

# How to Build up the Loan - Evaluation System toward Small and Medium Enterprises between Taiwan and China's Commercial Banks? The Application for Multi Criteria Decision Making

Shu Hui Lan<sup>1</sup>, Jia Yi Cheng<sup>2</sup> & Sheng Guo<sup>3</sup>

<sup>1</sup> Department of Marketing and Logistics Management, Ling Tung University, Taiwan, R.O.C.

<sup>2</sup> Department of Finance, Ling Tung University, Taiwan, R.O.C.

<sup>3</sup> Department of Finance, Chung Yuan Christian University, Taiwan, R.O.C.

Correspondence: Sheng Guo, Department of Finance, Chung Yuan Christian University, R.O.C. Tel: 886-976-924-023. E-mail: 549245594@qq.com, guosheng60142@gmail.com

Received: January 18, 2016

Accepted: February 10, 2016

Online Published: February 25, 2016

doi: 10.5539/ibr.v9n3p121

URL: <http://dx.doi.org/10.5539/ibr.v9n3p121>

## Abstract

Because of the financial market fast development between Taiwan and Mainland China, commercial banks, sometimes, cannot have an efficient method to investigate loan credentials for small and medium enterprises. Without efficient methods, commercial banks are forced to undertake the unnecessary default risks. The article chooses the behaviors of commercial banks between Mainland China and Taiwan to become study target. The purpose is to investigate the assessment method and influence factor of commercial banks toward small and medium enterprises for loan. Through modified Delphi approach and Fuzzy Analytic Hierarchy Process (FAHP) in multi-criteria decision-making (MCDM), the article attempts to analyze the decision-making measure of loan for commercial banks toward small and medium enterprises. From the results of practical evidence, the loan assessment measure of commercial banks between Taiwan and Mainland China is quite different. During loan assessment, China commercial banks focus on the debt-paying ability; on the contrary, Taiwan commercial banks focus on profitability of enterprises. The practical approved result of the study has supplied the insufficient data for related study articles in the past. More, the study can also be an important reference for perform related tasks in Taiwan's and China's commercial banks.

**Keywords:** commercial bank, Fuzzy Analytic Hierarchy Process, modified Delphi approach, multi-criteria decision-making, small and medium enterprises

## 1. Introduction

In 2011, Wenzhou city of China, the large-scale bankruptcy event from small and medium enterprises happened. Because many small and medium enterprises were bankrupt, the event had caused the credit crisis of small and medium enterprises along the coastal provinces in China. Another issue, the funding gap, also had increased the default risk of loans for small and medium enterprises toward banks. When the default risk is increased, it also increases the possibility for commercial banks that cannot retake loans and interests during operating loans for small and medium enterprises. Since 2013, China government has operated finance revolution and established multi-finance service methods. The purpose of the finance revolution method is to satisfy the requirement of small and medium enterprises and to increase the speed for assessment and loan. China has also development finance liberalization, which improves the bankruptcy risk of small and medium enterprises. In Taiwan, even though the economy development has been developed earlier than China, there are still many defects for commercial institutes operating risk management of loan toward small and medium enterprises. Furthermore, because the market share for commercial banks in Taiwan is almost saturated, so financial industry wants to develop finance market and enlarge profits in China. Therefore, the development and difficulties of commercial banks between Taiwan and China has caused high attention from government, and more analyses and discussions from finance scholars.

There are various organizations and management models of commercial banks in various countries and areas. General speaking, the main businesses in commercial banks are deposit, loan and property management. In financial market, small and medium enterprises are viewed as group needing large amount of funding turnover.

The insufficient internal and external financing conditions will cause the financing channel becoming limited. Relatively speaking, the loan business of commercial banks has become easier method for small and medium enterprises to receive funding. Longenecker, Moore, and Petty (1997) indicated that more than 60% of small and medium enterprises depend on commercial banks to be the main financing channel. In another word, loan from commercial banks becomes the main funding source for small and medium enterprises. Therefore, the relationship between commercial banks and small and medium enterprises is intimately. As the result, the management volume of commercial will be affected by the risk of funding gap that happens in small and medium enterprises. If the management deficit happens in small and medium enterprises, it will cause companies that cannot have normal operation. It is not only the survival issue for enterprises but also the giant impact for commercial banks. If commercial banks have not operated risk management properly, the default risk of small and medium enterprises will cause risk simultaneously. Chen (2013) brought up the theory about after financial market being built up, the regional financial chain system will continuously exist the possibility of collapse risk. The risk will affect the normal economy system operation in one country; more, it may cause regional or global financial crisis.

Traditionally, commercial banks have circulating, safety, and profitable characteristic and can provide multiple special finance service (Liu, Li, & Yi, 2013). Furthermore, the present commercial banks also provide main-capital transfer functions for economic activities of the world. Commercial banks have already been viewed a basic development foundation of economic system for countries. Additionally, commercial banks are also a key factor affecting competition and economy environment for various countries. Therefore, China Banking Regulatory Commission in China and Financial Supervisory Commission in Taiwan have executed strict superintendence and control to commercial banks. During economy developing tendency, commercial banks have also been facing keen competition from international and domestic bank industries. The result of excessive competition is a main key factor leading to loan-deposit spread progressively shrinking. Jagtiani, Kolari, Lemieux, and Shin (2003) indicated when commercial banks face to practical pressure from expanding interest earnings, they also need to actively loan money to small and medium enterprises. In other words, the loan conditions for commercial banks to small and medium enterprises have been loosening restrictions gradually.

Because of the keen competition in financial market, the loan quality of banks is in lower standard. Another, the chance of overdue loans also causes commercial banks intangibly to burden more potential risks. This also increases the operating cost of commercial banks. The Asian financial crisis in 1997 or U.S financial crisis in 2008, the reason of overdue loans increasing was the low-efficient risk control function of commercial banks. The overdue loans increasing also caused the bank run probability happening in commercial banks indirectly. While pursuing continuous earnings, banks also need pay attention to how to improve loan quality and decrease the ratio of overdue loans simultaneously. Therefore, the scientific management function toward loan risk is indispensable. Commercial banks need to use risky control skill to decrease encountered risks during management processes. When using the method, banks can make sure earnings stability and sustainable management. If commercial bank wants to build up fine risk control function, the first thing is to handle the necessary assessment factors and weight analysis. In another words, commercial need to build up reasonable standard of loan assessment.

Keasey and Watson (1987) indicated that most commercial banks when operating loan business need to consider two risky factor; financial factor and non-financial factor. If commercial banks considering the two factors at same time, it is a relatively difficult task for them to improve loan quality. Simultaneously, commercial banks need to consider their own profit and financial status or management performance of small and medium enterprises wanting loans. Nevertheless, the real truth is not easy to be disclosed. Chan and Kanatas (1985) indicate the information asymmetry situation is worse seriously in small and medium enterprises than in giant enterprises. This is one of the reasons that commercial banks cannot operate better for risk control. Information asymmetry lets commercial banks cannot totally control all right information and data from small and medium enterprises. The data, which is involved in financial factors and non-financial factors, will affect decision making of loan assessment. Generally speaking, financial factors can be really presented but non-financial factors usually cannot be quantitative.

As far as financial factor is concerned, the data of financial analysis of financial reports is the main source for financial reports of small and medium enterprises. The personnel of loan examine uses various financial analyses to judge the operating ability enterprises, debt-paying ability and profit ability of small and medium enterprises. The main purpose for commercial banks to proceed financial analysis is to evaluate the past management volume, the present financial status, and the future developing tendency. In order to avoid loans to small and medium

enterprises that break contracts, commercial banks need to assess various conditions to evaluate integrated risk of enterprises. However, it still cannot react the real condition of enterprises' financial status because the process of compiling norm-financial report is lacking. For example, in partial developing countries, many accounting performers in small and medium enterprises follow the special purposes to compile financial reports. Sometimes, in order to deduct operation cost small and medium enterprises probably hire non-professional accounting firms to handle accounting-occupational activities or compile fiscal financial reports. If the financial report cannot reach the standardization, it will cause relatively troubles for credit personnel. Also, it will increase operational cost of loan businesses of banks and default risks of small and medium enterprises. Therefore, the high-default small and medium enterprises also can receive loans.

As far as non-financial actors are concerned, China and Taiwan commercial banks all have their own assessment norms or philosophy. These banks all have set up professional loan-investigation departments. Nevertheless, undeniably, many banks still need to depend on business experiences and self-subject judgment of clerks in banks. These clerks or operational directors mostly still have used traditional methods to make final decisions. The difference of experience accumulation and sufficient data will lead to discrepancy for decision making of clerks. Shin and Han (2001) indicated that banks usually depend on subjective assessment of credit personnel to make credit assessment. The different judgment standard from different credit personnel cannot make sure the real credit risks. Some loan investigators use the value of collateral to become the main condition in order to decide to give credit or not. Also, some credit personnel because of personal factors or relationship still loan to unqualified enterprises. The bad quality of loans has some defects that will lead to giant loss of commercial banks. Another, because of the frequent transferring of clerks in loan departments, the practical experiences of professional personnel cannot be accumulated, which will affect the loan quality. When capital requirement from economic environment increases, the quantity of loan investigation businesses will also increase. Traditional man-made loan assessment models will cause the cost of banks increasing sharply. In sum, commercial banks need to evaluate financial risks and non-financial risks of small and medium enterprises in order to decrease the bad ratio of loans.

So far, although there are some credit rating institutes in Taiwan such as Taiwan ratings, their main assessment objects still focus on listed companies or larger scale companies. In China, the credit rating system is to lack more than Taiwan. Many china banks depend on personal relation, government-business relation, collaterals, and land sources to evaluate the loan standard toward small and medium enterprises. Therefore, it is very important for commercial banks to set up a systematic, scientific and data-based loan assessment function that has financial or non-financial standard. The assessment model can help loan audit personnel quickly and strictly to judge the loan risky. However, before setting up an objective and fair standard for loan investigation, commercial banks need to do more precise analyses and realization about loan behaviors to small and medium businesses. This method can disclose some financial or non-financial factors from the past that affect loan decisions of commercial banks for a long time. Another, commercial banks in China and Taiwan want to go into the other side financial market, also, they need to understand the loan decision of commercial banks from the opposite side. Therefore, the default risks exist in small and medium enterprises in China or Taiwan, which can be reasonably assessed.

In order to reach the purpose as mentioned above, the study is to study commercial banks of China and Taiwan as research targets. And, the study uses modified Delphi approach and Fuzzy Analytic Hierarchy Process (FAHP) that is located in multi-criteria decision-making (MCDM) to be the study method. The study, firstly, comply some relative articles and studies about loan investigation system for commercial banks with small and medium enterprises; then, uses modified Delphi approach to establish the structure of analytic hierarchy process. The structure, continuously, uses FAHP to analyze loan investigation functions of commercial banks then receives the arrangement of influent factors and weight. The result of the study not only can compensate the insufficient-relative study articles from the past until now, but also can become an important reference for commercial bank members to make loan assessment regulations. Through analyzing the loan decision function of commercial banks in China and Taiwan, supervisors in banks can improve the current loan process. Simultaneously, commercial banks in China and Taiwan can reduce loan risk and improve profitability. The first article of the study is to explain clearly about study background, study motivation, and purpose. The second articles is describing and compiling the relative articles about loan investigation function for commercial banks to small and medium enterprises. The third and fourth articles explain the study methods and processes and the result of analysis of practical evidence, which the study uses. The fifth article is the conclusion.

