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Legal Risks and International Regulatory Pathways of Prepaid Fund Supervision in the Era of Artificial Intelligence

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Abstract. The application of artificial intelligence technology in the field of prepaid business has disrupted the existing regulatory mode and process. Although several countries have basically formed relatively mature legal norms in the supervision of prepaid funds, they still face many problems and challenges in the international cooperation in the field of transnational prepaid funds. First, the regulatory rules are fragmented, cross-border supervision lacks a unified coordination mechanism, and the application of AI technology further exacerbates the failure of cross sectoral cooperation; Second, the abuse of technology has led to cross-border compliance arbitrage, highlighting the risks of algorithm manipulation and discrimination, and the lack of international cooperation has led to the exploitation of regulatory loopholes; Third, differences in national regulatory rules restrict international mutual recognition, and differences exist in the form of capital isolation and AI governance standards, which hinder the development of cross-border prepayment business. Collaborative governance should be strengthened, and international organizations should take the lead in formulating the basic principles and guidelines for the supervision of international prepaid funds to unify the core standards; Besides, we should also standardize the application of AI, clarify the technical bottom line standards, establish a cross-border regulatory cooperation platform, and strengthen information sharing and implementation linkage; Finally, we should implement hierarchical supervision, refine operators' filing standards, information disclosure obligations and risk prevention and control requirements, and strengthen access and compliance management.

Keywords. artificial intelligence; prepaid funds; regulatory arbitrage; international regulation; collaborative governance

1、 Introduction

The supervision of prepaid funds in the era of artificial intelligence is not an isolated industry problem, but a systematic legal problem that needs to be standardized and solved through risk assessment and system design from the perspective of holism. The central economic work conference in December 2024 in China clearly put forward that "vigorously boost consumption, improve investment efficiency, and expand domestic demand in an all-round way" should be the top priority, and stressed the need to "effectively prevent and resolve risks in key areas, and firmly hold the bottom line without systemic risks". As an indispensable transaction form in the modern market economy, prepaid business model not only injects stable cash flow into enterprises, but also brings greater convenience and benefits for consumers to

purchase goods or services. Generally speaking, advance payment often means lower single consumption cost and simpler transaction process, which greatly improves the transaction willingness of consumers and plays an indispensable role in boosting consumption and promoting the development of market economy. However, this business model is also accompanied by certain risks and challenges, especially in the consumption scenarios where AI has become popular. The wide application of big data, smart contracts and other technologies has indeed achieved real-time monitoring, accurate early warning and effective traceability of prepaid funds, but it also brings new legal risks such as privacy disclosure and algorithm bias. Under the background of optimizing the business environment and the construction of the rule of law, how to improve the relevant system of prepayment supervision in the balance of helping the development of enterprises and protecting the legitimate rights and interests of consumers has become an urgent problem and challenge for legislation to respond. This paper intends to follow this idea, clarify the legal nature of prepaid funds and the legal relationship between the parties, sort out the existing international regulatory norms and the new risks faced in the era of artificial intelligence, and put forward the corresponding countermeasures to improve the international regulatory path of prepaid funds regulation.

2、 The definition of prepaid funds and the necessity of supervision

Definition of prepaid funds

Prepaid transaction, as a common business operation mode, specifically refers to that consumers pay corresponding fees to operators before actually obtaining goods or enjoying relevant services. After completing the prepayment process, consumers can purchase the required goods and experience specific services in the future by virtue of various consumption vouchers issued by operators (such as entity cards, electronic account information, etc.), or proof of identity that can effectively identify prepaid consumers (such as bound mobile phone numbers, ID card information, etc.), and complete the final settlement of fees in this process.^[1] Such business models are widely used in various industries, such as beauty salons, fitness, catering, education and training, etc., and prepaid funds are the payments made by consumers to operators in advance in this business transaction model. Consumers can enjoy certain price concessions or other additional rights and interests by paying funds in advance, and merchants can take advantage of this to withdraw funds in advance to stabilize customer groups.

As far as its legal attribute is concerned, there are three different views in the academic circle. The first view is that the prepaid fund has the attribute of creditor's rights, which essentially belongs to the creditor's rights enjoyed by consumers to operators in a certain period in the future after paying in advance. Taking the common single-purpose prepaid card as an example, the Supreme People's Procuratorate of the people's Republic of China has determined in judicial practice that a single-purpose commercial prepaid card is a debt voucher bound by the prepaid consumption contract agreed between consumers and merchants. The amount in the card is a kind of debt in law. The essence is that consumers deposit money in the operator's account and convert it into the electronic digital amount of corresponding value goods or services or the face value of paper vouchers. This amount is the claim of consumers for consumption from corresponding merchants. The claim can be quantified by the currency of corresponding value, belonging to the category of property.^[2] In this view, the prepaid fund is the property paid by the consumer to the operator and owned by it. After the consumer pays the prepayment, he will get the right to request the operator to provide goods or services as agreed, while the operator has the obligation to perform the contract. However, the ownership of prepaid funds completely belongs to the operator, which will undoubtedly bring greater legal risks to

