

# Research on the Risk Problem of "NEEQ" of Securities Company-Based on Analytic Hierarchy Process

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**Abstract:** *Chinaset up the National Equity Exchange and Quotation (NEEQ) late in 2013, and the risk management system of the market is still in a constantly improving and optimizing process. In this paper, we put the securities company as the core enterprise as well as a credit transfer in solving the information asymmetry problem between upstream enterprise customers and downstream personal customers from the perspective of supply chain finance. Using analytic hierarchy process (AHP) to calculating the risk score, it may be increased as the target enterprise credit and can attract high net-worth clients (HNW). Meanwhile it can enhance their own credibility, promote the development of collaborative innovation between the securities company's internal businesses.*

**Keywords:** NEEQ; Securities Company; Analytic Hierarchy Process; Risk management

## 1. Introduction

As an important component of the multi-level capital market system, the NEEQ has experienced a rapid development period. By the end of 2016, more than ten thousand companies have been listed in NEEQ. The development of the market from 2013 to 2017 brought about a preliminary relief for the difficulties appeared in the financing process of small and medium-sized enterprises. It also played an important role in helping the public entrepreneurship, people's innovation and the structural reform on supply side.

With the growth of the NEEQ market, on one hand, the financing environment in china has been further improved. The expectable growth of the listed companies has attracted a large number of private capital into the equity market. Many small and medium enterprises realized a standard management and healthy development through the capital market services, at the same time, the industrial integration and structural optimization is promoted. The implement of the layered system in NEEQ has further strengthened the market containment which made more companies listed in the market. What's more, the prominent companies can be found by investors more easily. On the other hand, with the development of the NEEQ attracts more HNW customer especially institutional investors for securities firms. This has not only provided financing channels for target enterprises but also improved the credibility of Securities companies, which can promote the development of collaborative innovation between the securities company's internal businesses.

However, the listed companies' information disclosure institutes of the "NEEQ" business are not as strict as it was for those companies in main board. The internal control system of listed companies is not perfect, which makes the NEEQ market has serious information asymmetry. This has increased the investors' perceived risk which reduces

investors will, also led to some adverse selection risk at the same time, and that may cause the exit of quality enterprises and investors.

In the paper, we set securities company as the core enterprise from the perspective of supply chain financial considerations. We use the analytic hierarchy process (AHP) to identify the target enterprise risks, and take corresponding risk control measures based on the AHP analysis. Through the NEEQ market, the securities companies can help those target enterprises improve its management level and provide a more effective financing channels for the target enterprise. At the same time, it can help securities companies achieve diversified competition and a more widely market. It can help securities companies to connect its target enterprise and customer through the high value-added service it provided. It can improve the efficiency of the whole industry chain through professional financial services.

## 2. Research Summary

Supply Chain Finance is a kind of financial services provided for small and medium-sized enterprises. Through the supply chain, the enterprises can revitalize the illiquid assets, reduce supply chain operating costs and risks, and seek new solutions for financing difficult problem. It is a kind of business-flow-based comprehensive financial services, which carried for the participants in the supply chain. Its purpose is to promote the sustainable and healthy development of the industry supply chain and the benign interaction of each participation through financial optimization and industry supply chain collaborative innovation and development. Due to the short time of the development of financial supply chain, the researches of supply chain finance mainly concentrated on the theory stage.

Lamoureux and Evans suggested that supply chain finance is a system optimization process for capital availability and cost

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in the enterprise ecosystem led by those core enterprise, and the process includes classifies the information flow within the supply chain, by means of cost management and all kinds of financing methods. Randall and Farris defined the supply chain finance as a cooperation between the supply chains upstream and downstream in terms of capital flows, which purpose is to reduce the average cost and improve the supply chain benefits. Gonzalo Guillen put forward that the reasonable supply chain management model can help increase of overall efficiency through affecting the enterprise operation and financing. Yueliang Su argued that the supply chain finance is a kind of financial services which helped solve the financing problem of small and medium-sized enterprises by replacing the uncontrollable credit risk of those enterprises with controllable risk of the supply chain system. Jinzhao Shi (2015) analyzed the online supply chain based on third party e-commerce platform of financial services launched by commercial banks and found that it had not only solved the convenience and efficiency of the small and medium-sized enterprise financing problems but also improved the supply chain cooperation to a new height. At present, these scholars mentioned above mainly studied the whole supply chain from the perspective which took the supply chain as a whole system and even from the perspective of the whole macro economy, and they generally think that the goal of the supply chain is to realize the efficiency of financial flows in the supply chain, and to the supply chain operation management mode as well as to the parties of the specific research less specific benefits.

