Analysis of the Application of Blockchain in the Field of Commercial Medical Insurance

Mengle Zhang, Kaiwen He[*]

School of Finance, Harbin University of Commerce, Harbin, China

Email: nanxihekaiwen@163.com

*Corresponding Author

Keywords: Medical insurance, Moral hazard, Blockchain, Smart contract

Abstract: Behind the rapid development of health insurance, the use of insurance funds faces multiple risks, such as the problem of lack of integrity which needs to be resolved urgently. Based on the insurance industry's own characteristics, adverse selection and the existence of moral hazard, this article analyzes the causes of untrustworthiness during the operation of commercial medical insurance. Combined with the technical characteristics of the blockchain, the core advantages and significance of the blockchain used in commercial medical insurance are analyzed in this article. Finally, the article prospected the future development of the combination of blockchain technology and medical insurance.

1. Introduction

Commercial medical insurance, as an important supplement to social basic medical insurance, plays an increasingly significant role in promoting the process of building a medical security system. It can not only meet the higher-level and more diverse insurance needs of residents, but also broaden the financing channels of insurance companies and support the construction of a national multi-level medical security system[1].

However, in the rapid development of commercial medical insurance, the insurance industry has experienced many pain points and needs new technologies to solve them. The technical characteristics of decentralization, secrecy and high credibility of the blockchain have a natural fit with commercial medical insurance. If blockchain technology is introduced into the field of commercial medical insurance, it will have a significant impact on accelerating the transformation of insurance companies and reshaping the ecology of the insurance industry.

1.1 The Concept of Commercial Medical Insurance

Commercial medical insurance refers to the commercial insurance company, according to the medical insurance contract, taking the human body as the object of protection, collecting insurance premiums from the insured, establishing an insurance fund, and paying for the medical expenses caused by the occurrence of the medical accident agreed in the contract.

Compared with social insurance, commercial medical insurance is a type of insurance that aims to compensate the insured's medical expenses and loss of income due to illness or accidental injury based on the basic health of the insured's physical health.

1.2 The Problem of Lack of Good Faith in the Operation of Commercial Medical Insurance

When engaging in insurance activities, policyholders often lose their rationality and violate the principle of good faith driven by economic interests. According to data from the American Medical Insurance Anti-Fraud Alliance, 3% -10% of US medical expenditures are generated by fraud[2]. The British Insurance Anti-Fraud Agency estimates that insurance fraud increases the cost of premiums by approximately ￡ 50 per household per year. The lack of credibility in the process of insurance operation hinders the healthy operation of insurance markets in various countries.

Especially in the field of commercial medical insurance, lack of integrity not only damages the

legitimate rights and interests of insurance consumers, but also wastes insurance service resources. It is the biggest risk for the sustainable operation of insurance funds. The lack of integrity of the insured person is mainly manifested in the following two aspects. First, the insured person conceals the important facts of the risk of the insurance subject, such as family medical history and illness record. The second is to artificially create the illusion of insurance accidents to defraud insurance and to obtain insurance funds.

1.3 The Limitations Due to the Characteristics of the Insurance Industry

Insurance is a special industry that deals with risks and resists probabilities. Honesty is the cornerstone of the development of the insurance industry. Untrustworthy behaviors such as fraud insurance will seriously affect the public's recognition of the insurance industry and disrupt the normal market order.

Due to the information asymmetry between the two parties involved in the insurance, the integrity requirements of the insurance contract are much higher than other contracts. At the same time, the insurance contract has a strong shooting luck. The aleatory contract refers to the effect cannot be determined when the contract is signed, that is, one of the parties to the contract does not necessarily perform the payment obligations, but only when the conditions agreed in the contract are met. Therefore, both parties involved in the operation of insurance are prone to dishonest behavior.

2. The Existence of Adverse Selection and Moral Hazard

For a market to operate effectively, buyers and sellers need to have enough common information. In the process of carrying out medical insurance business, the actual situation of the subject matter of the contract is only in the hands of the policyholder, and there is a serious information asymmetry between policyholder and insurance agency, the resulting adverse selection and moral hazard problems have always troubled the development of insurance business.

According to insurance economics theory, voluntary participation in insurance will cause adverse selection problems in the insurance market. When an insurance company only provides a single weighted average insurance rate and does not distinguish insured people, once adverse selection occurs, people with high health risks will have a stronger incentive to purchase excessive insurance products, while low health risk groups will choose to buy only some insurance products or even give up. Under such circumstances, the insurance market is flooded with high-risk policyholders, and the insurance company's compensation risk suddenly rises, which ultimately leads to an increase in the compensation rate. This will not only directly damage the economic interests of insurance companies, but also lead to deviations in the supply and demand of the insurance market. In the long run, the insurance market with mutual aid as its business philosophy will fall into the dilemma of high risk and low return.