## 2. Article Review

The article focuses on the loan Investigation function of commercial banks toward small and medium enterprises,

to precede article review. When referring the analysis method of Keasey and Watson (1987), the study finds that the relative articles in the past have been separated into financial and non-financial two factors. Generally speaking, the risk assessment system that is processed in commercial banks will affect the financial factors of small and medium enterprises and the different characteristic will be separated into different categories. The results can provide for loan departments to verify the loan quota or establish interest rate, and expense ratio. Therefore, the assessment function and the considered factors must be objective, scientific, height consulted reference. However, loan department of commercial banks, during the practical verified and investigated processes, still need to consider many complicated non-financial factors. These non-financial factors might not be effectively quantitative but can really affect the result of loan assessment. The study, further, divides financial and non-financial factors from past articles into debt-paying ability, profitability, corporate non-financial factors and industrial environment indication.

### *2.1 Debt-Paying Ability*

Many articles from the past have indicated that debt-paying ability of many small and medium enterprises, which not only the main core of corporate credit capacity, but also the important indication for commercial banks when considering loan. Small and medium enterprises need to borrow money from commercial banks because they short of capitals. When enterprises have earned profits, the debt-paying ability will describe the ability of enterprise whether can be responsible for debts or not from earning profits. The debt-paying ability decides if enterprises can healthily survive and develop. Therefore, debt-paying ability can react operational risks of enterprises, and also can show the ability of enterprises using debts to operate business activities. The debt-paying ability also presents the financial status and operational ability of one company. Small and medium enterprises during the process of loan activity will generate the credit record. The record consists of figures and literates. The credit record presents the long-term history data of company debt-paying ability. Beaver (1996) is the first scholar using financial ratio to warn company will default. Beaver (1996), further, indicates when current assets of company paying out more than earning in, the current assets cannot cover the debts of company, which will cause the debt risks of company.

Many financial indexes can be used to present the debt-paying ability. Smith (1980) indicates from his study that the variety of the asset value becomes bigger and the default risk of enterprise becomes bigger, either. Huyhebaert, Gaeremynck, Roodhooft, and Vande (2000) think that cash flow is more precisely to assess the debt-paying ability of enterprises. Ugurlu and Aksoy (2006), Saleem and Rehman (2011) indicates that cash flow and variation change all can present the asset liquidity of one enterprise. Asset liquidity and enterprise's profits have very obvious connection. Asset liquidity can be the objective assessment indication of financial risk of an enterprise, and will affect the debt-paying ability of small and medium enterprises. Besides, some enterprises use financial leverage to bring other profits for enterprises. Ozdagli (2012) indicates financial leverage can be used to judge the relation between debt management of enterprises and the financial risk degree. Laster (2003), Ugurlu and Aksoy (2006) all think that financial leverage is the important risk index to show the debt-paying ability of enterprises. Ugurlu and Aksoy (2006) also indicate that the market risk and turbulence, which are caused by economy environment, also affect the debt-paying ability of enterprises. The variation of economic environment includes stock price, interest, exchange rate, national regulation and the change of policy. When comparing with giant enterprises, the operation scale of small and medium enterprises lacks stability. Therefore, small and medium enterprises are easily affected by market risk and market turbulence (Bruderl & Schussler, 1990).

When commercial banks evaluate loan cases, they also need to face about information asymmetry issues from loaners. Lgawa and Knatas (1990) indicate some related information that is belonged to internal data of enterprises. When facing debt-paying risk from enterprises that cannot pay back their loans, sometimes, commercial banks will implement some practical operations needs such as requiring loan enterprises to provide collaterals or guarantor in order to decrease default question. When debtor cannot pay back the loan, bank can sell collaterals or require guarantor needs to follow their responsibility to compensate losses. The collateral or guarantor can reinforce loan enterprise's debt-paying ability, reduce default risk, and improve the assessment of commercial banks toward debtor. Morsman (1986) think if default risk can be observed, the loan enterprises need to prove more collateral to commercial banks. The point of view is as same as Rajan and Winton (1995) who provide same theory. High-risk enterprises prefer proceeding pledge of collaterals and use collaterals to decrease debtors' risks. Berger and Udell (1995) indicate collaterals have positive effect to decrease loan risk. Various styles of collaterals present various risks. Swary and Udell (1988) indicate that many banks think that real assets are more suitable to become collaterals than stocks or financial assets. The main reason is that real assets have little fluctuation when comparing to other collaterals. In sum, banks must precisely evaluate the

numbers and values of collaterals, and prevent collaterals to cause depreciation.

## 2.2 Profitability

Booth (1992) and Laste (2003) indicate profitability can exactly present the competitive superiority, management ability, management strategy and management achievements. Therefore, profitability is the main indication of risk assessment for commercial banks toward small and medium enterprises (Ohlson, 1980). Many financial-report data can clearly disclose the profitability of companies. Cole, Kanz, and Klapper (2015) think that these financial indications for evaluating profitability of enterprises can let credit assessment personnel make right decision not from the effect of subjective factors. The main channel of commercial banks to receive financial status from small and medium enterprises is through analyzing financial reports. Skaife, Veenman, and Wangerin (2013) indicate that the profitability of enterprises can be induced from financial data. Financial reports provide qualification and direct financial data for banks. Dichev and Skinner (2002) use sale growth rate and return on equity to be an indication when judging the profitability of small and medium enterprises. Booth (1992) indicates the growth of annual sales volume that presents debtors that have good operation in businesses and also have stable income sources. Meanwhile, the chances of enterprises happen overdue payments will be reduced. Besides, the current income of enterprises not only shows the operational capacity of enterprises during one to three years, but also represents the short-term profitability.

The profitability of companies also can be represented to be other indication or characteristics. Beside tangible assets and currency, enterprises also own or control nonmonetary assets of intangible styles, which are called intangible assets. When comparing to real assets, for enterprises, the intangible assets also have same important economic value. Hall (1992) indicates that the intangible assets of enterprises and competitive superiority exist positive connection. Parr (1991) indicates that surplus is the foundation of enterprise value; nevertheless, intangible asset is the main source of surplus. In current enterprise assets, intangible asset occupies higher and higher portions in enterprise assets. Intangible asset not only brings profits for enterprises but also creates long-term values (Kaplan & Norton, 2004). Except intangible assets, the brand value of enterprises and marketing strategy are also advantage tools for enterprises to create core values and gain profits. Efficient marketing strategy can let enterprises provide satisfied products and services and finish the target profits.

Facing to the unknown environment and challenge in the future, many small and medium enterprises or new corporations have not gained excellent profits and incomes recently, but they have been found great potentials. Barclay and Smith (1995) indicate the potential development of enterprises will influence the will of commercials to ratify loans for companies. Enterprises that have not earned any profits since inception may become one super star of industry in the future and earn giant profits. Besides, efficiency improvement also can help enterprises to increase profitability, especially cost efficiency. Ugurlu and Aksoy (2006) indicate the supervisors of enterprises should focus on cost efficiency increasing in order to improve profitability. Cost efficiency is to calculate the results of input and output of enterprises after comparing with same industries. Cost efficiency also presents if enterprises can use capital efficiently in order to create maximum profits. Therefore, commercial banks can use cost efficiency to become one of the indications of assessment of enterprise profitability.

## 2.3 Corporate Non-Financial Factors

According to past articles, the study defines non-financial factors to be a factor of loan consideration, which cannot be presented by financial data. From the past articles, we can find when commercial banks add default risk of non-financial factor during loan assessment to small and medium enterprises, the better assessment results can be received (Richardson, Kane, & Patricia, 1998). To analyze the ability of non-financial data decides the loan quality of commercial banks. Through analysis of non-financial information, banks intend to solve the issue of information asymmetry; then, the repayment ability of enterprises becomes more transparency. Another, Zhang (2013) indicates that banks bring up risk warning to small and medium enterprises, which can reduce the chances of harmful loan of banks. Generally speaking, the main channel for commercial banks to gain financial status of small and medium enterprises is from analyzing financial reports of enterprises. Keasey and Watson (1987) indicate that many non-financial factors affecting the positivity and objectivity of financial reports let the real operation status of enterprises that cannot be disclosed such as the issue of Window Dressing of financial Statement. Therefore, Graham, Li and Qiu (2008) think that the commercial banks should consider the quality of enterprise financial reports to be the non-financial factors of main consideration for loans. The upright and honest companies usually will actively disclose financial information transparently. Sohn and Kim (2007) also consider the developmental process of enterprises to be the variation of non-financial index for judging default risks. After analyzing the past issues about enterprise development, revolution or vital economic affair, the data

and information can help banks to realize the stability of management from the past and can predict the operational performance of enterprises in the future.

The scale of enterprise, market value, and the range of operational business also can disclose the operational capacity of an enterprise. Small and medium enterprises pursue scale developing in order to decrease cost and enforce market competitiveness. The result of concrete evidence from Smith and Warner (1979) presents the small scale of loan enterprises that have higher default probability, the chance of bankruptcy and liquidation, and less disclosed information. Ohlson (1980) think that the scale of enterprises can be explained to be an important factor of financial risk happening of an enterprise. Chan and Kanatas (1985) indicate that the smaller the enterprises are the more internal information is concealed. Therefore, the issue of serious information asymmetry will generate. Nevertheless, the growth of enterprise scale cannot guarantee the long-term stable development of enterprises. Large-scale enterprises are also responsible of high risk. Huyhebaert et al. (2000) thinks that the enterprise scale is an important index for financial prediction model to predict cash flow. Among the scale of enterprises and stock right and debt structure, there is an existed special connection. If stock right or creditor's right is to centralize, it may cause commercial banks to retrieve internal information of enterprises difficultly (Berger & Udell, 1995).

The specialty of enterprise operator is an important non-financial index to show the financial risk of an enterprise. Comparing with giant enterprises, small and medium operators more directly influence dispense of internal resources and the decision making of enterprises. Chan and Thakor (1987) think when operators put in more attentions and personal resources to operate business, the ratio of business failure is lower and company can provide better products and service quality. Oyama and Tanaka (2003) also indicate that the credit of an operator obviously has the financial-risk connection with his or her enterprise. Commercial banks must put related variation about operators of small and medium enterprises when to do loan consideration. More, corporate governance also is an important non-financial factor to affect company operation. The main target of corporate governance is to integrate organizational operation, to superintend enterprise system, and internal stakeholders, and to prevent illegal managerial behavior and to implement the social responsibility of an enterprise. After studying the connection between non-financial variation and bankruptcy of small and medium enterprises, Keasey and Watson (1987) put corporate governance to be a vital non-financial target. Corporate governance not only is an important function of internal management of an enterprise, but also affects an enterprise's economic activity and profit foundation.