consumers. Once the operator goes bankrupt, runs away with money or maliciously encircles money, consumers will often face the dilemma of no way to protect their rights. The second view is that prepaid funds have the attribute of financial instruments, and prepaid cards used to store prepaid funds are a kind of marketable securities with commercial credit and strong market liquidity. For operators, issuing prepaid cards is an effective tool for financing substitution under the background of bank loan difficulties.^[3] For consumers, purchasing prepaid cards can obtain preferential discounts or additional recharge amounts, which is similar to the invisible investment income of securities.^[4] This view focuses more on the investment and financing attributes of prepaid funds, but does not change the ownership, and consumers still face great financial risks. The third view advocates that the prepaid fund should be independent of the inherent property of the operator, so that bankruptcy isolation can be achieved through the trust mechanism. Specifically, the money paid in advance by consumers is not only the consumption price, but also the "purpose property" paid for a specific purpose.^[5] The advantage of identifying prepaid funds as trust property is that it can be independent from the operator's own assets. The use and allocation of these assets by the operator need to be carried out under the supervision of consumers, and are not included in the bankruptcy property during bankruptcy liquidation, so as to better resolve the property risk faced by consumers in prepayment transactions.

The necessity of strengthening the supervision of prepaid funds in the era of artificial intelligence

A. Prevent financial risks

The main feature of prepaid consumption mode is that consumers pay all the prices in advance before operators provide all goods or services. Although this helps operators achieve financing purposes and invest in reproduction in a short time to expand the scale of operation, the prepayment funds paid by many consumers are attributed to the formation of a certain scale of capital pool at operators. If businesses lack an effective fund management and risk control mechanism and arbitrarily use the prepaid funds for other high-risk investments, once the investment failure causes the capital chain to break, they will not be able to fulfill their service commitments to consumers, which will lead to group consumption disputes and even local financial turmoil.^[6] In addition, the intervention of AI also greatly increases the transaction risk in such business models. AI can quickly generate false user evaluations and induce consumers to consume impulsively; Algorithmic recommendation may push high-risk prepaid projects in a directional way, aggravating the risk of capital concentration.^[7] Once the merchant runs away with money, the speed and concealment of AI driven capital flow will double the difficulty of recovery. The excessive marketing behavior of such AI holdings not only significantly increased the capital risk faced by consumers, but also substantially increased the systemic risk hidden danger faced by the entire financial market due to the rapid aggregation of huge capital pools in the short term.

B. Protect the legitimate rights and interests of consumers

The intervention of artificial intelligence blurs the flow of prepaid funds, which increases the difficulty of supervision and is not conducive to the protection of consumers' legitimate rights and interests. The traditional prepaid transaction is essentially a prepaid consumption contract between the operator and the consumer. The consumer pays the price according to the contract, and the prepaid funds directly enter the account opened by the operator or the third-party depository account. However, the emergence of black box algorithm makes the collection, storage and use of prepaid funds no longer transparent. AI can automatically split large prepaid funds into multiple small funds through preset algorithms, so

as to realize cross platform, cross account and even cross-border rapid flow of funds (such as through virtual currency, overseas payment tools, etc.). For example, a prepaid platform uses AI to analyze regulatory rules in real time. When monitoring the verification of regulatory accounts, it immediately transfers the misappropriated funds to the associated "shadow accounts" through algorithms, making it difficult for regulators to track their complete links. In addition, the operator may use AI's "algorithmic decision" to defend the misappropriation of funds. When operators are questioned about the use of prepaid funds, they often use technical loopholes such as "AI automatically optimizes the allocation of funds" and "algorithm misjudgment" to blur their responsibilities. However, due to the lack of ability to interpret the algorithm, regulators are difficult to distinguish between technical problems and subjective malice, thus falling into a dilemma in the allocation of responsibilities.^[8] Therefore, it is urgent to strengthen the supervision of the flow of prepaid funds through legislation, eliminate the regulatory problems caused by the black box of algorithms, and protect the legitimate rights and interests of consumers.

C. Maintain market order

Strengthening the supervision of prepaid funds has a positive significance in maintaining market order in multiple dimensions, and can form a systematic rights and interests protection mechanism under the legal framework. From the perspective of maintaining the market credit order, standardizing the circulation of prepaid funds can curb the operators' dishonesty. The unsound regulatory system for prepaid funds will greatly increase the risk of breach of contract and dishonesty of operators. The application of AI technology exacerbates the information asymmetry between operators and consumers. New consumption scenarios such as virtual product prepayment and cross dimensional product prepayment go beyond the traditional regulatory framework.^[9] In the absence of regulation, operators have greater autonomy over the prepaid funds, which makes it more likely to run away with money and reduce the scope of services without authorization driven by various commercial interests. Such behavior will directly impact the market credit chain. By establishing the systems of deposit and custody of prepaid funds, purpose filing, and punishment for breach of trust, it can link the operator's credit rating with its capital security, performance ability and other indicators, reduce the occurrence of credit default events from the source, and strengthen the trust foundation of market participants in the "prepaid transaction" mode.^[10] From the macro level of stable market order, effective regulation can prevent credit risk transmission. The default of individual operators in the absence of regulation may lead to the disorderly flow of some prepaid funds. If not intervened in time, it may expand from the internal risk of the enterprise to the external risk of the market, and cause industrial credit panic, such as the collective boycott of consumers on similar prepaid products or services, vicious competition among operators, etc.^[11] By strengthening the dynamic supervision of the flow of prepaid funds, establishing and improving the punishment system for dishonesty and other measures, local credit risks can be controlled within a controllable range, maintaining the credit ecological balance of the consumer financial market, and creating a stable and predictable trading environment for market players.

