Application Analysis on Blockchain Technology in Cross-border Payment

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ABSTRACT. Blockchain, as a new technology with decentralization, immutability and traceability, not only solves some of the pain points of traditional industries, but also promotes business model transformation and reshapes trust. At present, the scale of cross-border payments is increasing. However, there are many shortcomings in traditional cross-border trade, and technological breakthroughs are urgently needed. Blockchain technology has a natural match with cross-border payments and can solve the existing problems. Based on the summary of the cross-border payment models and their shortcomings, this paper analyzes the application modes and advantages of cross-border payment based on blockchain technology, then further proposes the application of blockchain technology to cross-border payment constraints.

1. INTRODUCTION

With the development of cross-border trade activities, cross-border payments are playing an increasingly important role. The McKinsey Global Payments Report 2018 mentions that global cross-border payments in 2017 amounted to $ 206.3 billion. Specific to China, the scale of cross-border E-commerce transactions in 2018 has also reached 9.1 trillion yuan. According to data released by the China Payments Clearing Association, cross-border Internet transactions by domestic third-party payment institutions exceeded 490 billion yuan in 2018, an increase of 55.0% over 2017. Due to the many problems in traditional cross-border payment, and the rapid development of cross-border trade, the demands for the transformation of traditional business models for cross-border payment are increasing. At the same time, the digital currency represented by bitcoin has attracted social attention, especially the blockchain technology that has overturned traditional technology behind it. Blockchain technology has the characteristics of decentralization, non-tampering of information, and openness, and is suitable for cross-border payment fields, thereby improving the efficiency and security of cross-border payments. In the past two years, relevant international institutions have conducted research and attempts on the application of blockchain technology in cross-border payment, and it is possible to rebuild the cross-border payment system in the future. Therefore, it is of great practical significance to study the impact of blockchain on traditional cross-border payments.

2. Theoretical research and development status

2.1 Impact of blockchain on cross-border payments

Satoshi Nakamoto (2008) [1] proposed his solution in the paper, which is an electronic payment system based on cryptographic principles rather than credit. Although the technology proposed in this paper is in the making, it is an excellent solution to solve credit barriers. Questions about different forms of blockchain in the development of technology, Vitalik Buterin.A (2014) [2] pointed out that according to different application scenarios and user needs, the blockchain form can be roughly divided into public blockchain (Public Blockchain), private blockchain (Private Blockchain) and consortium blockchain (Consortium Blockchain). form. Pilkington (2016) [3] pointed out that the application mode of the future blockchain should adopt he alliance chain,

because it can avoid the serious shortcomings of the public and private chains. Friedrich Holotiuk et al. (2017) [4] A panel of 45 people explored the impact of blockchain on the payment field, and they concluded that blockchain technology provides a solid framework for cross-border transactions and removes expensive Intermediary costs, thereby improving the payment system of multinational currencies, and gradually weakening or changing the business model of the existing payment industry. Zhang Yuan (2016) [5] pointed out that the impact of blockchain technology on China's payment system is reflected in the processing of transactions in a point-to-point manner, with a distributed structure, which can record transactions and transactions without the participation of trusted third parties. Settlement, thereby removing dependence on central authorities. The payment system based on the blockchain technology includes cross-border payment with the characteristics of decentralization, thereby changing the existing centralized settlement model. "China's Blockchain Industry White Paper (2018)" [6], in-depth analysis of the application of China's blockchain technology in the financial field and the real economy, and systematically explain the six characteristics and trends of the development of China's blockchain industry. Among them, the blockchain technology can realize real-time transactions and improve the payment and settlement efficiency of the existing financial system. Through the blockchain system, two or more parties in the transaction can share a set of trusted and mutually recognized ledgers. All transaction settlement records are available on the chain, which is safe, transparent and traceability, which greatly improves the accuracy of reconciliation And efficiency. By carrying smart contracts, automatic transaction settlement and settlement can also be realized, thereby realizing transactions as clearing, greatly reducing the cost and error rate of reconciliation personnel, greatly improving the efficiency of clearing, and in some transactions with low frequency and real-time business In the scenario where the sexual relevance is not strong, it can fully meet the needs of the clearing business and greatly optimize the existing processes.