Finally, the non-financial index to influence commercial banks to assess loans for small and medium enterprises is the relationship between two parties. The relationship between small and medium enterprises and commercial banks is two-way. When small and medium enterprises have financing activities in financial market, they go through the financial institutes, most banks, to proceed indirect financial. Boot and Thakor (1997) divide the loan of banks to transaction type and relationship type. The loan of relationship is an informative-intensive debt contract. Through long-term business and surveillance process, banks and loaners maintain long-term business relationship and own advantage information. The more frequent businesses they have, the more precise information commercial banks can receive from debtors. The method decreases information asymmetry between each other. Small and medium enterprises and commercial banks are closer in businesses, and banks are also willing to decrease interests and increase financial limit (Rajan, 1992; Petersen & Rajan, 1994; Degryse & Cayseele, 2000). Besides, economies of scale also decrease the fixed cost of banks to collect information and enterprises can receive better loan condition (Boot & Thakor, 1997). As small and medium enterprises in U.S.A to be study objects, the study of concrete evidence of Petersen, Rajan and Winton (1995) finds when the more competitions are in the bank industrial environment, the more loan contracts of traction type operate from banks. The study of Berger and Udell (2002) finds that large-scale banks, foreign banks, and financial-crisis banks do not mind long-term relationship with small and medium enterprises.

#### *2.4 Industrial Environmental Factors*

Nowadays, because of the prosper development and technology revolution, the life recycle of products have become shorter and shorter. After various industries have developed, the capital for various industries also has become bigger and bigger. Some unknown information about successful stories behind small and medium enterprises is that many small and medium enterprises have been eliminated by new trends. When banks want to finance to enterprises, enterprises that cannot adapt to industry environment and cannot follow the new trends will be eliminated by commercial banks. Besides enterprise's condition and effort, the external industry environment also can change management styles and profits of enterprises directly. The superior or inferior industry environment also will show the status of whole industry operation and future development situation. Steel and Takagi (1983) indicates that some industries need big amount of technology and capital investment in

the first period but the requirement will cause the entry barriers to industries. Therefore, commercial banks need to analyze the situations of industry environment of small and medium enterprises; then, the situations will become the decisive basis for commercial banks to ratify loans for enterprises.

Asamow (1995) indicates that the model of risk assessment of superior enterprise credits should consider the difference between various industries. Commercial banks probably are not using the same standards or preferences to evaluate the various loans for various industries. According to the study result of the Japanese banks, Uchida and Nakagawa (2007) has proved that banks observe each other's for different operation methods in order to reduce the management risk. The situation causes the loans from different banks to some specific industries have existed obvious differentiation when comparing whole partials.

Furthermore, the industry scales of small and medium enterprises will affect the development and potential profits of enterprises. If the industry scale belonging to enterprise is bigger, the development and profitability will be probably higher. Therefore, the differentiation of industry and scale is the important factor for enterprises to gain profits and development. The stability of industry development means the enterprises can continually receive profits from stable industry environment but facing the changes of industry environment. However, the stable industries let less competition between enterprises. But the stability also will let enterprise executives are lack of desire to pursue enterprise revolution.

Lcibenstein (1966) indicates that if the enterprise managers are lack of motivation to pursue the growth profit and reduce the cost for companies, the non-efficiency operations for enterprises will happen. On the contrary, the high growth industries belonging to some enterprises are not easily affected by external economy environment and can continually receive superior profit to whole economy growth. When growth profit of industry is predicted, more enterprises and investors will invest capital, creative technology and human resources to the industry. When enterprises lie in the high-growth period of industries, they will receive better profits. After analyzing the related factors and indication of whole industry, banks can easily assessed the risk of industry environment completely, which small and medium enterprises take responsibility.

### **3. Methodology and Study Procedure**

The explanation of main study procedure is as follow:

Step 1. Defining study subject, question description and study purpose

Step 2. Collecting and arranging related articles

Step 3. Using modified Delphi approach separates hierarchy process structure to become four assessment criteria and twenty five sub-criteria

Step 4. Using analytic hierarchy process structure to develop professional questionnaire

Step 5. Using FAHP to proceed analysis and gains the weight and arrangement of criterion and sub-criterion

Step 6. Having empirical analysis and conclusion

#### ***3.1 Application of Multiple-Standard Decision Method***

When consider various decisive policies or strategies, people need to consider different affecting factors and assessment indexes from various levels. Therefore, scholars develop a series of study method, MCDM in order to solve analysis, assessment, and decision making issues. After considering many possible-conflict assessment criteria, the study has found that MCDM method is an analysis tool for assessing superior or inferior cases. The method can avoid decision makers only consider single criterion, so the right, rational and data-base decisions cannot be made. Hwang and Yoon (1981) think that decision makers should always consider assessment criteria of multi-quality analyses, or quantitative analyses; then, they can continually evaluate some already known and replaceable methods to manage assessments. The decision makers can decide which replaceable method has possibility or the priority to operate cases.

Buede and Maxwell (1995) indicate that original assessment criteria are probable quality analysis or quantitative analysis, but using MCDM still needs to transform non-quantitative criteria before proceeding analysis. In conclusion, the final case decision is from assessing individual criterion between each other or comparing same assessment criterion between individual cases.

Generally speaking, MCDM can be divided into various methods such as: Simple Additive Weighting (SAW), Analytic Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) (Saaty, 1980; Hwang & Yoon, 1981). Bellman and Zadeh (1970) use the fuzzy theory and join individual judgment of decision maker to solve the related issues of decision assessment. The fuzzy theory can combine

most of MCDM. The study uses modified Delphi to approach and the FAHP of MCDM to become study method. Furthermore, the study uses FAHP to analyze the loan evaluation regulation and gains various priority and weights value of effecting factors.

### *3.2 The Application of Modified Delphi Approach*

Delphi approach developed in the nineteen-forties, twentieth century. The study method is an anonymous questionnaire method that uses several times of questionnaire issuing to collect opinions from experts. Delphi approach composes the common views from experts using descript statistics to present. The experts cannot discuss and connect to each other; they only can contact with researchers.

Through many times repeatedly asking experts' opinions, researchers can gradually receive the consensus decision method of predicting results. The successful factors of the study method are expert panel, reliability and validity, anonymity, feedback control, consensus, and the role of the researcher. Besides, Couper (1984) thinks that there are three important factors to complete Delphi approach: enough time, the competent of participants, and the will of attendance and inductive questionnaire compiling. The study process of Delphi approach is defining main topic, choosing participating experts, processing the first round, second round and third round of questionnaires and the final result analysis.

Until today since development, Delphi approach has broadly been applied by the study of arts and social science of education, commerce, politics and international environment. Delphi approach is a prediction and analysis method that commonly is used by the most of researchers of social science in modern society. Murry and Hommons (1995) submit the operation method of Delphi approach. The concrete implementation method of modified Delphi approach and statistics method, and traditional Delphi approach are almost the same. The difference is that Murry and Hommons (1995) omit the complicated process of opening questionnaire tested in the first round. Through the results of the study from related references, the projects of researchers or the conclusions of expert interviews are directly developing to structure questionnaire. Modified Delphi approach can make experts who participate the study to focus their wills on the main topic of study and eliminate the conjecture toward opening questionnaires and increase the recovery ration of questionnaires. Moreover, no matter using Delphi approach or modified Delphi approach, researchers should carefully avoid experts who incline to choose partial information and adventure attitude during acceptance testing. Experts who participate study process should judge independently and not be affected by the others, so the result of the study can be accurate.

### *3.3 Using Modified Delphi Approach Builds up Analytic Hierarchy Process Structure*

The study uses modified Delphi approach to build up an analytic hierarchy process structure. In order to confirm that using modified Delphi approach can receive the correct result, the group of experts for questionnaire should be chosen appropriately. Adler and Ziglio (1996) submit when studying expert questionnaire, ten to fifteen homogeneous experts are required. Couper (1984) and Parenté and Anderson-Parenté (1987) indicates when using Delphi approach before the end of the study, over ten experts should participate continually at least. The objects of the expert questionnaire are toward fifteen supervisors of loan department in each China and Taiwan commercial banks. Experts participate the whole study process also is the key point for successful study, so the study tries to increase the recovery ratio. After collecting questionnaires, we have received thirteen valid questionnaires from China experts and twelve valid questionnaires from Taiwan experts. The recovery ration of valid questionnaire is 86.67% and 80%.

According to the operative result of some related articles and modified Delphi approach, the study sets up the structure of analytic hierarchy process of the main topic of the study. The finance and non-finance factors of loan assessment institute of China and Taiwan commercial banks are divided to 4 assessment criteria and 25 sub-criteria of debt-paying ability, profitability, corporate non-financial factors, and industrial environmental factors. The Table 1 shows the structure of analytic hierarchy process of assessment criteria and sub-criteria.



Table 1. Hierarchical structure of problem in application

Objective : The Loan-Evaluation System toward Small and Medium Enterprises between Taiwan and China's Commercial Banks		
Criteria	Sub-criteria	
A Debt-paying ability	Asset liquidity (A1)	
	Financial leverage (A2)	
	Market risk and fluctuation (A3)	
	Cost of capital (A4)	
	Credit rating record (A5)	
	Security quantity and value (A6)	
	Essential factor of guarantor (A7)	
B Profitability	Current situation of corporate revenue (B1)	
	Intangible asset value (B2)	
	Corporate developing potentiality (B3)	
	Corporate brand value (B4)	
	Enterprise marketing strategy (B5)	
	Cost efficiency (B6)	
	Technology level of product and service (B7)	
C Corporate non-financial factor	Quality of financial statement (C1)	
	Corporate scale (C2)	
	Stock right and creditor's right (C3)	
	Character of corporate operator (C4)	
	Character of corporate history (C5)	
	Corporate governance (C6)	
	Contact relationship with banks (C7)	
D Industry environmental index	Industry differentiation (D1)	
	Industry scale (D2)	
	Industrial growth (D3)	
	Industrial stability (D4)	

The explanation of each sub-criterion in four assessment criteria is as following:

- Asset liquidity (A1): Small and medium enterprises whether can pay back debt, afford various capital requirements, sell asset for cash, collect funds and raise money or not, will be affected by asset liquidity. In order to gain maximum profit, most enterprises always want to loan more and invest more, and incline to use long-term and profitable property and assets. On the other way, enterprises must have enough current currency in order to avoid current risk.
- Financial leverage (A2): When enterprises establish some the decisions about capital structure, loan from bank is always one of the methods to raise funds. Using liability operation and financial leverage to adjust the whole capital structure, the operation methods bring extra profit for enterprises. If small and medium enterprises uses higher debt ratio to operate business, the range of burdening for enterprises to decrease their debt-paying ability enterprises will be decreased.
- Market risk and fluctuation (A3): There are various uncertainties and fluctuation of price in the future will impact the original targets and management strategies deciding by enterprises. The fluctuation of exchange rate, interest, merchandise, and stock price are possible to increase the market risk. Market risk and fluctuation may probably cause directly or indirectly disadvantageous effect to enterprises. In addition, debt-paying ability will be affected.
- Cost of capital (A4): Cost of capital is the cost that enterprises should pay for raising capital and operating fund including stock issuance, cost of bond, dividend payment, interest payment and other expenses. Small and medium enterprises may not decrease cost because of some factors of scale, credit rating and capital structure. If the capital cost is too high, it will compress the operation profit and decrease the debt-paying ability of enterprises.
- Credit rating record (A5): Using the basis of the risk of assessing fiduciary loan violation, some professional credit evaluation institutes and commercial banks focus on the targets of evaluation operate credit rating and record data. Furthermore, they use debt-paying records from the past of enterprises to manage investigation and analysis; then, the debt-paying ability of the enterprises can be reevaluated.

