The Performance Evaluation of Chinese Commercial Banks under the "Equator Principle"

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Abstract—**The implementation of "the equatorial principle" in commercial banks is of great significance for reducing the risk of project financing, fulfilling corporate social responsibility and realizing the sustainable development of society, economy and environment. This study examined the performance of commercial banks in order to analyze the operational strategies of commercial banks under the equator principle. Based on the DEA method, this paper made a comparative analysis on the operating efficiency of 10 commercial banks in China from 2009 to 2015, and focused on measuring the efficiency of industrial bank the Equator Principle. According to the results of efficiency evaluation, this paper analyzed the influencing factors of commercial banks' operating efficiency, and put forward the sustainable development strategy of commercial banks.**

Keywords—Equator Principle; DEA Method; Commercial Bank; Tobit Model; Performance Evaluation

I. INTRODUCTION

According to the "2016 China Climate Bulletin" issued by the China Meteorological Administration, the country appeared 8 large-scale, persistent moderate to severe haze weather events in 2016, the harsh environment seriously affected people's production and life, restricted the sustainable development of the economy. As the core of modern economy and capital circulation hub, finance plays a fundamental role in resource allocation, which has an important influence on guiding social capital flow, promoting industrial structure adjustment and economic green transformation. "the equatorial principle" is a financial industry standard to judge, evaluate and manage the environmental and social risks in project financing. It is a set of voluntary financial industry benchmarks established by the major financial institutions of the world in accordance with the sustainable development policies and guidelines of international financial companies. The implementation of equator principle by commercial banks is of great practical

significance in reducing the risk of project financing and alleviating the contradiction between economic development and environmental protection and social sustainable development.

II. THEORETICAL SUMMARY

As a product of the global corporate social responsibility movement, the core of the equator principle is to restrict the financing of projects that do not conform to the equator principle by conducting a prudent investigation or conducting project financing consultation, which establishes the lowest industry standard for the International Project financing environment and society for the first time. It represents the development direction of the future commercial Bank to promote the social responsibility and carry out the overall risk control.

It is relatively late to study the equator principle in China. Zhang Changlong first introduced the concept of equator principles into China, and pointed out that the equator principle was committed to helping commercial banks to judge, assess and manage environmental and social risks in project financing, which is the lowest industry standard of environmental and social for international project financing. [1] GaoShan, Tang Bin, etc. proposed that the equator principle is beneficial to the sustainable development of the bank, and put forward some suggestion to the domestic financial institution to implement the equator principle. [2] [3] Ma Yongfei, Du Zhaoyun used financial data to study the impact of "the Equator Principles" on the operating efficiency of China's commercial banks in the short and medium-term based on a global principal component analysis method. [4]Hu Po, Qiang Xiaojie made a reflection on the environment of our financial institutes and social responsibility, based on "the equatorial principle", and pointed out that the equator principle was the strategic choice and development direction of the environment and social responsibility of our financial institutions. [5] Though "the equatorial principle" is so promising, there is little literature to

make qualitative research on it. For example, to our knowledge, only Industrial Bank(CIB) adopted "the equatorial principle" in China. It is because the research data is limited and difficult to find.

The practice of foreign financial institutions showed that the implementation of the equator principle by commercial banks is helpful to strengthen the management of financing risk, gain a good reputation, maintain or enlarge the market share; it is beneficial to comply with the needs of the development of the times, satisfy the standards of the international financial industry, and go out to participate in the financing of international projects. However, because of different national conditions, we have to face two problems after implement the equator principle. First, whether the domestic commercial banks can maintain the original operating efficiency does not decline. And second, when the development of their own goals and social goals are unified, whether to achieve the "Win-Win" of economic benefits and social values.

Based on the characteristics of commercial banks and the Equator Principles, this paper chose DEA method to make a comparative analysis of the performance of commercial banks, tried to study the influence of the equator principle on the operating efficiency of our commercial banks, and then analyzed the influence factors of the efficiency value by Tobit model, and sought the path of sustainable development of commercial banks.

III. ANALYSIS METHOD AND SAMPLE SELECTION

A. Selection of sample and variable of model

On October 31, 2008, Industrial Bank(CIB) publicly committed to adopt the Equator principle as the world's 63rd, the only equatorial bank in China. This paper selected the data from Industrial Bank(CIB) and compared 5 shareholding commercial banks and 4 state-owned commercial banks as samples from 2009 to 2015.