2.2 Application path of blockchain in the field of cross-border payment

Ba Jieru (2016) [7] research found that the application of blockchain technology in the cross-border payment field has a high potential effect, and divided its development into three stages: the initial stage of account transfer between non-bank systems , Payment, remittance, online cross-border exchange of foreign currencies, and other third-party payment transaction fields; the intermediate stage establishes standardized smart contracts on the Internet for financial assets; the advanced stage is applicable to real-world transaction systems. Yao Xiang, Zhu Tao (2017) [8] Based on the exploration of VISA and SWIFT blockchain applications, they proposed the path of blockchain to cross-border payments. In the short term, blockchain technology will not become the core system of cross-border payments, but it can develop corresponding products based on certain scenarios; in the medium and long term, that is, in the next 3 to 5 years, the blockchain may change The underlying structure of traditional cross-border payment, but the application form of the upper layer may not change significantly. Currently, mainstream financial institutions such as VISA and SWIFT have begun to use block technology to build the underlying architecture of the alliance chain, and transplant existing payment processes to the alliance chain to pilot some businesses. Xu Mingxing (2016) [9] conducted a classification study on the application agencies of blockchain technology. He believes that the current development of blockchain is divided into two directions: one is traditional financial institutions, and these institutions prefer to block The function of chain decentralization is reflected in the underlying framework; the second is the blockchain technology company, which focuses on replacing digital currencies with existing currencies, building a powerful data processing system, and subverting traditional payment models. Zhang Aijun (2017) [10] focused on private blockchain cross-border payment companies. Taking Ripple, a typical foreign cross-border blockchain, as an example, he explained the four traditional settlement models and cross-border settlement of blockchain in China. Similarities and differences, the two main advantages of the proposed cross-border settlement of the blockchain are to improve efficiency and reduce capital occupation. At the same time, the exploration of foreign cross-border payment is

compared with China, and it is considered that the uncertain regulatory trend and the relative backwardness of China's blockchain technology are important factors restricting the exploration of blockchain in China's institutions. Nie Jia, Cheng Xiaorong (2018) [11] proposed that blockchain can effectively provide solutions in cross-border payments. The gateway and the customer are two important elements in the cross-border payment system. Starting from the functional modules in the cross-border payment, the network connector, market maker client, transaction client, and blockchain payment ledger are introduced respectively. Mutual logic of modules.

2.3 Application Status of blockchain in China's cross-border payment

Recently, China's financial institutions and technology finance companies are competing to deploy blockchain cross-border payments, successively launch services, and continue to expand their business territory. Ant Financial Services Group has launched a cross-border remittance business based on blockchain technology in June 2018, enabling cross-border remittances to e-wallets in the Philippines and Hong Kong in China to be credited within three seconds. As a bank financial institution that has long been engaged in payment business, large state-owned commercial banks have also conducted regional trials on cross-border payments on the blockchain. The blockchain company Oklink focuses on small and medium-sized cross-border remittances and now covers more than 30 countries including Southeast Asia. It can complete multiple processes of payment, exchange, and settlement within minutes to achieve rapid value transfer. From the existing research, the research on the application of blockchain technology in cross-border payments is mainly based on the "decentralization" of blockchain technology. It focuses on the potential impact of blockchain on the payment field and its application prospects. Therefore, a more macro development path of blockchain technology in the payment field is proposed.

3. Traditional Cross-Border Payments and its Problems

3.1 Definition of traditional cross-border payment

Cross-border payment generally refers to two or more countries or regions due to international claims on international trade, international investment, etc., with the help of certain settlement tools and payment systems to achieve cross-border or cross-regional capital transfers.

3.2 The main mode of traditional cross-border payment

China's cross-border payment can be divided into four models: bank cable transfer, professional remittance companies, international credit card companies, and third-party payment companies. These four cross-border payment models have their own characteristics.

Bank cable transfer refers to the remittance bank's application to send the remittance to the destination branch or agent bank (remittance bank) by telegram, telex or SWIFT, and instruct the remittance bank to the payee. A remittance settlement method that pays a certain amount. The cross-border wire transfer business of domestic banks in China generally adopts SWIFT. SWIFT is a non-profit international cooperation organization among international banks. At present, more than 4,000 banks around the world use the SWIFT system for international settlement. These banks have unique SWIFT codes as the bank code for inter-bank wire transfers or remittances. Telegraphic transfer usually arrives within 2 ~ 3 working days. In addition to the handling fee, a telegraphic fee is charged. It is generally used for large money order business.