Compared with the scholars above, the study of supply chain finance is relatively late in China and mainly focused on structured trade finance and logistics financial. For example, Yan Junhong and Xu Xiangqin studied small and medium-sized enterprise financing based on supply chain finance and analyzed the advantage of supply chain in solving the problems in the financing activity of small and medium-sized enterprise. But they ignored the particularity of the "NEEQ" market in China. Zhou Yiwen elaborated the risk prevention mechanism of the supply chain financing from the perspective of reducing information asymmetry and introducing logistics enterprises dominant core enterprise credit guarantees well as the invisible guarantee. But he did not make a more widen research in arrange which beyond the category of logistics enterprise. Jiang Chaofeng indicated that supply chain finance is a new kind of financing model tailored only for small and medium enterprises, and it can provide comprehensive financial services for a single or multiple small and medium-sized enterprises upstream and downstream by using the credit of the core enterprise in the supply chain. But he didn't combine his stand point with a specific industry. In this article, we had get rid of the traditional limit which concentrate only on a single enterprise or industry, which means we are aiming at offering an overall

financial service formulti-type of enterprises from the perspective of supply chain finance, and we are sure this has more practical significance.

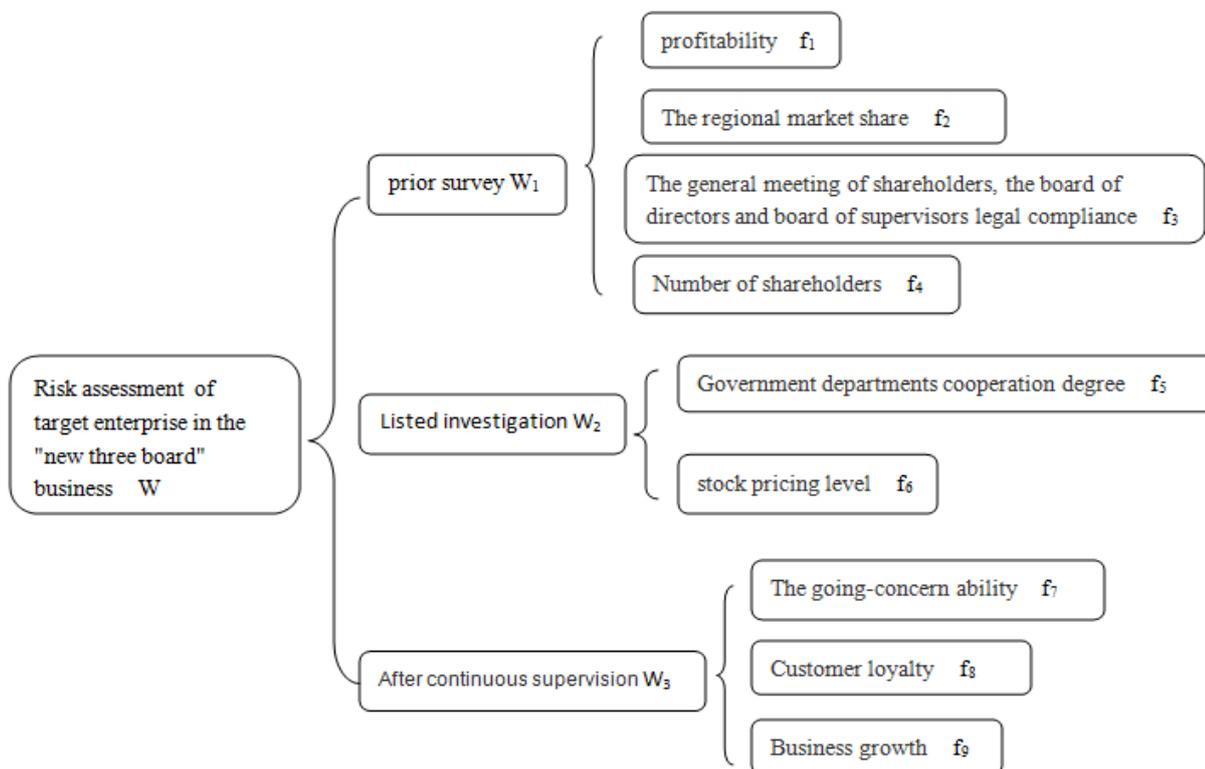
### 3. Application of AHP

This article adopts the analytic hierarchy process (ahp) method, and the basic steps of it can be summarized as four points: First, we simplify the overall problem, that is, the whole problem is treated as a single system, then we analyze the factor of the single system and integrate it to feedback to the whole problem. Second, we use a quantitative scale1-9tomeasuretheabstract among the system factors in order to quantification to reflect the contrast relationship of the factors. Third, we examine the results of the analysis feed backed to the whole problem and adjust it, then confirm the degree of consistency. Fourth, we deal with the matrix which gathered all information using the linear algebra theory and method to measure the affection on the system of every factors and provide an intuitive data for decision-making reference.

#### 3.1 Constructs the risk evaluation model according to the target

Analytic hierarchy process requires determine the target factor of risk in risk evaluation, then divide the target factor into several parts according to the target element causes. The sub-factors are divided and classified again so that we can get a recursive structure to finish the leveled risk evaluation model. The index that can influence the risk should be fully concerned in the setting up of the indexes of risk evaluation model of the "NEEQ" business of securities companies so that we can build comprehensive evaluation system accurately and make a scientific and reasonable evaluation result. And what we cannot ignore is that the situation of each index should be distributed rationally for the importance of different indexes differ from each other. This can help enterprise decision-makers to make correct decisions based on the results of listing plan and ensure enterprise has stronger ability to continue as a going concern and the financing ability, at the same time ensure price stability.