3、Regulatory status and problems of prepaid funds in various countries in the era of artificial intelligence

Fragmentation of regulatory rules in the AI era leads to failure of cross sectoral coordination

At present, the legal norms related to the supervision of prepaid funds in various countries are scattered in different fields and effectiveness levels. Although the supervision of the storage and use of funds in the prepaid business model has been achieved in general, the

supervision norms are seriously fragmented and there are different degrees of conflict between different regulatory rules. In addition, the application of artificial intelligence technology in the circulation and use of funds has exacerbated the failure of cross sectoral supervision and coordination.

Taking China as an example, China's prepayment supervision involves many departments such as commerce, market supervision, education, civil affairs, finance and taxation, but lacks a unified coordination mechanism. The measures for the administration of single purpose commercial prepaid cards (Trial) revised by the Ministry of Commerce in 2016 focuses on enterprise filing, and stipulates that large-scale card issuing enterprises, group card issuing enterprises and brand card issuing enterprises must file with the competent department of Commerce within 30 days. Among them, large-scale, group and brand card issuing enterprises also need to submit the fund management system, fund depository account information and fund depository agreement, and those who change the fund management method need to file again. In 2013, the notice of the Ministry of Commerce and the China Insurance Regulatory Commission on regulating the performance guarantee insurance business of single purpose commercial prepaid cards allowed enterprises to offset part of their depository fund obligations with performance guarantee insurance (such as paying part of the deposit with insurance coverage), so as to reduce compliance costs. The model insurance clauses cover bankruptcy, misappropriation, refusal to refund and other scenarios, agree to compensate according to the proportion of the cardholder's unused balance, and promote the coordinated protection of capital pool and insurance.^[12]

Taking the European Union as an example, the electronic money institutions under the framework of the Payment Services Directive 2 are managed by the financial regulatory authorities, but prepaid consumer cards (non electronic money category) are adjusted by the Consumer Protection Laws scattered in various member states, resulting in the lack of uniform capital isolation and technical application standards among the member states of the European Union. As far as the fund supervision involving AI is concerned, it follows hierarchical governance (for example, high-risk AI systems require basic rights impact assessment), but the AI tools related to prepaid fund management have not been clearly defined the risk level, resulting in that hierarchical governance cannot be accurately applied to the prepaid business field.

In the United States, for example, federal and state legislation coexist, and fund management standards are fragmented. The federal level mainly manages bank prepaid card issuers and non bank prepaid card issuers by category. The Federal Deposit Insurance Act requires bank prepaid card issuers (such as gift cards and stored value cards issued by banks) to strictly separate prepaid funds from their own funds and deposit them in independent custody accounts or trust accounts. The capital pool shall meet the liquidity requirements (such as investing in low-risk treasury bonds and high credit commercial bills), and the consumer funds shall have priority to be repaid in bankruptcy liquidation. The Electronic Funds Transfer Act (EFTA) and Regulation E apply to prepaid cards issued by non bank institutions (such as closed prepaid cards issued by retailers and service providers), forcing operators to record consumption flow, balance changes and capital flows, and provide written balance notification obligations to consumers.^[13] The US states adopt a decentralized legislative model for the regulation of prepaid funds, mainly state laws such as the Unified Monetary Services Model Law and the Prepaid Consumption Law, covering scenes such as non bank prepaid cards and subscription services, with significant differences. For example, in terms of the regulation of capital security isolation, the Unified Model Law on monetary services, as a model state law of the United

States, is responsible for the special administrative supervision of third-party payment institutions. Its core is the business license system, which forces prepayment fund Issuers (money transferers, retail sellers) to deposit a certain proportion of funds into a third-party custody account or margin account.^[14] However, there are great differences in the standard setting of capital deposit proportion among states: according to the California Health Spa Act and industry practice, according to the length of time for the operator to issue membership prepaid vouchers, it is required that 30% -50% of the capital balance received in advance should be managed by a special deposit account (30% within 3 months and 50% longer than 3 months). If the amount of the class hour prepaid voucher issued by the operator is less than 5000 yuan, 30% of the balance of the funds received in advance shall be managed by a special deposit account; If the amount exceeds 5000 yuan, it will be increased to 50%. However, the relevant regulations of Arizona do not legalize the specific proportion of deposit. According to the implementation regulations of the Arizona prepaid consumption law and the unified monetary services model law, prepaid service providers (such as retailers and fitness institutions) can choose to deposit deposits, custody or insurance to cover the risk of prepaid funds. The prepaid card issuer needs to maintain the minimum net assets or liquid assets according to the business scale, but the deposit proportion needs to be approved on a case by case basis. The differentiated regulatory rules among states may encourage operators to avoid more stringent state laws by transferring the place of registration and adjusting the structure of capital pool. This "depression effect" is very easy to cause development imbalance and coordination failure among regions.