Professional remittance companies usually have in-depth cooperation with banks, post offices and other institutions, and use these institutions to set up agents to expand their business coverage. At present, there are mainly professional remittance companies in the Chinese market, such as Western Union, Money Gram, Sigue, and BTS remittance companies. Taking Western Union as an example, its agents have branches in nearly 200 countries and regions around the world, which can realize global remittance payment around the clock. Compared with bank wire transfers, professional remittance companies take less time, only take a few minutes, and the handling fee is

relatively low, generally between 15 ~ 40 US dollars. In addition, the operation is relatively simple. The sender does not need to open an account, and only needs to provide identification and pay the remittance fee to obtain the remittance password. The recipient can use the remittance password and identity certificate to withdraw money.

International credit cards issued by international credit card companies can also make cross-border payments. At present, the common international credit cards are: VISA, MASTER, JCB, AMERICAN EXPRESS, etc. In the process of payment by international credit cards, payment is often failed due to excessive single payment, repeated online payments within the same IP within a short period of time, and network problems. Therefore, the success rate of international credit card cross-border payments is not high. In China, due to insufficient credit card related systems, the convenience of using international credit cards is low. In addition, international credit card organizations such as VISA and MASTER have added 3D password verification services to credit cards in Asia in order to reduce the risk of malicious fraud and credit card theft by merchants. This service increases the complexity of operations and further reduces the success rate of transaction payments.

The third-party payment company's cross-border foreign exchange receipts and payments business refers to the payment institution through banks to provide both parties of e-commerce transactions with the centralized collection and payment of foreign exchange funds involved in cross-border Internet payments and related foreign exchange settlement and sales services. According to regulations, third-party payment companies must first obtain a "Payment Permit" issued by the central bank for conducting e-commerce cross-border foreign exchange payment business, and secondly, they need approval from the State Administration of Foreign Exchange to allow the pilot of cross-border e-commerce foreign exchange receipts and payments.

3.3 Analysis of problems with traditional cross-border payment models

3.3.1. Time-consuming

92% of global cross-border payments are B2B payments, and 90% of B2B payments are made through banks, which shows that banks are the main channel for cross-border payments. However, because the banking channel has to go through multiple intermediary institutions, including the bank, central bank, and overseas banks (agent banks or overseas branches of the Bank), each intermediary institution has an independent accounting system. The Bank's records also require clearing and reconciliation with other counterparties at the same time, resulting in longer time consuming.

3.3.2. Expensive

According to the World Economic Forum report "The Future of Global Financial Infrastructure", cross-border payment fees for senders are generally 7.68% of the amount of remittances. McKinsey reports that the average cost of a bank's cross-border payment using a correspondent bank is between $ 25 and $ 35, which is more than 10 times the cost of a domestic clearing and settlement payment using an Automatic Clearing House (ACH). Taking telegraphic transfer as an example, the Bank of China generally charges a handling fee of 1/1000 of the remittance amount (minimum RMB 50), plus a telegraphic fee of RMB 150. If foreign currency remittance is used instead of foreign currency remittance, the bank will also charge foreign currency Spreads for exchange of banknotes into foreign currencies.

3.3.3. More capital occupation

At present, cross-border payment and settlement must be through banks, including domestic account banks, overseas correspondent banks, and central banks of various countries. In this cross-border payment process, each institution needs to have its own accounting system for transaction recording and settlement And reconciliation. Due to the long period of traditional cross-border payment, the amount of funds in transit is extremely large. For customers, to carry out related business in different banks, it is necessary to open corresponding margin accounts in these banks, and each margin account will occupy customers' funds to varying degrees, thereby reducing

the efficiency of fund use. For banks, in order to maintain liquidity, banks need to hold the currencies of multiple countries in their bank accounts. Such accounts are called "current accounts". The more funds held in the current account, the greater the bank's hedging and opportunity costs.

