# Journal of Applied Sciences

ISSN 1812-5654

science alert

ANSInet
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http://ansinet.com

Journal of Applied Sciences 13 (12): 2225-2231, 2013
ISSN 1812-5654 / DOI: 10.3923/jas.2013.2225-2231


# Research on Management of Credit Risk Information of Enterprise Group

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**Abstract:** In view of the current situation of commercial bank that the credit risk information of enterprise group is difficult to obtain, analysis pointed out that the information missing, inaccurate and delay are the three basic problems of credit risk information management in commercial banks and also the fundamentals for the commercial banks to assess credit risk of enterprise group; Based on the current situation, the problems like information missing, inaccuracy and delay of management system of commercial bank concerning credit risk information of enterprise group have better solved through the game analysis and the application of Internet of Things, thus laying a foundation for the commercial bank to assess the credit risk of enterprise group in a scientific and accurate way and perfecting and completing the management system of credit risk information of enterprise group.

**Key words:** Enterprise group, credit risk information, management, game, internet of things

## INTRODUCTION

Credit risk refers to an uncertainty of security coefficient of credit funds reflected in the possibility that an enterprise is reluctant or unable to repay the principal and interest of bank loan due to various reasons so as to result in the failure of recovering the bank loan and the formation of bad debts (Murphy, 2003).

The research of the World Bank on global banking crisis indicates that credit risk is the most common cause resulting in bankruptcy(World Bank, 1994). Therefore, the strengthening of credit risk management is a challenge Chinese commercial banks have to confront.

Due to the ability to bring considerable income to commercial bank under certain conditions, enterprise group has recently become a target each commercial bank strives to grant credit loans to. However, enterprise group is characterized with abundant affiliated enterprises, complicated equity structure and frequent related party transactions, thus resulting in more complicated factors for financial crisis and breach of contract of the enterprise group compared with relatively singular form of enterprise organization and more obstructions for banks to acquire credit risk information of the enterprise group. It has not only increased the cost of the bank to acquire credit risk information from the enterprise group but also, more importantly, prevented the commercial bank from obtaining timely, precise and sufficient credit risk information so as to influence their credit decisions. Apparently, if the information acquired by the commercial bank from the enterprise group is insufficient, outdated or inaccurate, we will lose the foundation for correct prediction or prevention of possible credit risk decision-making of the enterprise group. Once the enterprise group is involved in credit default, huge losses will be imposed on the commercial bank. Therefore, the management of credit risk information of enterprise group becomes a new challenge against credit risk management theory and practice of commercial bank.

There are two key points concerning the management of credit risk of the enterprise group by the commercial bank, (1) Acquire sufficient, timely and precise credit risk information of the enterprise group, (2) Utilize information to establish an evaluation model capable of measuring or predicting credit risk. Predict or evaluate the credit risk of the enterprise group based on the credit risk information acquired. The two supplement each other. The credit decisions made with missing, obsolescence and inaccuracy of credit risk information may cause immeasurable losses to the commercial bank; on the contrary, if the commercial bank is lack of an evaluation model capable of precisely measuring the credit risk of enterprise group, the credit risk of the enterprise group cannot be precisely measured or prevented even if the commercial bank has the most timely, complete and accurate credit risk information.

Compared with researches on models measuring or evaluating credit risk (Marais *et al*., 1984; Altman *et al*., 1994; Ke and Xue, 2004; Chen and Zhou, 2008; Luciano and Nicodano, 2008), there are

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relatively fewer researches on the management of credit risk information of enterprise group. The credit loans of the commercial bank are granted to the enterprise group under a condition of information asymmetry. Therefore, it is of great significance to lower the information asymmetry between commercial bank and enterprise group and acquire the credit risk information of enterprise group as precisely and timely as possible. In this study, the credit risk information of enterprise group is acquired through the application of principle of game theory and Internet of Things. As a result, it has overcome the problems of commercial bank like information asymmetry, obsolescence and accuracy during credit risk management of enterprise group to a certain extent, thus laying a foundation for the commercial bank to evaluate the credit risk of enterprise group in a more scientific and practical way.

