ANALYZING STRATEGIES FOR THE PEER-TO-PEER LENDING INDUSTRY IN THE FINANCIAL TECHNOLOGY ECOSYSTEM

Minh Huong To

Faculty of Economics and Management, ThuyLoi University, 175 TaySon, DongDa, HaNoi, VietNam

Abstract: As banks and venture capital firms increase investment in this industry, the globe has seen significant advances connected to financial technology (fintech), which has brought numerous advantages for consumers of financial services but also possible concerns. The private lending industry is becoming increasingly varied, as are the lending business models, particularly with the growth of P2P internet lending. A robust p2p ecosystem is now being developed by state management organizations like the State Bank of Vietnam, promoting innovation, risk management, and user safety. The State Bank is the dominant entity in this process among ministries and sectors, with Sandbox being one of the top options. To promulgate a formal legislative and regulatory framework, the State Bank of Vietnam must research and implement the regulatory sandbox management technique by worldwide best practices. The article will examine the theoretical underpinnings of peer-to-peer lending, draw on international experience, and use evolutionary game theory as a predicate to establishing an evolutionary game model between online lending companies, between companies and regulators, while also analyzing the development and stability of the model, providing the theoretical underpinnings for the choice of the online lending model and state supervision.

Keywords: state regulation, evolutionary game theory, P2P online lending company, online lending operation model

1. Introduction

Vietnam's technological and information system development is now accelerating. It impacts how people access various types of information or use various functions of online services. Internet users in Vietnam rose by roughly 52% between 2013 and 2021. As of January 2021, Vietnam had a population of approximately 97.8 million people, out of which 37.7% resided in urban areas. Around 68.17 million individuals, accounting for 70.3% of the population, use the internet on diverse platforms and applications, spending an average of 6 hours and 47 minutes per day online. This amount of time spent on the internet is considered to be disproportionately high. Vietnam, a Southeast Asian country, has an estimated population of 96 million people. Of this population, 37.7% live in urban areas. The country has made significant technological advancements, with an estimated 68.17 million individuals using the Internet on various platforms and apps. This accounts for 70.3% of the population, and they spend an average of 6 hours and 47 minutes online daily. This high usage rate has raised concerns about productivity levels and addiction to technology among Vietnamese citizens. Despite these concerns, the Internet has provided numerous benefits to the country, including increased access to education, healthcare, and job opportunities. As Vietnam continues to develop its infrastructure and economy, it will be interesting to see how its citizens' relationship with technology evolves.
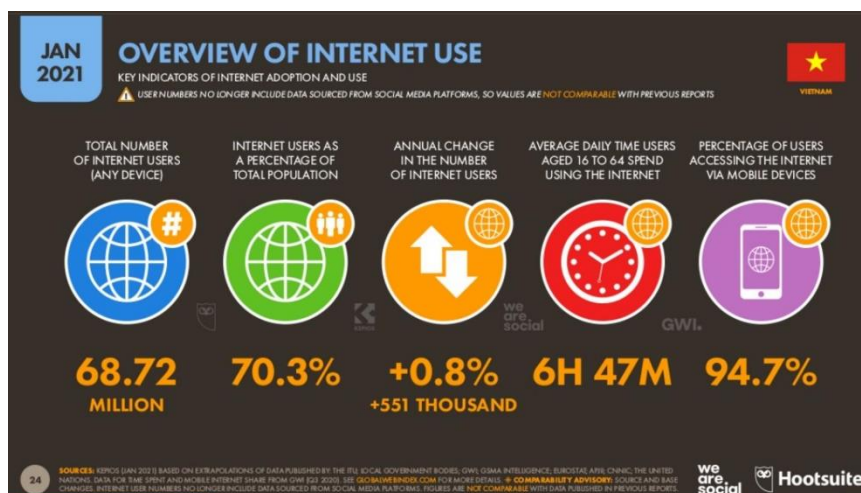
Figure 1. 1 Internet users in Vietnam

The rapid growth of technology adoption in Vietnam has had a significant impact on the economy, as evidenced by its growth rate. One notable example of this is the rise of Financial Technology (Fintech), which offers practicality, convenience, ease of access, and cost-effectiveness. Fintech is a disruptive innovation that transforms less desirable systems or markets into something that the community demands and needs, leading to changes in the industrial structure, technology, and marketing models for consumers [1] .The impact of this disruptive innovation extends to the entire financial services industry. This transformation is fueled by the widespread use of mobile devices and the internet, which has created an environment that is ripe for the development of Fintech. In Vietnam, the adoption of mobile devices has been particularly significant, with a high percentage of the population using smartphones to access the internet. This has facilitated the growth of Fintech, as it has enabled people to access financial services through their mobile devices. This has made financial services more accessible to people in rural areas and has enabled small businesses to access financing that they may not have been able to access through traditional channels. As a result, Fintech has emerged as a promising solution to some of the challenges facing Vietnam's financial services industry. With its potential to promote financial inclusion and economic growth, Fintech is expected to play an increasingly important role in Vietnam's economy in the years to come.