3.3.4. Low security

Traditional cross-border payment uses centralized payment. Customers need to provide their accounts and other information to intermediaries, and intermediaries complete remittances and withdrawals based on the information provided by customers. Under this payment model, intermediaries have accumulated a large amount of customer account information and transaction information, which is easily the target of hackers and criminals to steal information. If a third-party payment company is used for cross-border payments, the transaction data will be accessed by the third-party payment platform. These transaction data include personal information, transaction records, and authentication information. Because third-party cross-border payment services provide related services through the network, involving consumers, third-party payment platforms, overseas merchants, and financial institutions, any problem in any of these links may lead to information leakage.

4. Blockchain Technology and its Application Analysis in Cross-Border Payment

4.1 Blockchain basic concepts

At present, there is no clear and generally accepted definition of blockchain. Blockchain is a brand-new technology. It builds a decentralized bridge for credit. It is a shared ledger that is not easy to tamper with. In this way, point-to-point bookkeeping is performed by adding an open and transparent database that is not easily tampered with, without the need for any intermediary to reach a credit consensus. However, blockchain is not a specific technology, but a comprehensive collection of original collections of various basic technologies such as Internet technology and P2P distributed ledger. In the current applications, the specific application model of the blockchain technology is not static, because Bitcoin and Ethereum are the two most successful applications of the current blockchain technology, and they are also the representative applications of different stages of blockchain development. So the two are more representative. Generally speaking, a blockchain system consists of a data layer, a block layer, a network layer, a consensus layer, an incentive layer, and a contract layer.

4.2 Blockchain Basic Concepts

4.2.1. Decentralization

Decentralization is the core feature of blockchain technology. At the same time, the operation design of blockchain as the underlying technology relies on the idea of decentralization. In a blockchain network, the information exchange between nodes is a complete point-to-point transaction method. Any node has the same rights and obligations. This model solves the biggest drawback of the traditional centralized interaction model-excessive dependence on third parties. The center also overcomes information asymmetry, one of the core problems in the financial field. The point-to-point interaction model simplifies the traditional transaction process. The business model that requires multiple parties to participate in the transaction can save costs and improve efficiency in the middle link, which helps to build a flat business system in many fields.

4.2.2. Immutable and traceability

Immutable traceability is not the core feature of the blockchain, but it is the most basic feature. Technologies such as timestamps and merkle trees encapsulated in the blockchain ensure the irreversibility of the data on the chain, thereby ensuring the security of information data. In theory, the starting point in the Internet virtual world can be trusted. As the easiest to understand, The characteristics of direct use can be used as the underlying technology in many fields, which is the entry point for the application of blockchain technology. It can also achieve more optimized risk management in the financial field where data is king.

4.2.3. Efficient Intelligence

Efficient intelligence is the most collective feature of blockchain technology. If it is said that they cannot be tampered with and can be traced back to a certain level of the blockchain technology architecture, decentralization is the core idea of the blockchain technology, and they can all individually intervene in traditional business models. Then efficient intelligence is the embodiment of the technology encapsulated by all blockchains. The blockchain uses consensus-based specifications and protocols to enable all nodes in the entire system to exchange data freely and securely. The high efficiency of the process makes human intervention ineffective and the entire system has intelligent autonomy.

4.3 Analysis of blockchain cross-border payment application model

4.3.1. Tokenized blockchain

Taking Ripple as an example, Ripple intends to use XRP as a "bridge currency" to make transactions cheaper and faster, and to use XRP tokens as its core pillar for settlement fund transfers. Currently, Ripple provides access software for different banks, accesses the Ripple network, and performs currency transmission [12]. Different banks do not need to adopt a unified accounting system. They maintain the original accounting system. Banks act as nodes in the Ripple network system and use cryptographic algorithms for verification. The details of transactions are not visible, so that the original can be maintained. The bookkeeping system hides the specific information of inter-bank transactions, but if necessary, the bank can trace the source through its own bookkeeping system. This guarantees the privacy and security of the bank, and the bank can use the protocol with only minor changes. XRapid is the latest product of Ripple. With xRapid, this transfer is almost instantaneous and has almost no cost. The first person transfers money by converting it into XRP, from which it will automatically be converted into the currency required by the recipient-specific Asian country [13].
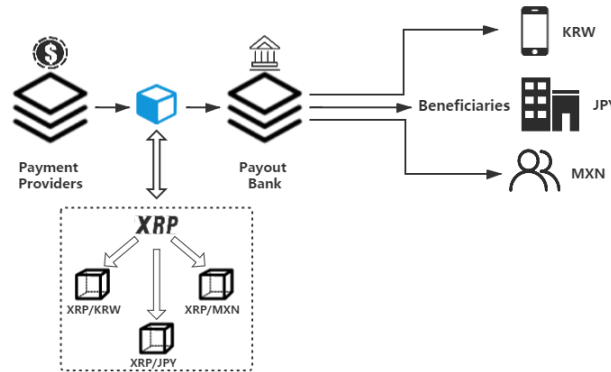