## PROBLEMS EXISTING IN MANAGEMENT OF CREDIT RISK INFORMATION OF ENTERPRISE GROUP

During analysis of credit risk, the typical practice of commercial bank is to follow 5C principle to qualitatively analyze the current financial status, management level and macro and industrial economic conditions of the borrowing clients according to their information; then, determine an index system that can reflect the loan repayment ability of the borrowers; utilize certain techniques and models (evaluation models) to judge the credit risk of the borrowers according to the index system. However, the acquisition of index information required by the evaluation models is a game process under the background of information asymmetry between commercial bank and enterprise group. This condition has not been properly handled for a long time. As a party with information advantage, enterprise group is always in an advantaged position during risk information transaction with the commercial bank. The information asymmetry has resulted in that enterprise group may often use its information advantage to bring forth adverse selection. To be specific, enterprise group with information advantage may hide the information mastered and even distort information or make false messages before transaction to benefit its option while the commercial bank is not informed. As a result, some important information becomes inaccessible, thus influencing the comprehensive analysis and judgment of the enterprise group by the commercial bank. In return, moral risk may come into being to the enterprise group due to reverse selection caused by information asymmetry so as to intensify the increase of credit risk from enterprise group.

The problems existing in the credit risk information management of commercial bank towards enterprise group mainly include the following three aspects.

**Information missing:** Most commercial banks have established enterprise group archives and databases. However, since enterprise group has abundant affiliated enterprises and complicated equity structures, the difficulty and cost for information acquisition are tremendous. Meanwhile, during the game with enterprise group under information asymmetry, enterprise group as the party owning information advantage is always in an advantaged position during risk information transaction with commercial bank. Therefore, enterprise group often utilizes this advantage to implement adverse selection and hide some unfavorable data information from the credit risk information provided for commercial bank, thus resulting in the missing of credit risk data information of commercial bank.

**Information delay:** The credit risk data required by the credit risk information system of commercial bank is instantaneous. However, since commercial bank is lack of awareness, mechanism or technique to acquire credit risk data information of enterprise group ,contemporary, Some credit risk information of enterprise group cannot be timely updated; besides, during the game of credit risk data information between enterprise group and commercial bank, enterprise group as the party owning information advantage may delay the disclosure of its credit risk data in order to maximize its interests. These factors result in that the credit risk data information acquired by commercial bank is delayed information instead of real-time information.

**Information accuracy:** As a party with information advantage, enterprise group is always in an advantaged position during risk information transaction with commercial bank. The enterprise group may often use its information advantage to bring forth adverse selection and offer or disclose distorted information to the commercial bank or even make false data. The enterprise group may utilize the fact that commercial bank is not informed to benefit its option. As a result, the information acquired by commercial bank is not accurate. Such disqualified data information can hardly reflect reliable risk parameters in an honest manner.

In order to make the credit risk information management of enterprise group more scientific and reasonable, the commercial bank is required to establish and complete credit risk information management of enterprise group from the following two aspects: firstly, it

is required to establish and complete a mechanism used to acquire credit risk information, which is not only directly related to information source but also concerns the cost of information communication. Therefore, it will inevitably influence the distribution of information mechanisms. Generally speaking, the more diversified and open the information mechanism is, the more the information acquisition channels, the information screening channels and information acquisition opportunities of the commercial bank will be; secondly, the commercial bank must study more technical approaches to acquire credit risk information of enterprise group so as to make up the insufficiency of merely establishing an information mechanism to acquire credit risk information. In this study, game theory and Internet of Things will be applied to further complete and solve the insufficiencies existing in the credit risk information management of commercial bank towards enterprise group.

