

Self-Organized Evolutionary Mechanism Model for Industrial-Financial Systems

Wei Yao¹, Wang Shanshan²

¹*FuYang Teachers College Business School*
Fuyang Anhui ,236037 ,China.

²Key Laboratory of Regional logistics planning and Logistics Engineering
FuYang AnHui ,236037,China.

Abstract — Industry-Finance group is a new group type that comes from the mutual alliance of capital and management between the industry and finance organizations. It is a self-organized synergy evolutionary system that combines financial with industrial innovations. The paper constructs a self-organization model capable of analyzing the evolutionary mechanism and processes within an Industry-Finance group system. The results show that the subsystem in Industry-Finance group creates synergy effects by self-organization through an organized non-linear role. This promotes the system from non-state organization to self-organization, from a chaotic state to an ordered state of organization.

Keywords -- *Industrial-Financial Group System self-organization evolutionary mechanism*

I. INTRODUCTION

Industrial-financial group is a new type of enterprise group that is generated from the mutual permeation and mutual fusion of capital and management between industrial organization and financial organization. With the open of financial market and the financial deregulation, the financial organization and industrial organization become increasingly diversified. Enterprises, with certain scales of industrial capital like Haier Group, Dlong Group, New Hope Group, etc., have built the industrial-financial group which is suitable to industrial development features and invested heavily into finance industry through forms of establishing, sharing equities, holding equities, purchasing financial institutions or setting up financial sector company, etc. Meanwhile, financial capitals represented by CITIC Group also permeate rapidly to industrial capital and form the industrial-financial type enterprises featuring the alliance of financial capital and industrial capital.

Currently, there is no unanimous recognized view about the research on the evolutionary mechanism of industrial-financial group. The Information Asymmetry Theory considers that the precondition of industrial-financial alliance is the information asymmetry between industrial capital and financial capital. [1] The Transaction Cost Theory considers that the industrial-financial allied net group can reduce the transaction cost. [2] The Late-developing Advantage Theory considers that the industrial-financial group is the effective mechanism for the early-stage industrial capital formation of late-developing countries. [3] The Corporate Diversification Theory considers that the generation and evolution of industrial-financial group is the inevitable result of enterprises diversification caused by the differences of the institutional environment, which is the better choice for the enterprises to improve their core competitiveness. [4] The current researches only focused on the external manifestation, different costs, fees and performance issues between bond model and ownership model of the industrial-

financial group and did not reveal the formed and evaluative inner factors, evaluative forces and process of different alliance modes of financial system.

We regard industrial-financial group as a coevolution process and evolution results of financial innovation and industrial innovation. [5] The industrial-financial group combines several industries with the financial industrial through self-organization and other-organization strategies, and formed an industrial-financial system with multiple allied subsystems. The inner subsystems of industrial-financial system can generate synergic effect through the nonlinear interactions of self-organization and other-organization and can push the non-organization status to organized status, from organization disordered status to organization ordered status. On this base, this paper establishes the self-organization evolutionary model of industrial-financial group to analyze the self-organization evolutionary process and mechanism of industrial-financial group from the complex system characteristics of industrial-financial groups.

II. THE SELF-ORGANIZATION CHARACTERISTIC OF INDUSTRIAL-FINANCIAL GROUP SYSTEM

From the system science perspective, whether it is industrial organization or financial organization, as an open system organization process, it exchanges material and energy with the external world continually and achieves the "input-output" in-out process. In this process, both self-organization and other-organization can arouse the evolution and development of atom ordering and management model in the inner structure of industrial system and financial system, and lead the system to an ordered direction. On the other hand, no matter for industrial organization or financial organization, as an evolution process of being away from balance status system, it shall break the original balance and let the system be in a nonlinear transition process from one balanced status to a new balanced process. Therefore, industrial-financial group combined by industrial capital and

financial capital is an open complex system featuring self-organization dissipative structure. Subsystems or basic units in the system act with each other and evolve new unique nature, structure and function on the whole.

