

Research on Innovation of China's Regulatory Sandbox System under the Impact of Blockchain Technology

-- Based on the Perspective of Fault-tolerant Supervision

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Abstract

The emerging financial technology represented by blockchain and 5G has developed rapidly, which has spawned more new financial products, services and business models. Because the business models and application models of financial technology are diverse and complex, the corresponding regulatory mechanisms are difficult to develop synchronously, and how to maintain the dynamic balance between financial innovation and risk prevention and control has become a major problem. In view of this, based on the development status and existing problems of blockchain technology and "regulatory sandbox" system, this study established a regulatory sandbox system model for blockchain financial product design, and proposed measures such as strengthening the top-level design, learning from the "regulatory sandbox" model, increasing the use of blockchain technology, and re-understanding the relationship between traditional financial supervision methods and blockchain, so as to promote the healthy development of blockchain in financial product innovation.

Keywords

Blockchain; Technology and finance; Supervision sandbox; Financial supervision; Construction of new pattern.

1. INTRODUCTION

Emerging financial technologies, such as blockchain and 5G, have developed rapidly and played an important role in building new financial formats, improving financial service quality and promoting financial innovation. In 2019, the Chinese government officially positioned blockchain technology as a national strategy, which opened up a huge imagination space for the development of blockchain industry. At the same time, blockchain also expands the original financial supervision scope, strengthens the risk transmission of the financial system, enhances the risk concealment, and puts forward higher requirements and new challenges for financial supervision. The innovation and supervision of blockchain in the financial field is always in a dynamic game. How to realize risk prevention and control without stifling technological innovation has become a topic that regulators ponder deeply. In order to meet the demand of supervision under the blockchain, the "supervision sandbox" system came into being.

In this context, what potential impact does the barbaric growth of blockchain technology have on the application of regulatory sandbox system? Can we achieve a win-win situation between financial innovation and risk prevention? In the future, from what aspects can we create an external system and policy environment conducive to the transformation of financial technology supervision mode? The answers to these questions have important practical significance for China's financial science and technology field to achieve "overtaking in corners".

This paper is problem-oriented, aiming at the problems arising from the supervision sandbox in practice, and puts forward a new mode of supervision sandbox suitable for financial technology. The most distinctive feature of this new mode is its inherent technological elements. The second part introduces the compatibility and conflict between blockchain technology and supervision sandbox; The third part expounds the present situation and problems of sandbox supervision practice in China, and summarizes its characteristics; The fourth part puts forward a regulatory sandbox model suitable for financial technology, including guiding principles, design ideas, processes and templates, and compares this regulatory sandbox model with the British regulatory sandbox; The fifth part summarizes the full text.

2. THE COMBINATION AND CONFLICT BETWEEN BLOCKCHAIN TECHNOLOGY AND REGULATORY SANDBOX SYSTEM

2.1. The Combination of Blockchain Technology and Regulatory Sandbox System

The "regulatory sandbox" system is more suitable for the characteristics of blockchain finance. First, the "regulatory sandbox" fits the regional characteristics of blockchain finance. China's blockchain companies mainly engaged in blockchain business are geographically concentrated, with 80% of blockchain companies concentrated in Beijing, Shanghai, Guangdong and Zhejiang, with obvious agglomeration effect. The "Regulatory Sandbox" has the characteristics of "trans-regional and integration" and a high degree of openness, which is very suitable for conducting financial innovation product tests in regions with mature conditions. Enterprises that meet the evaluation criteria can enter the sandbox for testing, without geographical restrictions, and it is also conducive to the nationwide market promotion in the later mature stage.

The "regulatory sandbox" fits the product characteristics of blockchain finance. The application of blockchain products in China shows a diversified trend, covering financial fields such as supply chain finance, trade finance, credit reporting and insurance, as well as physical industries such as energy, medical care and Internet of Things. The access conditions of the "Regulatory Sandbox" are financial technology innovation products, which are not subdivided into categories and have a wide range. All qualified financial innovation products can enter the sandbox, and there are usually many types of products tested in it, which is conducive to comprehensive testing of diversified blockchain products and boosting the high-quality development of products.

The "regulatory sandbox" fits the technical characteristics of blockchain finance. In addition to compliance risks, the development of blockchain industry also faces technical risks, such as private keys, security of terminal security consensus mechanism and network congestion. The "Regulatory Sandbox" mainly tests online high-tech innovative products, and uses advanced technology to supervise the test process and results, which is more efficient and more reliable, and is more suitable for the new financial format in which the financial field and the Internet merge, and can effectively prevent certain risks caused by technology abuse.