## TRI-STAGE GAME OF MANAGEMENT OF CREDIT RISK INFORMATION OF ENTERPRISE GROUP

Usually, when commercial bank offers credit loans to enterprise group, the enterprise group intends not to provide all credit risk information for the commercial bank when applying credit loans from commercial bank. In order to lower its credit rate, the enterprise group usually conceals credit information which is against itself, while commercial bank hopes to lower its credit risk with more credit information. Therefore, the two parties will launch a game for credit risk information in order to obtain the maximum expected revenue.

During repeated game process, the two parties have different psychological pressures ($p_a \neq p_b$) which original from the information quantity under the condition of information asymmetry. The bigger the information quantity acquired by the two parties from the opponent is and the smaller their psychological pressure will be. On the contrary, if the psychological pressure gets bigger, negative correlativity shall be presented between information quantity q and psychological pressure p: when $0 \le p < \infty$:

$$\frac{dp}{dq} < 0$$

and $q \to \infty$ and $q \to 0$. There are many expressions fitting these requirements. In order to facilitate discussion, the simplest ($0 \le p < \infty$, $0 \le q < \infty$) is selected in this study.

Further assumption is required for modeling. The bigger the psychological pressure of the game parties is and the easier for the parties to accept final revenue which is much less than that obtained from long-term game during the game. Then, any staged revenue obtained in a relatively long period will seem to be relatively low when it is discounted to the down payment (the revenue discount rate under high psychological pressure $\sigma$ is smaller than that under low psychological pressure). In other words, discount rate $\sigma$ and psychological pressure p present negative correlativity (Wang and Wang, 2010). The following relatively simple expression:

$$\sigma = 1/(1+p)$$

is selected in this study, i.e.:

$$\sigma = \frac{1}{1+1/q} = 1 - \frac{1}{1+q} \quad (1)$$

In other words, the smaller the information quantity comprehended from game opponents is and the bigger the psychological pressure will be. At this point, it is easier to make transaction decisions within a relatively short term. Meanwhile, game party with smaller information quantity intends to think that the risks brought by transactions will become bigger and the discount rate will become higher. Under normal circumstances, the game parties are not clear about the game interval of credit rate:

$$[\underline{r}, \bar{r}]$$

In other words, commercial bank has no idea of maximum acceptable credit rate $\bar{r}$ for the enterprise group, while enterprise group has no idea of the minimum acceptable interest rate $\underline{r}$ for the commercial bank. The commercial bank things the maximum acceptable interest rate for the enterprise group is $\bar{r}^*$, while the enterprise group is apparently clear of the maximum acceptable interest rate $\bar{r}$ for itself.

Make $r^* = \bar{r}^* - \underline{r}$ and $r = \bar{r} - \underline{r}$ and then game interval:

$$[\underline{r}, \bar{r}]$$

is mapped to [0, r*] for commercial bank and [0, r] for enterprise group.

Assume that the commercial bank knows the following information in the early stage of the whole game: the credit rate acceptable for enterprise group obeys the even distribution on interval [0, r*]. Meanwhile, the commercial bank has no idea as which is bigger, r or r*; the enterprise group is aware that the commercial bank thinks the acceptable credit rate for the

enterprise group obeys even distribution and knows which is bigger, r or r*. Certainly, the game parties fit the most fundamental assumption of game, i.e., both parties pursue maximization of interests. Currently, three-stage game is considered to apply backward induction. Then, the dynamic equilibrium analysis of the game is shown as follows.