The emergence of fintech has significantly impacted the financial services industry. It has disrupted the traditional industrial structure, which large financial institutions dominated. Fintech companies are using technology to provide financial services that are more accessible, convenient, and affordable to consumers. They are also changing the marketing model for financial products by leveraging social media and digital channels to reach customers. Fintech innovations such as Internet banking, mobile payments, and peer-to-peer loans have made it easier for people to manage their finances and access credit. Online identification and blockchain technology have improved security and transparency in financial transactions. Fintech is transforming how we do business and creating new opportunities for entrepreneurs and investors. As fintech continues to evolve, it will likely drive further changes in the financial services industry, making it more efficient, customer-centric, and inclusive[2].

The rise of fintech has led to a significant shift in the way financial services are delivered and consumed. Traditional banks and financial institutions are facing stiff competition from fintech startups that offer innovative products and services. Fintech companies have challenged the status quo and are transforming the financial services industry by offering personalized solutions that are tailored to the needs of consumers. One of the key advantages of fintech is its ability to provide financial services that are more accessible and convenient than traditional banks. Consumers can now manage their finances and access credit through digital platforms, such as internet banking and mobile payments, from the comfort of their own homes. Peer-to-peer lending platforms have also made it easier for individuals and small businesses to obtain loans, without having to go through the rigorous and time-consuming process of obtaining funding from traditional banks. Moreover, fintech innovations such as online identification and blockchain technology have made financial transactions more secure and transparent. These technologies have the potential to reduce fraud and enhance financial inclusion by enabling

more people to participate in the financial system. In addition, fintech has also changed the marketing model for financial products by leveraging social media and digital channels to reach customers. Fintech companies can now use data analytics to better understand their customers and offer them personalized solutions that meet their specific needs [3]. Overall, the emergence of fintech has led to a disruption of the traditional industrial structure of the financial services industry. As fintech continues to evolve, it is likely to drive further changes in the industry, making it more efficient, customer-centric, and inclusive. This presents new opportunities for entrepreneurs and investors alike to create and invest in innovative solutions that address the needs of consumers in this rapidly changing landscape.

Klafft defines Fintech as a business sector that utilizes software to provide a range of financial services, which may include internet banking, mobile payments, crowdfunding, peer-to-peer lending, online identification, and blockchain technology. He's view, fintech is a broad term that encompasses a range of financial services that are delivered through software and digital platforms [4]. These services include internet banking, mobile payments, crowdfunding, P2P lending, online identification, and blockchain technology. Fintech has emerged as a disruptive force in the financial industry, challenging traditional financial institutions and offering new ways for individuals and businesses to access financial services. With its focus on innovation and technology, fintech is poised to transform the financial landscape in the coming years and provide greater opportunities for financial inclusion and economic growth.
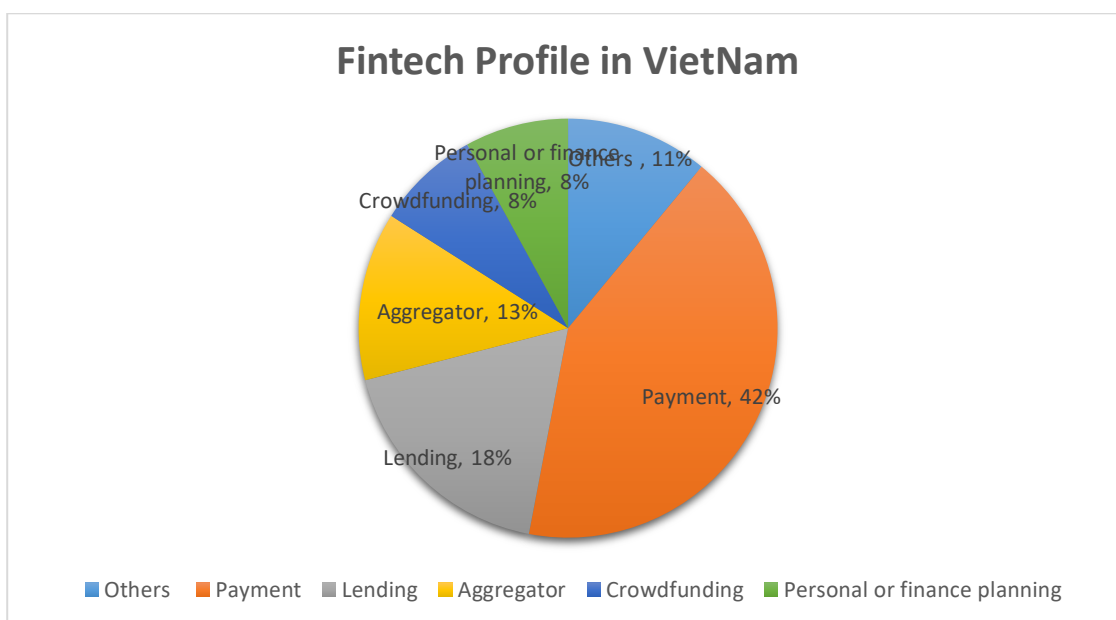

Figure 1. 2 Fintech Profile in Viet Nam (Based on Sector)