Technology abuse leads to transnational compliance arbitrage

The application of artificial intelligence in the prepaid business model can not only help operators realize refined operation through big data analysis, but also strengthen the transparent management of prepaid funds by relying on blockchain and other technologies, which not only improves the production efficiency of operators, but also greatly reduces the capital risk faced by consumers. However, at present, countries have not paid enough attention to the legal risks caused by the application of artificial intelligence in the field of prepaid funds supervision. The lack of regulatory rules has brought problems such as technology abuse, privacy disclosure, algorithm manipulation, and the lack of international cooperation has further aggravated legal evasion and regulatory arbitrage.

In terms of AI regulation of prepaid funds, some regions in China have conducted pilot projects. For example, Beichen District, Tianjin, China, drives risk prevention and control through AI, "the platform establishes a risk assessment model by integrating business data, consumer complaint records, capital changes, credit evaluation and other information, and realizes AI regulatory alarm. If it finds that the business capital chain is abnormal or the number of complaints is increasing, it immediately pushes an early warning to the regulatory department, and law enforcement personnel can take measures such as interview and investigation in advance".^[15] In Changning District, Shanghai, a pilot project will combine the notarized withdrawal fund pool with the AI dynamic analysis system. The "prepaid notarization supervision platform" will adopt the methods of "three-level guarantee", "blockchain certificate deposit" and "fund notarization office special account retention", and rely on the security protection system of the financial industry cloud platform to ensure the authenticity and security

of the platform data, and maximize the protection of consumer privacy through data isolation on different ports.¹

The European Union has a leading position in the field of AI regulation, and its legislative framework has formed indirect but clear constraints on the application of AI in the regulation of prepaid funds. The European Artificial Intelligence Act classifies AI systems into four levels: unacceptable risk, high risk, limited risk and minimum risk, and sets strict requirements for high-risk systems. AI systems (such as smart contract fund custody platform and risk assessment model) used for the supervision of prepaid funds, which involve key areas such as consumer rights and interests and financial security, are usually classified as "high-risk systems", requiring the provision of decision-making logic interpretation and the retention of manual intervention mechanisms. For example, when banks or third-party regulators use AI to analyze the abnormal flow of prepaid funds pool, they must ensure traceability and auditability.

The United States adopts the model of "federal principled guidance and state legislative innovation". The Consumer Financial Protection Bureau requires the AI credit decision-making system to explain the specific reasons for refusing loans or fund custody to consumers and protect the right to appeal against prepaid fund custody financial institutions (such as banks and third-party payment platforms). Article 5 of the Federal Trade Commission Act of the United States Federal Trade Commission (FTC) "Prohibition Of Unfair Or Fraudulent Acts" also applies to the use of artificial intelligence systems to protect consumers from misleading or cheating.^[16] In contrast, the UK focuses on non mandatory legislation. Some cities pilot AI to integrate consumer complaints, business operation data and capital change records, and establish a dynamic risk assessment model. For example, the prepaid capital pool in the fitness industry uses the AI early warning system to identify businesses with "surge in complaints and abnormal cash flow", freeze custody funds in advance and start joint law enforcement.^[17]

However, the above regulatory rules do not specifically regulate the loopholes caused by technology abuse. On the one hand, the application of AI may bring the risk of algorithm manipulation and discrimination. The AI fund pool model may be designed to give priority to the interests of businesses (such as dynamically adjusting the threshold of fund release to reduce the probability of refund), or implement differentiated refund policies based on consumer portraits (such as faster refunds for users with high credit scores), aggravating substantive unfairness. For example, the fitness platform uses AI to analyze user activity and adjust the difficulty of refund, and low-income groups face a higher threshold. Although the EU AI Act prohibits discriminatory AI systems, it is difficult to prove algorithm bias in the field of prepaid funds and the accountability mechanism is weak. Moreover, the consumption and capital data related to prepaid funds are concentrated on large platforms or AI service providers, whose technical failures, algorithm vulnerabilities or network attacks may cause regional or even cross market risks. On the other hand, the application of AI fund management system is very easy to trigger cross-border compliance arbitrage. AI fund management system relies on cross-border technical architecture such as cloud computing. Businesses may evade the regulation of specific countries by transferring data or adjusting algorithm logic, such as deploying controversial fund

¹ Creating a Legal Business Environment and Improving the "Law" and "Temperature" to See the Good Practices in the Supervision and Law Enforcement in These Areas,
https://mp.weixin.qq.com/s?__biz=MzA4NTE5ODk2MA==&mid=2649071919&idx=1&sn=f0e15d37ce79c6cb9cb36446d4b5a35f&chksm=86e9aae4777f51aae97a209ccc386f4902eed43b5571059e6c3ea13b05db87bdf5f522638088&scene=27 Last visit on August 11, 2025.

release rules on servers in regions with loose compliance.^[18] The lack of international cooperation exacerbates vulnerability exploitation. For example, the EU's high-risk AI transparency obligation is difficult to restrict the fund pool management rules of non local prepaid service providers.

