

Blockchain based financial case analysis and its implications

Soonduck Yoo

International Department, Hansei University in Korea, Gunpo, Republic of Korea

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Abstract

Purpose – In Korea and abroad, this paper investigates the use of blockchains in the financial sector. This study aims to examine how blockchains are applied to the financial sector and how to respond to the Korean conditions.

Design/methodology/approach – This paper investigates the movements of the financial sector and related services using the blockchain in the current market.

Findings – First, as a result of examining domestic and foreign cases, it can be seen that the areas where blockchains are most actively applied in the financial sector are expanding into settlement, remittance, securities and smart contracts. Also, in Korea, many of the authentication procedures based on the equipment possessed by the consumers are used so that introduction of the blockchain in the authentication part is prominent. Second, the move to introduce a closed (private) distributed ledger that does not go through the central bank is accelerating in payments between banks. Third, domestic financial institutions also need joint action by financial institutions through a blockchain consortium to apply blockchain technology to the financial sector. Fourth, consumer needs and technological developments are changing. At the same time, as the opportunity to infringe on the information held by individuals has expanded, the need for blockchain technology is strongly emerging because of the efforts of the organizations to defend it.

Originality/value – This paper contributes to understanding the changes in the financial sector using the blockchain.

Keywords Finance

Paper type Research paper

1. Introduction

Recently, the blockchain, which is attracting attention as an innovative technology to change the future, has emerged as a new paradigm of the financial market. The World Economic Forum (WEF) in 2016 predicted that the blockchain will revolutionize financial services, a platform for connecting consumers and producers. In addition, a blockchain was included in the “future of 10 new technologies” of the UN Future Report. Therefore, a large number of countries and companies in the relevant markets have invested in the blockchain sector, increasing the funding scale and participating in international development research.

This paper examines the use of blockchains implemented in accordance with these investments. Here, we provide an overview of the concept of blockchain technology and its potential to change the world of banking through facilitating global money remittance, smart contracts, automated banking ledgers and digital assets. In this regard, we first



provide an overview of the core aspects of this banking service using blockchain, as well as the comparison between international market and Korean market. This study presents issues and countermeasures related to Korea's related fields through the case of application of blockchain-based finance in foreign countries and Korea.

2. Previous research

2.1 Blockchain

A blockchain is a distributed ledger technique in which all the members participating in the network share transaction information between the parties. That is, blockchain is a distributed database that maintains a continuously growing list of data records that are hardened against tampering and revision, even by operators of the data store's nodes.

To verify the transaction information, the form of collecting transactions that occurred for 10 min is called a block, and conceptually, it is called a blockchain in which the blocks are sequentially connected. The blockchain is a ledger in which the Bitcoin transactions that have occurred so far are recorded in chronological order, and it is a public ledger open to everyone on the network. All members of the network collectively record, verify and store transaction information so that they can secure the reliability of transaction records without being notified by a "trusted third party" (TTP) such as a central bank or an administrative agency. It is also a very secure technology because it updates all the ledgers that are kept by each member every time a new transaction occurs. The blockchain cannot be counterfeited or hacked because it is counterfeit only when more than 51 per cent of the participants are synchronized by recording transaction details on the dispersal ledger.

The blockchain technically has a low-cost effect when operated according to a public key algorithm, a hash encryption technique and a distributed processing structure. It is therefore possible to replace the current centralized ledger structure with a distributed ledger. In addition, the banking sector considers the benefits in terms of stability, security and data management costs to be significant. As a result, service speed is expected to improve.

The blockchain technology is the most threatening to the pay-per-view transit system because P2P financial transactions are possible between the parties if only the internet is available without the involvement of a financial company or a TTP. Owing to the transparency of transaction, information is guaranteed and we are considering using blockchains in various fields such as finance, health and administration. For this reason, start-up companies are already actively developing in the field of settlement, remittance and loan, banking, securities and investment, and are also expanding services based on blockchains.

2.2 Blockchains in the financial sector

Modern electronic payment systems rely on trusted, central third parties to process payments securely. The pressure to reduce these transaction costs led to banks starting to accept claims on each other. This innovation made trading more convenient as merchants could now deposit notes from other banks directly into their own bank, eliminating the burden of converting paper money into gold to transfer the funds. In accepting the note from a different bank, though, the payee's bank faced a new problem in which it was now exposed to the payer's bank until settlement in gold could be arranged. Where note acceptance was limited to a small number of banks, this could be handled bilaterally. As the number of banks in the system increased, interbank payments became more cumbersome, and the incentive for banks to create a more efficient system increased.