The aim of this study is to explore the processes involved in peer-to-peer lending (P2P lending), an online borrowing service that enables lenders to lend to small businesses or individuals. Initially, P2P lending was characterized by its "alternative" nature, which offered direct and informal lending within a group of peers, eliminating intermediaries and lowering barriers to accessing products and services through internet-based trade [5]. In the financial industry, Fintech P2P lending serves as a substitute for traditional banking in lending and borrowing activities. Additionally, P2P lending is expected to promote the distribution and balance of financing for Micro, Small, and Medium Enterprises (MSMEs) in various regions while maintaining an appropriate level of risk [6]. The rise of Fintech has transformed our understanding of lending and borrowing, and P2P lending has become a popular alternative to conventional banking. By directly connecting borrowers with lenders, P2P lending platforms have created a more efficient and transparent marketplace for loans. This model benefits both borrowers who have difficulty accessing traditional financing options and lenders who can earn higher returns on their investments. Supporting the growth of small businesses is one of the most significant advantages of P2P lending. MSMEs often use the loan marketplace to obtain funding at competitive rates, benefiting both borrowers and P2P lenders. As the industry evolves, P2P lending is expected to play an increasingly crucial role in driving

economic growth and supporting entrepreneurship. However, it is critical to remember that careful risk management is essential to maintaining the integrity and stability of the P2P lending ecosystem. Furthermore, the rise of fintech P2P lending has prompted regulators to consider the need for appropriate regulatory frameworks. The lack of established regulations has left room for some platforms to engage in fraudulent practices, which can harm both borrowers and lenders.

Therefore, it is important for regulators to develop appropriate regulatory frameworks that can ensure the integrity and stability of the P2P lending market. To achieve the objective of this study, a thorough analysis of the business processes involved in P2P lending is necessary. This will involve an examination of the roles and responsibilities of the different stakeholders involved, including the platform, borrowers, and lenders. Additionally, the study will explore the risks and challenges associated with P2P lending and the strategies that can be employed to mitigate them. In conclusion, the growth of fintech P2P lending has had a significant impact on the financial industry, offering alternative options to traditional banking and promoting financial inclusion. While the benefits of P2P lending are numerous, it is important to recognize the risks and challenges associated with this industry and take appropriate measures to mitigate them. This study aims to contribute to the understanding of the business processes involved in P2P lending and the development of appropriate regulatory frameworks to ensure the integrity and stability of this emerging market.

The business processes of fintech P2P lending and traditional loan financing systems are fundamentally different. In traditional loan financing, the lending process is longer and more complex due to stringent regulations. Loans with high amounts and low to medium rates typically have low loan risks. However, traditional loan financing involves high transaction costs and requires collateral from borrowers. On the other hand, fintech P2P lending offers convenience to borrowers who need quick access to small funds with easy requirements, loose regulations, and low transaction costs. However, this convenience comes at a trade-off: medium to high risks and applied interest rates. Table 1.1 below provides a comparison between traditional loan financing and fintech P2P lending.

Table 1. 1 Comparison between the Traditional Loan Financing vs Fintech P2P Lending

Major Aspects	Traditional Loan Financing	Fintech P2P Lending
Process	Long time, complex	Fast, simple
Regulation	Strict	Loose
Risk	Low	High
Interest Rate	Low-Medium	Medium-High
Loan Amount	High	Low
Transaction Cost	High	Low
Collateral	Yes	No
Party Involved	Borrower, bank	Borrower,lender, platform

Source: compiled by the author

The practice of fintech P2P lending necessitates collaboration among multiple stakeholders in its business processes, and effective integration can have a positive impact on its continuity in the financial industry. To effectively practice P2P lending, collaboration among borrowers, lenders, and the platform itself is critical in the business process. By working together, these stakeholders can ensure that the lending process is efficient and effective for all parties involved. Furthermore, seamless integration among these stakeholders can have a positive effect on the continuity of fintech P2P lending in the financial industry. Such integration can streamline processes, reduce friction between borrowers and lenders, and build trust among all parties involved in the lending process, which is crucial for its long-term success. Overall, successful P2P lending requires a collaborative effort from all stakeholders involved in the process, and effective integration is vital to ensuring its continuity in the financial industry. A diagram illustrating the business process of fintech P2P lending with related parties can be found in Figure 1.
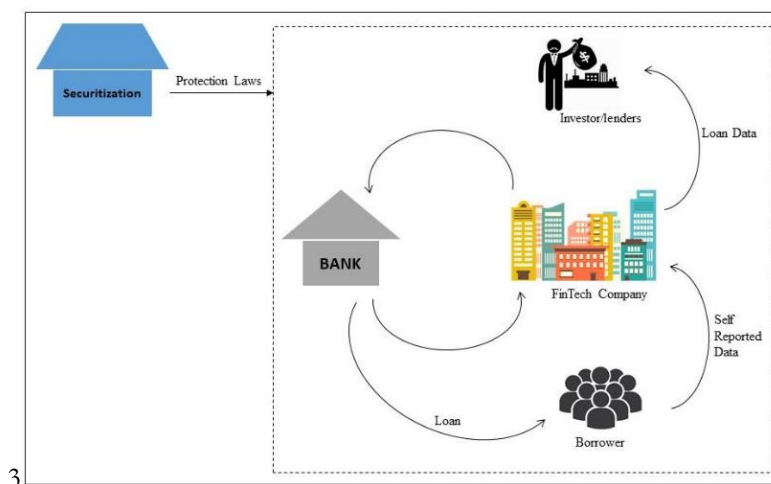
Figure 1. 3 Business Process of Fintech P2P Lending