Differentiation of advance fund regulation rules restricts international mutual recognition

In terms of international cooperation, countries have significant differences in the form of capital isolation, consumer rights relief and AI governance standards. Cross border prepaid services and supporting dispute resolution mechanisms face multiple challenges, which not only hinder the development of cross-border prepaid business, but also bring great synergy barriers and technical problems to cross-border regulation and cooperation.

As for the form of capital isolation, it mainly focuses on trust, risk margin, guarantee insurance, bank custody, etc., and in practice, most countries tend to adopt a variety of modes. Japan mainly adopts the supervision mode of combining the deposit system and the trust mechanism. According to the provisions of the capital settlement law, the prepaid card issuer needs to separate a certain proportion of the prepaid capital balance from its own funds through bank custody, trust contract or depository. For example, a multi-purpose prepaid card institution must sign a trust contract or a deposit preservation contract to ensure that the funds are independent of the merchant's own assets. In such trusts, consumers are the ultimate beneficiaries, and the remaining funds can be obtained in priority in case of bankruptcy. The trust model is widely used in the prepayment fields of pension, education and other industries in Japan. The prepayment funds are released to merchants by stages according to the progress of service performance, effectively realizing bankruptcy isolation. The European Union, through the payment services directive and the electronic money directive, requires non bank advance fund Issuers (such as electronic money institutions) to strictly separate customer reserves from their own funds, deposit them in commercial banks, and purchase insurance to prevent bankruptcy risks. In addition, in view of the risks of privacy disclosure and algorithm discrimination brought by AI, the transparency obligation of the European Union's AI Act requires high-risk AI systems to provide explanatory notes on the use of funds, which indirectly restricts the application of algorithms in the storage and use of prepaid funds. China's measures for the administration of single purpose commercial prepaid cards (for Trial Implementation) establishes the deposit system for prepaid funds, requiring that "large-scale card issuing enterprises, group card issuing enterprises and brand card issuing enterprises should determine a commercial bank account as the fund deposit account, and sign a fund deposit agreement with the depository bank" and that the above-mentioned enterprises can "offset all or part of the deposited funds by means of guarantee insurance, bank guarantee, etc. of guaranteed prepaid funds". In Taiwan, China, through the construction of a multi-level legal system, the regulations on the administration of the issuance of electronic tickets and the standard contract for the finalization of gift certificates in the retail industry, it is clear that there are three guarantee methods, namely, the deposit reserve of prepaid funds, trust delivery or bank performance guarantee, covering the advance collection in gift certificates, pre-sale houses and other fields. The trust company manages the fund pool and gives priority to consumers in case of bankruptcy.

In terms of AI governance standards involving the supervision of prepaid funds, differentiated rules and standards have further intensified the mutual recognition process of international cooperation. The European Union's AI act classifies AI systems into four categories: "unacceptable risk", "high risk", "limited risk" and "minimum risk". AI applications

(such as risk control model and anti fraud system) in advance fund supervision are usually classified as high risk. Such applications need to meet the conditions of interpretability, data privacy, third-party authentication and so on. The algorithm decision logic needs to be disclosed transparently to users and regulators. The relevant data needs to strictly comply with the provisions of gdpr. It requires that training data be traceable, sensitive data be encrypted and stored, and cross-border transmission to countries that have not passed the "adequacy identification" is prohibited. And the high-risk system needs to pass the compliance assessment by an independent agency, with an average certification cycle of 9 months and a cost of more than 500000 euros. The Interim Measures for the management of generative artificial intelligence services implemented in China in 2024 requires that AI systems related to prepaid funds (such as consumer credit approval and intelligent customer service) must complete the algorithm filing, and the core standards include interpretability, data compliance and dynamic review. A mechanism of "prior evaluation plus in-process plus check plus Post punishment" is established. Systems without filing face a penalty of APP offline or up to 8million yuan. The United States adopts a governance model of decentralized regulation and industry self-discipline. So far, there is no law on AI regulation at the federal level, but some states have issued or will soon pass special regulations on AI regulation. For example, the frontier AI model security innovation act of California requires AI developers to submit compliance certification every quarter, while Texas has less restrictions on AI applications regulated by prepaid funds. In practice, American enterprises rely more on industry alliances (such as OECD AI principles) and open source tools (such as AI verify) to achieve compliance.

It can be seen that although countries have relevant legislation or industry norms in the field of prepaid capital regulation and AI governance, the differences in regulatory rules between countries lead to many difficulties in cross-border prepaid consumption and capital regulation.

4、 The international path to improve the supervision of prepaid funds in the era of artificial intelligence

Strengthen collaborative governance and formulate regulatory guidelines for international prepaid funds

With the development of economic globalization and digital intelligence, the problems exposed in the process of digital supervision of global prepaid funds are frequent. The root cause is the imbalance between "technological innovation speed" and "rule synergy efficiency". If a unified framework for mutual recognition of basic standards cannot be established, the technical advantages of AI in cross-border prepayment regulation will be offset by internal friction caused by rule conflicts, and may even force small and medium-sized platforms to withdraw from the cross-border market due to high compliance costs, ultimately damaging the integration process of consumer choice diversity and the global digital economy.