The rationality of DEA model operation requires that the number of decision unit is more than twice times of the sum of input and output items, the net fixed assets and the total number of employees are used as input variables, and total loans and total profits as output variables. The sample data was directly from the annual reports published by each commercial bank or indirectly by the annual reports of commercial banks.

The correlation analysis of input and output indicators, as shown in Table 1, shows that the input and output indicators of 10 commercial banks from 2009 to 2015 are highly positive correlated, and the correlation coefficient is above 0.9. It indicates that when the investment of the fixed assets and personnel elements increases, the loan ceiling and the total profit also increase correspondingly, which is in line with the same the requirement of the DEA model, and the result of the model evaluation are more available. Therefore, the input and output indicators selected in this paper are reasonable.

TABLE I.   CORRELATION ANALYSIS OF INPUT-OUTPUT INDICATOR

Indicator/Correlation	Loan ceiling	Total profit
Net fixed assets	0.960	0.912
The number of employees	0.953	0.930

B. Model establishment

From the current research results, there are a variety of factors affecting the operational efficiency of commercial banks. This paper referred to the factors selected by other scholars, and combined the main operating indicators of commercial; the following Tobit model is established:

$$Y = \alpha + \beta_1 ROA + \beta_2 NIRR + \beta_3 LDR + \beta_4 NPL + \beta_5 CIR + u_i$$

Note: Y is the operational efficiency of commercial banks calculated by super efficiency DEA model.

The specific assumptions of the model are as follows:

1) Profitability. Profitability reflects the ability of commercial banks to gain profit. It is the main index to measure the current income level of commercial banks and the persistence and growth of future profit. The return on assets (ROA) is used as an index to measure profitability, and it is assumed that profitability is positively related to the operating efficiency of commercial banks.

2) Innovation ability. Financial innovation is the main channel to improve the performance and efficiency of commercial banks. Non-interest income is mainly income generated by intermediary business income and consulting and investment activities, most of which depend on innovation business. If choose non-interest income ratio (NIRR) index, and assume that the bigger the index, the stronger financial innovation ability of commercial Bank, the higher operating efficiency.

3) Asset allocation capability. The ability of asset allocation reflects the level of decisions made by commercial banks to the type, quantity and structure combination of assets and liabilities held by them. It is generally believed that the loan-deposit ratio (LDR) is the main indicator to reflect the asset allocation ability of commercial banks. This paper assumes that this index is positively correlated to the operational efficiency of commercial banks.

4) The security of credit assets. The non-performing loan ratio (NPL) is an important index to measure the security status of commercial banks' credit assets. This paper assumes that the higher the NPL is, the lower the operating efficiency of commercial banks is, and the negative correlation is found between them.

5) Managerial and administrative expertise. The cost income ratio (CIR) is an important index to assess the management level and economic benefit of commercial banks, which reflects the cost of the income of each unit's income. This paper assumed that the lower the CIR, the higher the management level of the commercial banks caused the higher the operating efficiency.

IV. EMPIRICAL COMPARISON AND ANALYSIS CONCLUSION

A. Comparative analysis of operating performance

The input and output data of 10 commercial banks from 2009 to 2015 were entered into the super efficiency DEA model and the results of the evaluation of operating efficiency of commercial banks were obtained, as shown in Table 2.

From the results of the super efficiency DEA evaluation of Table 2, it can be seen that the operating efficiency of the joint-stock commercial banks is higher than the state-owned commercial banks on the whole. Industrial Bank, which implements "the equatorial principle", ranked first among the 10 commercial banks is 1.5411, and the lowest is the Agricultural Bank with 0.3254 in terms of the average value of super-efficiency DEA. The operating efficiency of the joint-stock commercial banks is higher than that of the state-owned commercial banks, and Industrial Bank is much higher than other comparable commercial banks in terms of operational efficiency through the super efficiency DEA trend Chart of Commercial Banks from 2009 to 2015.The super efficiency DEA trend Chart of Industrial Bank and other comparable joint-stock commercial banks shows the U-shape trend, which is mainly due to the heavy damage of the real economy under the impact of the international financial crisis in 2008. It has more and more impacts on commercial banks, the rate of non-performing loans is rising, and the commercial banks face enormous pressures of operation and profit.

According to the results of super efficiency DEA analysis, the comprehensive technical efficiency, pure technical efficiency and scale efficiency are all up to DEA effective since Industrial Bank announced its accession to the Equator principles in 2008.This shows that, after the implementation of "the equatorial principle", Industrial Bank has not affected its operational efficiency by taking into account the selective lending of social and environmental issues in the financing decisions. On the contrary, it has maintained a stable DEA efficiency.

