Study on Chinese Commercial Bank's CSR Efficiency and Sustainable Development through Corpus Analysis and DEA Model

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Abstract

By applying the efficiency DEA model and corpus analysis tool Antconc into the analysis of Corporate Social Responsibility report (CSR report) and taking commercial banks' performance of CSR as an input which may bring banks effective output, this research investigates CSR input-output efficiency and the achievement of sustainable development of China's major commercial banks by means of qualitative, quantitative and comparative analysis on the basis of the outcome of DEA empirical study. DEA model finds that the CSR input efficiency of 6 smaller commercial banks including China Citic Bank (CITIC Bank), Huaxia Bank (HB), China Guangfa Bank (CGB), China Merchants Bank (CMB), China Industrial Bank (CIB)and China Bohai Bank(CBB); the other 9 commercial banks including the 4 big banks in China are the inefficient banks. Then 30 keywords and 6 semantic domains of DEA efficient banks' CSR reports are summarized relative to DEA inefficient banks' through corpus tool's keyword analysis. Based on discursive context of CSR reports and characteristics of commercial banks sustainable development, this research finds that DEA efficient banks achieve a better sustainable development than DEA inefficient banks in corporate culture, stakeholder concern, marketization level, application of Fintech, green finance and business innovation, reference to exterior supervision mechanism. In the end, several advices are given for China commercial banks to improve their CSR input efficiency and achieve sustainable development. Different from the previous single linguistic perspective of CSR report, this study uses corpus tool for text analysis on the basis of empirical research on economic efficiency model. The combination of the two can avoid the subjectivity of traditional linguistic research, making the results of text analysis can more effectively serve the improvement of CSR input efficiency of commercial banks in order to to achieve better sustainable development. At the same time, this research also enriches the study of business discourse analysis such as CSR reports.

Keywords:CSR input; efficiency; DEA; sustainable development; commercial banks

1 Introduction

As China has gradually entered the transition period, with the fast development of the economy, the outbreak of many social issues has also aroused strong public concern. Corporate social responsibility, CSR for short, has gradually become a topic of public concern and discussion. Michael Porter, the father of the competition strategy, once pointed out that corporate social responsibility is not just a cost but also a source of opportunity, innovation and competitiveness（Porter, 2006.The investment in CSR is not only a manifestation of corporate social responsibility, but also a strategic choice for enterprises to enhance their economic and social benefits, so it becomes an inevitable choice for corporate development. The improvement of CSR not only relies on the input of the company in social responsibility, but also depends on whether the company can reach its expected goal, that is, the efficiency of the CSR input.

Nowadays, the study of corporate social responsibility issues in the coal, food, and pharmaceutical industry has been relatively in-depth, but the study of corporate social responsibility in the commercial banks is still in its infancy. As the most important supplier of social financing under the background of supply-side structural reform, the commercial banks provide the core strength for China's social stability and sustainable development of China's economy. Compared with general enterprises, the fulfillment of the commercial banks' CSR has a radiation effect. The commercial banks can affect their customers' and related industries' CSR performance through green credit policy and investment concepts. In addition, while performing CSR, the commercial banks can realize the optimal allocation of social financial resources, the control of risks, the protection of environment and the reduction of energy consumption through the capital's leading function, thus achieving the sustainable development of economy and environment. Fundamentally, the commercial banks promote the harmonious development and mutual benefit among the banks themselves, the environment and the economy by fulfilling CSR, which directly or indirectly affects the economic stability and overall security of the entire country. For example, the commercial banks' credit supply for the real estate industry will affect the price of real estate assets, and the loosening level of the commercial banks' credit policy will also indirectly affect the consumer price index by affecting the amount of money supply. Therefore, the fulfillment of the commercial banks' CSR is not only related to their own sustainable development, but also conducive to the stable development of the entire economy and society. The study of the efficiency of the commercial banks' CSR input will enable commercial banks to change the stereotype that CSR input is just a no-output cost, increase their CSR input efficiency and operating efficiency, thus increasing the efficiency of their CSR input and actively performing their social responsibilities, such as lowering the financing cost in the green industry, the new-economy industry, the small and micro enterprises, and the inclusive finance area by proactively conducting business innovation. In general, the commercial banks can increase their soft power and gain public recognition by fulfilling their CSR while creating profits. Thus, commercial banks can realize the comprehensive sustainable development between themselves, the economy and the society in order to serve China's supply-demand reform better.