- Security quantity and value (A6): When commercial banks loan to enterprises, they receive some equal assets or property from enterprises for security. If debtor cannot pay back loans, banks can sell security in order to compensate their losses. Therefore, banks need to evaluate precisely the quantity and value of security and prevent the risk of security devaluation.
- Essential factor of guarantor (A7): When enterprises cannot provide valuable security, banks can ask enterprises providing satellite companies to become guarantor, also called loan guarantor. When debtor cannot pay back loans, guarantor needs to obey the contract to fulfill liability and assume obligation. The guarantors such as corporation, natural person, other organization, or government should have ability to pay off debt.
- Current situation of corporate revenue (B1): Revenue is the income that an enterprise sells merchandise and provides labor activities. It also presents one enterprise the inflow volume of receiving financial resources. As enterprise is concerned, when more revenues are gaining in a special period of time, it presents enterprises receive higher income. Therefore, it also has positive relation between enterprise profit and revenue. Current situation of enterprises not only shows the management ability of enterprises in one to three years, but also represents the short-term profitability of enterprises.
- Intangible asset value (B2): Intangible asset is what enterprises own or control non-currency style assets that have no real substantial property. Intangible asset and tangible asset both can be estimated, transferred, sold, leased, or permit awarded. Intangible assets include patent right, technology, copy right, intellectual property right, land-usage right, franchise, and reputation of business.
- Corporate developing potentiality (B3): The developing potential of enterprises affects the profitability and debt-paying ability of enterprises in the future. When facing the future unknown environment and challenge, enterprises using adaptability and developing potentiality make their targets can be achieved.
- Corporate brand value (B4): In order to distinguish competitors in the same field, enterprises endeavor to promote the brand value and identification. The brand value is the connection between enterprises and consumer to form a system concept. Even though brand value has no tangible material style comparing with tangible asset, it still has very important economic value. Enterprises use the economic value to create profits. In other words, brand asset mainly is to show the core value of the brand.
- Enterprise marketing strategy (B5): According to the analysis information of customer requirement and purchasing ability, enterprises have planned and organized to establish their marketing strategy of merchandises and services. Marketing strategy includes product design and product strategy, price strategy, channel strategy and promotion strategy, etc. Efficient marketing strategy can provide satisfied products and service for customers and then achieve the profit targets of enterprises.
- Cost efficiency (B6): As the economics is concerned, cost efficiency discusses the connection between the level of enterprise investing resources and outputs acquisition. Through comparison with other enterprises of same category, cost efficiency of enterprise can be accurately calculated and analyzed. Increasing cost efficiency, enterprises use the most appropriate method to integrate resources and usage efficiently. Cost efficiency shows enterprises whether can efficiently use capital coat to create the most profit.
- Technology level of product and service (B7): The technology level of producing products or providing service of enterprises can crucially affect the competition superiority and profitability of enterprises. Research and development activity can let enterprises acquire new science technology, productive technology, and management knowledge. Comparing with giant conglomerates, small and medium enterprises are so eager to increase technology level of products and service. The situation reflects the obstacles of enterprises such as capital, technology, human resource and resource limitation, so the increase of technology level is more likely to bring probability of profit growth for enterprises.
- Quality of financial statement (C1): The quality of financial statement discloses the reality of financial report of corporate and useful financial information toward banks. Commercial banks reuse the information to evaluate the financial status and risk of enterprises. Most of honest companies usually disclose financial information actively and transparently to outsiders. Inside of these companies are strictly to manage and request data announcement accurately.
- Corporate scale (C2): The corporate scale describes the size, market value, net amount of business income, net profit, employee numbers, operation scale and scope of a company. Generally, big scale companies that own more capital and resource can gain higher profit and remuneration. Small and medium enterprises try to pursue dimension extension in order to decrease cost and enforce competitiveness in market. Sometimes, corporate scale also is used to describe the market share and occupation ratio of an enterprise in the special industry.

- Stock right and creditor's right (C3): Ownership structure and debt structure of a company have relatively obvious and profound effect to the company for future development. Ownership structure is the different kinds of occupation ratio and mutual relation of stock rights in the total shareholding equity of one joint-stock company. Debt structure is the various debt ratio and relation of one company. Ownership structure and debt structure decide the different management methods of one company.
- Character of corporate operator (C4): The character of corporate operator is an important factor to affect success or failure of corporate operation. The acknowledgement of economic environment and individual style of an enterprise operator will decide the strategy of an enterprise, management model, management system, and organization culture. When comparing with operators of giant corporates, operators of small and medium enterprises affect internal resource allocation and decision making more directly.
- Character of corporate history (C5): The character of corporate history is the development, revolution, or vital economic affair of a corporate, which ever happened in the past management period. Through the analysis of history of corporate development, external interested parties of an enterprise including customers, suppliers, government, and loan banks can realize the steady ability of an enterprise in the past.
- Corporate governance (C6): The main connotation of corporate governance is a corporate using the design of legal control and institution to let whole enterprise and internal interested parties be supervised and administered efficiently. Furthermore, the main target of corporate governance is how to perfect the institute operation and how to prevent the corrupt practice of management of illicit behavior, and then to perform the social responsibility of an enterprise. Corporate governance also includes the relationship between internal interested parties and the target of corporate governance in the company.
- Contact relationship with banks (C7): Small and medium enterprises are not easy to receive capital from capital market; therefore, the method of most enterprises is indirect finance of loan money from banks. To build up a good relationship with banks is a very important lesson for small and medium enterprises. Through loan procedure, banks and companies can maintain an intimate relation between each other. At same time, the procedure also can let banks decrease the influence of information asymmetry of enterprises.
- Industry differentiation (D1): When facing the trend of internationalization and diversification of financial market, commercial banks appeal for differentiation of industries into credit rating model, which belongs to enterprises. In other words, considering differentiation of various industries, commercial banks do not use same standards and preferences to evaluate loan cases of various industries.
- Industry scale (D2): Industrial scales of small and medium enterprises affect the development and potential profit of enterprises directly. When corporates have bigger industrial scales, they probably have higher development and profit. The productivity, value of output, corporate numbers, amount of imports or exports and importance are all probably to describe the industrial scale.
- Industrial growth (D3): Because market demand is bigger than supply, the high growth industry is not easy to be affected by the external economic environment and can continue to gain profit that is superior to whole economic growth. The predictions of profit growth also attract more corporates and invertors to invest capital, creative technology, and human resource to the industry. Industrial growth includes corporate numbers, products, and service quality, and the change of quantity, and technology improvement of the industry.
- Industrial stability (D4): The stable development of industry means that the industry belonging to the corporate can continue to gain profit in the stable industrial environment, rather than continuously faces the change of industrial environment. Mature technology, perfect policy and regulation, distribution of professional occupations, inclination of market saturation and completing development of industrial chains are all the signs of industry stable development.

### 3.4 Fuzzy Analytic Hierarchy Process

Van Laarhoven and Pedrycz (1983), using the concept of fuzzy to solve the values in the pairwise comparison matrix with subjectivity, imprecision and vagueness, etc. in traditional AHP, who stated FAHP. Literature review and Delphi technique were adopted to construct the hierarchical framework on this study. Following by the establishment of hierarchy architecture, each evaluator respectively enables to give pairwise comparison matrices of the ultimate goal and criteria by a nine-point scale. To ensure the logic judgment of expert or evaluator fulfills the consistency, Consistency Ratio (CR) is used to measure (Saaty, 1980).

#### 3.4.1 FAHP Calculated Procedures of China Experts Questionnaire

According to the study method, fuzzy pairwise comparison matrix of each criterion in level 2 is compiled as

equation (1)

$$T_2 = \begin{bmatrix} (1,1,1)(3.00,3.79,7.00)(4.00,5.08,7.00)(2.00,4.54,7.00) \\ (0.14,0.26,0.33)(1,1,1)(2.00,3.44,5.00)(2.00,3.05,6.00) \\ (0.14,0.17,0.25)(0.20,0.29,0.50)(1,1,1)(0.33,0.44,1.00) \\ (0.14,0.22,0.50)(0.17,0.33,0.50)(1.00,2.29,3.00)(1,1,1) \end{bmatrix} \quad (1)$$

Accordingly, the fuzzy weights of each criterion in level 2 are showed as equation (2) to equation (5).

$$W_A = [0.51 \ 0.58 \ 0.58] \quad (2)$$

$$W_B = [0.19 \ 0.24 \ 0.24] \quad (3)$$

$$W_C = [0.07 \ 0.07 \ 0.07] \quad (4)$$

$$W_D = [0.09 \ 0.12 \ 0.12] \quad (5)$$

The fuzzy pairwise comparison matrices of sub-criteria under the criteria of debt-paying ability, profitability, corporate non-financial factor and industry environmental index in level 2 are compiled respectively as equation (6) to equation (9).

$$T_{31} = \begin{bmatrix} (1,1,1)(2.00,3.05,6.00)(0.50,1.27,5.00)(2.00,3.98,7.00)(0.20,1.10,6.00)(0.50,1.89,4.00)(2.00,3.48,6.00) \\ (0.17,0.33,0.50)(1,1,1)(0.20,0.58,4.00)(0.50,2.79,6.00)(0.25,1.26,6.00)(0.20,1.04,5.00)(0.50,1.89,4.00) \\ (0.20,0.79,2.00)(0.25,1.73,5.00)(1,1,1)(1.00,3.80,6.00)(0.50,1.66,5.00)(0.33,1.28,4.00)(0.50,1.91,4.00) \\ (0.14,0.25,0.50)(0.17,0.36,2.00)(0.17,0.26,1.00)(1,1,1)(0.20,0.47,2.00)(0.20,0.27,0.50)(0.25,0.41,1.00) \\ (0.17,0.91,5.00)(0.17,0.80,4.00)(0.20,0.60,2.00)(0.50,2.14,5.00)(1,1,1)(0.25,0.52,3.00)(0.33,0.79,4.00) \\ (0.25,0.53,2.00)(0.20,0.96,5.00)(0.25,0.78,3.00)(2.00,3.66,5.00)(0.33,1.92,4.00)(1,1,1)(0.50,1.87,4.00) \\ (0.17,0.29,0.50)(0.25,0.53,2.00)(0.25,0.52,2.00)(1.00,2.45,4.00)(0.25,1.26,3.00)(0.25,0.54,2.00)(1,1,1) \end{bmatrix} \quad (6)$$

$$T_{32} = \begin{bmatrix} (1,1,1)(0.25,1.18,4.00)(0.25,0.54,2.00)(0.20,0.47,3.00)(0.25,0.63,3.00)(0.33,0.84,3.00)(0.50,2.45,7.00) \\ (0.25,0.85,4.00)(1,1,1)(0.25,0.46,2.00)(0.20,0.46,2.00)(0.33,0.96,3.00)(0.33,1.27,4.00)(0.50,3.12,5.00) \\ (0.50,1.87,4.00)(0.50,2.19,4.00)(1,1,1)(0.50,1.04,3.00)(2.00,3.38,5.00)(0.50,2.66,5.00)(3.00,4.19,6.00) \\ (0.33,2.14,5.00)(0.50,2.16,5.00)(0.33,0.96,2.00)(1,1,1)(0.50,2.11,4.00)(0.50,2.43,5.00)(2.00,4.08,7.00) \\ (0.33,1.60,4.00)(0.33,1.04,3.00)(0.20,0.30,0.50)(0.25,0.47,2.00)(1,1,1)(0.25,1.48,5.00)(2.00,2.89,5.00) \\ (0.33,1.20,3.00)(0.25,0.79,3.00)(0.20,0.38,2.00)(0.20,0.41,2.00)(0.20,0.68,4.00)(1,1,1)(2.00,2.65,5.00) \\ (0.14,0.41,2.00)(0.20,0.32,2.00)(0.17,0.24,0.33)(0.14,0.25,0.50)(0.20,0.35,0.50)(0.20,0.38,0.50)(1,1,1) \end{bmatrix} \quad (7)$$