A fintech P2P lending firm serves as a link between investors and borrowers. Investors must meet specific income and wealth requirements, and they can peruse the loan list and access the profile information of registered borrowers. If the borrower's profile meets the criteria for the risk class and lending rate set, they can receive the loan transfer through their bank account. Effective management of the business process by regulators is necessary for P2P lending activities to avoid causing harm to either party involved. To enhance transparency in lending and borrowing and encourage Fintech adoption as a reliable financing option, it is crucial to educate the public on its advantages. This suggests that the current regulations for fintech P2P lending have not kept up with the rapid advancement of fintech. The absence of legal regulations governing P2P lending may result in potential harm to the community, and it is essential for the community to have a sound understanding of the business procedures of Fintech P2P lending to minimize risks. To prevent illegal fundraising, which could contribute to the growth of loan sharks, it is crucial to strike a balance between the desire to invest and sound financial literacy. To optimize the role of fintech, it is critical to establish mutually beneficial business synergies among related parties, including P2P lending companies, lenders, and borrowers, to maintain Indonesia's financial system's stability. Therefore, strategic analysis is necessary to develop the fintech industry based on the community's needs while operating under a regulatory framework that can mitigate risks and safeguard people's interests [7].This study aims to develop the fintech industry in Vietnam, particularly in the lending business that meets the community's needs, while maximizing benefits for lenders and borrowers. To achieve this, the research will employ a combined approach of system dynamics and game theory. Game theory is a decision-making model suitable for analyzing situations involving two or more players. Fintech P2P lending involves three players - lenders, borrowers, and the platform - who interact to achieve the highest utility. By filling the payoff table, the best logical and rational strategies can be analyzed. To search for the optimal strategy, the system dynamics approach will also be employed, which can model the system's behavior and its characteristics. Integrating both approaches can lead to the best strategy for fintech P2P lending that considers profit for lenders and borrowers while maintaining business stability.

2. Method

Game theory and economic behaviour, written jointly in 1944 by American mathematicians von Neumann and Morgenstein, marked the initial formation of game theory. Traditional game theory adopts the hypothesis of "complete rationality", but human limitations in the game process cannot be avoided. "Game analysis method and equilibrium concept based on complete rationality, that is, one-time choice based on reasoning analysis (for general static and dynamic games) or overall planning based on high visibility (repeated games)" The analysis framework is usually not applicable to the analysis of game problems for bounded rational players. Because these game analysis frameworks cannot reflect the learning process of the game side, nor can they discuss the dynamic stability of the game side's behaviour and strategy, it is necessary to study the evolution of rational games. Evolutionary game theory has been around since the 1960s. Ecologists take Darwin's biological evolution theory and Lamarck's genetic gene as the basic ideas to explain ecological phenomena. The development of evolutionary

game theory can be divided into two stages: the first stage is the substitution of limited rationality for complete rationality; the second stage is to introduce evolutionary game theory from the biological field into all fields of society. In the traditional game, the use of game theory to study human economic behaviour adheres to the hypothesis of economic man and the principle of rationality, but in reality, people are not entirely rational but have limited rationality. As an alternative, population dynamics and stability replace code population dynamics and stability, while Darwin's fitness replaces the self-interest principle. Evolutionary game theory has two core contents: a long-lasting evolutionary strategy (ESS) and a dynamic replication model [8]. The criterion of evolutionary stability emphasises the role of variation, while replication dynamics emphasises the role of selection. The evolutionary stability strategy states that if the whole population chooses this strategy, under the action of natural selection, no mutation strategy can invade the population. It is also a refinement of Nash equilibrium. It is also suitable for us to introduce evolutionary game theory from the biological field into the economic area. The dynamic replication process is a random pairing evolutionary game problem in a large group of members with low rational levels and slows learning speeds in repeated games. According to the replicator dynamics, we can establish the dynamic differential equation of behavior evolution game between groups:

$$\frac{dx}{dt} = x * U_1 - \overline{U}) = x * [U_1 - (x * U_1 + (1 - x) * U_2)] \quad = x * (1 - x) * (U_1 - U_2)$$

Where x (0 < x < 1) represents the probability of adopting strategy 1, and the probability of adopting strategy 2 is 1-x;

U1 and U2 respectively represent the expected return of adopting strategies 1 and 2; $\overline{U}$ represents the average expected return of a group. When a strategy satisfies the conditions, it is an evolutionary stable strategy.