**Game analysis upon r*<r:** When t = 3, the commercial bank quotes credit rate. Then, under the pressure that the game is over in the third stage, as a rational man, the enterprise group will accept any quotation from the commercial bank on [0, r*]. But how can we make the decision finally? Since the commercial bank estimates that the quotation offered by the enterprise group is evenly distributed on [0, r*], the expected revenue of the commercial bank is $\max\{r_{a3}\, p_a + 0(1-p_a)\}$ in which $r_{a3}$ refers to the interest rate quotation of the commercial bank in the third stage ($r_{a3} \le r^*$) while $p_a$ refers to the probability estimated by the commercial bank that the enterprise would accept the quotation ($p_a = (r^*-r_{a3})/r^*$). At this point, the best option for the commercial bank is as follows:

$$r_{a3}^{*} = \arg\max\{r_{a3}\, p_a + 0(1-p_a)\} \tag{2}$$

$r_{a3}^{*} = r^*/2$ is worked out. Then, according to the quotation of the commercial bank, the revenue of the enterprise group in the third stage is $r - r^*/2$. At this point, the commercial bank is still not clear of r.

When t = 2, due to existence of asymmetric pressure, the revenues of the commercial bank and the enterprise group in the third stage are discounted to $\sigma_a r^*/2$ and $\sigma_b(r - r^*/2)$, respectively in the second stage. $\sigma_a$ and $\sigma_b$ represent the revenue discount rates of the commercial bank and the enterprise group respectively. Apparently, the following formula is established:

$$r - \sigma_a r^*/2 > \sigma_b(r - r^*/2) \tag{3}$$

In this stage, the quotation of this enterprise group $r_{b2}$ shall satisfy the followings:

Worst and best quotation: $r_{b2} \ge \sigma_a r^*/2$

$$r - r_{b2} \ge \sigma_b(r - r^*/2) \tag{4}$$

Worst and best quotation: $r_{b2} < \sigma_a r^*/2$

$$r - r_{b2} \ge \sigma_b(r - r^*/2) \tag{5}$$

Equation 4 indicates that the enterprise group maximizes its revenue if the quotation is accepted by the commercial bank; Eq. 5 indicates that the enterprise group maximizes its revenue if the quotation is rejected by the commercial bank;

Equation 3-5:

$$r_{b2} = \sigma_a r^*/2 < r - \sigma_b(r - r^*/2) \tag{6}$$

Since the enterprise group knows that r>r*, if the enterprise group quotes:

$$r_{b2} = \sigma_a \frac{r^*}{2}$$

the commercial bank can establish r>r* according to the reaction of the enterprise group despite that the commercial bank has no idea of the precise value of r and the comparative relation of Eq. 6 has become a common understanding. In this stage, the quotation of the enterprise group is not acceptable. IN order to realize the game equilibrium of this stage, the enterprise group will choose to send a signal, i.e., its maximum acceptable quotation is $r_{b2}^*$, satisfying:

$$r_{b2}^* - \sigma_a r^*/2 > \sigma_b(r_{b2}^* - r^*/2) \tag{7}$$

i.e.:

$$r_{b2}^* = (\sigma_a - \sigma_b) r^*/2(1-\sigma_b) \tag{8}$$

It is a piece of false information. However, under the condition that the commercial bank only knows a part of information and it is guaranteed to obtain $\sigma_a r^*/2$, it is a credible fraud. At this point, as for the commercial bank, the information of interval:

$$(0, r_{b2}^*)$$

is complete and the enterprise group will always take the lead.

**Game analysis upon r≤r*:** When t = 3, the commercial bank will quote as discussed above. The commercial bank still has no idea of r. But its best decision is still the half of maximum reserve price of the enterprise group as estimated, i.e., $r_{a3}^* = r^*/2$. The revenue of the enterprise group in the third stage is $r - r^*/2$. Apparently, if $r - r^*/2 < 0$, the enterprise group will refuse and the game will fail. When $r - r^*/2 \ge 0$, the enterprise group will accept the quotation.