TABLE II.   THE RESULTS OF THE 2009-2015 SUPER EFFICIENCY DEA EVALUATION OF EACH COMMERCIAL BANK

| Bank	2009	2010	2011	2012	2013	2014	2015	Mean
CIB	1.95	1.84	1.46	1.36	1.23	1.37	1.59	1.541
CMB	0.71	0.86	0.91	0.80	0.73	0.72	0.80	0.789
HB	0.81	0.90	0.75	0.72	0.72	0.73	0.69	0.760
SPDB	1.08	1.13	1.13	1.21	1.28	1.24	1.22	1.186
CNCB	1.04	0.95	0.97	0.93	0.91	1.00	1.16	0.995
CMBC	0.85	0.84	0.85	0.82	0.75	0.71	0.74	0.793
BOC	0.53	0.57	0.51	0.53	0.55	0.59	0.64	0.559
ICBC	0.55	0.62	0.59	0.58	0.55	0.55	0.56	0.572
CCB	0.58	0.62	0.58	0.58	0.55	0.57	0.61	0.584
ABC	0.25	0.30	0.31	0.33	0.33	0.36	0.40	0.325
Mean	0.83	0.86	0.81	0.79	0.76	0.78	0.84	
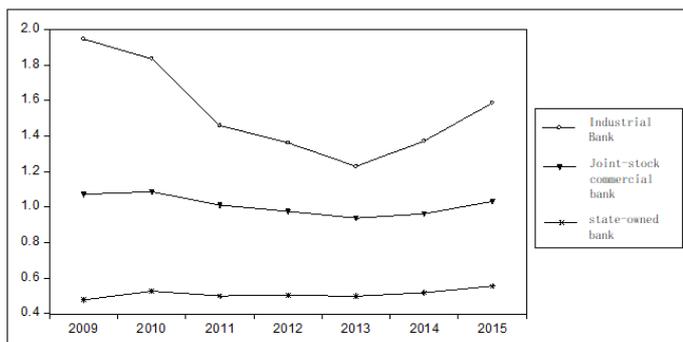
Fig. 1.   Super efficiency DEA trend Chart of Commercial Banks 2009-2015

B. Analysis on the influencing factors of Bank efficiency

Build the Panel data model; the results of super-efficiency evaluation of 10 commercial banks from 2009 to 2015 were analyzed by Tobit regression analysis, including total asset yield, non-interest income ratio, deposit and loan ratio, non-performing loan ratio and cost-income ratio. The data were derived from the annual report of the commercial banks or indirectly calculated from the annual report. The results of the analysis are as follows:

TABLE III.   REGRESSION RESULTS OF INFLUENCING FACTORS ON OPERATING EFFICIENCY OF COMMERCIAL BANKS

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	3.109307	0.680761	4.5674	0
ROA	-0.920428	0.204698	-4.496506	0
NIRR	-0.010562	0.005405	-1.954054	0.0507
LDR	0.010028	0.006431	1.559209	0.1189
NPL	-0.414005	0.084608	-4.893215	0
CIR	-0.038184	0.00569	-6.711067	0

As shown in Table 3, the return on assets (ROA), the non-performing loan rate (NPL) and the cost and income ratio (CIR) pass the significant test, and the non-interest income ratio (NIRR) reaches a significant level of 10%, indicating that the profitability, the security of the credit assets, the management level and the innovation ability have a significant impact on the operating efficiency of the commercial banks. And the loan-deposit ratio (LDR) has a positive effect to the efficiency of the bank, but at present, the impact is weak. The concrete results are as follows:

1) The return on assets (ROA) coefficient is negative, reaching a significant level of 1%, which indicates that the profitability of commercial banks has a great impact on bank efficiency. However, the profitability has a negative correlation with the operating performance of commercial banks. It is inconsistent with assumptions. It can be seen from the core matching scatter diagram of the super-efficiency evaluation value (Y) and the return on assets (ROA) in Fig. 2, it can be seen that in the range of ROA less than 0.6 and bigger than 1.2, the profitability is negatively related to the operating performance of commercial banks, indicating that it is unfavorable to improve the operating efficiency of commercial banks whether the ROA is too high or too low. ROA should be controlled in a reasonable interval, and the increase of profitability will promote the operating performance of commercial banks.