$F'(\text{x}) = \frac{dx}{dt} < 0,$

3. Results

3.1. Evolutionary Game Theory Model Analysis of P2P Network Lending Platform

Suppose there are only two groups in the P2P online lending industry, namely platform A and platform B, and the number of individuals is N. Platform A is a group that voluntarily accepts supervision, and platform B is a group that does not accept supervision. There is information asymmetry between platform A and platform B and they are both bounded rational and mutually random. Within the same group, platforms have the same set of strategies for their attitudes towards regulation and make decisions about regulation at the same time.

Table 2.1 The payoff matrix of the game between platforms A and B

B ⟍ A	be regulated (P)	not regulated $(1-P)$
be regulated (P)	$(R + S, R + S)$	$(R + 2S - M, R + M - 2F)$
not regulated $(1-P)$	$(R + M - 2F, R + 2S - M)$	$(R - F, R - F)$

In Table 1:

(P): Proportion of groups under supervision

$(1-P)$: Proportion unwilling to accept regulation

R: Platform operating income

S: The platform's increased revenue due to acceptance of supervision

M: The platform loses revenue due to supervision

F: The cost of platform violations

If both platform A and platform B voluntarily accept the regulatory conditions of the regulator, then in addition to the platform's operating income R, the two parties also increase the income S due to accepting supervision, and the total income is $R+S$;

If both platform A and platform B choose not to accept supervision, the operating income is still R, but may be fined by the regulatory authorities F, so the income of both platforms will decrease F, and the income will become $R-F$;

If the two platforms choose different: Platform A is regulated (or Platform B is regulated). At this time, platform A is restricted by regulatory conditions, and the operating income is lost due to the loss of customers to platform B (M). However, platform A will receive twice the benefit of customers who voluntarily accept the regulatory policy as 2S, so the total benefit is $(R+2S-M)$.

Platform B does not accept supervision (or platform A does not accept supervision. Platform B will receive the loss revenue M due to platform A being supervised, and also bear the fine cost of the regulated department 2F, so the total revenue is $(R+M-2F)$.

(2) Establishment of evolutionary game model

The expected return (u_1) of the game player who voluntarily accepts supervision is:

$$u_1 = p(R+S)+(1-p)(R+2S+M) = R+S+(1-p)(S-M)$$

The expected return (u_2) of the game party that does not accept supervision is:

$$u_2 = p(R+M+2F)+(1-p)(R-F)$$

Then the average income (U) of the group is:

$$u = pu_1+(1-p)u_2$$

Therefore, the replication dynamic equation of the evolutionary game model is:

$$F(p) = dp/dt = p(u_1-u) = p(1-p)(u_1-u_2)$$
$$= p(1-p)\left[2S+F-M-p(S-F)\right]$$

Let $F(p)=0$, when $p^*=0$, $p^*=1$, $p^*=(2S+F-M)/(S-F)$, the proportion of the platform under supervision is stable, but it cannot be determined whether it belongs to the evolutionary stable strategy ESS, in $F'(p^*)<0$ equilibrium point is the evolutionary stable strategy ESS.

$$F'(p) = (2S+F-M)-2p(3S-M)+3p^2(S-F)$$

Putting the above p* value into the equation, it can be calculated as:

$$F'(0) = 2S+F-M$$
$$F'(1)M-S-2F = -(S+2F-M)$$
$$F'[(2S+F-M)/(S-F)] = (2S+F-M)(S+2F-M)/(S-F)$$

At this time, the relationship between values exists in the following two cases:

Case 1:

When $S - F > 0$, $2S + F - M > 0$ when $S + 2F - M < 0$

Then $F'(0) > 0$, $F'(1) > 0$, $F'[(2S + F - M)/(S - F)] < 0$

At this point only $p^* = (2S + F - M)/(S - F)$ is the only stable evolutionary stable strategy.

When the market meets the above conditions, the probability of P2P platforms voluntarily accepting supervision will eventually stabilize at a level around $p = (2S + F - M)/(S - F)$ at this point, the average return of the group reaches its maximum value.
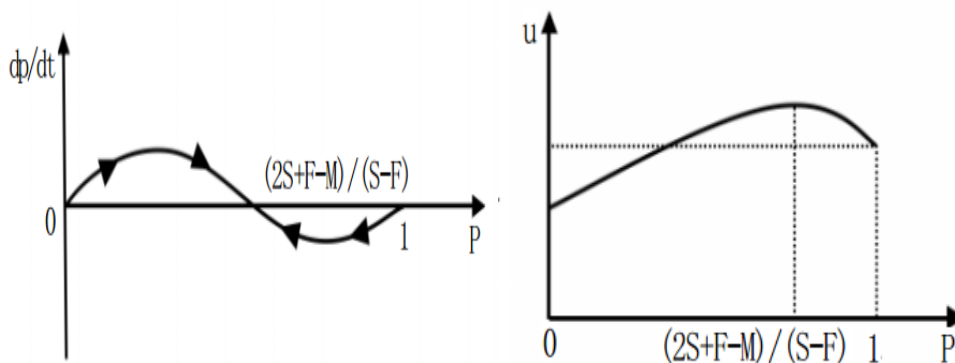
(Figure 2.1 The phase diagram of the eagle-dove game replicating the dynamic equation) (Figure 2.2 The average payoff curve of the eagle-dove game)

Case 2:

When $S - F > 0$, $2S + F - M < 0$ when $2S + F - M > 0$
Then $F'(0) < 0, F'(1) < 0, F'[(2S + F - M)/(S - F)] > 0$

At this time $p^* = 0$ and $p^* = 1$ are evolutionary stable strategies of the game, forming a "coordination game". And $p^* = (2S + F - M)/(S - F)$ is not an evolutionarily stable strategy.

