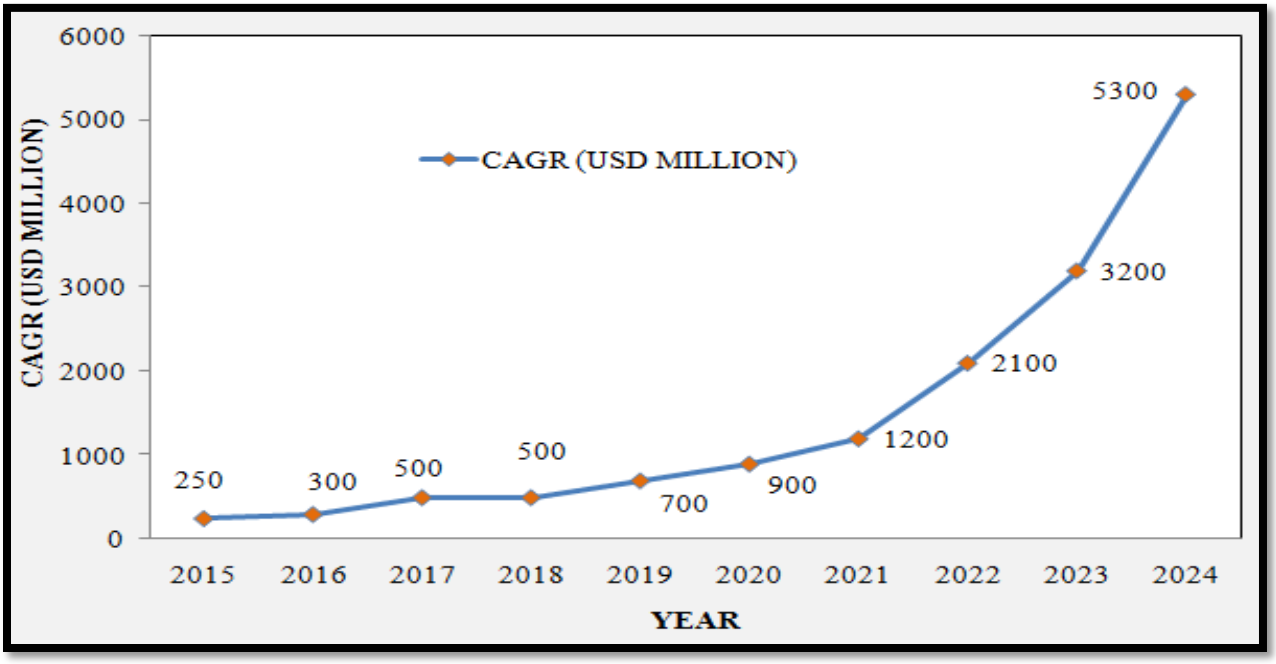


**Figure 4:**Graphical representation of BCtechnologies in the financial sector (USD million) for CAGR from 2015 to 2024

From figure 4, it is clear that year by year, CAGR is getting increased in USD million. Initially, in the year 2015, CAGR is about 250 USD million and for the future years of 2023 and 2024, it has about 3200 and 5300 USD. The adoption of BCTechnology is expected to grow at a CAGR of 38.6% for the subsequent‘6’ years [75].

## 4. Conclusion

Since the financial sector offersloans,deposits, andother financial products, it is considered as a crucial building block for the public and private sector development; in addition, it augments the capability of individuals and households to access fundamental FSs. In facilitating economic growth, a key role is played by the financial sector enhancement. A sound financial system supports augmentation via mobilizing and pooling savings; thus,generating information ex-ante regarding possible investments, assigning capital, checking investments, and exerting corporate governance. In finance, 2 techniques like AI and BC have a significant role. AI struggles with transparency and privacy; while BC struggles with scalability and efficiency. Trust, privacy, and accountability to AI are offered by BC; whereas scalability, efficiency, and security are offered by AI. Thus, the employment of AI cases in the FSs industry as of 2020 and the BC in the financial sector (USD million) at a CAGR had been analysed in the result. However, making useful regulations will be tedious while employing both technologies in the financial sector. Thus,the difficulty in making needful adjustments can be removed if researchers develop advancements in AI and BC in the future.

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