$$T_{33} = \begin{bmatrix} (1,1,1)(0.33,0.96,3.00)(0.20,0.35,0.50)(0.14,0.35,0.50)(0.17,0.69,3.00)(0.14,0.74,3.00)(0.50,2.23,4.00) \\ (0.33,1.04,3.00)(1,1,1)(0.17,0.46,2.00)(0.20,0.40,2.00)(0.17,0.83,2.00)(0.20,0.63,3.00)(0.25,1.72,6.00) \\ (2.00,2.84,5.00)(0.50,2.18,6.00)(1,1,1)(0.33,1.37,7.00)(2.00,2.38,5.00)(0.50,2.07,5.00)(2.00,3.56,6.00) \\ (2.00,2.89,7.00)(0.50,2.52,5.00)(0.14,0.73,3.00)(1,1,1)(0.33,1.64,4.00)(0.33,1.06,3.00)(3.00,4.29,7.00) \\ (0.33,1.46,6.00)(0.50,1.21,6.00)(0.20,0.42,0.50)(0.25,0.61,3.00)(1,1,1)(0.25,0.57,2.00)(2.00,3.19,6.00) \\ (0.33,1.36,7.00)(0.33,1.59,5.00)(0.20,0.48,2.00)(0.33,0.94,3.00)(0.50,1.76,4.00)(1,1,1)(2.00,3.19,6.00) \\ (0.25,0.45,2.00)(0.17,0.58,4.00)(0.17,0.28,0.50)(0.14,0.23,0.33)(0.17,0.29,0.50)(0.17,0.31,0.50)(1,1,1) \end{bmatrix} \quad (8)$$

$$T_{34} = \begin{bmatrix} (1,1,1)(0.25,1.08,6.00)(0.17,0.62,2.00)(0.17,0.67,2.00) \\ (0.17,0.93,4.00)(1,1,1)(0.20,0.36,0.50)(0.17,0.43,2.00) \\ (0.50,1.62,6.00)(2.00,2.78,5.00)(1,1,1)(0.50,1.57,5.00) \\ (0.50,1.49,6.00)(0.50,2.32,6.00)(0.20,0.64,2.00)(1,1,1) \end{bmatrix} \quad (9)$$

Accordingly, the fuzzy weights of sub-criteria under the criterion of debt-paying ability in level 2 are shown as equation (10) to equation (16).

$$W_{A1} = [0.21 \ 0.26 \ 0.26] \quad (10)$$

$$W_{A2} = [0.07 \ 0.13 \ 0.19] \quad (11)$$

$$W_{A3} = [0.09 \ 0.19 \ 0.20] \quad (12)$$

$$W_{A4} = [0.05 \ 0.05 \ 0.06] \quad (13)$$

$$W_{A5} = [0.06 \ 0.11 \ 0.19] \quad (14)$$

$$W_{A6} = [0.11 \ 0.16 \ 0.18] \quad (15)$$

$$W_{A7} = [0.07 \ 0.10 \ 0.11] \quad (16)$$

The fuzzy weights of sub-criteria under the criterion of profitability in level 2 are shown as equation (17) to equation (23).

$$W_{B1} = [0.07 \ 0.11 \ 0.21] \quad (17)$$

$$W_{B2} = [0.07 \ 0.12 \ 0.20] \quad (18)$$

$$W_{B3} = [0.20 \ 0.26 \ 0.26] \quad (19)$$

$$W_{B4} = [0.13 \ 0.24 \ 0.26] \quad (20)$$

$$W_{B5} = [0.10 \ 0.13 \ 0.19] \quad (21)$$

$$W_{B6} = [0.09 \ 0.10 \ 0.19] \quad (22)$$

$$W_{B7} = [0.05 \ 0.05 \ 0.07] \quad (23)$$

The fuzzy weights of sub-criteria under the criterion of corporate non-financial factor in level 2 are shown as equation (24) to equation (30).

$$W_{C1} = [0.06 \ 0.09 \ 0.11] \quad (24)$$

$$W_{C2} = [0.06 \ 0.10 \ 0.14] \quad (25)$$

$$W_{C3} = [0.23 \ 0.26 \ 0.27] \quad (26)$$

$$W_{C4} = [0.17 \ 0.21 \ 0.21] \quad (27)$$

$$W_{C5} = [0.11 \ 0.12 \ 0.16] \quad (28)$$

$$W_{C6} = [0.12 \ 0.16 \ 0.20] \quad (29)$$

$$W_{C7} = [0.05 \ 0.05 \ 0.06] \quad (30)$$

The fuzzy weights of sub-criteria under the criterion of industry environmental index in level 2 are shown as equation (31) to equation (34).

$$W_{D1} = [0.12 \ 0.19 \ 0.24] \quad (31)$$

$$W_{D2} = [0.12 \ 0.14 \ 0.17] \quad (32)$$

$$W_{D3} = [0.38 \ 0.38 \ 0.38] \quad (33)$$

$$W_{D4} = [0.19 \ 0.28 \ 0.32] \quad (34)$$

### 3.4.2 FAHP Calculated Procedures of Taiwan Experts Questionnaire

According to the study method, fuzzy pairwise comparison matrix of each criterion in level 2 is compiled as equation (35).

$$T_2 = \begin{bmatrix} (1,1,1) & (0.17,0.60,3.00) & (0.50,1.01,3.00) & (0.33,2.13,6.00) \\ (0.33,1.66,6.00) & (1,1,1) & (0.50,2.74,5.00) & (2.00,2.56,6.00) \\ (0.33,0.99,2.00) & (0.20,0.36,2.00) & (1,1,1) & (0.50,1.07,4.00) \\ (0.17,0.47,3.00) & (0.17,0.39,0.50) & (0.25,0.93,2.00) & (1,1,1) \end{bmatrix} \quad (35)$$

Accordingly, the fuzzy weights of each criterion in level 2 are shown as equation (36) to equation (39).

$$W_A = [0.18 \ 0.25 \ 0.31] \quad (36)$$

$$W_B = [0.37 \ 0.42 \ 0.42] \quad (37)$$

$$W_C = [0.18 \ 0.18 \ 0.23] \quad (38)$$

$$W_D = [0.13 \ 0.15 \ 0.17] \quad (39)$$

The fuzzy pairwise comparison matrices of sub-criteria under the criteria of debt-paying ability, profitability, corporate non-financial factor and industry environmental index in level 2 are compiled respectively as equation (40) to equation (43).

$$T_{31} = \begin{bmatrix} (1,1,1)(2.00,3.52,5.00)(0.33,1.14,2.00)(0.50,3.52,6.00)(0.20,0.77,3.00)(0.17,0.87,3.00)(0.25,0.53,2.00) \\ (0.20,0.28,0.50)(1,1,1)(0.20,0.27,0.50)(0.33,0.76,3.00)(0.17,0.27,2.00)(0.14,0.34,0.50)(0.20,0.53,2.00) \\ (0.50,0.88,3.00)(2.00,3.68,5.00)(1,1,1)(2.00,3.84,6.00)(0.25,0.38,0.50)(0.25,1.47,3.00)(0.25,1.03,4.00) \\ (0.17,0.28,2.00)(0.33,1.32,3.00)(0.17,0.26,0.50)(1,1,1)(0.14,0.19,0.33)(0.20,0.33,0.50)(0.25,0.41,0.50) \\ (0.33,1.30,5.00)(0.50,3.66,6.00)(2.00,2.63,4.00)(3.00,5.13,7.00)(1,1,1)(0.50,2.63,5.00)(2.00,3.92,6.00) \\ (0.33,1.15,6.00)(2.00,2.94,7.00)(0.33,0.68,4.00)(2.00,2.99,5.00)(0.20,0.42,2.00)(1,1,1)(0.50,1.66,3.00) \\ (0.20,0.52,4.00)(0.50,1.88,5.00)(0.25,0.97,4.00)(2.00,2.42,4.00)(0.17,0.25,0.50)(0.33,0.60,2.00)(1,1,1) \end{bmatrix} \quad (40)$$

$$T_{32} = \begin{bmatrix} (1,1,1)(2.00,3.68,5.00)(0.33,1.14,4.00)(0.50,1.25,3.00)(2.00,3.45,7.00)(4.00,5.24,7.00)(2.00,3.77,6.00) \\ (0.20,0.27,0.50)(1,1,1)(0.17,0.42,2.00)(0.20,0.62,4.00)(0.33,0.97,3.00)(0.50,2.13,5.00)(0.33,1.37,4.00) \\ (0.25,0.88,3.00)(0.50,2.38,6.00)(1,1,1)(0.33,1.25,3.00)(2.00,3.17,6.00)(3.00,4.47,7.00)(0.50,3.21,5.00) \\ (0.33,0.80,2.00)(0.25,1.60,5.00)(0.33,0.80,3.00)(1,1,1)(0.50,2.31,5.00)(0.50,3.40,6.00)(2.00,3.28,5.00) \\ (0.14,0.29,0.50)(0.33,1.03,3.00)(0.17,0.32,0.50)(0.20,0.43,2.00)(1,1,1)(0.33,1.97,4.00)(0.25,1.11,3.00) \\ (0.14,0.19,0.25)(0.20,0.47,2.00)(0.14,0.22,0.33)(0.17,0.29,2.00)(0.25,0.51,3.00)(1,1,1)(0.20,0.49,2.00) \\ (0.17,0.27,0.50)(0.25,0.73,3.00)(0.20,0.31,2.00)(0.20,0.30,0.50)(0.33,0.90,4.00)(0.50,2.03,5.00)(1,1,1) \end{bmatrix} \quad (41)$$

$$T_{33} = \begin{bmatrix} (1,1,1)(2.00,2.76,5.00)(0.50,2.67,4.00)(0.25,0.54,2.00)(0.33,0.77,2.00)(2.00,3.64,6.00)(2.00,4.92,7.00) \\ (0.20,0.36,0.50)(1,1,1)(0.33,1.32,3.00)(0.17,0.30,2.00)(0.20,0.49,2.00)(0.33,1.71,4.00)(0.50,2.75,5.00) \\ (0.25,0.37,2.00)(0.33,0.76,3.00)(1,1,1)(0.17,0.35,2.00)(0.25,0.44,2.00)(0.50,1.47,3.00)(0.33,2.67,4.00) \\ (0.50,1.87,4.00)(0.50,3.30,6.00)(0.50,2.84,6.00)(1,1,1)(0.33,1.49,3.00)(0.50,3.99,7.00)(2.00,5.03,7.00) \\ (0.50,1.30,3.00)(0.50,2.03,5.00)(0.50,2.29,4.00)(0.33,0.67,3.00)(1,1,1)(2.00,3.67,6.00)(2.00,4.92,7.00) \\ (0.17,0.28,0.50)(0.25,0.58,3.00)(0.33,0.68,2.00)(0.14,0.25,2.00)(0.17,0.27,0.50)(1,1,1)(0.33,1.62,4.00) \\ (0.14,0.20,0.50)(0.20,0.36,2.00)(0.25,0.37,3.00)(0.14,0.20,0.50)(0.14,0.20,0.50)(0.25,0.62,3.00)(1,1,1) \end{bmatrix} \quad (42)$$

$$T_{34} = \begin{bmatrix} (1,1,1)(0.25,0.68,2.00)(0.14,0.24,2.00)(0.20,0.53,3.00) \\ (0.50,1.47,4.00)(1,1,1)(0.20,0.37,2.00)(0.25,0.63,3.00) \\ (0.50,4.11,7.00)(0.50,2.70,5.00)(1,1,1)(0.33,2.42,4.00) \\ (0.33,1.89,5.00)(0.33,1.60,4.00)(0.25,0.41,3.00)(1,1,1) \end{bmatrix} \quad (43)$$