When t = 2, the revenues of the commercial bank and the enterprise group in the third stage are discounted to $\sigma_a r^*/2$ and $\sigma_b(r-r^*/2)$, respectively in the second stage. Since the enterprise group knows $r > r^*/2$, if it proposes $r_{b2} = \sigma_a r^*/2$, the commercial bank will not accept the quotation of the enterprise group in this stage as analyzed above although the commercial bank has no idea of the exact value of r. In order to realize the game equilibrium of this stage, the enterprise chooses to send a signal: the maximum acceptable quotation for it is:

$$r_{b2}^* = (\sigma_a - \sigma_b) r^*/2(1-\sigma_b)$$

It is clearly known that $r_{b2}^* \le r^*/2$. We can see from the above that the maximum acceptable quotation for the enterprise group is $r \ge r^*/2$. Although the commercial bank has no idea of the exact value of r, the maximum quotation available for the enterprise group has already been revealed during game according to the equilibrium analysis of game. In other words, when $r \le r^*$, the quotation of the enterprise group under the condition of maximum revenue is half of that previously recognized by the commercial bank, i.e., $r_{b2}^* = r^*/2$. Therefore, the game equilibrium option of the enterprise group is as follows:

$$r_{b2}^* - r_{b2} = r^*/2 - \sigma_a r^*/2 = (1-\sigma_a) r^*/2 \quad (9)$$

When t = 1, the revenues of the commercial bank and the enterprise group are discounted to $\sigma_a^2 r^*/2$ when t = 1. The commercial bank will quote; $r_{a1}$ satisfies:

$$r^* - r_{a1} = (1-\sigma_a)\sigma_b r^*/2$$

Then, we can obtain:

$$\begin{aligned} r_{a1} &= ((1-\sigma_b(2-\sigma_a)/2))r^* \\ r_{b1} &= r^* - r_{a1} = (1-\sigma_a)\cdot\sigma_b r^*/2 \end{aligned} \quad (10)$$

It is the balance equilibrium under this condition. $r_{a1}$ and $r_{b1}$ derivative with respect to $p_a$ and $p_b$, respectively and obtain:

$$\begin{aligned} \frac{\partial r_{a1}}{\partial p_a} &= -\frac{1}{(1+p_a)^2}\cdot\frac{1}{(1+p_b)}\cdot\frac{r^*}{2} < 0 \\ \frac{\partial r_{a1}}{\partial p_b} &= \frac{1}{(1+p_b)^2}\cdot\frac{p_a}{(1+p_a)}\cdot\frac{r^*}{2} > 0 \end{aligned} \quad (11)$$

$$\begin{aligned} \frac{\partial r_{b1}}{\partial p_a} &= \frac{1}{(1+p_a)^2}\cdot\frac{1}{(1+p_b)}\cdot\frac{r^*}{2} > 0 \\ \frac{\partial r_{b1}}{\partial p_b} &= -\frac{1}{(1+p_b)^2}\cdot\frac{p_a}{(1+p_a)}\cdot\frac{r^*}{2} < 0 \end{aligned} \quad (12)$$

**Conclusion 1:** From Eq. 11 and 12, we can see that the transaction revenue of the game parties has a decreasing functional relationship with the pressure factor and a monotone increasing relationship with the information quantity of the game opponent; the transaction revenue of the game parties has an increasing functional relationship with the pressure factor of the game opponent and a monotone decreasing relationship with the information quantity of the party acquired by the game opponent. Therefore, the commercial bank may properly reduce the credit rate (i.e., waiver of some revenue) to obtain the credit risk information of the enterprise group as the game opponent through the game with the enterprise group, so as to lower the credit risk generated due to the credit loans offered to the enterprise group.

**Conclusion 2:** From Eq. 1 and 10 that the transaction revenue of the game parties is not only related to the information quantity of the game opponent acquired but also related to the psychological price of maximum acceptance credit rate r* for the enterprise group as prejudged by the commercial bank. In other words, the commercial bank holds the initiative upon r<r*. Therefore, the commercial bank may raise the psychological price of r* in a proper manner to make it in a relatively initiative position. The commercial bank shall not put itself in a passive position due to the fear of losing the credit loans of an enterprise that may bring relatively high revenue to increase its credit risk.