The "regulatory sandbox" fits the development trend of blockchain finance. At present, China's blockchain industry is in a high-speed development stage. Internet giants, entrepreneurs and capital are constantly pouring in, and the number of enterprises is rapidly increasing. By the end of March 2018, the number of companies with blockchain as their main business has reached 456. The entry of many subjects and the injection of huge capital put forward higher requirements for the examination and approval authorization system and administrative supervision framework. As the "regulatory sandbox" system comprehensively authorizes all subjects and products tested in the sandbox, the authorization is stronger, and the scope of authorization for financial innovation is wider. At the same time, the policy is relaxed for specific content, and the authorization is relatively flexible and diverse, which is

conducive to encouraging financial innovation and effectively responding to the future industrial development trend.

2.2. The Conflict Between Blockchain Technology and Regulatory Sandbox System

2.2.1 The first problem faced by the blockchain supervision sandbox is the type limitation.

Not all businesses in the blockchain supervision sandbox can be piloted, which can only cover the types of businesses supervised by the regulatory authorities, and does not exceed the jurisdiction of the region. For example, payment services and electronic money are governed by relevant regulations, and they cannot be included in the supervision sandbox. In addition, some financial businesses involve the level of national legislation, and there will be many restrictions when they are included in the supervision sandbox pilot. In addition to payment services and electronic money, credit institutions, insurance and reinsurance companies, insurance intermediaries, asset management companies, brokerage institutions and other business types are facing such problems.

2.2.2 The second problem faced by the blockchain supervision sandbox is the lack of infrastructure.

Innovative financial products and services developed by financial technology companies often need the support of the underlying technology, especially in the blockchain industry. Taking asset confirmation as an example, the corresponding supporting facilities are not perfect at present. To effectively carry out operations such as asset transfer in the chain, it still needs the underlying technical support with high performance and high privacy and more consensus nodes. However, in fact, there is a huge gap in infrastructure construction in the blockchain industry at present, which makes it difficult to support enterprises in the regulatory sandbox to conduct business normally. The supervision sandbox is essentially a small-scale business pilot with limited business scale. Especially in the blockchain industry, performance issues directly affect the practicality of technology and the feasibility of projects. Enterprises need to carry out experiments with the market and users themselves. Many start-ups can't pilot in the sandbox just because they can't find users who are willing to cooperate.

2.2.3 The third problem faced by the blockchain supervision sandbox is that the new model matches the old supervision, and the innovation potential is naturally limited.

Sandbox pilot can help regulators find outdated regulations that hinder innovation, which is true in theory, but it is difficult to really play a role. A lot of innovative projects that are contrary to the existing rules were rejected at the sandbox application stage; Second, the sandbox pilot is still essentially a new model applying the existing regulatory rules, which will inevitably be inappropriate, and the innovation potential may not be brought into full play. Generally speaking, it is good for the development of blockchain industry to implement supervision sandbox, but there are still many restrictions. How to avoid the disadvantages of supervision sandbox still needs the joint research of supervision departments and enterprises.

3. THE APPLICATION STATUS AND PRACTICAL PROBLEMS OF CHINA'S REGULATORY SANDBOX SYSTEM

3.1. The Development of Chinese Regulatory Sandbox It Has Been More Than Three Years Since the Pilot Exploration of Monitoring Sandboxes

The Ganzhou Blockchain Financial Industry Sandbox Park launched in July 2017 is the first pilot practice of monitoring sandboxes in China, and then Hangzhou and Shenzhen have successively piloted it. These sandbox explorations mainly apply blockchain technology to deposit and trace information and monitor Internet financial risks. There are the following common problems: First, regulatory innovation is not the primary goal, and most of them are

incentives for local governments to innovate financial technology. The contact between regulatory agencies and enterprises is evacuated; Second, the innovation subject lacks initiative, relies on the support and guidance policies in the industrial park, and conflicts with the R&D incentive goals; Third, the R&D results of innovative products of financial science and technology are generally homogeneous, and it is difficult for many places to overcome the core technologies.

In July 2019, the People's Bank of China indicated that it would work with relevant ministries and commissions to carry out pilot sites for the application of financial technology in 10 provinces and cities such as Beijing, Shanghai and Guangdong, calling for a new form of supervision. In December of the same year, Beijing took the lead in carrying out the pilot work of sand box supervision. On January 14, 2020, Beijing Local Financial Supervision Administration released the first batch of supervision sandbox test items, and the test period was from January to March 2020. A total of 46 financial technology application projects have applied for this batch of sandbox tests, and only 6 projects have been successfully approved, with a passing rate of only 13%. The approved projects mainly focus on technologies such as big data, artificial intelligence and application program interface, rather than just blockchain technology. Judging from the actual application of regulatory sandboxes in China, there are not many government-led sandboxes, and most of them are set up by non-profit organizations, such as regulatory sandboxes industrial parks in Shenzhen and Hangzhou. At present, the pilot project of supervision sandbox in Beijing adopts a new form of cooperation between financial institutions and the government. Considering the development of regulatory sandbox in China, whether it is a regulatory sandbox established by non-governmental organizations or a government-led regulatory sandbox, it is still in its infancy, and the specific regulatory laws and requirements have not yet been agreed.