Accordingly, the fuzzy weights of sub-criteria under the criterion of debt-paying ability in level 2 are shown as equation (44) to equation (50).

$$W_{A1} = [0.10 \ 0.18 \ 0.22] \quad (44)$$

$$W_{A2} = [0.05 \ 0.05 \ 0.09] \quad (45)$$

$$W_{A3} = [0.13 \ 0.16 \ 0.18] \quad (46)$$

$$W_{A4} = [0.05 \ 0.05 \ 0.07] \quad (47)$$

$$W_{A5} = [0.26 \ 0.30 \ 0.30] \quad (48)$$

$$W_{A6} = [0.14 \ 0.15 \ 0.25] \quad (49)$$

$$W_{A7} = [0.10 \ 0.10 \ 0.18] \quad (50)$$

The fuzzy weights of sub-criteria under the criterion of profitability in level 2 are shown as equation (51) to equation (57).

$$W_{B1} = [0.26 \ 0.28 \ 0.28] \quad (51)$$

$$W_{B2} = [0.06 \ 0.09 \ 0.17] \quad (52)$$

$$W_{B3} = [0.16 \ 0.23 \ 0.26] \quad (53)$$

$$W_{B4} = [0.13 \ 0.19 \ 0.23] \quad (54)$$

$$W_{B5} = [0.06 \ 0.08 \ 0.11] \quad (55)$$

$$W_{B6} = [0.05 \ 0.05 \ 0.09] \quad (56)$$

$$W_{B7} = [0.06 \ 0.07 \ 0.13] \quad (57)$$

The fuzzy weights of sub-criteria under the criterion of corporate non-financial factor in level 2 are shown as equation (58) to equation (64).

$$W_{C1} = [0.16 \ 0.21 \ 0.22] \quad (58)$$

$$W_{C2} = [0.06 \ 0.10 \ 0.15] \quad (59)$$

$$W_{C3} = [0.06 \ 0.09 \ 0.16] \quad (60)$$

$$W_{C4} = [0.12 \ 0.29 \ 0.29] \quad (61)$$

$$W_{C5} = [0.15 \ 0.21 \ 0.25] \quad (62)$$

$$W_{C6} = [0.05 \ 0.06 \ 0.11] \quad (63)$$

$$W_{C7} = [0.04 \ 0.04 \ 0.08] \quad (64)$$

The fuzzy weights of sub-criteria under the criterion of industry environmental index in level 2 are shown as equation (65) to equation (68).

$$W_{D1} = [0.12 \ 0.12 \ 0.27] \quad (65)$$

$$W_{D2} = [0.16 \ 0.16 \ 0.32] \quad (66)$$

$$W_{D3} = [0.22 \ 0.49 \ 0.49] \quad (67)$$

$$W_{D4} = [0.16 \ 0.23 \ 0.40] \quad (68)$$

#### 4. The Result and Analysis of Substantial Demonstration

The article is composed of four parts. The first section states that the study uses modified Delphi approach to build up analytic hierarchy structure and explain four assessment criteria and 25 sub-criteria of the hierarchy structure. The second section states that the study uses FAHP to analyze the questionnaire coming from Chinese experts and receives substantial demonstration. The third section states that the study uses the same analysis method to analyze the questionnaire coming from Taiwan. The final section states that the study analyzes and compares the result of analytic hierarchy process from experts between China and Taiwan, and develop conclusion.

##### 4.1 FAHP China Experts Questionnaire Analysis

The phase of the study focuses on the last phase, modified Delphi approach, which collects 13 experts of valid questionnaire to precede questionnaire of hierarchy structure analysis. The interviewees, experts, use pairwise comparison method to fill out questionnaire. After compiling experts' questionnaire using advance integration, the study uses FAHP to analyze the loan assessment standard of small and medium enterprises, which is considered by loan supervisors of China commercial banks. The result of analysis is shown as Table 2.

Table 2. FAHP analysis result of China expert questionnaire

Rank	Sub-Criteria	Final Fuzzy Weights	Defuzzier (R) Values
1	A1 Asset liquidity	(0.1095,0.1491,0.1491)	0.1370
2	A3 Market risk and fluctuation	(0.0473,0.1111,0.1157)	0.0960
3	A6 Security quantity and value	(0.0547,0.0922,0.1046)	0.0862
4	A2 Financial leverage	(0.0341,0.0765,0.1106)	0.0796
5	A5 Credit rating record	(0.0316,0.0667,0.1095)	0.0757
6	B3 Corporate developing potentiality	(0.0398,0.0619,0.0634)	0.0561
7	A7 Essential factor of guarantor	(0.0373,0.0553,0.0614)	0.0523
8	B4 Corporate brand value	(0.0245,0.0557,0.0638)	0.0508
9	D3 Industrial growth	(0.0329,0.0440,0.0455)	0.0412
10	B1 Current situation of corporate revenue	(0.0134,0.0258,0.0502)	0.0334
11	B5 Enterprise marketing strategy	(0.0184,0.0298,0.0454)	0.0331
12	B2 Intangible asset value	(0.0140,0.0277,0.0478)	0.0328
13	B6 Cost efficiency	(0.0172,0.0242,0.0454)	0.0313
14	A4 Cost of capital	(0.0245,0.0279,0.0376)	0.0305
15	D4 Industrial stability	(0.0163,0.0328,0.0379)	0.0304
16	D1 Industry differentiation	(0.0104,0.0221,0.0286)	0.0217
17	C3 Stock right and creditor's right	(0.0163,0.0180,0.0199)	0.0181
18	D2 Industry scale	(0.0106,0.0166,0.0208)	0.0165
19	C4 Character of corporate operator	(0.0115,0.0148,0.0156)	0.0141
20	B7 Technology level of product and service	(0.0089,0.0109,0.0164)	0.0125
21	C6 Corporate governance	(0.0083,0.0113,0.0144)	0.0116
22	C5 Character of corporate history	(0.0075,0.0087,0.0119)	0.0095
23	C2 Corporate scale	(0.0041,0.0068,0.0102)	0.0074
24	C1 Quality of financial statement	(0.0042,0.0066,0.0079)	0.0064
25	C7 Contact relationship with banks	(0.0035,0.0035,0.0046)	0.0039

From the Table 2, loan supervisors of China commercial banks consider that the most important five loan assessments of sub-criteria toward small and medium enterprises are asset fluidity ( $R = 0.1370$ ), market risk and fluctuation ( $R = 0.0960$ ), security quantity and value ( $R = 0.0862$ ), financial leverage ( $R = 0.0796$ ) and credit rating record ( $R = 0.0757$ ). Above five sub-criteria all describe the debt-paying ability of enterprises. From the point, when loan assessment members of China commercial banks evaluate the loan assessment, they considering the debt-paying ability of enterprises are the most important proportion. Obviously, the most important thing for loan supervisors of China commercial banks is the asset fluidity of sub-criterion. Generally,

asset fluidity of enterprises mainly is composed by capital flow and cash flow. Smith (1980) and Ugurlu and Aksoy (2006) ever proved the similar point. Asset fluidity can sufficiently react the debt-paying ability, liquid asset ability, and capital receivable ability of enterprises.

The second influence power of sub-criterion is the market risk and fluctuation. The amount of capital and capital source, fewer economic factors, always limit the economic activities of small and medium enterprises. Bruderl and Schussler (1990) think that the limitation let small and medium enterprises be affected easily by market risk and fluctuation. At same time, market risk and fluctuation probably affect the debt-paying ability furthermore, causing the loss of banks. The third important sub-criterion is the security quantity and value. When debt-paying ability of an enterprise declines, related departments of banks can sell collateral to compensate the capital loss. More, loan supervisors of banks evaluate collateral provided by enterprises to assess the debt-paying ability of enterprises. Loan supervisors of banks can further evaluate the risk of enterprise breaching contracts. The rank fourth and fifth sub-criteria are records of financial leverage and credit rating. If small and medium enterprises have higher-debt ratio, debt-paying ability also declines. Therefore, financial leverage can be used to measure the relationship between an enterprise contracting a loan for operation and the degree of financial risk. The view point is as the same as (Ozdagli, 2012). Besides, commercial banks also analyze the credit assessment records of small and medium from past. Of course, the bad records of credit assessment of companies will face more strict-loan conditions and higher capital costs.

In the result of analysis, the three smallest sub-criteria of R value are corporate scale ( $R = 0.0074$ ), quality of financial statement ( $R = 0.0064$ ) and contact relationship with banks ( $R = 0.0039$ ). The result shows that 3 sub-criteria are not taken seriously by loan members of banks. Among the records, the degree of contact relationship with banks is the most unimportant assessment factor that loan evaluators consider. The possible reason is China commercial cannot quickly integrate the history records from enterprises and banks. When bank employees collect and judge the factuality of history records, they need more manpower a time cost. Small and medium enterprises of China usually deal with many banks in finance issues. Banks of bank industry compete to each other sharply. For the situation, banks will not exclude loans to customers, even though the customers have never cooperated before with banks. Moreover, the financial statement quality of sub-criterion also receives low evaluation scores.

Small and medium enterprises in Mainland China usually lack professional experts and financial compiling members who have experiences. The result causes that many financial reports that are compiled by small and medium enterprises are not accurate. In order to save the operation cost, some small and medium enterprises hire some accounting firms which charge cheap price for services to compile audited financial statement. Some small and medium enterprises also compile some inaccurate-financial reports for special purposes. The financial reports usually are bad quality and not reach standard and regulation. Therefore, loan supervisors do not strictly require the quality of financial reports of enterprises and also do not seriously consult references about financial reports. Finally, enterprise scale also is not the main point for loan evaluators of commercial banks. The reason may be the scale of small and medium enterprises similar, but the risk of breach contract is not the same. From the past loan experience, commercial banks find that the scale of an enterprise cannot accurately react the possibility of breach contract of an enterprise.

#### 4.2 FAHP Questionnaire Analysis of Taiwan Experts

The section has the same method as 4.2 that we interview 12 loan experts in Taiwan commercial banks. The result is as Table 3.