A. *The Industrial-financial Group System Has Dissipative Structure Characteristic [6]*

Firstly, industrial-financial group system is open. The industrial-financial group introduces “negative entropy flow” of material, energy and information from the external world and discharges its “metabolite” to reduce the positive entropy remained by system and make the system move from the disordered status to an ordered dissipative structure spontaneously. External environment like financial market opening and financial deregulation have become the source of negative entropy of the alliance between industrial capital and financial capital. Reducing transaction cost, eliminating the information asymmetry between industries and financial industry, achieving scale economy and scope economy have become the dynamic mechanism to promote industrial-financial alliance. Secondly, industrial-financial group system keeps away from the balance status. There are differences between industrial system and financial capital in development vision, business flow, customer structure and competitive strategy, so the material energy distribution is rather imbalanced. This forms the endogenous factor of industrial-financial group evolution. Thirdly, industrial-financial group system is under the effect of nonlinear effect. The industrial-financial group is a virtual network organization between market and enterprises, which is generated from the synergic network relationship between financial organization and industrial organization featuring industrial relations, capital links, strategic alliance and management union. There is a complete supply chain mechanism among the inner factors from product, price, distribution and sale promotion to capital structure, competitive cooperation, position and client management. These mechanisms have nonlinear relationship in material and energy, and this nonlinear relationship has become the inner motivation of alliance between industrial system and financial system. Fourthly, the fluctuation phenomenon is the dynamic factor of the self-organization evolution of industrial-financial group. The industrial-financial group evolution produces myriad micro-fluctuation under the influence of the external environment. When the external fluctuation effect reaches the critical point, the industrial-financial group system will generate “huge fluctuation” to achieve the growth and evolution of the new system’s organization structure and function on a complex huge system level. It is exactly this environmental fluctuation that drive the system evolves from the industrial-financial separation balance statue to the industrial-financial alliance balance status.

B. *The Industrial-financial Group System Has Integral Compatibility*

The Self-organization Theory considers that the key point for a system transaction from disorder to order is not the

distance from the balanced status but the inner synergic mechanism and coupling of the open system constituted by subsystems. The industrial-financial group can achieve the share and supplement of industrial capital and financial capital through industrial-financial alliance and reach the integral synergic effect where the integral value is greater than the values of subsystems. It includes the willingness of industrial capital and financial capital strategic combination, dependence severity towards the excess earnings from the future cooperation or the strategic integral synergic effect coupling by recognition level, the integral synergic effect combined by the homogeneous factors and heterogeneous factors of the industrial-financial group, operational integral synergic effect combined by the scale economy effect, scope economy effect, transaction cost effect and learning curve utility and the financial integral synergic effect combined by financial integrated effect, tax-efficient interest effect, internal and external financing cost reduction, financial leverage and expected effect. ^{[7][8][9]}

It is this conscious integral coordinating function of industrial-financial group system that drives the original industrial system and financial system to break the original isolate and single imbalanced status, and starts to go from financial system competition to system competitive cooperation, from organization separation to organization synergy. The self-organization evolves into a new type of industrial-financial type enterprise group.

C. *The Industrial-financial Group System Has Self-organization Evolution [10]*

The self-organization evolution process of industrial-financial group is self-adaptive and the evolutionary balanced results are self-creation type. The created new system can achieve self-growth and self-cycle, thus to achieve the self-transcendence integral synergic effect. The original industrial system and financial capital can achieve the match between resources and environment through the exchange, integration and configuration of the internal and external environment resources by self-adaptive function. Then new system structure and new adaptive ability can spring out. In the industrial-financial group self-organization evolutionary process, new status, structure and function not processed by the original system will be generated because of the synergic effects among internal subsystems. The new system status has orderable transaction compared with the original system to achieve the self-creation of industrial-financial group system. The generated new industrial-financial group system can keep the orderable status through self-copy function, copy the original self-openness, self-regulation and self-growth process and strengthen the autocatalysis and cross-catalysis of industrial-financial group, and finally, achieve the integral synergic effect in a huger system scale, more complex system network and higher system order.