Table 1. Application of regulatory sandbox in China

region	Supervision subject	Supervision sandbox name	start time
Ganzhou	Ganzhou Municipal Government, National Internet Center, Internet	Blockchain financial industry sandbox park and local new financial supervision sandbox	Jul-17
Shenzhen	china electronic commerce association	Shenzhen supervision shahe industrial park	Sep-17
Hangzhou	China Electronic Commerce Association, China Blockchain Supervision Sandbox Committee	China Blockchain Supervision Sandbox Hangzhou Bay Industrial Park	Sep-19
Beijing	Management Department of People's Bank of China, Beijing Local Financial Supervision Bureau	Pilot project of financial science and technology innovation supervision	Jan-20
Shanghai	Shanghai head office of the people's bank of China	Shanghai Financial Science and Technology Innovation Supervision Pilot	Apr-20
Hangzhou	China Electronic Commerce Association, China Blockchain Supervision Sandbox Committee	China Blockchain Supervision Sandbox Hangzhou Bay Industrial Park (Second Batch)	Jun-20
Beijing	Management Department of People's Bank of China, Beijing Local Financial Supervision Bureau	Pilot supervision of financial science and technology innovation (second batch)	Jun-20

3.2. The Problems Exposed in Practice

1. The supervision sandbox is an institutional sandbox, which is subjective and has a strong discussion on one case at a time. This is the traditional supervision sandbox, which mainly focuses on legal and institutional issues, and supervises by process rather than by scientific and

technological means. There is no strict process, the evaluation criteria are not specific, and the five issues of monitoring sandbox access are open, high-level and short, which can be interpreted broadly or even contrary. Different people may implement them, and the results may be completely different.

2. The supervision sandbox is a kind of Principles-Based Regulation. Because the companies involved in sandbox are given flexibility and discretion, so that their innovation conforms to the goal of sandbox system. However, it may lead to Deregulation, and its legitimacy is questionable, because it is informal and opaque. Unless the principles are carefully designed, clearly explained and the consequences of not adhering to them, it is very likely to become rule-based regulation by the backdoor. (there are some special English nouns here.)

3. The evaluation subject of the supervision sandbox is the financial supervision institution. Financial regulators are responsible for monitoring and evaluating the whole process. Because the regulatory sandbox is aimed at financial technology, the products or services to be evaluated are high-tech, while the financial regulatory agencies lack scientific and technological talents, are unfamiliar with technology and lack the ability to evaluate technology.

4. The capacity and function of supervision sandbox are limited. The supervision sandbox is very small in scale, and the number of entities in the sandbox is usually very small. The number of testing institutions in each batch of supervision sandboxes in the UK is only ten digits. The number of companies that have passed the sandbox test is even smaller, even if some of them are facing bankruptcy.

4. THE INNOVATION OF REGULATORY SANDBOX MODE BASED ON FAULT-TOLERANT PERSPECTIVE

In order to solve the above problems and learn from the experience of industrial sandbox, we propose a new three-stage supervision sandbox, which is a platform for supervision, technology and law parties to participate, perform their duties and responsibilities, adopt a more scientific and rigorous, open and transparent process with three-stage full coverage, and use scientific means to test and evaluate.

4.1. Guiding Principles

One is intelligence. Try to be automated or even intelligent, reduce human intervention, and reduce subjectivity or human error.

The second is authenticity. The information disclosure is open, the process is scientific and reasonable, and all the result data are uploaded to ensure the authenticity of the data.

The third is appropriateness. Do their part, the regulators make the supervision rules and organize the evaluation, the technology companies do the technology evaluation, and the third party organizations make the test set public.

Fourth, openness. Brainstorm ideas and find as many solutions as possible.

4.2. Design Ideas

Sandbox combines physics, system and technology.

4.2.1. Physical sandbox, which has physical space and can include multiple squares.

(1) location. Different sandbox locations and policies, such as special taxation and talent policies, will affect sandbox experiments.

(2) Personnel. It is convenient for personnel management, training and development because of the occupancy of technical and management personnel.

(3) Server. This can't limit the public chain, but it has a great influence on the alliance chain.

(4) Exchange. Legal and compliant exchanges are settled in, which is convenient for management. Exchange and regulators or sandbox park jointly manage customers' wallets and accounts, and close illegal exchanges and prohibit financial institutions from connecting with them.

4.2.2. Institutional sandbox, which is mainly regulated by law and system, is consistent with the aforementioned British regulatory sandbox.