Table 3. FAHP analysis result of Taiwan expert questionnaire

Rank	Sub-Criteria	Final Fuzzy Weights	Defuzzier (R) Values
1	B1 Current situation of corporate revenue	(0.0970 ,0.1165 ,0.1165)	0.1103
2	B3 Corporate developing potentiality	(0.0611 ,0.0991 ,0.1095)	0.0920
3	B4 Corporate brand value	(0.0481 ,0.0807 ,0.0960)	0.0773
4	A5 Credit rating record	(0.0470 ,0.0749 ,0.0945)	0.0745
5	D3 Industrial growth	(0.0276 ,0.0724 ,0.0826 )	0.0651
6	A6 Security quantity and value	(0.0244 ,0.0370 ,0.0765)	0.0508
7	C4 Character of corporate operator	(0.0221 ,0.0523 ,0.0648)	0.0496
8	B2 Intangible asset value	(0.0242 ,0.0402 ,0.0704)	0.0486
9	A1 Asset liquidity	(0.0173 ,0.0445 ,0.0689 )	0.0481



Rank	Sub-Criteria	Final Fuzzy Weights	Defuzzier (R) Values
10	D4 Industrial stability	(0.0209, 0.0337, 0.0668)	0.0446
11	A3 Market risk and fluctuation	(0.0240, 0.0397, 0.0571)	0.0424
12	C5 Character of corporate history	(0.0269, 0.0390, 0.0558)	0.0421
13	C1 Quality of financial statement	(0.0300, 0.0378, 0.0497)	0.0400
14	B7 Technology level of product and service	(0.0231, 0.0310, 0.0535)	0.0380
15	B5 Enterprise marketing strategy	(0.0203, 0.0355, 0.0482)	0.0365
16	A7 Essential factor of guarantor	(0.0172, 0.0256, 0.0548)	0.0361
17	D2 Industry scale	(0.0204, 0.0244, 0.0531)	0.0356
18	D1 Industry differentiation	(0.0148, 0.0173, 0.0457)	0.0294
19	B6 Cost efficiency	(0.0175, 0.0199, 0.0378)	0.0266
20	C3 Stock right and creditor's right	(0.0115, 0.0164, 0.0353)	0.0234
21	C2 Corporate scale	(0.0104, 0.0181, 0.0338)	0.0229
22	A2 Financial leverage	(0.0093, 0.0129, 0.0274)	0.0182
23	C6 Corporate governance	(0.0088, 0.0112, 0.0256)	0.0169
24	A4 Cost of capital	(0.0092, 0.0126, 0.0205)	0.0149
25	C7 Contact relationship with banks	(0.0075, 0.0075, 0.0198)	0.0129

From Table 3, the weight scores of 5 sub-criteria such as current situation of corporate revenue ( $R = 0.1103$ ), corporate developing potentiality ( $R = 0.0920$ ), corporate brand value ( $R = 0.0773$ ), credit rating record ( $R = 0.0745$ ), industrial growth ( $R = 0.0651$ ) are higher. The pre-three terms describe the sub-criteria of enterprise profitability. From the practical analysis, when loaning to small and medium enterprises, loan supervisors of commercial banks in Taiwan consider that the enterprise profitability is an important standard of loan assessment. The analysis result indicates that sub-criteria can disclose the operation ability and short-term ability of current business turnover of enterprises, which is the most important consideration for loan supervisors. When current business turnover of enterprise is better, it presents the stronger management ability, and the risk of breach contract, being smaller during debt-paying period. The high income of enterprise in recent period implies the guaranty multiple of higher interest, and it also shows the safety of creditor's right. The second high-weight score of sub-criterion is corporate developing potentiality.

Current business turnover of enterprise reacts the operation achievement of enterprise. Nevertheless, development potential of enterprise predicts the future performance of enterprise. If current income of enterprise is fine but no development in the further, the future profitability of enterprise is also doubtful. Therefore, when loaning to an enterprise, bank loaners may adjust loan interest according to the development potential of enterprises. Besides, corporate brand value is the third important sub-criterion. Brand value of enterprise is the achievement of accumulation from constant economic activities. In Taiwan, people pay more attention to intellectual property right; brand value of enterprise cannot be easily imitated and copied by the similar enterprises. Usually, brands that are known by customers have more product requirement from consumers, and the brand owners also have higher profitability. When an enterprise has higher profitability, the risk of breach contract of loan is lower (Ohlson, 1980).

Table 3, at the same time, shows that the smallest three sub-criteria are corporate governance ( $R = 0.0169$ ), cost of capital ( $R = 0.0149$ ), and contact relationship with banks ( $R = 0.0129$ ). The result shows that loan supervisors of commercial banks in Taiwan do not pay attention to the three sub-criteria. Having the same viewpoint with China banks, loan supervisors of commercial banks in Taiwan consider that dealing relationship with banks is the most unimportant evaluation index. Some small and medium enterprises in Taiwan have stronger operation ability and not require borrowing money from banks. These enterprises have no high dealing relationship with banks, but banks also are pleased to do business with them. The weight scores rank second low and third low sub-criteria are capital cost and company management. The reason is that loan supervisors of commercial banks in Taiwan think the profit of enterprises can balance the risk of breach contract, which comes from capital cost. Furthermore, managers of small and medium enterprises also are the important shareholders of enterprises. Therefore, agent issue of small and medium enterprises in Taiwan is not clear. Corporate management issue also cannot efficiently disclose the risk of breach contract of small and medium enterprises in Taiwan.

#### 4.3 Comparison and Analysis

Comparing the practical evidence result of FAHP expert questionnaires between China and Taiwan, the study finds that loan assessment institution of small and medium enterprises of commercial banks about two areas is

very different. In other words, loan supervisors of commercial banks are not exactly using the same index or assessment standards to consider loans that are borrowed by enterprises. Generally speaking, loan supervisors of commercial banks in Taiwan broadly choose assessment standards. Nevertheless, loan supervisors of China commercial banks always focus on some standards when auditing loan cases. Undeniably, the result of practical evidence of the study can provide references for loan evaluators in China and Taiwan. If commercial banks of Taiwan go to China to set up branches and expand loan businesses, the conclusion of the study also has reference values for banks.

The result of practical evidence discloses some interesting facts. First, loan evaluators of Taiwan commercial banks consider the profitability is the most important assessment standard but loan supervisors of China commercial banks think the debt-paying ability is the most important. Therefore, the result of practical evidence proves that China commercial banks pay more attention to collateral quantity and value than commercial banks of Taiwan. The result also indirectly proves that China commercial banks are worried about financial difficulties caused by decision makers of small and medium enterprises because of personal subject consciousness. Second, obviously, China commercial banks pay more attention on small and medium enterprises to use financial decisions of financial leverage than Taiwan commercial banks. When facing economy recession of global or some areas, enterprises owning higher financial leverage are easier to face the bigger financial risk. When pre-tax earnings are higher than interest payment, loan money for investment can bring profit for company. On the contrary, if interest payment is higher than pre-tax earnings, enterprise will get loss. In Taiwan, loan evaluators of commercial banks in Taiwan pay more attention on profitability of enterprises, so they do not focus on the financial leverage.

Third, loan evaluators of commercial banks of China and Taiwan all think highly of credit assessment records of enterprises. Credit assessment records are considered the most direct and easiest references of valid assessments of corporate loans. Excellent credit records usually show that enterprises pay interests and debt-paying ability and will. Fourth, the degree of dealing relationship between banks and enterprises is the most unimportant evaluation for loan evaluators of commercial banks in China and Taiwan. The sign has showed that banks probably are all located in industry that has high competitive environment. Finally, as the whole factors are concerned, commercial banks in China or Taiwan all focus on financial factor more than non-financial factor. The result shows that loan supervisors of commercial think that the non-financial factor of loan assessment system is the most difficult to be quantized and assessed. As the result, banks also incline to financial index to be the foundation for decision-making policy.

## 5. Conclusion

Following to the America and Europe economy integration and popularity of global regionalism, Asia countries base on protecting region interest and increasing international status, so they aggressively participate in regional finance cooperation. These Asia countries devote to decreasing dependence from national finance organization and advance countries. The convention of regional finance cooperation becomes the focal point of various countries. Simultaneously, commercial banks in Asia also contribute to enforce supervision and supervision structure and construct perfect risk-control institution. In the situation, China commercial banks try to receive high interest and reduce risk in China and Asia financial market. Taiwan commercial banks also want to expand business territory in Mainland China. As financial market in China and Taiwan has fast development, commercial banks sometimes cannot effectively audit the loan qualification of small and medium enterprises. The situation lets commercial banks need to be responsible for unnecessary the risk of breach contract. The study uses China and Taiwan commercial banks to be the study subject. The main purpose of the study is to analyze and discuss the assessment system and influence factor of loan of commercial banks toward commercial banks. In order to reach the purpose of the study as mentioned above, the study uses modified Delphi approach and FAHP in MCDM to become study method.

The result of practical evidence in the study shows that there are different loan assessment measures between China and Taiwan. When China commercial banks evaluate loan issues of small and medium enterprises, asset fluidity, market risk and fluctuation, collateral quantity and value, financial leverage and record of credit assessment are the main points for commercial banks in China. In other words, China commercial banks regard debt-paying ability as the first consideration for loaning. On the contrary, Taiwan commercial banks pay more attention to current business turnover of enterprise, corporate development potential, enterprise brand value, credit assessment record and industrial growth. Put it another way, profitability of enterprise is the first priority for Taiwan commercial banks to loan money. As Taiwan banks are concerned, when they aggressively enter China financial market, simultaneously, they require to reevaluate the measure for the risk of breach contract of small and medium enterprises. Taiwan commercial banks can enforce the assessment of debt-paying ability of

China enterprises. As the whole situation is concerned, analyzing the loan of decision-making approach of commercial banks toward small and medium enterprises can effectively evaluate the risk of breach contract of enterprises. Commercial banks can use more appropriate methods to settle scientific and data function for credit assessment model. This model can let commercial banks operate loan businesses become more efficient. Considerable human resource, operation cost, capital cost and time cost also can be saved. Commercial banks have sources to expand other businesses or increase the quality of loan businesses. Of course, the most important thing is to reduce commercial banks themselves to burden the risk of breach contract.

Another, financial market in different regions, debt-paying ability of enterprise, profitability, non-financial factor of enterprise, and industrial environment index present the various risks of breach contracts of enterprises. In other words, commercial banks need to design special model of credit assessment for enterprises in that market. It does not matter that whether commercial banks belong to China or Taiwan, they all need to avoid a vicious circle of horizontal competition. In order to gain business, loan evaluators of commercial banks focus on immediate interest and then ignore the potential risk. Hence, for increasing profit stably, commercial banks need to analyze and control loan assessment standard accurately, and update and upgrade the self-evaluative model. Through the loan decision-making measure of commercial banks of China and Taiwan, bank superintendents can improve current loan procedure. Decreasing loan risk can help banks to increase higher profitability. The study result not only can reimburse the insufficient articles of related studies, but also can be an important reference for commercial bankers to set up loan assessment standard.