According to the requirements of the risk evaluation model of ahp, we detailed, systematized and leveled the risk evaluation of the consumer products manufacturing enterprises engaged in the "NEEQ" business to construct risk evaluation model of the "NEEQ" business based on the analytic hierarchy process (ahp).



In the "NEEQ" business of the target enterprise risk assessment model above, W is set as the target layer and was divided into three elements: the prior investigation  $W_1$ , listed investigation  $W_2$  and after continuous supervision  $W_3$ . Preliminary investigations of  $W_1$  is decomposed into four specific evaluation indexes:  $f_1$  is profitability,  $f_2$  is region market share,  $f_3$  is the general meeting of shareholders, the board of directors and board of supervisor's legal compliance and  $f_4$  is the number of shareholders. The more number of shareholders, the more potential disputes, and greater the risk is. The smaller the target enterprise of regional market share, the lower the grasp of the market and the greater the risk. The lower legal compliance of the target enterprise of the general meeting of shareholders, the board of directors and board of supervisors, the greater the risk. We decompose  $W_2$  into three specific evaluation indexes:  $f_5$  is the government cooperation degree and  $f_6$  is the stock pricing level. the lower the government cooperation degree is, the longer the cycle of the qualification documents needed to declare of the enterprise production is, and the greater the risk is. The lower the stock price level, the greater the risk. The after continuous supervision  $W_3$  is decomposed into three specific evaluation indexes:  $f_7$  is the sustainable operation ability,  $f_8$  is the customer loyalty and  $f_9$  is the business growth. Ability to continue as a going concern of the target enterprise, the lower the customer loyalty and business growth are, the greater the risk is. The nine indicators of risk factors constitute the solution of the model layer W. With the help of the three indicators and nine specific indicators of risk factors listed above, we can use the analytic hierarchy process to evaluate the risk of enterprise.

### 3.2 Set up two comparative judgment matrix about the target enterprise risk factor

According to the target enterprise's development stage in the "NEEQ" business, the paper constructed a risk assessment model, and analyzed the characteristics of the elements in different stages, so we can judge the importance of the elements set in the same level to its higher level element. As we all know, criteria layer contains the preliminary investigations, the listed investigation and the afterwards continuous supervision.  $W_{xy}$  is set to express the comparative result to  $f_x$  factor to  $f_j$  factor in the criteria layer. According to the evaluated weight of every risk factors, we can get the judgment matrix W that measures the criteria layer's influence degree to target level by using Saaty's 1-9 scale quantization tables,

$$W = \begin{bmatrix} 1 & 4 & 2 \\ 1/4 & 1 & 1/2 \\ 1/2 & 2 & 1 \end{bmatrix}$$

Build comparative matrix between criterion layer and scheme layer  $F_1, F_2$  and  $F_3$ .