4.2.3. The technical sandbox is divided into four levels from high to low:

- ① There is an industrial sandbox that can test the bottom layer of the blockchain, test the blockchain application, and monitor the blockchain system at runtime;
- ② There is an industrial sandbox that can test the bottom layer of the blockchain and test the blockchain application;
- ③ There is an industrial sandbox, but only the bottom layer of the blockchain can be tested;
- ④ There is no industrial sandbox. The three-stage sandbox described in the next section belongs to the highest level.

4.3. Advantages of Three-stage Sandbox

4.3.1 The whole process is covered, which solves the problems of limited testing time and unsustainable testing in sandboxes.

First of all, before entering the box, the tested institution uses the open test set to test, and can submit the application for entering the box only after passing the test, and can enter the sandbox only after passing the examination. Test scripts and cases can be divided into the following three types, which can be dynamically adjusted: First, they must pass completely (100% pass rate);

Second, it is strongly recommended to pass (if 90% pass rate is required); Third, it can be partially passed (such as 80% pass rate). Secondly, in the sandbox, one or more evaluation institutions are designated by the regulatory authorities, and the evaluation institutions can test the technology and analyze big data from various aspects and dimensions. When the tested institution submits a box application, the evaluation institution shall provide an evaluation report, and the sandbox certificate shall be issued after passing the examination.

Table 2. Three stages of supervision

Comparative elements	Sandbox front	In the sandbox	Behind the sandbox
testing environment	Self-test environment	Unified test environment is a three-stage supervision sandbox	Unified test environment is a three-stage supervision sandbox
Test cases and scripts	Each industry can establish industrial test cases and scripts, which can be crowdsourced	In each period, the test set must be fixed, and the test set is the "industrial specimen"	Use standard test set+specific test set
test report	You can selectively put it into the blockchain and do big data analysis. You must submit a test report of the blockchain before entering the box	It must be put into the blockchain to ensure that the test is fair and complete, and the test set is the industry standard	Regular reports must be placed on the blockchain, or every time a new version comes out, the report is updated on the blockchain
Participating institutions	Technology companies, potential customers, three-stage sandbox, incubator, instructor, etc.	Technology companies, institutions, three-stage supervision sandbox	Technology companies, potential customers, three-stage sandbox, incubator, instructor, etc.

Thirdly, the sandbox test continued after the sandbox was released. Tested institutions with sandbox certificates continue to test products and services, provide regular reports, and conduct spot checks.

4.3.2 All parties have clear responsibilities and cooperate with each other, so that the sandbox can play its role effectively.

According to the overall regulatory objectives, the regulatory agency formulates the entry and exit box standards and specifies the list of evaluation agencies; Check whether it is possible to enter and exit the box; Issue sandbox certificates; Spot check the box-out items; Revoke sandbox certificate. The appraisal institution shall conduct an objective, scientific and fair appraisal of the project and provide an appraisal report.

Test sets are jointly developed by regulators, science and technology evaluation agencies and independent testing experts, and the sandbox allows anyone to contribute test cases and footnotes.

Templates are stored in the blockchain, and information providers must guarantee the authenticity and legitimacy of information through digital signatures. Once the information provided is found to be wrong, it will be traced back to the information providers, and those who intentionally provide wrong information will bear corresponding responsibilities according to the severity of the situation.

5. CONCLUSION

5.1. The Radiation Range Should Cover the Whole World

It is necessary for the competent authorities of any sovereign country in the world to participate in and jointly create innovative regulatory schemes for new cases. Of course, this does not mean that the regulatory authorities of all countries need to participate in the whole process. An initial team management sandbox can be established first, and then the staffing can be adjusted according to the actual needs.

5.2. Be Flexible Across Industries

That is to say, once it is determined that blockchain application may have an impact on a certain field, the regulatory sandbox should assemble the regulatory agencies responsible for this field. Different use cases will lead to different corresponding regulatory agencies, such as taxation, securities, consumer protection, banking supervision, medical care, labor and so on.

5.3. The Operating Structure Should Be Friendly Enough for Start-ups

Some start-ups are small in scale and limited in budget, so the blockchain sandbox should give them proper care. At present, many blockchain start-ups that meet the sandbox standard are faced with such a problem: without the approval of the regulatory authorities, many companies cannot further expand their scale. If they want to obtain approval, it means going through a maze-like complex procedure, which may involve running through many law enforcement departments, and the cost is too high for many start-ups.

One of the ways to solve this problem is to establish a single contact point, which will directly coordinate with the other party to supervise the sandbox, and bring the corresponding representatives into the sandbox team.

5.4. Set Corresponding Index Parameters for Different Cases

Blockchain sandboxes must be able to set test parameters (timeline, user profile test, etc.) for application cases, as well as design regulations for supervision and data monitoring. Because there are numerous ways, purposes and objects to use blockchain technology, we should fully

consider the regulatory issues that may arise from each case when designing sandbox parameters.

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