We should promote the formation of international uniform regulatory rules for prepaid funds as soon as possible. At present, countries have basically formed relatively mature legal norms and industry standards in the supervision of prepaid funds, but the differentiated rules have brought greater barriers and difficulties to the transnational cooperation in the field of prepaid business. The United Nations Conference on Trade and development, the organization for economic cooperation and development (OECD) and other international organizations can jointly take the lead to sort out the core elements of the supervision of prepaid funds in various countries, including but not limited to capital custody, enterprise filing, risk prevention and control, and formulate the Basic Principles And Guidelines For The Supervision Of

International Prepaid Funds (hereinafter referred to as the Guidelines). As far as its regulatory objectives are concerned, it can be based on the common objectives of "protecting the safety of consumers' funds", "maintaining the fair order of the market" and "preventing systemic risks" in the current regulatory practices of China, the European Union, the United States, Japan and other countries, and the main regulatory objectives of the guidelines can be defined as the following three points: first, to ensure the safety of consumers' prepaid funds.^[19] We should ensure that consumers' prepaid funds in prepaid capital transactions are not misappropriated or embezzled, and that they can get priority compensation in the event of enterprise bankruptcy, breach of contract, etc; Second, promote the healthy and orderly development of the cross-border prepayment market. The guidelines should strive to reduce the conflict of regulatory rules in various countries, so as to reduce the cost of cross-border compliance of enterprises and promote the convenient circulation of prepaid services (such as cross-border prepaid cards and subscription services); Finally, balance technological innovation and risk prevention and control. We should further standardize the application of AI, blockchain and other technologies in the management of prepaid funds. We should not only encourage technological innovation to improve regulatory efficiency, but also prevent the risks of algorithm abuse and data leakage in the AI field.

The Guidelines should specify the core regulatory standards for the supervision of prepaid funds (such as the bottom line of capital isolation, information disclosure requirements, etc.) and the basic specifications for the application of AI technology (such as data sharing boundaries, algorithm transparency, etc.), so as to provide reference for national legislation and reduce rule conflicts.^[20] In terms of specific requirements for capital custody, we can clarify the core requirements of diversified custody methods based on the existing custody modes in various countries (such as bank custody in China, reserve isolation in the European Union, trust accounts in the United States, and the combination of trust and margin in Japan).^[21] On the one hand, we should ensure the compatibility of capital custody methods. Diversified fund custody methods not only help operators in various countries to make diversified choices under the current legal framework, but also promote the convergence of rules and international mutual recognition in transnational cooperation. The guidelines should clarify the equivalence of fund deposit methods including bank account deposit, trust custody, performance guarantee insurance, risk margin, etc. in meeting the requirements of fund deposit and recognize its legitimacy. Operators in various countries can choose to deposit prepaid funds in a way that conforms to their own laws, but they need to meet the core standard of "funds are independent of operators' own assets". In terms of the deposit proportion of funds, the general standard can be set by referring to the method of "setting the deposit proportion according to the prepayment duration or amount" in California (i.e. 30% within 3 months and 50% over 3 months). At the same time, referring to the classification regulation of "large-scale card issuing enterprises need full or partial deposit" in China, countries are allowed to set the deposit proportion for prepayment operators in different fields according to the industry risk, but the bottom line is not less than 20% of the balance of prepaid funds. In addition, the bottom line criteria for the isolation of prepaid funds should be clearly set. Specifically, we can integrate the requirements of "strict separation of funds" in the Federal Deposit Insurance Act of the United States, the "preferential benefit for consumers" in Japan's "capital settlement act" and the regulatory rules of "independent depository account" in China's "single purpose commercial prepaid card management measures (Trial)", and set the obligation of separation of prepaid funds as the legal obligation of the operator, that is, the operator must completely separate the prepaid funds from its own funds and operating funds, and prohibit them from being used for the daily operation of

enterprises, debt repayment or investment in high-risk assets (such as stocks, derivatives, etc.). At the same time, referring to the rules of the United States that "consumer funds have priority over ordinary claims in bankruptcy liquidation" and Japan that "consumers are the ultimate beneficiaries under the trust mode", it is clear that prepaid funds will not be included in the bankruptcy property when the enterprise goes bankrupt, and consumers will have priority to be repaid according to the proportion of unused balance.

Standardize the application of AI and strengthen the supervision and cooperation of cross-border prepaid funds

The application of artificial intelligence in prepaid business not only improves the security level of users' funds, but also provides more diversified technical means for the compliance supervision of prepaid funds. At the same time, the emergence of algorithm discrimination, privacy disclosure, regulatory arbitrage and other issues also further increases the difficulty of the supervision of prepaid funds. In addition, AI's technical regulation standards in different countries are different, which also brings new challenges to transnational regulatory cooperation. The guidelines should further clarify the application standards of AI in the field of prepaid funds supervision, and integrate multi-party data through the establishment of a cross-border supervision coordination platform to achieve information sharing and implementation linkage in supervision.^[22]