Therefore, the game between platforms will evolve into two stable states

When the probability of the platform being regulated is *(P)* and the initial level falls within the interval $[0, (2S + F - M)/(S - F)]$, the replication dynamics will tend to a stable state of $p^* = 0$, that is, all platforms are not regulated;

When the initial level falls within the interval $[(2S + F - M)/(S - F), 1]$, the replication dynamics will tend towards $p^* = 1$, that is all platforms will be voluntarily regulated;

When the initial level is equal to $(2S + F - M)/(S - F)$ each platform will randomly choose whether to accept supervision. At this time, the expected return of the two options of the platform is the same, and the average return of the group will be at the minimum.
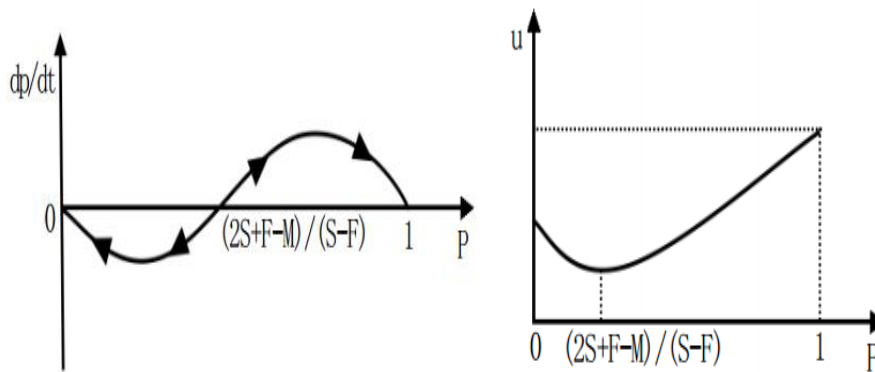
(Figure 2.3 Phase diagram of the coordination game replication dynamic equation) (Figure 2.4 Average payoff curve of coordination game)

Table 2.2 List of model equilibrium results

Condition	Equilibrium point $p*$	Value $F'(p*)$	Result
Pigeon game:: $S-F>0$ $2S+F-M>0$	$p*=0$	$2S+F-M>0$	unstable point
	$p*=1$	$M-S-2F>0$	unstable point
	$p*=\dfrac{2S+F-M}{S-F}$	$\dfrac{(2S+F-M)(S+2F-M)}{S-F}<0$	ESS
Coordination game: : $S-F<0$ $2S+F-M<0$	$p*=0$	$2S+F-M<0$	ESS
	$p*=1$	$M-S-2F<0$	ESS
	$p*=\dfrac{2S+F-M}{S-F}$	$\dfrac{(2S+F-M)(S+2F-M)}{S-F}>0$	unstable point

(3) Analysis of game parameters

In the "eagle-dove game", when the market tends to be in a stable state, the probability that each P2P lending platform decides to accept the supervision of the regulatory authority will be stable at $p=\frac{(2S+F-M)}{(S-F)}$. Because the platform chooses supervision will lead to loss of revenue *(M)* and increase of supervision revenue *(S)*. At this time, the regulator should strengthen management, maintain a stable increase in revenue *(S)* to the platform that accepts supervision, and at the same time increase the fine *(F)* for illegal behaviors that do not accept the regulator to make $p=\frac{(2S+F-M)}{(S-F)}$ approach 1. At this time, The probability of platform A voluntarily accepting supervision will approach 1, and the average benefit of the group will be the largest at this time.

In the "coordination game", when the regulator first implements the regulatory policy, the number of platforms that accept supervision is very important, which will directly affect the evolution direction of the game. In order to implement regulatory policies more effectively, regulators should pay attention to grasping the regulatory standards when regulatory policies are introduced, appropriately propose incentive policies, increase the revenue (S) of their platforms, and strive for more resources for regulated platforms. Platforms that do not accept supervision or violate supervision shall be strictly punished, and the amount of fines shall be increased *(F)*. The willingness to accept supervision through the platform increases, so that the overall probability of accepting supervision is greater than $p=\frac{(2S+F-M)}{(S-F)}$ to ensure that the evolutionary stability strategy will tend to 1, that is, the platform will choose to accept supervision.