Figure 1(Organized from: https://ripple.com/)

4.3.2. Tokenless Blockchain

Tokenless blockchain, which uses blockchain technology, but does not add Tokens for incentives, generally appears between nodes that have been trusted and do not need to transfer value. They can share data without token transfer, such as private Chain, alliance chain. Tokenized blockchain are suitable for the C side, while tokenless blockchain are suitable for the B side. Tokenless blockchain generally establishes a closed system in the enterprise, and the public transfers the bookkeeping right to the government's intelligent department. They usually have a certain business foundation and stable cash flow. They obey government supervision and apply blockchain technology, regardless of operation. Users or users, the demand for coins is not high, and they pay more attention to the underlying technology. Large domestic and foreign companies such as IBM, Microsoft, Tencent, Ali, Huawei, JD.com, etc. have released related projects on tokenless blockchain. In addition, except for the central bank's cryptocurrencies, the application of crypto consensus in the field of government affairs is tokenless. At the same time, banks are most suitable

for adopting the form of a non-currency blockchain. Banks are a natural node group. Different banks' systems are linked to form a trading alliance circle, creating a good internal ecological circle that is convenient for transactions and settlement. Tokenless blockchain is generally equipped with a private chain and an alliance chain. A number of cooperative organizations or institutional nodes selected in advance are jointly managed by it. Its open objects are selective, more in line with realities, and conducive to the landing of the scene. Tokenized blockchain can achieve high achievements in pursuit of high decentralization and non-tampering. However, the calculation speed under the whole network verification is always flawed, and it is not suitable for industries that require high-speed calculations. And the effect that the tokenless blockchain can achieve in government affairs and public services is also beyond the reach of the tokenized blockchain [14].

4.4 Advantages of blockchain in cross-border payment

4.4.1. Fewer intermediate links increase transaction speed

In the traditional cross-border payment model, a large number of manual intervention operations and payment together need to be transferred by agents, which greatly reduces the transaction speed. Compared to the traditional cross-border payment model, blockchain technology does not involve intermediaries, and shared ledgers improve cross-border payment efficiency. Direct transactions between the payees and payees eliminate the time cost of clearing between different intermediaries and greatly shorten the transaction cycle. The banking industry can make full use of blockchain technology to upgrade the current centralized banking system, optimize the background and infrastructure tools, and improve the quality of modern financial services.

4.4.2. Higher transparency reduces costs

The main cost in the traditional cross-border payment model lies in the various types of settlement of the intermediary, and the blockchain technology does not involve centralization in the entire payment settlement, reducing the indirect costs in the transaction, and at the same time making the costly small cross-border payment business in the past become true. The peer-to-peer model can enable any node unit to use its own network to access the blockchain network equally, to achieve direct connection between nodes, reduce credit costs and billing costs, and realize peer-to-peer payment information transmission between payees . In addition, due to the open source and transparent nature of blockchain technology, users can understand and know the rules of the system, improve the traceability of the system, resulting in no additional cost to establish a credit system, and reduce the trust cost of the system.

4.4.3. Distributed architecture better protects against single points of failure

Traditional cross-border payment is based on trust. In order to maintain trust, many powerful intermediaries have been created. Payment transactions are often centered on these intermediaries, and customer power is often not guaranteed. If the center is attacked or malfunctions, it will As a result, the entire system cannot operate normally, that is, the probability of a single point of failure increases. There is no central point in the blockchain distributed system architecture. Each node on the blockchain conducts transactions and bookkeeping based on the consensus mechanism. Any problems in any part will not affect the overall operation, so it has stronger stability and reliability. , Fault tolerance and business continuity.