On the one hand, the bottom line standards and rules for the application of AI technology should be clear. Specifically, we can set the core standards for AI supervision of prepaid funds, mainly including the transparency, fairness and traceability of algorithms, based on the "hierarchical governance requirements" of the European Union's AI act, the "algorithm filing requirements" of China's interim measures for the administration of generative AI services, and the "interpretability requirements" of the United States. Transparency requires that the AI algorithm system used for prepayment fund pool management, risk assessment and refund decision-making should be regarded as a "high-risk system", and the algorithm logic should be filed with the regulatory authority, and the decision-making basis affecting the rights and interests of consumers should be explained to consumers when they raise objections. Fairness requires that AI systems are prohibited from setting differentiated capital rules based on consumers' gender, income, region and other characteristics (e.g. higher refund threshold for low-income groups). Enterprises need to regularly submit the "algorithm fairness report" audited by a third party, which will be regularly reviewed by regulatory authorities and publicized to enterprises with algorithm discrimination. Traceability requires that the operator's AI system should have the function of "operation trace and exception backtracking" (refer to the technology of "blockchain certificate storage" in Changning District, Shanghai), and the algorithm iteration should retain the historical version, so that the regulatory authorities can trace the illegal operations.^[23]

On the other hand, a cross-border and cross sectoral coordination platform for the supervision of prepaid funds should be established. On the specific operation path, we can learn from the technical experience of Shanghai's "prepaid capital supervision platform", promote the establishment of a global or regional "prepaid capital supervision cooperation network", integrate the data of Commerce, finance, science and technology and other departments, and use AI technology to realize real-time information sharing (such as cross-border card issuance records of enterprises and capital change warning). For example, the EU can first establish a data interface between the consumer protection departments of Member States and the financial regulatory agencies internally, and then gradually connect with major economies such as the

United States and China to form a cross regional collaborative response mechanism. As far as the data sharing boundary is concerned, the regulatory authorities should be allowed to share enterprise operation data and consumption records across departments on the premise of "preventing capital risks", but they should comply with the data privacy protection rules in the EU gdpr and should not be used for non regulatory purposes. In addition, the division of rights and responsibilities of AI supervision should also be clarified. Especially for the application of AI in the circulation of prepaid funds, the corresponding relationship between specific technology application scenarios and specialized regulatory entities should be clearly defined in the guidelines. For example, the compliance review of the AI risk assessment model is assigned to the financial regulatory department, and issues such as algorithmic discrimination and privacy protection are assigned to the data protection agency to avoid regulatory vacuum or blank due to technology intersection.^[24]

Hierarchical supervision, strengthen operator access and risk compliance management

A sound regulation of prepaid funds is an important institutional guarantee to reduce the risk of misappropriation of funds and promote the healthy and orderly development of the prepaid market. To a large extent, the qualification of operators in the market determines whether the prepaid funds can be properly used and whether the system can be well complied with. However, in practice, the operators in the market are often mixed. It is common for operators to misappropriate prepaid funds by taking advantage of their advantageous position in setting transaction conditions and managing prepaid funds. Some operators even closed their stores maliciously after attracting a large number of consumers to apply for cards and raise a large amount of funds. This has seriously damaged the legitimate rights and interests of consumers and disrupted the normal trading order of the prepaid market. It is necessary to strengthen the qualification supervision of operators in the access link and establish their risk prevention and control standards.

First of all, we should clarify the minimum filing standards of card issuing enterprises and refine the filing obligations. For the setting of specific filing standards, reference can be made to the model of "hierarchical filing" in China's "measures for the administration of single purpose commercial prepaid cards (Trial)", the EU's "e-money agency licensing" and the US's "federal and state classified management" to unify the core elements of the filing. The enterprises that need to be recorded include the following categories: first, the "large-scale card issuing enterprises" (such as enterprises with annual sales of more than 50 million yuan in China), countries can set the minimum filing standards for their "large-scale card issuing enterprises" according to their own economic development; Second, operators providing cross-border prepaid services, such as enterprises issuing cross-border general prepaid cards, enterprises with cross-border flow of prepaid funds, etc; Third, enterprises involved in the application of AI technology in the use and management of prepaid funds. For small-scale local enterprises, the filing process can be simplified. When filing, the operator shall submit the fund management system, depository agreement, AI system description and other materials to the regulatory authority, specifying its prepaid business scale, fund use scope, risk response plan and other matters. In addition, if the operator adjusts the way of capital deposit, modifies the logic of AI algorithm or changes the scope of cross-border services, it shall re file within 30 days from the date of change.

Secondly, we should clarify the information disclosure obligations of enterprises on record. We can refer to the "balance disclosure obligation" of the U.S. electronic funds transfer

act and the "algorithm transparency" requirements of the European Union artificial intelligence act to clarify the disclosure scope and standard of the filing enterprise. The regulatory authority shall promptly publicize the registration information, business qualification, name of the fund depository institution and other information of the prepaid service provider to the public, and require the filing enterprise to publicly explain the capital flow and use, refund and default rules to consumers. Specifically, the operator should regularly (no more than 30 days) disclose the deposit balance, consumption deduction records, investment direction, etc. of prepaid funds to consumers and regulatory authorities, and display the amount of unused funds to consumers in real time through a visual interface (such as the app end balance query function). In addition, the operator should take the initiative to fulfill the obligation of explanation and notification, and clearly state the refund conditions, process and time limit in the agreement or the articles of Association for card use. If AI refund decision-making system is involved (such as adjusting the refund threshold according to user activity), additional disclosure of algorithm logic is required, such as "refund review is based on consumption frequency, remaining time and other indicators, and non discriminatory weight", and explain it when consumers apply for objection.