III. THE SELF-ORGANIZATION EVOLUTION MODEL OF INDUSTRIAL-FINANCIAL GROUP SYSTEM

Organization process is the procedure where the system emerges qualitative changes and increases the orderable

degree. This organized process is divided into two categories: self-organization and other-organization. Self-organization is the process and phenomenon where the system forms structure and function spontaneously without any external instructions and interventions.^{[11] [12]} While the other-organization emphasizes that the system organization behavior and evolutionary process is preceded under the purposes and willingness of the external organizers and to complete orderable behaviors and structure of the design, arrangement and coordination by the external organizers. The self-organization uses order parameters to describe the macro-orderable degree of a system. The synergic cooperation and competition among order parameters decide the system deepening process from disorder to order.^[9] The Self-organization Theory also considers that it can take other-organization method to impose external pressure on the order parameters of self-organization i.e. through changing the control parameter that leads the synergic competition of order parameters to change the self-organization status and promote the system orderable status or structure.

The core concept of Self-organization Theory is to force external pressure on the order parameters to improve system self-organization synergic degree through seeking the order parameters that can affect the system synergic evolution and certain other-organization strategies. As for industrial-financial group system, the industrial-financial group can combine several industries with financial organizations and form an industrial-financial group system with several subsystems. In this system, there are factors verging to synergic development and fluctuations verging to synergic frustration. In all these factors, some dominate the synergy degree of industrial-financial group system, which are the order parameters governing the industrial-financial group system evolution. The purpose of using self-organization theory to study the self-organization evolution issues is to find out the leading factor of industrial-financial group synergic evolution and reveal the self-organization evolutionary mechanism and process of industrial-financial group. On this basis, this thesis tries establishing a self-organization model to describe the spontaneous formation process of industrial-financial group system and analyzing the inner factors and evolutionary regulations in the process.^{[13] [14] [15]}

In the industrial-financial group system evolutionary process, we hypothesize that the development of industrial system, financial capital and industrial-financial system comply with development and change of Logistic Rule. For the convenience of analysis, we use the total capital, total interests or the multivariate function of several factors to express system development scale x_i . r_i indicates the fixed growth rage of industrial capital and financial capital. k_i indicates the possible maximum scale of industrial capital and financial capital under a certain economic resources. Both the theory and practice indicate the mutual influence of industrial capital or financial capital development, both cooperative and competitive, and form a competitive-cooperative mechanism. The competitiveness can bring both positive effect and negative effect. We use correlation

coefficient k_{ij} to indicate the influence of competitiveness, and $-1 < k_{ij} < 1$. The effective cooperation can improve enterprise competitiveness, while the invalid cooperation will reduce the enterprise competitiveness. We use cooperative parameter σ_i to indicate the influence of cooperation and $-1 < \sigma_i < 1$. Based on the above hypothesis, we can get the following system evolution equations:

$$\frac{dx_i}{dt} = r_i x_i \left(1 - \frac{x_i}{k_i} - \sum_{j \neq i} k_{ij} \frac{x_j}{k_j} + \sum \sigma_i \frac{x_i}{k_j} \right) \quad (1)$$

For the convenience of analysis, we further hypothesize the industrial-financial alliance between an industrial capital and a financial capital. These two systems have coupling phenomenon and achieve self-organization evolution. Then the evolutionary equation of industrial-financial group system is the following simultaneous equations:

$$\begin{cases} \frac{dx_1}{dt} = r_1 x_1 \left(1 - \frac{x_1}{k_1} - k_{12} \frac{x_2}{k_2} + \sigma_1 \frac{x_1}{k_2} \right) \\ \frac{dx_2}{dt} = r_2 x_2 \left(1 - \frac{x_2}{k_2} - k_{21} \frac{x_1}{k_1} + \sigma_2 \frac{x_2}{k_1} \right) \end{cases} \quad (2)$$