## APPLICATION OF INTERNET OF THINGS IN MANAGEMENT OF CREDIT RISK INFORMATION OF ENTERPRISE GROUP

**Concept and introduction of internet of things:** Internet of Things is a network that utilizes information sensing devices like radio Frequency Identification (RFID), infrared sensor, global positioning system, laser scanner, etc. to connect things with the network pursuant to the agreed protocol to realize intelligent identification, positioning, tracking, monitoring and management so as to realize the interconnection among things, between people and things and among people (ITU, 2005). It has expanded the interconnection among people realized by current network to the scope of things by using sensor technologies. The core of Internet of Things is to realize the interconnection among things (including people) so as to realize active information exchange and communication among all things. After the information of things is transmitted to the information processing center through network, various information services and applications can be implemented.

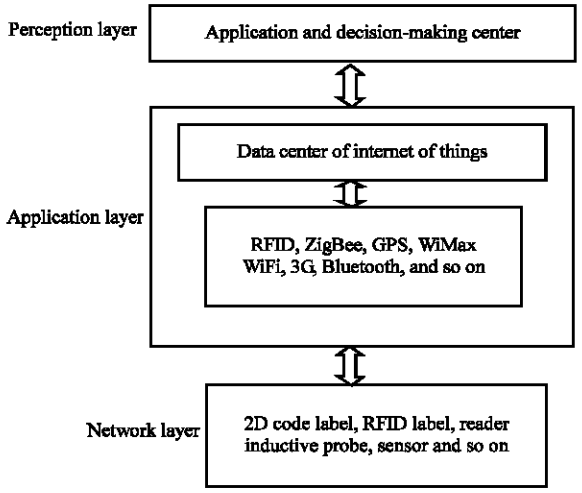


Fig. 1: Diagram of architecture of internet of things

The architecture of Internet of Things can be divided into 3 layers, i.e., perception layer, network layer and application layer as shown in Fig. 1.

Perception layer is the skin and five sense organs of Internet of Things used to identify objects. The perception layer includes 2D code label and recognizer, RFID label and reader, camera, GPS, sensor, terminal, sensor network, etc. which are mainly used to identify objects and acquire information. Network layer is the neutral center and brain of Internet of Things used for information delivery and processing. The network layer includes integration network with Internet, network management center, information center, intelligent processing center, etc.

The network layer delivers and processes the information acquired from perception layer. The application layer is the profound integration between Internet of Things and professional industry technologies. It is combined with industry demands to realize industry intelligence.

## APPLICATION OF INTERNET OF THINGS IN MANAG EMENT OF CREDIT RISK INFORMATION OF ENTERPRISE GROUP

The technique of Internet of Things can be applied in the management of credit risk information of enterprise group to realize the perception of people, devices, environment and products and acquisition, integration and utilization of integrated data. The principle of application of Internet of Things in the management system of credit risk information of enterprise group is shown in Fig. 2.