$$F_1 = \begin{bmatrix} 1 & 2 & 4 & 7 \\ 1/2 & 1 & 3 & 4 \\ 1/4 & 1/3 & 1 & 5 \\ 1/7 & 1/5 & 1/5 & 1 \end{bmatrix}$$

$$F_2 = \begin{bmatrix} 1 & 1/3 \\ 3 & 1 \end{bmatrix} F_3 = \begin{bmatrix} 1 & 5 & 3 \\ 1/5 & 1 & 1/2 \\ 1/3 & 2 & 1 \end{bmatrix}$$

We put the matrices normalized and get  $F'_1, F'_2, F'_3$

$$F_1' = \begin{bmatrix} 0.528 & 0.566 & 0.488 & 0.412 \\ 0.264 & 0.283 & 0.366 & 0.235 \\ 0.132 & 0.094 & 0.122 & 0.294 \\ 0.076 & 0.057 & 0.024 & 0.059 \end{bmatrix}$$

$$F_2' = \begin{bmatrix} 0.250 & 0.250 \\ 0.750 & 0.750 \end{bmatrix}$$

$$F_3' = \begin{bmatrix} 0.652 & 0.625 & 0.667 \\ 0.130 & 0.125 & 0.111 \\ 0.217 & 0.250 & 0.222 \end{bmatrix}$$

By averaging the various elements of the matrix, we can get the normalized vector corresponds to the maximum characteristic root.  $W'$  corresponds  $M$ ,  $F_1'$  corresponds  $M_1$ ,  $F_2'$  corresponds  $M_2$ ,  $F_3'$  corresponds  $M_3$ .

$$M = (0.571, 0.143, 0.286)^T, M_1 = (0.499, 0.287, 0.163, 0.054)^T$$

$$M_2 = (0.250, 0.750)^T, M_3 = (0.648, 0.122, 0.230)^T$$

According to  $WM = \lambda_{max}$ , we can get  $WM = (1.715, 0.429, 0.858)^T$ ,  $\lambda_{max} = 3.002$ . At the same time, we also get  $F_1 M_1 = (2.103, 1.242, 0.653, 0.215)^T$ ,  $\lambda_{1max} = 4.213$ .

$$F_2 M_2 = (0.45, 1.5)^T, \lambda_{2max} = 1.95;$$

$$F_3 M_3 = (1.948, 0.367, 0.69)^T, \lambda_{3max} = 3.005$$

### 3.3 Check Consistency

The random consistency index is  $CI = (\lambda_{max} - n) / (n - 1) = 0.001$ . According to the mean random consistency index shows that when  $n = 3$ ,  $RI = 0.58$ , so we can get  $CR = 0.001 / 0.58 = 0.002 < 0.10$ . In this way we can judge matrix  $W$  through the consistency check. Because  $CI_1 = (\lambda_1 \max - n) / (n - 1) = 0.071$ , according to the mean random consistency index shows that when  $n = 4$ ,  $RI = 0.90$ , so the  $CR_1 = 0.071 / 0.90 = 0.079 < 0.10$ , the judgment matrix  $F_1$  passed the consistency check. Because  $CI_2 = (\lambda_2 \max - n) / (n - 1) = -0.95$ , according to the mean random consistency index shows that when  $n = 2$ ,  $RI = 0$ , so the  $CR_2 < 0.10$ , the judgment matrix  $F_2$  passed the consistency check. Because  $CI_3 = (\lambda_3 \max - n) / (n - 1) = 0.0025$ , according to the mean random consistency index shows that when  $n = 3$ ,  $RI = 0.58$ , so the  $CR_3 = 0.0025 / 0.58 = 0.004 < 0.10$ , the judgment matrix  $F_3$  passed the consistency check.