Recent developments have seen the creation of digital currencies like Bitcoin, which combine new currencies with decentralized payment systems. Although the monetary

aspects of digital currencies have attracted considerable attention, the distributed ledger underlying their payment systems is a significant innovation. As with money held as bank deposits, most financial assets today exist as purely digital records. This opens the possibility for distributed ledgers to transform the financial system more generally. The distributed ledger, which is implemented as a blockchain, is divided into closed and private, closed and public and open and public ledgers depending on participation and limitation of ownership of the ledger. Non-permissioned means that it is opened to everyone. Permitted is a structure in which only authorized persons can participate. Private ledger also limits the possession of the ledger to a small number of interested parties, but the public ledger can be owned by anyone.

In the financial sector, such as interbank payment and global financial transactions, we use a closed distributed ledger. Because of the nature of finance, reliability, stability and efficiency are priorities, blockchains based on a closed distributed ledger, where only authorized personnel can participate, are preferred. The closed type has a consensus mechanism that ensures the authenticity of the transaction, so that only a small number of specific groups can participate to offset the problems of openness. First, it is to secure technological development and standardization. Open type is difficult to standardize because of the lack of new standard method owing to technological development, but closed type is easy to agree and accept technical standards among participants. Second, this type can achieve efficiency and independence. Open type has the advantage that there is no specific power or reliance agency intervention, but the efficiency structure is lower compared to the closed type in consensus structure. Third, in the case of closed type, the transaction can be changed. An open type is not possible to modify the transaction recorded in the spreadsheet and can only be corrected by reverse trading, but the closed type can be modified by mutual agreement. In this respect, the financial sector adopts a closed distributed ledger.

2.3 Previous research

Recently, blockchain is being studied in various fields. [Lee and Kim's \(2016\)](#) study showed that to cope with various security threats, we propose an inexpensive and secure smart grid system authentication method using a blockchain, which is a key technology of Bitcoin and verify its practicality to authenticate the components of smart grid system.

According to [Hwa's \(2016\)](#) research, to introduce the blockchain technology, it is necessary to reorganize current centralized regulation system to be able to adopt distributed ledger system. In addition, significant number of legal issues such as physical data storage location, legal intervention grounds of regulatory authority, or common protocol and governance of the blockchain exists. In the case of financial institutions, it is more likely to introduce blockchain technology in the form of a consortium or a private blockchain because there is a limit to introduce a public blockchain.

According to Marc Pilkington's study (2015), he presented the core concepts at the heart of the blockchain and discussed the potential risks and drawbacks of public distributed ledgers, and the shift towards hybrid solutions. He exposed the main features of decentralized public ledger platforms.

3. Application example of financial sector based on blockchain

3.1 International market

3.1.1 Consortium. The financial industry needs pre-emptive response to the decline in customer turnover and commission income from online technology development. This requires the financial industry to innovate the operating platform itself by accepting

technology changes. Recently, developing a competitive business platform or building partnerships is emerging as a core competency in determining business initiatives. Accordingly, a consortium was established to develop and build a standard platform based on blockchains focusing on global companies and large banks. The financial industry, which is expected to be the most directly affected, is trying to simplify complex interbank by pre-emptively adopting blockchains, building an “R3CEV” (Crypto, Exchanges and Venture practice) consortium and developing a trading platform based on blockchains. R3 is working with the world’s largest financial project, “R3CEV” , in collaboration with leading financial institutions. R3 is responsible for basic system design and technology development, and global banks are in charge of the test and designing user interfaces by linking to their API. 22 global banks, including Barclays and RBC, are developing a standard platform based blockchains in partnership with a FinTech corporation, R3 (Table I).

Linux Foundation, led by IBM, has announced the collaborative project “Hyperledger project”. IBM is working on the standardization of global blockchain technology by participating in the “Hyperledger project” involving 48 companies including Intel and Wells Fargo. IBM also plans to invest in the US, European and Asian financial markets and related services by establishing the IBM Blockchain laboratory. In accordance with this situation, it is expected that not only finance but also various tasks such as legal transactions, copyright, identification will be done on the platform-based standardized blockchain in the future.