From the above system simultaneous equations, we can get four fixed points $(0, 0)$, $(k_1, 0)$,

$(0, k_2)$ and

$$\left(\frac{k_1(k_2 k_{12} - \sigma_1 - 1)}{(k_2 k_{12} - \sigma_1)(k_1 k_{21} - \sigma_2) - 1}, \frac{k_2(k_1 k_{21} - \sigma_2 - 1)}{(k_2 k_{12} - \sigma_1)(k_1 k_{21} - \sigma_2) - 1} \right).$$

By analysis of the system stability through these four fixed points, the matrix can be reached:

$$A = \begin{bmatrix} \left. \frac{\partial x_1}{\partial x_1} \right|_f & \frac{\partial x_1}{\partial x_2} \\ \frac{\partial x_2}{\partial x_1} & \left. \frac{\partial x_2}{\partial x_2} \right|_f \end{bmatrix} = \begin{bmatrix} r_1 \left(1 - \frac{2x_{1f}}{k_1} - k_{12} \frac{x_{2f}}{k_2} + \frac{\sigma_1}{k_2} x_{2f} \right) \\ r_2 \left(\frac{\sigma_1}{k_1} - k_{21} \right) x_2 - k_{21} \\ r_1 \left(\frac{\sigma_2}{k_2} - k_{12} \right) x_1 - k_{12} \\ r_2 \left(1 - \frac{2x_{2f}}{k_2} - k_{21} \frac{x_1}{k_1} + \frac{\sigma_2}{k_1} x_1 \right) \end{bmatrix} \quad (3)$$

We conduct stability analysis on them:

$$(0, 0) \text{ point, } A = \begin{bmatrix} r_1 & 0 \\ 0 & r_2 \end{bmatrix} \quad (1)$$

At this moment:

$$\tau = r_1 + r_2 > 0 \quad \Delta = r_1 r_2 > 0 \quad \tau^2 - 4\Delta = (r_1 - r_2)^2 \geq 0.$$

The analysis indicates that point $(0, 0)$ is the unstable fixed point, which means when the industrial capital and financial capital scale of industrial-financial group system is 0, it is unstable and impossible.

$$(k_1, 0) \text{ point, } A = \begin{bmatrix} -r_1 & r_1 k_1 \left(\frac{\sigma_1}{k_2} - k_{12} \right) \\ 0 & r_2 (1 - k_{21} k_1 + \sigma_2) \end{bmatrix} \quad (2)$$

At this moment:

$$\tau = r_1 + r_2 (1 - k_{21} k_1 + \sigma_2) \quad \Delta = -r_1 r_2 (1 - k_{21} k_1 + \sigma_2).$$

If $(1 - k_{21} k_1 + \sigma_2) > 0$,

then fixed point $\Delta < 0$

is the saddle point.

If $(1 - k_{21} k_1 + \sigma_2) < 0$,

$$\text{then } \tau < 0 \quad \tau^2 - 4\Delta = [r_1 + r_2 (1 - k_{21} k_1 + \sigma_2)]^2 \geq 0,$$

fixed point $\Delta > 0$

is the stable point.

When $(1 - k_{21} k_1 + \sigma_2) > 0$, the industrial-financial group system is in an unstable status because of the invalid competitiveness and cooperation and this will finally make the industrial-financial group system difficult to exist and go back to industrial-financial separation from industrial-financial alliance. In the end, industrial capital and financial capital in the industrial-financial group will capture each other because of competitiveness, or there is only one capital existing or the industrial-financial group system merges into a huge system.

$$(0, k_2) \text{ point, } A = \begin{bmatrix} r_1 (1 - k_{12} k_2 + \sigma_1) & 0 \\ r_2 \left(\frac{\sigma_2}{k_1} - k_{21} \right) k_2 & -r_2 \end{bmatrix} \quad (4)$$

At this moment:

$$\tau = r_1 (1 - k_{12} k_2 + \sigma_1) - r_2, \quad \Delta = -r_2 r_1 (1 - k_{12} k_2 + \sigma_1).$$