Finally, we should clarify the risk prevention and control standards of enterprises on record. According to the UK's "dynamic risk assessment model" and the EU's "high-risk system intervention mechanism", we can establish and improve the enterprise's risk assessment mechanism and cross-border risk coordination mechanism. On the one hand, the regulatory authorities should integrate the data of enterprises' indicators such as "complaint volume, capital changes and operation data", establish a unified prepaid capital risk assessment model for real-time monitoring, and automatically trigger the intervention of the regulatory authorities when the number of complaints surges within a certain period of time and the capital chain is abnormal, that is, the risk level exceeds the threshold. At this time, we can refer to the practical experience of "AI automatically freezes custody funds after identifying abnormal businesses" in the UK, clarify emergency measures such as "fund freezing, partial refund, and joint law enforcement", and allow the regulatory authorities to temporarily freeze more than 50% of the prepaid funds of enterprises when there is a risk of misappropriation of funds. For operators who provide cross-border prepaid services, they should be forced to set up a risk reserve of no less than 10% of the total cross-border prepaid funds in the main service places to deal with consumer compensation in cross-border disputes.^[25]

5、 Conclusion

The rapid development of artificial intelligence has injected unprecedented vitality into the prepaid capital business model, but also pushed it into the regulatory deepwater area where "innovation dividends and risk challenges" coexist. From member stored value cards in the beauty and hairdressing industry to prepaid courses for cross-border education, prepaid funds, as the core link between consumers and operators, are not only related to consumers' individual rights and interests, but also affect the credit foundation and financial stability of the market economy. The central economic work conference listed "boosting consumption" and "preventing risks" as the primary tasks, highlighting the key position of advance fund supervision in the strategy of expanding domestic demand. The current debate on the legal attribute of prepaid funds is essentially an exploration of the balance logic of "capital security and transaction efficiency". The credit attribute theory completely transfers the risk to consumers, the quasi financial instrument attribute theory enlarges the investment and financing risk, and the trust property attribute theory builds a "safety wall" for consumers through the bankruptcy isolation mechanism. This idea not only conforms to the essence of the "target property" of prepaid funds, but also provides the possibility of system convergence for cross-

border supervision. When AI technology further blurs the flow of funds and accelerates cross-border flows, regulation can no longer be limited to a single country or department. China's multi sectoral regulation lacks coordination, the rules of EU member states are scattered, and the U.S. federal and state legislation conflicts. These fragmentation not only reduce the regulatory efficiency, but also leave an opportunity for operators to avoid liability through "algorithm migration" and "change of registration".

The core to solve the dilemma lies in the construction of a regulatory system driven by "technology adaptability" and "international synergy". On the one hand, technological innovation forces the upgrading of rules. The algorithm discrimination and data leakage risks brought by AI need to be regulated through unified technical standards, such as clarifying the interpretability requirements of high-risk AI systems, establishing algorithm filing and third-party audit mechanisms, and making the "black box" transparent. On the other hand, the cross-border flow of prepaid funds requires mutual recognition of rules. Due to the differences in capital isolation methods and AI governance standards among countries, it is urgent to establish the principle of "minimum standards plus flexible adaptation" through international guidelines to realize mutual recognition of core elements and reduce the cost of cross-border compliance of enterprises on the premise of respecting the sovereignty of countries.^[26]

For China, improving the supervision of prepaid funds needs to take into account both "local practice" and "international vision". It is necessary to promote the experience of local pilot projects such as Shanghai's "prepaid capital supervision platform" and Tianjin's AI risk early warning system, and upgrade the rules such as trust mechanism and dynamic depository ratio to national legislation; We should also actively participate in the formulation of international rules, promote the equivalent mutual recognition of "algorithm filing" and EU "high-risk AI certification" under the framework of the basic principles and guidelines for the supervision of international prepaid funds, and let China's experience contribute wisdom to global supervision. At the same time, we need to balance the interests of three parties: for consumers, we should protect their right to know and claim through capital isolation and transparent disclosure; For operators, it is necessary to reduce compliance costs and encourage technological innovation through hierarchical supervision and flexible depository ratio; For regulators, it is necessary to establish a cross sectoral coordination mechanism and cross-border data sharing platform to realize the whole chain governance path of "prevention in advance, monitoring in the process and relief after the event".

The prepaid fund regulation in the era of artificial intelligence has never been the opposition between "regulation and innovation", but the symbiosis of "security and development". Only by breaking the rule barriers with international coordination, taming the algorithm risks with technical specifications, and balancing the rights and interests of all parties with institutional innovation can prepaid funds truly become the "lubricant" to activate the consumer market and lay a solid legal foundation for the healthy development of the global digital economy.

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