3.1.2 *Payment and remittance.* The blockchain technology has spread to financial transactions, and it is very likely to be used in financial systems including payment systems such as micropayment and large payment systems. As a result of intervention by a number of institutions, foreign remittance services, in which customers have to pay a high commission fee, are considered to be the most effective field of blockchain technology by enabling direct transactions between individuals without a financial intermediary. In the case of banknotes, it is likely to be designed as a private blockchain.

Ripple, a FinTech company in the payment sector, from USA, aims to implement a global payment network system by instituting blockchain technology. This global network system is expected to be used in international currency settlement and foreign exchange market besides remittance services for individual customers. In addition, start-up companies are actively developing remittance services using blockchains. ABRA (www.goabra.com) is a FinTech start-up company that is developing a system that can change the way people send money to individuals all over the world.

The exchange market is also expected to change. TenX, a Singapore-based virtual money settlement service company, is working with Visa and MasterCard to prepare a service that allows customers to pay in virtual currency on a regular credit card network. For example, if TenX check card holders pay \$10 at a convenience store, it will subtract \$10 worth of virtual money to match the price on your account. However, the convenience store receives the legal tender of \$10 from the card company not the virtual money. Because the transactions that

Project name	Contents
Project zero	Based on the Ethereum blockchain platform, 11 banks have completed real-time processing to exchange encrypted currencies called ether coins as a Ethereum’s Bitcoin
Project on	42 banks completed the smart contract test based on Ethereum blockchain platform
Project genesis	40 banks completed the test that three procedures of issuing, trading and closing the corporate bills in the form of smart contracts using a blockchain technology from Ethereum, Chain, Eris, Intel and IBM

Table I.
Project examples of
R3CEV

convert virtual money into cash occur quickly, the shop owner cannot know whether the other party has used the virtual money card or not. In particular, the virtual money settlement service operates on an existing card payment system regardless of whether the authority permits the virtual money settlement. Financial consumers can choose whether they want to exchange money with their bank account when they travel overseas or travel, exchanging money to pay the bank a fee or recharging their check cards with these services.

3.1.3 Securities exchanges. If a securities transaction took place using a blockchain, the transaction can be confirmed directly at the place where the transaction is concluded and the approval is automatically completed. Currencies, over-the-counter stocks, and derivatives are actively traded using blockchain technology in the USA. Also Canada, Australia and Japan prosecute actively the use of blockchain technology. The NASDAQ OMX group in the USA plans to build an over-the-counter stock market based on blockchains to connect companies and investors. Then, they have applied blockchain technology to Nasdaq Private Market, a private professional investor curb market, to reduce the actual trading time from four days to 10 min since 2015. The Securities and Exchange Commission also granted the company “Overstock” the authority to issue internet stocks public offering with a blockchain in December 2015. [Sachs \(2016\)](#) developed a virtual currency system called SETL coin based on blockchain for use in settlement of securities transactions and register at the Patent and Trademark Office. The Toronto Stock Exchange and the London Stock Exchange have organized working groups to introduce blockchains, and the Japan Stock Exchange Group has worked with The Nomura Research Institute and IBM to conduct substantiation test of the blockchain technology. The Australian Stock Exchange acquired a 5 per cent stake in start-ups called Digital Asset Holdings-based blockchain (about \$15m) and has worked on the project that blockchain technology applies to post trade.

3.1.4 Smart contracts. The smart contract function is applied to real estate transactions, legal contracts and financial trade when the conditions and contents of transactions are registered, the relevant laws and procedures are automatically applied and the result is notified to the transaction parties. Smart contracts are expected to simplify physical and visual transactions and reduce transaction costs against existing forms of transactions based on physical exchanges. Global companies such as Microsoft and IBM are also interested in a platform-based blockchain and are working to connect and commercialize their business. In particular, Microsoft is partnering with ConsenSys, a specialized start-up of Ethereum technology, and is working on a project to commercialize a “smart contract function” that automatically executes transactions when certain conditions are met. Various attempts have been made to easily implement smart contracts. Ethereum is a blockchain platform optimized for smart contracts. There are examples of music distribution, insurance contracts, marriage report and smart grid billing based on the Ethereum platform in the smart contract area.