If $(1 - k_{12} k_2 + \sigma_1) > 0$,

then fixed point $\Delta < 0$

is the saddle point. If $(1 - k_{12} k_2 + \sigma_1) < 0$,

$$\text{then } \tau < 0, \tau^2 - 4\Delta = [r_1 (1 - k_{12} k_2 + \sigma_1) + r_2]^2 \geq 0.$$

And fixed point $\Delta > 0$

is the stable point. i.e. when $(1 - k_{12} k_2 + \sigma_1) > 0$, the system inner coupling synergic effect within the industrial-financial group should exceed the restricted effect brought by effective competitiveness and make the competitiveness and cooperativeness within the system be on balanced status. In a long-term period, the system will finally go to disintegration because of the existence of the fluctuations. The industrial-financial group system cannot exist for a long period through

self-organization evolution. When $(1 - k_{12} k_2 + \sigma_1) < 0$, the two systems will finally become one huge system because of the excessive competition between the industrial capital and financial capital within the industrial-financial group system.

$$\left(\frac{k_1 (k_2 k_{12} - \sigma_1 - 1)}{(k_2 k_{12} - \sigma_1)(k_1 k_{21} - \sigma_2) - 1}, \frac{k_2 (k_1 k_{21} - \sigma_2 - 1)}{(k_2 k_{12} - \sigma_1)(k_1 k_{21} - \sigma_2) - 1} \right)$$

point,

$$A = \begin{bmatrix} \frac{(1 - k_2 k_{12} + \sigma_1)}{(k_2 k_{12} - \sigma_1)(k_1 k_{21} - \sigma_2) - 1} \\ \frac{r_2 k_2 (k_1 k_{21} - \sigma_2 - 1)(\sigma_2 - k_1 k_{21})}{k_1 [(k_2 k_{12} - \sigma_1)(k_1 k_{21} - \sigma_2) - 1]} \\ \frac{r_1 k_1 (\sigma_1 - k_2 k_{12})(k_2 k_{12} - \sigma_1 - 1)}{k_2 [(k_2 k_{12} - \sigma_1)(k_1 k_{21} - \sigma_2) - 1]} \\ \frac{r_2 (1 - k_1 k_{21} + \sigma_2)}{(k_2 k_{12} - \sigma_1)(k_1 k_{21} - \sigma_2) - 1} \end{bmatrix}$$

$$\text{At this moment, } \tau = \frac{r_1 (1 - k_2 k_{12} + \sigma_1) + r_2 (1 - k_1 k_{21} + \sigma_2)}{(k_2 k_{12} - \sigma_1)(k_1 k_{21} - \sigma_2) - 1},$$

$$\Delta = \frac{-r_1 r_2 (1 + \sigma_2 - k_1 k_{12})(1 - k_2 k_{12} + \sigma_1)}{(k_2 k_{12} - \sigma_1)(k_1 k_{21} - \sigma_2) - 1} \quad (5)$$

If $(1 - k_{12} k_2 + \sigma_1) > 0$ and $(1 - k_{21} k_1 + \sigma_2) > 0$, then $\tau < 0, \Delta > 0, \tau^2 - 4\Delta > 0$. This fixed point is the stable point. If $(1 - k_{12} k_2 + \sigma_1) < 0$ and $(1 - k_{21} k_1 + \sigma_2) < 0$, then $\tau > 0, \Delta < 0$, this fixed point is the saddle point i.e. when $(1 - k_{12} k_2 + \sigma_1) > 0, (1 - k_{21} k_1 + \sigma_2) > 0$, the synergic cooperation of industrial capital and financial capital within the industrial-financial group system is effective and can make the system remain stable for a long period through coupling and synergic effect. Both industrial capital and financial capital can gain developments. When $(1 - k_{12} k_2 + \sigma_1) < 0, (1 - k_{21} k_1 + \sigma_2) < 0$, the synergic cooperation of industrial capital and financial capital within the industrial-financial group system is not completely effective, and the system is in a unstable saddle status. The industrial-financial group system may finally go to disintegration.