3.2. Evolutionary game model of P2P network lending regulators and guarantee institutions

There are two groups of P2P online lending platforms, those who accept guarantees and those who do not accept guarantees. The regulatory authorities also have two strategies to supervise and not supervise P2P online lending platforms, that is, the number of individuals in the online lending enterprise platform group is N, N Sufficiently large and satisfying: The P2P network lending enterprise platform accepts guarantees and does not accept guarantees and the supervision departments interact with each other, and it is random and bounded rationality. Regardless of whether the P2P platform accepts the guarantee or not, the decision-making time when choosing supervision is the same, the same group has the same selection supervision strategy, and there is information asymmetry between the two.

Table 2.3 Game income matrix of guaranteed and unguaranteed by regulators and online lending companies

Regulators	P2P Platform			
	no guarantee (x)		guaranteed $(1-x)$	
be regulated (y)	$U_a - V_a$	S_a	$U_d - V_d$	$S_d - W$
not regulated $(1-y)$	U_a	S_a	U_d	S_d

S represents the income of the online loan platform; Sa represents the unsecured income of the online loan enterprise, Sd is the guaranteed income of the online loan enterprise, and the supervision income of the supervision department is Sd-W, where W is the supervision fee and fine, Sd>Sa

When the regulatory authorities supervise, investors do not pay much attention to whether there are guarantee factors for online loan platforms, but online loan companies that take guarantees will increase the cost of guarantees, so Sd>(Sa-W)

V represents the cost of supervision; Va is the supervision cost of the unsecured government supervision department of the online loan enterprise, Vd is the supervision cost of the government supervision department with the guarantee of the online loan enterprise, Vd>Va,

U represents the income of the supervision department, Ua is the income of the unsecured government supervision department of the online loan company, Ud is the guaranteed income of the government supervision department of the online loan company, Ua>Ud

When $x < \frac{V_a}{V_d - V_a}$, $x^* = 0$, $x^* = 1$ are still two stable strategies, but $F'_{(0)} < 0$, $x^* = 0$ is an evolutionary stable strategy.

When $x = \frac{V_a}{V_d - V_a}$ all (y) are in equilibrium. Because of $V_d > V_a$ when $x > \frac{V_a}{V_d - V_a}$ no matter what strategy the platform adopts (guaranteed or not), the best choice for regulators is regulation, and when $x < \frac{V_a}{V_d - V_a}$ no matter what strategy the platform adopts (guaranteed or not) regulation The best option for the sector is to not regulate.

By analyzing the replication dynamic equation of online loan platform enterprises,

When $y > \frac{S_d - S_a}{W}$, $x^* = 0$, $x^* = 1$, two stable strategies, but $F'_{(1)} < 0$ ie $x^* = 1$ is an evolutionary stable strategy;

When $y < \frac{S_d - S_a}{W}$, $x^* = 0$, $x^* = 1$, are still two stable strategies, but $F'_{(0)} < 0$ i.e. $x^* = 0$ is an evolutionary stable strategy;

When $y = \dfrac{S_d - S_a}{W}$ all y are in equilibrium.

Because of $S_d > S_a$ when $y > \dfrac{S_d - S_a}{W}$ i.e. no matter what strategy the government adopts (regulatory or not), the platform chooses the unsecured model, and when $y < \dfrac{S_d - S_a}{W}$ i.e. no matter what strategy the government adopts (regulatory or not), the platform's maximum The preferred option is the secured model.

4. Discussion and Conclusion

Through the construction of the above two models and the deduction and analysis of the relevant parameters, the following conclusions can be drawn:

Conclusion 1: Without the intervention of regulatory authorities, only relying on the adjustment of market interests and the improvement of platform social responsibility awareness, the standardized development of P2P online lending platforms will not reach an ideal state.

Conclusion 2: In the early stage of the implementation of regulatory policies, it is necessary to protect the competitive advantages and operating income of formal platforms, optimize the market competition and development environment through legislation "rectification", and support and promote the construction of a social credit system, so that most platforms consciously accept supervision.

Conclusion 3: The regulatory authorities should increase the penalties for violations of the platform, so that the cost of the platform being investigated and punished for the illegal operation is far greater than the income obtained by the illegal operation, so as to eliminate the impulse to violate the regulations; the platform itself should also strengthen corporate governance and improve internal control management. level, prevent the risk of violation, and reduce the cost of violation.

Conclusion 4: The regulatory department should reduce the cost of supervision through the comprehensive use of various channels and methods. The first is to improve supervision capabilities and reduce supervision costs through collaborative supervision, informatization of supervision methods, and diversification of supervision methods; the second is to strengthen the information disclosure of the platform, and improve the efficiency of supervision through market supervision; The construction and management of the organization, strengthen the standard operation of the platform itself to reduce the cost of supervision.

The informatization of supervision methods and diversification of supervision methods are two key strategies that can help improve the efficiency of regulatory oversight. By leveraging technology and data analytics, regulators can gain greater insights into market trends and identify potential risks before they become major issues. Additionally, diversifying the types of supervision methods used can help ensure that all areas of a market are being properly monitored. Strengthening the information disclosure of the platform is another important step in improving regulatory oversight. By requiring companies to provide more detailed information about their operations, regulators can better understand how they operate and identify any potential risks. Finally, the construction and management of the organization itself is critical to reducing the cost of supervision. By ensuring that all employees are properly trained and that standard operating procedures are in place, regulators can streamline their operations and reduce inefficiencies. Overall, these strategies can help ensure that regulatory oversight is effective, efficient, and able to adapt to changing market conditions.