The moral hazard of medical insurance refers to the rational response to economic incentives caused by the price elasticity of medical services[3]. The moral hazard in the medical insurance market includes ex-ante moral hazard and ex-post moral hazard. Ex-ante moral hazard refers to the policyholders would not make enough effort to control disease after purchasing commercial medical insurance services, or even not taking any measures to prevent the risk of illness, which will directly increase the insurance company's later payment risk. Ex-post moral hazard refers to the unreasonable increase in medical expenses caused by the insured's excessive use of medical services after the illness, which directly causes the insurance company's compensation to rise.

Based on the above analysis, we can see that "asymmetric information" is the biggest problem that limits the health and sustainable development of medical insurance and even the entire insurance industry. In recent years, the rapid progress of science and technology provides a new way of thinking and methods to ease the information asymmetry between insurers and insured persons. Among them, the stable operation of blockchain technology with its highly secure and reliable architecture, algorithm design and with innovative technologies such as distributed ledgers and smart contracts, can break information barriers under the premise of protecting user data

privacy. These functions will bring more possibilities in the industry, then these possibilities will bring innovation and change to the entire insurance industry.

3. The Concept and Core Advantages of Blockchain Technology

3.1 The Meaning of Blockchain Technology:

As a new application model of computer technology such as distributed data storage, point-to-point transmission, consensus mechanism, encryption algorithm, etc. [4], when it is defined from a technical perspective,blockchain is a global distributed decentralized shared ledger, with data that cannot be tampered and decentralized characteristic.; but from the perspective of application, blockchain is a trust infrastructure that can be applied to any social relationship reconstruction and intelligent field.

3.2 The Core Advantages of Blockchain Technology

(1) Decentralization

Blockchain is a decentralized system composed of P2P networks to maintain consistent data records among various nodes. Through this system, a distributed ledger could be established. Distributed ledger means distributed storage of data, even if one or more nodes on the blockchain network are damaged, the remaining information will not be damaged, and the information flow will remain stable.

(2) Strong openness

The blockchain system is open. Except that the identity information of each node is encrypted, the data of the blockchain is open to everyone. Anyone can query the data of each node on the blockchain through the public interface to realize the point-to-point transmission of information. Therefore, the entire information recorded in this system is highly transparent.

(3) High reliability

The traditional trust model is often based on trust in "people". The blockchain adopts consensus-based specifications and protocols so that people can access data information on each node in the entire system through public procedures and records without intermediary credit guarantee or credit endorsement, which changes the trust of "human" to the trust of the machine. Any human intervention does not work, and the degree of transparency and credibility is quite high. In addition, the consensus mechanism ensures that the data stored on the blockchain cannot be tampered and can be trusted.

These excellent characteristics enable the blockchain to make up for the shortcomings of current insurance companies, improve operational efficiency, reduce operating costs, prevent data forgery and tampering, and reduce the risk of compensation. Therefore, the applicable scenarios of blockchain are very extensive, and many insurance institutions are studying how to apply the blockchain technology to the financial insurance market.

4. The Great Significance of Blockchain Applied in the Field of Commercial Medical Insurance

Commercial insurance companies can reduce the risks of insurance companies in underwriting and supervising through the application of blockchain technology such as distributed ledgers and smart contracts. At the same time, they can use the blockchain consensus mechanism to solve privacy protection and information security in data transmission, ensuring the credibility of the transaction from the source.
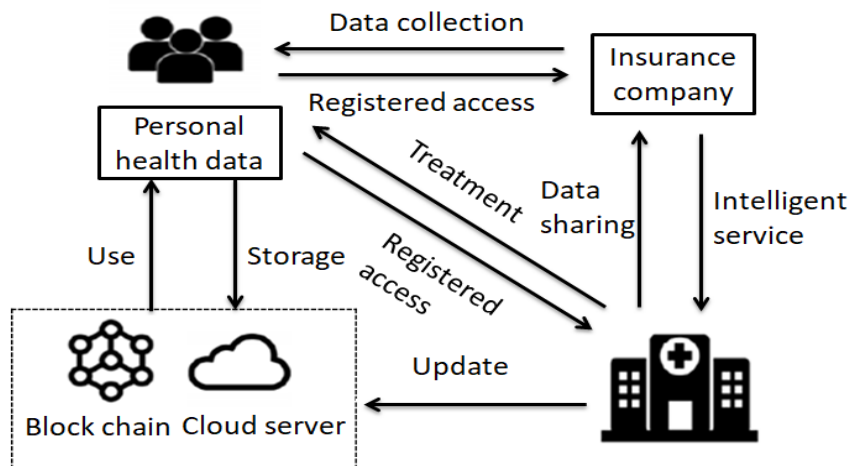
Figure 1: Illustration of Blockchain Application