In order to further discuss the effect of competitive-cooperative mechanism towards the self-organization of industrial-financial group system, we hypothesize that k_1, k_2 are equal and > 1 . The stable condition of industrial-financial group system is $(1 - k_{12} k_2 + \sigma_1) > 0, (1 - k_{21} k_1 + \sigma_2) > 0$. When $\sigma_1, \sigma_2 > 0$, the condition of inequalities is $k_{12} < \frac{1 + \sigma_1}{k_2}, k_{21} < \frac{1 + \sigma_2}{k_1}$.

This requires that the negative effect of competitions to both parties of industrial-financial group system should be smaller than the quotient of positive effect and scale

restriction. When the competition effect brought to industrial-financial group system partners increases their resources advantages, i.e. $k_{12}, k_{21} < 0$, the industrial-financial group system is a stable system on the point:

$$\left(\frac{k_1(k_2k_{12} - \sigma_1 - 1)}{(k_2k_{12} - \sigma_1)(k_1k_{21} - \sigma_2) - 1}, \frac{k_2(k_1k_{21} - \sigma_2 - 1)}{(k_2k_{12} - \sigma_1)(k_1k_{21} - \sigma_2) - 1} \right).$$

The system can survive and grow stably through self-organization evolution. When $\sigma_1, \sigma_2 < -1$, because the negative effect brought from the industrial-financial group system partners is greater than the positive effect of competition, the system is unstable. The industrial-financial allied ownership mode will finally go to industrial-financial separation ownership mode because of the invalid competition and cooperation.

IV. THE SELF-ORGANIZATION EVOLUTION PROCESS OF INDUSTRIAL-FINANCIAL GROUP SYSTEM

Industrial-financial group is a new type of enterprise group that is generated from the mutual permeation and mutual fusion of capital and management between industrial organization and financial organization. The group combines various industries with financial industry through self-organization strategy and other-organization strategy and forms the industrial-financial group system with multiple subsystems. From the Finance perspective, we can regard industrial-financial group as a dynamic balance from industrial-financial allied ownership mode to self-organization ownership mode and a kind of dynamic evolution process and results of financial innovation and industrial innovation. From the System Science perspective, we can regard industrial-financial group as internal system entropy changes caused by external system environmental fluctuation, thus to generate the reflection diffused dissipative structure process of order of industrial capital and financial capital inner structure and management mode and the self-organization evolution process. [16]

The above analysis of industrial-financial group system self-organization evolution model indicates that the industrial organization and financial organization can improve its competitive capacity and growth capacity through synergic cooperation among its departments depending on the self possessed material, energy and information, which forms the self-catalysis process of the inner industries or financial subsystems of industrial-financial group. Meanwhile, the industrial and financial organizations exchange material, energy and information with external world continuously, adsorb negative entropy from the external world and discharge positive entropy to improve their structure transformation and system synergic ability. In this way, it can form different alliance method between industrial capital and financial capital, like claim mode, ownership mode or other modes. The function that affects other organizations through self-development and alliance form the cross catalysis process among the industrial-financial group inner industries or the subsystems of financial industries. In the industrial-financial group system after coupling, the industrial capital and financial capital will make the self-organization degree or order of

industrial-financial group system improve continuously through resource supplement, factor integration, synergic management and learning effect and again form another self-catalysis cycle within the industrial-financial group system. Meanwhile, the industrial-financial group system absorbs negative entropy from the external system and discharge positive entropy to change the system external environment system. The new system imposes external pressure on the order parameter that affects the system self-organization through other-organization system to change the system self-organization status and prompts the financial system to evolve from a lower orderable claim mode to a higher orderable claim mode. And there is a cross-catalysis cycle among the industrial-financial group systems. It is through the self-catalysis and cross-catalysis cycle effect that the industrial-financial group system evolves from non-organization to be organized, from lower organization degree to higher one and evolves from simple to complex on a higher level. Finally, it can achieve advanced order and synergy in the industrial-financial group system. The specific self-organization evolutionary process can be described as Fig.(1).