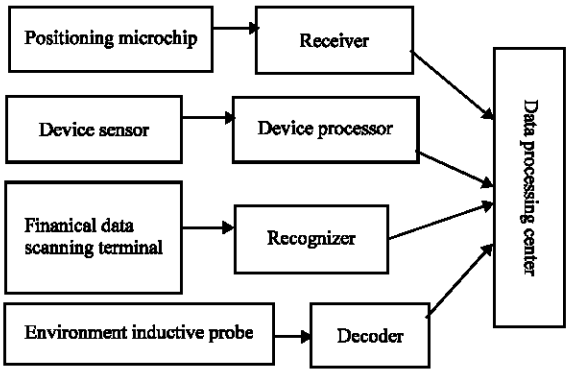


Fig. 2: Schematic diagram of application of internet of things

It can be divided into 3 parts: Positioning, device and environment perception and financial data monitoring. (1) The positioning of management system of credit risk information of enterprise group includes two parts, (1) Positioning of decision-making personnel and key technical personnel of the group within the monitored area, (2) Positioning of devices, raw materials, products, etc. The abnormal change of important personnel in the group can impose a tremendous influence on the group at any time. It is an important reference index for evaluation of credit risk of the enterprise group. Meanwhile, the tracking and positioning of directions of devices, raw materials and products is also an effective method to lower credit risk of the group. The specific application method is shown as follows: Prepare positioning microchips to decision-making personnel and key technical personnel of the group. When these personnel enter induction information areas, their positioning microchips will be captured and the chip information and position will be transmitted to the signal receiver so as to send the data to the data processing center through wired and wireless networks; label 2D code labels on devices, raw materials and products and their positional information will be captured through positioning system. Then, the data information will be transmitted back to the data processing center through wired and wireless networks, (2) The data scanning in the management system of credit risk information of enterprise group can be classified into the followings: 2D code scanning of devices, raw materials, products, etc., with 2D code labels attached to identify their information including newness of devices and quality of raw materials and products and transmit the information the processor; acquisition of data information that may cause qualitative changes of devices, raw materials and products including temperature and humidity through environment inductive probe and

transmission of such information to the processor which will process the information acquired according to the setting requirement and transmit data to the data processing center; (3) The monitoring of financial data in the management system of credit risk information of enterprise group refers to the monitoring of data of enterprise group including fund flow and related party transactions through monitoring software and the timely returning of data information to the data processing center.

Apparently, the application of Internet of Things has solved the problems of enterprise group like information missing and obsolescence to a certain extent. Therefore, it has laid a foundation for credit agencies like commercial bank to improve the evaluation precision of credit risk of enterprise group.

## CONCLUSION

The management of credit risk information of enterprise group is a complicated system engineering project. In the contemporary world with the credit market becoming increasingly active, commercial banks always grant credit loans to enterprise groups under information asymmetry. Therefore, the timely, precise and abundant acquisition of credit risk information of enterprise group is of great significance for commercial banks. It is the foundation and root for the analysis of credit risk of enterprise group as well as a precondition for avoidance of wrong credit decisions due to inaccuracy or missing of credit risk information. This study has analyzed the problems existing in the management of credit risk information of enterprise group first and then applied game theory and Internet of Things to solve problems existing in the management of credit risk information of enterprise group including difficult information acquisition and information obsolescence in a relatively satisfactory way.

## REFERENCES

Altman, E.I., G. Macro and F. Varetto, 1994. Corporate distress diagnosis: Comparisons using linear discriminant analysis and neural networks (The Italian experience). J. Bank Finance, 18: 505-529.

Chen, L. and Z.F. Zhou, 2008. A fault tree analysis for credit risk of enterprise group's holding company based on multi-hiberarchy fuzzy Logic. Syst. Eng., 26: 52-56.

ITU, 2005. ITU internet reports 2005: The internet of things. Executive Summary, International Telecommunication Union (ITU), Geneva, Switzerland.

Ke, K.L. and F. Xue, 2004. Evaluation of business bank?s credit risk based on extended data envelopment analysis-discriminant analysis. Syst. Eng.-Theory Practice, 4: 117-122.

Luciano, E. and G. Nicodano, 2008. Ownership links leverage and credit risk. International Financial Research Forum, Paris.

Marais, M.L., J.M. Patell and M.A. Wolfson, 1984. The experimental design of classification models: An application of recursive partitioning and bootstrapping to commercial bank loan classification. J. Account. Res., 22: 87-114.

Murphy, A., 2003. An empirical analysis of the structure of credit risk premiums in the Eurobond market. J. Int. Money Fin., 22: 865-885.

Wang, K.L. and S. Wang, 2010. Dynamic game of asymmetry information bargaining with tri-stagainting as example. Syst. Eng.-Theory Practice, 30: 1636-1642.

World Bank, 1994. The Commercial Banks in the Emerging Market Economy. China Financial and Economic Publishing House, Beijing.