The Corporate Social Responsibility Report (CSR report) is a public report reflecting the self-discipline of the enterprise. It is mainly used to review the modern enterprise's service and contribution in the environment, consumers, employees, communities, shareholders and other public areas. (Bhatia, 2012; Zhong et al., 2015) As an important tool for communicating with stakeholders, CSR reports have become increasingly important. Textual analysis techniques that investigate the relationship between CSR performance and CSR disclosure have been used in several studies, with the specific techniques used ranging from counting the number of words in disclosures to creating indices to measuring the quality of entire CSR reports. For example, Wiseman's (1982) index, developed to analyze annual reports for determining the extent of CSR disclosure, is one of the first and most widely used indices in earlier research that evaluated environmental performance (e.g. Neu et al., 1998). some studies find a positive relationship between CSR performance and CSR disclosure (e.g. Al-Tuwaijri et al., 2004; Clarkson et al., 2008; Luo and Tang, 2014). In view of the fact that CSR reports of China commercial banks are long and complex, content analysis concerning CSR reports have a certain degree of subjectivity (Su, 2010). A corpus-based approach to CSR report from a

linguistic point of view where information technology is used to allow the identification of routine patterns of lexical and co-textual distribution over large volumes of data (Mautner, 2005) pays more attention to the cumulative effect of language and reduces the subjective bias of researchers. The function of corpus tool's keyword list, concordance, collocation can provide objective and effective quantitative analysis tools for the comparative analysis of the text features of the CSR reports of the CSR efficient and inefficient commercial banks.

Thus by applying the efficiency DEA model and corpus analysis tool Antconc into the analysis of Corporate Social Responsibility report (CSR report), this research takes China major commercial banks' performance of CSR as an input which may bring banks effective output and objectively evaluate the CSR efficiency of each commercial banks through the DEA model; then on the basis of outcome of DEA model, by adopting the quantitative, qualitative, and comparative analysis, this research examines keyword features of DEA efficient commercial banks' CSR report relative to DEA inefficient banks' through Corpus retrieval tool Antconc. In addition, according to the assessment criteria of commercial banks' sustainable development in previous study and specific semantic context in CSR report, causes of the DEA efficient and inefficient banks are inferred and suggestions for China major commercial banks' improvement of CSR input-out efficiency and achievement of sustainable development are given in the end.

2 Literature Review

2.1 Research on Corporate social responsibility and sustainable development

Corporate social responsibility (CSR) and sustainable development (SD) are seen as the two of the main drivers for businesses including the banking industries over the past decade or so. CSR is becoming an ever more important field for business. Today's corporates ought to invest in CSR as part of their business strategy to become more competitive. CSR could be defined as the voluntary commitment of companies to contribute to sustainable economic development by integrating social and environmental concerns into their operations and interactions (Banerjee, 2008). Corporate success depends on the local environment including an appropriate infrastructure, the right types and quality of education to future employees, co-operation with local suppliers, quality of institutions and local legislation. In this corporate competitive context, the entrepreneurs' social initiatives can have great impact not only for themselves but also for the local society in terms of sustainable development (Porter, 2003).

Development can be defined as eliminating poverty, unemployment and inequality. Sustainability is associated with satisfying a national economy's needs for natural resources without compromising generations (Luke, 2013). Sustainable development is defined as "the development that meets the needs of present without comprising the ability of future generations to meet their own needs" (UN Brundtland Report, 1987). According to Bersler's model, there are three dimensions of sustainability: societal sustainability, economic sustainability, environmental sustainability (Besler, 2009). A business model, which has the value creation at the core, will allow concepts of CSR and sustainability because value creation is the primary motivator (Wheeler, Colbert & Freeman, 2003). It is impossible for a company to achieve its sustainable survival without creating value to its employees, shareholders, customers, society and all of its stakeholders because of the new dimensions of competition such as environmental politics (Iyiun, 2015). A company could not be successful by focusing on only its short-term based economic performance, neglecting environmental and societal performance (Besler, 2009). The overwhelming complexity of sustainable development has increased the goals for companies and entrepreneurs to take on responsibility for social and environmental challenges in a more proactive way and beyond mere legal compliance (Seelos & Mair, 2004). Besides, research has been conducted to examine the status of the research concerning CSR and sustainability in the management literature and finds that recently open calls for papers suggests that scholars will continue their efforts to shed more light on the two topics (Kudlak & Kathleen, 2015) Special issues on CSR／corporate sustainability also put special emphasis on how businesses organized and maintained their sustainability

orientation (see e.g., Journal of Business Ethics, 2009, 2012, 2013). A large number of literature shows that corporate's performance of CSR will lead to their sustainable development. The connotation of corporate's CSR and the principle of sustainable development are tightly connected and they extend the traditional fields of business ethnic jointly and enrich the theme of corporate governance.