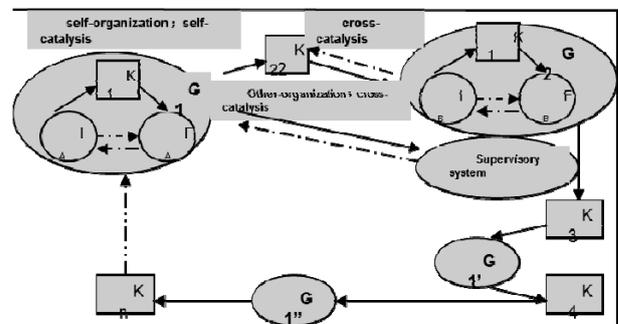


Fig. 1. Self-organization Evolutionary Process Graph of Industrial-financial Group System

In Fig.(1), firstly, depending on their self possessed factor resources, the industrial organization I_A and financial organization F_A develop their growth scale and improve their core competitiveness through inner synergy to achieve the inner self-catalysis cycle of the subsystems. Secondly, with the restriction of credit rationing problem, adverse selection, moral hazard problem and other factors of industrial-financial group system, industrial capital I_A and financial capital F_A form cross-influences and catalysis under the catalysis of financial market openness, financial deregulation, industrial diversification and other conditions K_1 like industrial alliance, industrial group and industrial network model. On the basis of “credit loan, relationship and learning”, we gradually establish mutual trust and network commitments and internalize the external transaction fees and catalyze a new type of industrial-financial order on the basis of long-term banks-enterprises synergic cooperation and common union. [15] That is the industrial-financial type enterprises groups G which can lead the industrial-financial group system to achieve the dynamic evolution from disorder to order.

In the industrial-financial group system after coupling, the industrial capital and financial capital share the information, match the resources and complement each

other's advantages. Through strategic, management, operational and financial synergy, it can reach the effect that the whole value is higher than the integral value of all subsystems and form a self-catalysis cycle in the system, then promote the self-organization evolution of industrial-financial group system to grow from lower organization degree to higher one. Thirdly, along with the emergence of new environmental problems K_2 like credit associated business risks, capital short loan long investment risks, and interest conflict risks and so on, on the one hand, the industrial-financial group system improves its risk management ability and synergic management ability through inner self-organization transition. On the other hand, through external supervision system and other industrial-financial group system other-organization strategy, it imposes influences and pressures on the internal self-organization behavior and forms cross-catalysis cycle among systems and promotes the industrial-financial group system evolve from simple order to advanced order on a higher level. It is this dynamic continuous self-catalysis and cross-catalysis, self-organization and other-organization cycle evolutionary mechanism that the industrial-financial system ends as a industrial-financial group system featuring high level of stability, synergy and order through countless forks and chaotic financial capital network.

V. CONCLUSION AND PROSPECT

The industrial-financial group is a new type of enterprise group that is generated from the mutual permeation and mutual fusion of capital and management between industrial organization and financial organization featuring self-organization characteristics as dissipation structural, integral synergy and self-organization evolution. It is the evolutionary process and results of self-organization synergy of financial innovation and industrial innovation. Based on this hypothesis, this thesis establishes a self-organization model to describe the spontaneous formation process of industrial-financial group system and analyzes the inner factors and evolutionary rules of this process. The analysis results indicate that the self-organization revolutionary process of industrial-financial group can be regarded as the financial system of claim right and ownership alliances on a higher level through the self-catalysis and cross-catalysis cycle of the competition and cooperation mechanism of the industrial organization and financial organization. This higher level financial capital promotes the ordered claim model to evolve into an advanced ordered claim model through the self-catalysis within the system and cross-catalysis among systems.