4.4.4. Cash flow more quickly

In traditional cross-border payments, due to the slower flow of funds, the efficiency of fund use is reduced, and the blockchain as a decentralized point-to-point system, transaction processing can be completed almost in real time, which greatly reduces the amount of travel money. To help improve liquidity. On the other hand, in the blockchain cross-border payment model, banks only need to use a digital currency recognized by both parties, and do not need to reserve other legal currencies, thereby reducing the occupation of other currencies.

4.4.5. Reduce the difficulty of monitoring

The characteristics of the distributed accounting method of the blockchain enable all relevant transaction records to be stored in the block, and Timestamp achieve traceability of cross-border

transactions. Timestamps ensure that all transaction activity can be tracked and queried. Under the blockchain technology, all nodes in the entire network can verify the authenticity and integrity of the account content and the account itself, ensure the reliability and non-tampering of the transaction history, improve the accountability of the system, and reduce the trust risk of the system .Under this model, any link implemented on the blockchain is within the sight of supervision, which greatly enhances the anti-money laundering.

4.4.6. The reconstruction of the credit system

Blockchain technology provides a new way to collect credit statistics for the improvement of the social credit system. In the field of credit reporting, the advantage of the blockchain is that it can rely on algorithms to automatically and faithfully record every transaction information and other credit-related information, and store it on every computer in the blockchain network, so the blockchain credit system has a full The characteristics of process tracking and cannot be faked. The massive amount of real information is not only helpful for the evaluation of personal credits, but also for in-depth analysis and prediction of personal credit development processes and trends. It has the characteristics of wide range, complete data, authentic content, low cost, and automatic process. Advantages of substitution.

5. Constraints Faced by Blockchain Technology in Cross-Border Payments

5.1 Bottlenecks existing in blockchain technology

At present, blockchain technology is in the initial stage of development, and the cross-border payment industry generates a large amount of data every day or even every second. The blockchain technology is not yet mature, the system cannot carry large-scale data volumes, and cannot support high concurrent retrieval and query. That is, blockchain technology is currently not applicable to large-scale cross-border payment solutions. The degree of decentralization and the performance of the consensus mechanism are not co-existing relationships, and the mutual advantages are difficult to save. The two have a long history, and the higher the degree of decentralization, the lower the efficiency of the consensus mechanism. Conversely, the higher the degree of decentralization of the blockchain, the longer the transaction delay directly determined by the efficiency of the consensus mechanism and the lower the transaction throughput. Therefore, the development of the blockchain must solve the balance between the degree of decentralization and the efficiency of the consensus mechanism. In addition, its traceability and non-tampering have certain limitations. When adding transaction information, it is necessary to obtain the consensus of the entire system. If you need to participate in the network in the late stage of blockchain development, you will need to make a complete copy of the entire blockchain data, which costs a lot of money. Time and storage space.

5.2 Industry standards and policy supervision issues

The decentralized nature of the blockchain makes its application a huge advantage in cross-border payments, and will not affect the operation of the entire system due to the damage of a single node. Due to the decentralization of blockchain technology, a large number of transaction nodes have been generated, so it is inevitable that transaction nodes entering the chain network do not have a uniform access standard. In addition, the demand levels of each transaction node are complex and different. Especially in cross-border trade, the rights and interests maintained by various entities are different, and the attitudes towards the degree of openness of the blockchain are different. Therefore, it is difficult to form uniform industry standards in the blockchain industry. Due to the differences between countries and trade and financial development, the supervision of financial transactions is not the same. The supervision of many transaction nodes must be treated differently, which makes it more difficult to supervise the transaction of the blockchain. At the same time, the corresponding regulatory policies have not been perfected, and there are no corresponding legal restrictions.

6. Conclusion

At present, blockchain technology is in its infancy. Although there are some limitations and challenges, but there are subversive of positive significance in cross-border payments as well as other areas. Therefore, the future development of blockchain technology needs and is worth exploring to solve the existing problems. First of all, blockchain technology as a concept of innovation has had a positive impact in a certain field. For the existing technical problems of blockchain, market participants from all walks of life need to explore and solve them together. At the same time, international exchanges should be strengthened to jointly explore and promote the advancement of blockchain technology, but also to prevent blockchain risks and improve the security of cross-border payments.

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