4.1 Effectively Solve the Problem of Information Asymmetry between Policyholders and Insurance Companies

In the past, the medical information of patients was controlled by both the hospital and the patients. It was easy to falsify data, and the phenomenon that collusion between doctors and patients to defraud insurance often happened. But blockchain technology provides a solution for insurance companies to fight against fraud. With the advancement of medical information digitization and personal credit information system, the insured 's medical records, claims records, and illegal behavior records can be transparently stored on the blockchain. The data on the chain is stored by multiple parties including hospitals, medical service departments, and government regulatory agencies to ensure the traceability and reliability of the information[5]. Therefore, the insurance company can access the information on the chain to understand the policyholders' detailed medical conditions and medical records, ensure the accuracy of the underwriting, strengthen the risk management of the insured so that the fraudsters have no opportunity.

4.2 Reduce the Administrative Cost of Commercial Medical Insurance

PricewaterhouseCoopers, a well-known accounting firm, estimates that if the insurance industry adopts blockchain technology actively, it will save 15-20% of operating expenses. The process of commercial medical insurance from settlement to final claims requires the participation of hospitals, insurance companies and regulatory departments. But insurance companies are faced with many obstacles when they intervene in medical services, and need to pay high fees of coordination. However, the consensus mechanism of blockchain enables all nodes on the chain to share and use, ensures the authenticity and transparency of transaction data and greatly reduces the difficulty of coordinating transactions between different units. Then, the claims of medical insurance can be directly realized through the intelligent contract, thus reducing the labor cost generated in the underwriting and claims process. Therefore, the block chain reduces the insurance management cost to zero through smart contract so that all the insurance funds can be used for compensation or welfare to maximizes the interests of the policyholders.

4.3 Assist Commercial Insurance Companies to Realize Precision Insurance

As income increase, residents pay more attention to healthy quality. However, the insurance industry in China is still in the early stage of development, and the insurance varieties provided by commercial insurance companies are simple and single, which makes it difficult to meet the diversified and personalized insurance needs of consumers. Blockchain can provide commercial

insurance companies with a distributed database for storing personalized medical information, so that insurance companies can reasonably recommend insurance varieties, design personalized insurance policy and realize accurate insurance according to the real health status of the policyholders. On this basis, commercial insurance companies can also make use of big data and cloud computing to analyze and forecast the insurance market to discover potential insurance needs and trends. Due to these development in insurance, insurance companies could provide better service and protection for people.

4.4 Strengthen the Data Protection of Policyholders

By creating a transparent distributed ledger, the blockchain records data such as the flow path of users' medical information, insurance policy transactions and historical claims information. Although the data stored on the chain is public, asymmetric encryption and authorization technologies strengthen the restriction on member access to ensure that the identity information of the account can only be accessed under the authorization of the data owner, thus protecting the personal privacy of users. In addition, the safe storage and flow of data can be guaranteed by the excellent tamper-proof characteristic of data on the chain. Therefore, blockchain technology can balance privacy protection and data sharing. In order to ensure the security and operability of the blockchain platform, the key technology in security and privacy of blockchain will be continuously improved in the future. And the encryption algorithms and standards will be fully supported to meet the privacy requirements of business data.

5. Looking Ahead to the Application

The establishment of an insurance contract is premised on mutual trust between the insured and the insurer. In the background of the Internet, trust based on brands, institutions, and government authority is no longer sufficient to support interconnected social relationships. Thus, a higher level of trust model is needed.

Blockchain is the technological infrastructure for the Internet society to build trust, which is conducive to the establishment of a more open and transparent social governance system. Combined with the analysis of the application of blockchain in the field of medical insurance, in the future, we should actively build a cooperation platform, connect data from different insurance companies, promote the deep integration of the insurance industry and financial technology, and increase the management capabilities of the risk of the insurance industry.

References

[1] Li Yuquan. Accelerate the development of health insurance and actively serve the construction of a multi-level medical security system [J]. China Insurance, 2012, 3: 18-21.

[2] He Haiqing. Strengthening the medical insurance audit to ensure the safety of the fund [J]. Chi Zi, 2017, 8: 16-20.

[3] Xie Mingming, Wang Meijiao, Xiong Xianjun. Moral risk or medical demand release? -- Medical insurance and medical expense growth [J]. Insurance Research, 2016, 01: 102-112.

[4] Zhang Peng. Research on the impact of blockchain technology on traditional trade settlement methods of commercial banks [D]. Beijing: University of International Business and Economics, 2017.

[5] Zhang Jianmin. Don't hurt the credibility of the media [J]. Audiovisual Aspects, 2014, 2: 31-32.