3.2 Korea market

3.2.1 Consortium. The banks of Korea, which have joined R3CEV, are the 16 major banks in Korea, including Kookmin Bank, Shinhan Bank, Hanan Bank, Hana Bank and Woori Bank. The Financial Services Commission is also involved. Five major banks in Korea (Kookmin, Shinhan, Woori, Hana and IBK) succeeded in the project of storing and co-management of the customer identification information in Codar. This is an improvement over the inconvenience of having to go through a customer verification process for each bank that the customer wants to trade by sharing information with other banks when they go through a customer verification process at a bank. Customer due diligence (CDD) is a system that identifies the customer’s real name, address, contact details and purpose of financial

transactions so that the financial products and services provided by the financial company are not used in illegal activities such as money laundering. Moreover, enhanced due diligence (EDD) refers to the identification of customers or services that are at high risk for money laundering, identifies the customer as an actual party, as well as additional information such as the purpose of the transaction and the source of the transaction funds.

In February 2017, the Korea Financial Investment Association, 26 securities companies and five blockchain technology companies have also formed consortiums and are seeking ways to use blockchain technology for authentication, information sharing, liquidation and settlement. Hana Financial, Korea's first blockchain payment settlement, verification of customer authentication technology was completed on November 15, 2016.

Currently, in the accredited certificate system, the customer must register for each financial institution (including the administrative office), and each financial institution must store and manage the accredited certificate. The blockchain certification that each company promotes is not conceptually different from that of the accredited certificate system. However, once issued, it is advantageous that it can be freely used by consortium institutions and financial holding subsidiaries without having to register for each individual financial institution. Although it was made through the blockchain, the development and construction of infrastructure jointly in the financial sector has been a major change that has been unprecedented in the financial sector. This has resulted in increased convenience and safety for financial consumers and increased competitiveness in the financial industry.

3.2.2 Payment and remittance. Cooperation between finance companies and FinTech companies is actively taking place for the overseas remittance market of 10 trillion won in Korea. As an introduction of the blockchain, the most promising area for the effect is remittance abroad. Furthermore, some amendments to the Foreign Exchange Transactions Act will allow non-financial investors to remit overseas in July 2017. One of the promising effects of the introduction of the blockchain is that both the time and cost can be reduced by overseas remittance. If blockchains are introduced into overseas remittances, the payment, settlement and payment processing will be faster, which will reduce counterparties and liquidity risk. Internet professional banks are also entering the overseas remittance market and competition for lowering commissions has already begun.

As the existing bank uses the intermediary bank through the SWIFT network, it takes three days for the remittance, and the commission rate is 4-6 per cent of the remittance fund, including the remittance fee, the commission fee and the overseas banking fee. Given the size of remittances in South Korea, major Korean banks have received commission income of approximately \$450m a year owing to overseas remittances. On the other hand, if you send money through the FinTech Company, you can expect to receive within one day by a 1 per cent commission. Kakao Bank from Korea has set its goal of lowering the remittance fee to one-tenth compared to the existing Korea's commercial banks in 2017. As of 2016, Korea's overseas remittances are estimated at about \$9.6bn. Recently, the largest remittance is made to China, and other remittances are made mainly to the USA, Hong Kong and Japan. The strength of the remittance service provided by FinTech is shortened costs and time.

While major global banks are pursuing the development of remittance and payment systems using blockchain technology, major banks in Korea are actively reviewing them. Kookmin Bank has worked in cooperation with FinTech startup "CoinPlug" to build a "non-face-to-face blindness proof document storage system" and has completed testing of international remittance services based on blockchain technology. Hana Bank signed a business agreement with FinTech "Sentbe" and developed a remittance service using blockchain technology. Shinhan Bank has invested in Streami, a remittance start-up based on blockchain, and will develop a foreign currency remittance service using blockchains.

IBK is in the process of researching and developing blockchains in partnership with start-up K, and it is seeking to apply a private blockchain to overseas remittance and settlement areas. In the case of Kakao Bank, it is working to develop overseas remittances by signing a business alliance with TransferWise, a FinTech company specializing in global remittance.