### 3.4 The result analysis and the evaluation of the effectiveness

After we determined that the judgment matrix  $W$ ,  $F_1$ ,  $F_2$  and  $F_3$  can pass consistency check, we need to calculate the impact weight  $f_1, f_2, f_3, f_4, f_5, f_6, f_7, f_8$ , and  $f_9$  to the total goal of "NEEQ" in the business of the target enterprise risk evaluation.

$$F_1's \text{ influence on the risk assessment } W \text{ weights: } 0.571 \times 0.499 = 0.285$$

$$F_2's \text{ influence on the risk assessment } W \text{ weights: } 0.571 \times 0.287 = 0.164$$

$$F_3's \text{ influence on the risk assessment } W \text{ weights: } 0.571 \times 0.163 = 0.093$$

$$F_4's \text{ influence on the risk assessment } W \text{ weights: } 0.571 \times 0.054 = 0.031$$

$$F_5's \text{ influence on the risk assessment } W \text{ weights: } 0.143 \times 0.250 = 0.036$$

$$F_6's \text{ influence on the risk assessment } W \text{ weights: } 0.143 \times 0.750 = 0.107$$

$$F_7's \text{ influence on the risk assessment } W \text{ weights: } 0.286 \times 0.648 = 0.185$$

$$F_8's \text{ influence on the risk assessment } W \text{ weights: } 0.286 \times 0.122 = 0.035$$

$$F_9's \text{ influence on the risk assessment } W \text{ weights: } 0.286 \times 0.230 = 0.066$$

According to the hierarchy total ordering consistency ratio formula for the consistency check. We can get:

$$CR = \frac{(0.571 \times 0.071 + 0.286 \times 0.0025)}{(0.571 \times 0.90 + 0.286 \times 0.58)} = 0.061 < 0.1$$

Therefore, the hierarchy total sorts passed the consistency check. According to the  $f_1$  to  $f_9$ , the weight of affection on target enterprise, we can confirm the size of the various influence factors risk. Through analysis, we can know the profitability of the target enterprises has the largest influence on the "NEEQ" business risk and the influence of the number of shareholders of the target enterprise on the "NEEQ" business risk is minimal. Therefore, securities firms can use this method to evaluate the target enterprise, take effective measures to deal with risks to ensure the steady development of the enterprise in order to ensure the enterprise have a stronger ability to deal with business and to guarantee the stability of stock prices. And finally can improve the securities company reputation in the industry.

## 4. Risk Control Measures

Based on the research conclusions above, we put forward some control measures to deal with the securities company "NEEQ" business risk. And we analyses how to prevent and control the risk in the "NEEQ" business from two aspects of securities companies and target companies.

### Securities company risk control measures

According to the risk analysis of securities companies' "NEEQ" business, this paper suggests that the securities company in view of the existing in the "NEEQ" business risk control measures are mainly concentrated in preliminary investigations, case investigation and after continuous supervision.

#### 4.1.1 The risk control measures of preliminary investigations phase

According to the theory of supply chain finance, securities companies belong to the core enterprise, its play an important role in promote the development of collaborative innovation between upstream and downstream industry chain. First of

all, the securities firm should be detailed comprehensive investigation of the enterprise before engaged in the "NEEQ" business, by building the target enterprise risk cognitive measure index system, let the target enterprise measure the risk level of the company. At the same time, we design the questionnaire survey in view of the target enterprise Directors, supervisors and senior management personnel, employees, customers in the securities company interior. Through interviews with directors, supervisors, senior managers, employees and customers of the target enterprise, the securities company can form a complete risk control system on the basis of fully understand the profitability of the target enterprise, regional market share, general meeting of shareholders, the board of supervisors and the board legal compliance and the number of shareholders. Main performance: in terms of profitability, the securities company can understand the business model and profit model of the target enterprise. And the securities company can investigate the valuation model for clues, to understand target enterprise's competitive advantage. In terms of general meeting of shareholders, the board of supervisors and the board legal compliance and the number of shareholders, securities companies corroborated with industrial and commercial and other relevant government agencies, and consulted target enterprise business data to understand the legal compliance of the target enterprise. Meanwhile Through the overall understanding of the target enterprise upstream in investigation stage in advance, On the one hand, it can provide valuable information for downstream customers, and can meet the demand for investment of the downstream customers; On the other hand, it is advantageous for the securities companies to found potential high net worth clients, and Increase the earnings of securities companies.

#### **4.1.2 The risk control measures of case investigation phase**

This stage the risk is mainly manifested in two aspects: on the one hand, the government cooperation degree; On the other hand, the stock price level of the target enterprise.