Of course, this thesis only uses the self-organization model to analyze China's industrial-financial group system evolution theoretically. As for how to specify, systematize and demonstrate the theory of industrial-financial group into practice, we also need conduct further deepening researches. Meanwhile, because the evolution of industrial-financial group system also depends on entrepreneurship, the interpersonal process between individual and organizational

learning, payoff matrix of entrepreneur and banker industrial-financial alliance, the starting status before industrial-financial alliance and the system arrangement after the industrial-financial alliance. Therefore, the further researches mainly focus on two aspects. Firstly, conduct quantification and demonstration analysis and tests concerning the self-organization model of industrial-financial group system evolution. Secondly, from the perspective of the behavior interaction process of entrepreneurs and bankers, we can conduct evolutionary game theory and behavior game theory researches for the formation of China's industrial-financial group system.

ACKNOWLEDGMENT

This work is supported by the Key Project of National Natural Science Foundation of China (Project No. 71201034), Anhui Province Philosophy and Social Science Planned Project (Project No. AHSK11-12D225, and Anhui Province Soft Science Project (Project No. 1502052051).

REFERENCES

- [1]. Boot, Arnould. "Relationship Banking: what do we know", *Journal of Financial intermediation*, vol. 2, No. 07, pp. 54-65, 2014.
- [2]. Goto, Akira. "Business Group in a market Economy", *European Economic Review*, vol. 2, No. 13, pp. 53-70, 1988.
- [3]. Guinnane, Timothy W. "Delegated Monitors. Large and Small : Germany's Banking System", 1800-1914. *Journal of Economic Literature*, vol. 2, No. 71, pp. 73-142, 2002.
- [4]. Zhu Wuxiang. "Effectiveness and enterprise diversification of financial system resource allocation function—concurrently discussing the enterprise group diversification strategies" . *Management World*, vol. 2, No. 04, pp. 54-65, 2001.
- [5]. Wei Yao, Lei Lianghai, "Evolutionary game analysis of industrial-financial group system" . *Journal of Management*, vol. 2, No. 08, pp. 54-65, 2009.
- [6]. Wei Yao, Lei Lianghai, "the analysis on dissipative structure of industrial-financial group", . *Special Zone Economy*, vol. 2, No. 07, pp. 54-65, 2009.
- [7]. Andrew Campbell, Katherine Sam. "Strategic Synergy" (Version II) . Translated by Ren Tonghai etc, Beijing: Mechanical Industry Press, vol. 2, No. 207, pp. 541-650, 2000
- [8]. Pan Kailing, Bai Liehu, "Management Synergy Theory and its application" . Beijing: Economic Management Press, vol. 92, No. 07, pp. 4-65, 2006
- [9]. Wang Qian, "Researches on the China's enterprises transnational merger and acquisition issues" . Beijing: Economic Science Press, 2006
- [10]. Chief editor Xu Zhian, "System science" . Shanghai: Shanghai Science and Technology Education Press, vol. 27, No.1 07, pp. 54-65, 2000
- [11]. Germany Herman Hawking, "translated by Dai Mingzhong, Synergetics" . Shanghai Science Popularization Press, 1988
- [12]. Niclis G, Prigogine "I. Self-Organization in Non-Equilibrium System". New York : Wiley, vol. 2, No. 07, pp. 549-650, 1968.
- [13]. He Jianxun. System modeling and mathematic model. Fuzhou: Fuzhou Science Technology Press, vol. 2, No. 07, pp. 256—280., 1995 :
- [14]. Zhao Changping, "the formation and management researches on the transnational corporations strategic alliance" . Economic Management Press, vol. 2, No. 07, pp. 54-65, 2005
- [15]. Sheng Zhaohan, Jiang Depeng, "Evolutionary economic" . Shanghai: Shanghai Sanlian Bookstore pp. 54-65, 2014.

- [16]. Wei Yao, "Industrial-financial group formation mechanism research based on brusselator model". Management Comment, vol. 8, No. 07, pp. 54-65, 2010.