3.2.3 Securities exchanges. Since July 2016, Korea Securities Depository Company (KSDC) has been a member of Hyperledger, a global blockchain project. Hyperledger-based blockchain services manages the distributed ledger through P2P protocol based on HTTP/2 standard. The data structure is optimized to manage the most efficient way to manage such as replicating the world state through the hash algorithm, and it can connect and configure other agreement algorithm plugins (PBFT, Raft, PoW, PoS) as needed. The Korea Exchange conducted the Korea Start-up Market (KSM) project, which adopted blockbuster technology in 2017, and it was ranked second in the world for applying the blockchain technology to the capital market following the US Nasdaq. In addition, LG CNS developed “B-Trading”, a P2P OTC stock trading service using the blockchain-led technology.

3.2.4 Smart contracts. Smart contract means that documents containing various contracts or information that are used offline can be safely recorded online so that contract information and information can be checked at any time and place. Korbit, a Korean venture that operates an exchange of virtual coins, Bitcoin, has launched a trading service for ether, which is used for smart contracts. The basic unit used to run smart contracts on distributed network-based platforms called Ethereum is Ether. For example, Ether can be programmed to hedge commodity futures in the form of an option futures against rising international oil prices. This way, you will be able to deal with the necessary people without having to go through a financial institution in the interim. In addition, it is possible to upload and sell information on various derivative contracts as well as information on car accident history and mileage, which are essential for automobile pre-trade.

4. Discussion

As a result of examining the case of financial sector applying blockchain in Korea and abroad, I have found several directions as follows. In the financial sector, changes in the application areas of blockchains are seen as settlement and remittance, securities and smart contracts. The blockchain, which is a closed-type distributed ledger, plays an important role in future finance. In addition, it is necessary to jointly use regional consortiums such as domestic banking companies, blockchain consortiums of financial investment institutions as well as global blockchain consortia. At the same time, the need for blockchain technology is becoming stronger owing to the expansion of opportunities for individuals to infringe on the information they possess and the efforts of institutions to defend them (Table II).

4.1 Enlarge the application area of the blockchain

As a result of examining the case of Korea and overseas, the areas where the blockchain is most actively applied in the financial sector are settlement and remittance, securities and smart contracts. Unlike overseas, the blockchain technology applied to the consumer authentication part in Korea is applied. In the case of overseas transactions, the method of authentication using a third party (e.g. SSL: secure sockets layer authentication) method is generally used for financial transactions. However, Korea is using a method of directly authenticating through devices owned by consumers. The applying of the blockchain is becoming more prominent in authentication part. It is considered appropriate to use the blockchain technology from the customer certification field. To expand the use of blockchain technology in the future, research on the efficiency and safety of technology and cost compared to existing systems should be conducted along with thorough test bed verification.

It is difficult to predict when the blockchain technology will mature, but there is a possibility that it will be used in trade finance, liquidity management and fund monitoring in the future. By combining blockchain technology with direct effects such as simplification of procedures and cost reduction in trade finance, settlement and transfer of funds and record management will be easy and quick. The blockchain technology is also expected to be used for international remittance and overseas C/P (cash pooling, liquidity management means that minimizes the amount of cash needed by the region/corporation), thereby reducing liquidity risk and reducing management costs. It can also be used for financial management/monitoring by security-based records management.

4.2 The blockchain based on the closed distributed ledger plays a role of innovation power of future finance

The move to introduce a closed (private) distributed ledger that does not go through the central bank when payment is made between banks is accelerating. In the field of global financial transactions, a closed (public) distributed librarian service, in which banks and customers are participating, is emerging in the international remittance service. In particular, if smart contracts are introduced in full swing, they will be rapidly applied to the introduction fields of trade finance, compliance, asset management, insurance payment and capital market transactions, which are connected to a large number of stakeholders. Therefore, the blockchain, which is a closed-type distribution ledger, is expected to become an innovation engine of future finance. Microsoft is working on its blockchain technology in conjunction with its business, including trade, real estate and legal contracts. IBM has set up a blockchain laboratory and plans to focus on investments in European and Asian financial markets and services.

The blockchain technology, which is a distributed policy led by bit coin, is already emerging as a new trend in finance. With the spread of introduction of distributed ledgers centred on financial institutions, closed distributed leader technology is expected to lead innovation of future finance in terms of reliability, stability and efficiency.