2) The non-interest income ratio (NIRR) coefficient is negative, which has strong correlation with bank efficiency. As can be seen from figure 2, the impact of innovation ability on efficiency banks presents three stages, a first rise, then fall, and rise again. In order to promote the innovation ability has a positive effect on the operation efficiency of banks, it is necessary to control the non-interest income to 0-5 or more than 30. It is obvious that commercial banks need to enlarge their external business and increase the proportion of non-interest income in operating income in order to enhance their operating efficiency.

3) The loan-deposit ratio (LDR) is positively correlated with the operating efficiency of commercial banks, which is consistent with previous assumptions, but with a low level of significance. It shows that, although the allocation of assets has little impact on the efficiency banks at present, it cannot ignore the level of decisions made by commercial banks to the type, quantity and structure combination of assets and liabilities held by them.

4) The non-performing loan rate (NPL) and the cost and income ratio (CIR) reflect the security of credit assets and management level. The both coefficient is negative and consistent with previous assumptions, all reach a significant level of 1%. It shows that the security of credit assets and the level of management are the important factors, which affect the operational efficiency of commercial banks, and should pay more attention to control non-performing loans and strengthen the level of management.
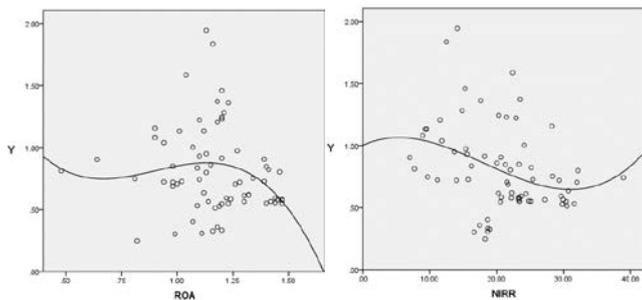

Fig. 2. The core matching scatter chart of Super efficiency evaluation value and its influence factors

V. THE OPERATING STRATEGY OF COMMERCIAL BANKS UNDER THE EQUATOR PRINCIPLE

This paper selected the net fixed assets and the total number of employees as the input variables of the commercial banks, the total amount of loans and the total profits as output variables, and made a quantitative study on the operating efficiency of the 10 commercial banks 2009-2015 though the DEA method. The influencing factors of commercial banks' operation efficiency were analyzed by taking the evaluation value of the commercial banks' super efficiency as the dependent variable. The business strategy of commercial banks under "the Equator Principles" is as follows

1) Commercial banks should firmly implement the equator principle, fulfill corporate social responsibility, set up the strategic thought of sustainable development, and combine the economic goals with corporate social responsibility organically. The equator principle makes the project financing business of commercial banks more competitive in the area of green environment, broadens the project financing business channels, and good corporate image will result in positive social impact, more conducive to the development of project financing business, as well as the optimization of loan structure.

2) The commercial banks should innovate the investment mode, leverage the capital elements to the industries supported by the equator principle, improve the innovation ability and increase the proportion of non-interest income in the operating income, and strength the construction of the internal system.

We should improve the management level, prepare for joining the equator principle, set up a complete supporting system for the implementation of the equator principle, and put it into place.

3) Under the equator principle, commercial banks should constantly improve their innovative ability, prevent social and environmental risks, transfer the direction of credit assets to energy-saving and environmental-friendly enterprises, strengthen the management level, ensure the security situation of credit assets by reducing non-performing loans, and constantly improve the operational efficiency of banks.

4) The commercial banks should strengthen talent reserve and training, train employees in credit, law, project financing and other aspects of business, hire and reserve some social and environmental experts or industry environmental Professionals as external consultants. The corporate social responsibility is raised to the bank's corporate culture, and we should permeate the concept of Equator principle to all aspects of the banking project financing business.

VI. CONCLUSION

The results of this study showed that the operating efficiency of Industrial Bank has always been DEA effective after joining "the equatorial principle", and because of the consideration of resources and environmental problems in the investment and financing decision, the total amount of loans and profits have not declined instead of still maintain a steady growth momentum. The influencing factors of commercial banks' operation efficiency include profitability, innovation ability, security of credit asset and the level of management, commercial banks should control the profit level and innovation ability in a reasonable interval, pay more attention to control non-performing loan, strengthen the management level, and can't neglect the rational allocation of assets and liabilities. Therefore, the equator principle not only will not reduce the operating income and market share of commercial banks, but also will make commercial banks build up their corporate image, broaden business channels, optimize loan structure, maintain higher management efficiency and management level. Besides, commercial banks should conform to the needs of the times, fulfill their social responsibilities and actively implement the Equator Principles.

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