1) Following the national policy, strengthen the cooperation with government departments

With the implementation of the market-maker system and hierarchical system, the NEEQ market in our country gradually formed a perfect multi-level market supervision system. At the same time, according to the size of the NEEQ market different, different objectives and different levels of profitability, China's regulators provide differentiated regulation and services. In the "NEEQ" business, securities company should closely cooperate with regulators, and assist the regulatory to review listed enterprises qualification. Then securities company should pay attention to whether the disclosure of information in accordance with the relevant provisions and Whether meet the basic requirements of the listed. At the same time, the important files should keep working papers for later accountability.

#### **2) By using the B-S model, to assist the target enterprise determine reasonable pricing level**

At present, China's securities firms mainly adopts the relative

valuation method to determine the price of stock pricing, which is a method by analogizing the market value of similar enterprises, and matching the reasonable coefficient to obtain the target enterprise's valuation in the "NEEQ" businesses. The first requirement for this approach is that there is a comparable enterprise, but because of the listed enterprises of the "NEEQ" business are more innovative technology enterprises, it is difficult to find the reference enterprises. Therefore, it does not apply to the "NEEQ" enterprise. Due to the NEEQ listed enterprise most is for a incorporated company, ordinary shareholders have equity is at the end of the creditor's rights and preferred equity allocation power to enjoy. Investors only assume limited liability for the company's debts, not unlimited joint and several liabilities. This means that the nature of the equity and options to some extent is similar. When the company's debt coming deadline, if the company cannot repay the debt, the company will go bankruptcy, but investors have lost only part of their investment to the company's debt, won't be pursued by the company's debt indefinitely. This is equivalent to the call option, When it comes deadline, there is no price increase, so we should give up the exercise of power. Such investors only lose the investment part of the enterprise. If the total assets of an enterprise are greater than its liabilities when it is due, then the shareholders shall have the right to the remaining profits after the repayment of the debt, which is the equivalent of exercising the option rights at the expiration date. The equity of the NEEQ listed companies and financial options are very similar.

Therefore, securities firms can be combined with the target enterprise's actual and B - S model to assist the target enterprise to determine reasonable price level and to make it fully reflect the value of the company level.

#### **4.1.3 The risk control measures of after continuous supervision phase**

The successful listed of the target company does not mean that the host brokers finish work. Brokers should earnestly implement continuous supervision work, and timely correcting listed enterprises behavior in violation of the regulations of the market. Providing auxiliary work for after the enterprise capital operation so that the enterprise can set a good image in the capital market. Aiming at the continuous supervision risk of later stage, brokers should take control measures mainly include:

1) Assist target enterprise to establish the perfect company governance mechanism, highlight the main business competitiveness

Target enterprises are generally small and medium-sized enterprises in the "NEEQ" business. The main purpose of the listed companies is to obtain direct financing channels and solve financing difficulties so as to create conditions for the free circulation of shares. After the target enterprises enter the capital market, it is an important way for enterprises to obtain funds from capital markets. The main business extruding, with sufficient competitiveness is the effective means for enterprises to obtain funds, and it is favorable to ensure company's ability to continue as a going concern.

Securities companies should give full play the supervision and guidance role of in the stage of subsequent continuous supervision. Securities companies should help the target enterprise reasonable allocation of manpower, material resources, financial resources, play to the enterprise innovation ability, keep the competition ability of the target enterprise main business, and keep the competitive advantage of the target enterprise.

2) Using its reputation as the target companies to increase credit, cultivate customer loyalty. After years of entrepreneurship and development, securities companies, as the core enterprise, have the highest level of business and comprehensive strength among the top nationwide. And they have comprehensive investment and financing service capability. Securities companies have advanced technology, safe and efficient securities firms trading platform. The target enterprises listed in the "NEEQ" business in securities companies, which can use the credibility of securities firm and make the securities company as the guarantee. While helping target enterprises solve the financing difficulties, they can effectively reduce the risk taken by investors.

## 5. Summary

Based on the theory of supply chain finance, Securities companies get the risk index of the listed enterprise through using analytic hierarchy process to evaluate the "new three board" business of securities companies. And we put forward the corresponding solutions to the existing risk of listed companies. It helps the securities company attracts more HNW customer especially the institutional investors of securities firms. This has not only provided financing channels for target enterprises but also improved the credibility of Securities companies, which can promote the development of collaborative innovation between the securities company's internal businesses. At the same time, it is helpful for our country to establish a stable pyramid type multi-layer capital market structure and to service for different levels of enterprise.

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