Since most of the Investors are risk-averse, will be interested in P2P companies To maximize, attract investors and expand market share, P2P companies will choose underwriting model to collect attract more user groups. P2P lending platforms have emerged as a popular alternative to traditional banking channels. With the help of lenders, these platforms can ensure that they are safe, secure, and beneficial for all parties involved. As most investors are risk-averse, P2P companies have the potential to attract them by offering attractive underwriting models. By using data analytics and machine learning algorithms, P2P companies can collect information on user behavior and creditworthiness to make informed decisions about lending. This approach not only helps attract more user

groups but also ensures that the loans are granted to those who have a high probability of repaying them. Moreover, P2P companies can expand their market share by leveraging technology and creating innovative products that cater to specific customer needs. By doing so, they can create a loyal customer base that trusts their services and is willing to recommend them to others. In conclusion, P2P lending platforms have the potential to revolutionize the financial industry by providing safe, secure, and profitable investment opportunities However, it is impossible not to mention the potential problems behind the guarantee model such as the unknown subject of the guarantee, the company. Underwriters are affiliates, problems like self-financing are loopholes in oversight and even false underwriting platforms will emerge. Providing safe, secure, and profitable investment opportunities is a top priority for any investor. However, it is important to acknowledge the potential risks associated with the guarantee model. One of the main concerns is the unknown subject of the guarantee, which is often the company itself. This can create a conflict of interest for underwriters who are affiliates of the company and may prioritize their own financial interests over those of investors. Additionally, self-financing can be a loophole in oversight, allowing companies to manipulate their financial statements and mislead investors. Another risk is the emergence of false underwriting platforms that may lure investors with promises of high returns but ultimately fail to deliver. To mitigate these risks, investors should conduct thorough due diligence on any investment opportunity and carefully evaluate the credibility and track record of underwriters and companies before making any investment decisions.

In the evolutionary game between the studied P2P enterprise and the supervision of the regulators, it is found that whether the Firm has an underwriter under the underwriting model as an associate depends largely on the extent of regulatory oversight and the degree of sanctions. When making any investment decisions, it is important to consider the regulatory environment in which the investment operates. The evolutionary game between P2P enterprises and regulators highlights the importance of regulatory oversight and sanctions. Under the underwriting model, the presence of an underwriter as an associate can have a significant impact on the success of a P2P enterprise. However, this success is heavily dependent on the level of regulatory scrutiny and enforcement. Investors should carefully evaluate the regulatory landscape before investing in any P2P enterprise, as non-compliance with regulations can lead to significant financial losses. Additionally, it is important to consider other factors such as market trends, competition, and management expertise when evaluating investment opportunities. By taking a comprehensive approach to investment analysis, investors can make informed decisions that maximize their returns while minimizing risk. Certainly, the deterrence of companies in the regulatory policy of the regulator affects the income of the business, which in turn affects the choice of operation method of online lending businesses. Regulators need to improve the supervision system, increase the supervision density, raise the industry threshold, evaluate the credit platform system, develop risk monitoring indicators for online lending businesses, etc and establishing a good P2P network funding environment is essential. The impact of interest rates on the lending industry cannot be overstated. With the advent of online lending businesses, the choice of operation method has become even more crucial. As such, regulators must step up their efforts to improve the supervision system and increase supervision density. Raising the industry threshold is also essential to ensure that only credible players are allowed to operate in this space. Evaluating the credit platform system and developing risk monitoring indicators for online lending businesses are other critical steps that must be taken. A good P2P network funding environment is also essential for the growth and success of these businesses. This can be achieved by establishing a robust regulatory framework that promotes transparency, accountability, and fairness. In conclusion, it is imperative that regulators work closely with industry players to create an enabling environment that fosters innovation while protecting consumers' interests.

Here are some suggestions for the research findings and future research sustainability sharing:

1. Create thorough and easily accessible system dynamic models that can demonstrate in greater detail the expansion and influence of Fintech P2P Lending.
2. Investigate the potential for intricate strategies that take into account the interests of multiple players, and conduct further research.
3. Explore the integration of system dynamics and game theory in various scenarios involving multiple players, and assess its efficacy in diverse contexts.

Fintech P2P lending has rapidly expanded and influenced the financial industry. The emergence of online platforms has made it easier for borrowers to access loans and investors to earn higher returns. However, this

growth has also led to concerns about regulation and risk management. To address these issues, intricate strategies that take into account the interests of multiple players must be developed. Conducting further research can help identify potential solutions and improve the overall effectiveness of the industry. Integrating system dynamics and game theory can provide a more comprehensive understanding of how different players interact in various scenarios. This approach can be particularly useful in assessing risk and developing strategies that benefit all parties involved. While there may be challenges in implementing such approaches, exploring their potential in diverse contexts can lead to more sustainable and equitable outcomes for all stakeholders in the Fintech P2P lending industry.

5. References

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