4.3 Korean financial institutions need joint response

Global companies and large banks are trying to develop and commercialize a blockchain technology-based business platform by establishing partnerships to pre-empt the initiative. Developing a blockchain-based financial platform through the implementation of the R3CEV consortium will lead to streamlining of complex interbank transactions. The banking industry, which is most directly affected by blockchain technology, will provide a simplified blockchain transaction through the development of a blockchain-based financial

Classifications	Abroad market	Korea market
Consortium	R3CEV (crypto, exchanges and venture practice) the collaborative project, "hyperledger project"	Joined R3CEV the Korea Financial Investment Association
Payment and remittance	Ripple TenX (a Singapore-based virtual money settlement service company)	Kookmin Bank and Hana Bank are building remittance service using blockchain technology
Securities exchanges	Nasdaq private market	KSDC LG CNS developed "B-Trading"
Smart contracts	Ethereum technology	Kobit has launched a trading service which is used for smart contracts

Table II.
The comparison
between abroad and
Korea market

platform by pre-emptively building the “R3CEV consortium”. Korean financial institutions also need to take joint action in the financial sector through blockchained domestic and overseas consortium for applying the blockchain technology to the financial sector and to carry out the business. To decentralize the centralized existing financial system, changes in financial regulation and system transformation of financial institutions should be accompanied by overall changes. Therefore, it takes a considerable amount of time for the blockchain to be applied to the entire financial industry.

The blockchain technology will be introduced in other industries such as supply chain management, medical service and real estate. Therefore, it is necessary to cooperate with financial institutions using regional consortiums such as a consortium of global blockchains such as R3CEV, Hyperledger Project and Enterprise Ethereum Alliance as well as domestic banknotes and a blockchain consortium of financial investment companies.

4.4 Strengthening consumer security needs

As technology develops, consumer needs and related environments are changing. At the same time, there is an increased opportunity for individuals to be infringed by information such as hacking, and there is a strong need for blockchain technology because of the efforts of institutions trying to defend hacking. To encourage market movements, the government and related organizations should recognize the power of blockchains in individual and business transactions, public services, etc., and support them through development of original technologies and finding out best practices.

5. Conclusion

The blockchain, which is attracting attention as an innovative technology, is bringing about changes in the financial market. In this regard, we first provide an overview of the core aspects of this banking service using blockchain, as well as the comparison between international market and Korea market. From there we discuss key issues that must be considered in developing banking service based on blockchains.

First, as a result of examining the case of Korea and abroad, it can be seen that the areas where the blockchain application is most actively applied in the financial sector is expanded to settlement, remittance, securities and smart contracts. For example, the banks of Korea, which have joined R3CEV, are the 16 major banks in Korea. In Korea, a lot of authentication procedures based on devices owned by consumers are used in financial transactions. In Korea, blockchain technology has been introduced in the certification services sector. It is considered appropriate to use the blockchain technology from the customer certification field. To expand the use of blockchain technology in the future, the efficiency and safety of technology and cost of existing systems should be studied simultaneously with thorough test-bed verification.

Second, in the case of payment among banks, the move to introduce a closed (private) distributed ledger that does not go through the central bank is accelerating. In global financial transactions, such as Ripple and Korea Bank Association, a closed (public) distributed ledger service involving banks and customers is emerging in the international remittance service. The blockchain technology, which is based on the distributed ledger origin led by Bitcoin, is already emerging as a new flow of finance. With the spread of introduction of distributed ledgers centred on financial institutions, closed distributed ledger technology is expected to lead innovation of future finance in terms of reliability, stability and efficiency.

Third, for Korean financial institutions to apply and implement blockchain technology throughout the financial sector, it is necessary for financial institutions to cooperate together through a blockchain consortium. To decentralize a centralized existing financial system, it is highly likely that it will take a long time for the blockchain to be applied and implemented

throughout the banking industry, as financial regulation changes and system transformation of financial institutions must be accompanied overall. Therefore, it is necessary to cooperate with financial institutions using regional consortiums such as banking in Korea and blockchain consortium of financial investment institutions.

Fourth, Korea's blockchain service should be focused on strengthening consumer security needs to activate for the blockchain business. Consumer needs and the environment related to technology development are changing. At the same time, the need for blockchain technology is becoming more and more important because of the increased opportunities for individuals to infringe on the information they possess and the efforts of institutions to defend them.

This paper will contribute to provide an overview of banking sectors by applying blockchain technology and also find the difference between international market and Korea market. Therefore, it provides directions on how we should respond.

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Corresponding author

Soonduck Yoo can be contacted at: koreasally@gmail.com

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