## References

- Adler, M., & Ziglio, E. (1996). *Gazing into the oracle: The Delphi method and its application to social policy and public health*. Jessica Kingsley Publishers.
- Alves, J. R. (1978). *The prediction of small business failure utilizing financial and nonfinancial data*. Ph. Dissertation, University of Massachusetts.
- Asamow, E. (1995). Measuring the hidden risk in corporate. *Commercial Lending Review*, 10(1), 24-32.
- Barclay, M. J., & Smith, C. W. (1995). The maturity structure of corporate debt. *The Journal of Finance*, 50(2), 609-631.
- Beaver, W. H. (1966). Financial ratios as predictors of failure. *Journal of Accounting Research*, 71-111. <http://dx.doi.org/10.2307/2490171>
- Bellman, R. E., & Zadeh, L. A. (1970). Decision-making in a fuzzy environment. *Management Science*, 17(4), B-141. <http://dx.doi.org/10.1287/mnsc.17.4.B141>
- Berger, A. N., & Udell, G. F. (1990). Collateral, loan quality and bank risk. *Journal of Monetary Economics*, 25(1), 21-42. [http://dx.doi.org/10.1016/0304-3932\(90\)90042-3](http://dx.doi.org/10.1016/0304-3932(90)90042-3)
- Berger, A. N., & Udell, G. F. (1995). Relationship lending and lines of credit in small firm finance. *Journal of Business*, 68, 351-381. <http://dx.doi.org/10.1086/296668>
- Berger, A. N., & Udell, G. F. (2002). Small business credit availability and relationship lending: The importance of bank organisational structure. *The Economic Journal*, 112(477), 32-53. <http://dx.doi.org/10.1111/1468-0297.00682>
- Boot, A. W., Thakor, A. V., & Udell, G. F. (1991). Credible commitments, contract enforcement problems and banks: Intermediation as credibility assurance. *Journal of Banking and Finance*, 15(3), 605-632.
- Boot, A. W., & Thakor, A. V. (1997). Financial system architecture. *Review of Financial Studies*, 10(3), 693-733. <http://dx.doi.org/10.1093/rfs/10.3.693>
- Booth, J. R. (1992). Contract costs, bank loans, and the cross-monitoring hypothesis. *Journal of Financial Economics*, 31(1), 25-41. [http://dx.doi.org/10.1016/0304-405X\(92\)90010-U](http://dx.doi.org/10.1016/0304-405X(92)90010-U)
- Bruderl, J., & Schussler, R. (1990). Organizational mortality: The liabilities of newness and adolescence. *Administrative Science Quarterly*, 35, 530-547. <http://dx.doi.org/10.2307/2393316>
- Buede, D. M., & Maxwell, D. T. (1995). Rank disagreement: A comparison of multi-criteria methodologies. *Journal of Multi-Criteria Decision Analysis*, 4(1), 1-21. <http://dx.doi.org/10.1002/mcda.4020040102>
- Chan, Y. S., & Kanatas, G. (1985). Asymmetric valuations and the role of collateral in loan agreements. *Journal of Money, Credit and Banking*, 17, 84-95. <http://dx.doi.org/10.2307/1992508>
- Chan, Y. S., & Thakor, A. V. (1987). Collateral and competitive equilibria with moral hazard and private

- information. *The Journal of Finance*, 42(2), 345-363.
- Chen, L. (2013). *Regional financial risk prevention research*. Master's thesis, Hebei University China.
- Cheng, Y. W. (2004). Using non-financial information to predict bankruptcy: A study of public companies in Taiwan. *International Journal of Management*, 21(2), 194.
- Cole, S., Kanz, M., & Klapper, L. (2015). Incentivizing calculated risk-taking: Evidence from an experiment with commercial bank loan officers. *The Journal of Finance*, 70(2), 537-575. <http://dx.doi.org/10.1111/jofi.12233>
- Couper, M. R. (1984). The Delphi technique: Characteristics and sequence model. *ANS. Advances in Nursing Science*, 7(1), 72-77. <http://dx.doi.org/10.1097/00012272-198410000-00008>PMid:6435511
- Degryse, H., & Van, C. P. (2000). Relationship lending within a bank-based system: Evidence from European small business data. *Journal of Financial Intermediation*, 9(1), 90-109. <http://dx.doi.org/10.1006/jfin.1999.0278>
- Dichev, I. D., & Skinner, D. J. (2002). Large-sample evidence on the debt covenant hypothesis. *Journal of Accounting Research*, 40(4), 1091-1123.
- Gentry, J. A., Newbold, P., & Whitford, D. T. (1987). Funds flow components, financial ratios, and bankruptcy. *Journal of Business Finance and Accounting*, 14(4), 595-606. <http://dx.doi.org/10.1111/j.1468-5957.1987.tb00114.x>
- Graham, J. R., Li, S., & Qiu, J. (2008). Corporate Behavioral, and Bank Loan Contracting. *Financial Economics*, 89(1), 44-61.
- Jagtiani, J., Kolari, J., Lemieux, C., & Shin, H. (2003). Early warning models for bank supervision: Simpler could be better. *Economic Perspectives-federal Reserve Bank of Chicago*, 27(3), 49-59.
- Hall, R. (1992). The strategic analysis of intangible resources. *Strategic Management Journal*, 13(2), 135-144. <http://dx.doi.org/10.1002/smj.4250130205>
- Kaplan, R. S., & Norton, D. P. (2004). Measuring the strategic readiness of intangible assets. *Harvard Business Review*, 82(2), 52-63.
- Keasey, K., & Watson, R. (1987). Non-financial symptoms and the prediction of small company failure: A test of argenti's hypotheses. *Journal of Business Finance and Accounting*, 14(3), 335-354.
- Hester, D. D. (1979). Customer relationships and terms of loans: Evidence from a pilot survey: A note. *Journal of Money, Credit and Banking*, 11(3), 349-57. <http://dx.doi.org/10.2307/1991796>
- Huyhebaert, N., Gaeremynck, A., Roodhooft, F., & Van, G. L. M. (2000). New firm survival: The effects of start-up characteristics. *Journal of Business Finance and Accounting*, 27(5-6), 627-651.
- Hwang, C. L., & Yoon, K. (1981). *Multiple Attribute Decision Making: Methods and Applications*. New York: Springer-Verlag.
- Laster, D. (2003). Insurance Company Ratings. *Swiss Re Sigma*, 4, 23-39.
- Leibenstein, H. (1966). Allocative efficiency vs. X-efficiency. *The American Economic Review*, 392-415.
- Liu, J., Li, X., & Yi, S. (2013). Our country commercial bank performance evaluation index system design. *Commercial Times*, 33, 72-73.
- Longenecker, J. G., Moore, C. W., & Petty, J. W. (1997). *Credit scoring and the small business: A review and the need for research*. In a Paper Presented in USASBE 1997 National Conference, San Francisco, California.
- Mensah, Y. M. (1984). An examination of the stationarity of multivariate bankruptcy prediction models: A methodological study. *Journal of Accounting Research*, 380-395. <http://dx.doi.org/10.2307/2490719>
- Morsman, E. J. (1986). Commercial Loan Structuring. *Journal of Commercial Bank Lending*, 68, 2-20.
- Murry, J. J. W., & Hammons, J. O. (1995). Delphi: A versatile methodology for conducting qualitative research. *Review of Higher Education*, 18(4), 423-36.
- Igawa, K., & Kanatas, G. (1990). Asymmetric information, collateral, and moral hazard. *Journal of Financial and Quantitative Analysis*, 25(4), 469-490.
- Ohlson, J. A. (1980). Financial ratios and the probabilistic prediction of bankruptcy. *Journal of Accounting Research*, 18(1), 109-131. <http://dx.doi.org/10.2307/2490395>

- Oyama, T., & Tanaka, H. (2003). Macroeconomic factors behind the rapid increase in Japanese banks' loan losses: Analysis of the interrelation between bad loans and the macroeconomy. *Bank of Japan, Mimeo Bank Examination*.
- Ozdogli, A. K. (2012). Financial leverage, corporate investment, and stock returns. *Review of Financial Studies*, 09-13. <http://dx.doi.org/10.1093/rfs/hhr145>
- Parenté, F. J., & Anderson-Parenté, J. K. (1987). Delphi inquiry systems. *Judgmental Forecasting*, 129-156.
- Parr, R. L. (1991). *Investing in intangible assets: Finding and profiting from hidden corporate value*. John Wiley & Sons Inc.
- Petersen, M. A., & Rajan, R. G. (1994). The benefits of lending relationships: Evidence from small business data. *The Journal of Finance*, 49(1), 3-37. <http://dx.doi.org/10.1111/j.1540-6261.1994.tb04418.x>
- Petersen, M. A., & Rajan, R. G. (1995). The effect of credit market competition on lending relationships. *The Quarterly Journal of Economics*, 407-443. <http://dx.doi.org/10.2307/2118445>
- Rajan, R. G. (1992). Insiders and outsiders: The choice between informed and arm's-length debt. *The Journal of Finance*, 47(4), 1367-1400. <http://dx.doi.org/10.1111/j.1540-6261.1992.tb04662.x>
- Rajan, R. G., & Winton, A. (1995). Covenants and collateral as incentives to monitor. *The Journal of Finance*, 50(4), 1113-1146. <http://dx.doi.org/10.1111/j.1540-6261.1995.tb04052.x>
- Richardson, F. M., Kane, G. D., & Patricia, G. (1998). The impact of recession on the prediction of corporate failure. *Journal of Business Finance and Accounting*, 23(1-2), 167-186. <http://dx.doi.org/10.1111/1468-5957.00182>
- Saaty, T. L. (1980). *The Analytic Hierarchy Process*. New York, NY: McGraw-Hill.
- Saleem, Q., & Rehman, R. U. (2011). Impacts of liquidity ratios on profitability. *Interdisciplinary Journal of Research in Business*, 1(7), 95-98.
- Shin, K. S., & Han, I. (2001). A case-based approach using inductive indexing for corporate bond rating. *Decision Support Systems*, 32(1), 41-52.
- Skaife, H. A., Veenman, D., & Wangerin, D. (2013). Internal control over financial reporting and managerial rent extraction: Evidence from the profitability of insider trading. *Journal of Accounting and Economics*, 55(1), 91-110. <http://dx.doi.org/10.1016/j.jacceco.2012.07.005>
- Smith, C. W., & Warner, J. B. (1979). On financial contracting: An analysis of bond covenants. *Journal of Financial Economics*, 7(2), 117-161.
- Smith, C. W. (1980). On the theory of financial contracting: The personal loan market. *Journal of Monetary Economics*, 6(3), 333-357. [http://dx.doi.org/10.1016/0304-3932\(80\)90046-X](http://dx.doi.org/10.1016/0304-3932(80)90046-X)
- Sohn, S. Y., & Kim, H. S. (2007). Random effects logistic regression model for default prediction of technology credit guarantee fund. *European Journal of Operational Research*, 183(1), 472-478. <http://dx.doi.org/10.1016/j.ejor.2006.10.006>
- Steel, W. F., & Takagi, Y. (1983). Small enterprise development and the employment-output trade-off. *Oxford Economic Papers*, 35(3), 423-446.
- Swary, I., & Udell, G. F. (1988). *Information production and the decured line of credit*. In New York University New York, NY Working paper.
- Uchida, H., & Nakagawa, R. (2007). Herd behavior in the Japanese loan market: Evidence from bank panel data. *Journal of Financial Intermediation*, 16, 555-583. <http://dx.doi.org/10.1016/j.jfi.2007.03.007>
- Ugurlu, M., & Aksoy, H. (2006). Prediction of corporate financial distress in an emerging market: The case of Turkey. *Cross Cultural Management: An International Journal*, 13(4), 277-295.
- Van, L. P. J. M., & Pedrycz, W. (1983). A fuzzy extension of Saaty's priority theory. *Fuzzy Sets and Systems*, 11, 229-241. [http://dx.doi.org/10.1016/S0165-0114\(83\)80082-7](http://dx.doi.org/10.1016/S0165-0114(83)80082-7)
- Zhang, Z. L. (2013). Identification of credit risk of personal loan in commercial bank based on SVM. *In Applied Mechanics and Materials*, 281, 682-687. <http://dx.doi.org/10.4028/www.scientific.net/AMM.281.682>

**Copyrights**

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/3.0/>).