As for the commercial bank---the foundation of the financial system, their social responsibilities aren't limited to the environmental profits making, resources reserving and philanthropy. Instead, the essential connotation of banks' CSR is to develop a series of proper mode of business operation and focus on stakeholder's concern since they are the allocator of financial resources and risk manager of the whole society. Commercial banks should combine CSR with bank' business, such as green finance and SMEs loan and find the commercial opportunity in the performance of social responsibility in order to achieve a sustainable win-win situation with society. Chen (2002) defined the sustainable development of commercial banks as commercial banks should guarantee the effective operation and steady development through refining internal business operation, taking the advantage of resource allocation and strengthening the capacity of development potentials which requires both the quantitative and qualitative financial development of commercial banks in order to achieve the overall financial efficiency of the society. Thus the research on commercial bank's improvement performance of CSR and achievement of sustainability which contains duel function will contribute not only banking industry but also other corporates' even the whole society's CSR performance and sustainable development.

2.2 Research on CSR and DEA model

Since Oliver Sheldon proposed the concept of CSR in the 1820s, there has been debate in the academic community about what CSR includes and whether companies should fulfill their social responsibilities. In recent years, the correlation between the social performance resulting from the fulfillment of corporate social responsibility and the operational performance has become a research hotspot. But so far, due to the inconsistency of indicators selection, sample selection methods and other control variables selection in the regression model that validates the correlation between the corporate social performance and the corporate operational performance, the correlation study between the two has not yet reached a unified conclusion. (Ding & Fu 2003) Porter & Kramer (2003), Schniez (2005), Yao Haixin et al (2005), Wang et al (2013) believe that there is a positive correlation between them, that is, fulfilling CSR can help improve the company's financial performance; Freeman (1999), Amir Barnea (2010) believe that the company's investment in fulfilling CSR is bound to waste capital and other resources, which indirectly affects the company's profits, that is, the two are negatively correlated. Margolis & Walsh analyze and summarize 127 documents and still cannot reach a unified conclusion on the relationship between the corporate social performance and the corporate operational performance. (Margolis & Walsh, 2007). This article believes, with the development of stakeholder theories and the rise of corporate citizenship, it has become the consensus of the academic community and the practice community that companies should fulfill their social responsibilities. Therefore, how to effectively fulfill social responsibilities has become today's new focus, and the research on the effectiveness of corporate social responsibility investment can provide theoretical guidance for enterprises to better conduct social responsibility investment and achieve sustainable development.

Charnes, Cooper, and Rhodes proposes a method for evaluating the efficiency of data envelopment analysis (DEA), and successfully uses the DEA method to evaluate the relative effectiveness of departments (Charnes et al., 1978). Su use the DEA analysis method to evaluate the listed company's corporate efficiency in the study of the relevance of CSR and corporate efficiency (Su et al., 2010). Ding and others also use the DEA method to evaluate corporate efficiency in the study of the impact of the social responsibility of large enterprises in China and the United States on business efficiency. (Ding et al., 2015) Although the above research on CSR has adopted the DEA method, it only considers the DEA value as an indicator to evaluate the operating efficiency of the enterprise rather than regard the implementation of CSR by the enterprise as an input indicator that can bring output.

Lin applies the DEA method to analyze the effectiveness of corporate CSR from the perspectives of input and output, and used compliance expenditure, employee expenditure, employee training expenditure, product assurance expenditure, environmental protection expenditure and charitable donation expenditure as the input indicators, and the main business income and main business profit as output indicators to conduct empirical research on the social corporate investment efficiency of listed companies in different industries, scales, and years, and proposed suggestions to help listed companies improve the efficiency of CSR investment(Lin, 2007). Song uses the DEA model, the book income tax, wage and welfare rate, earnings per share, interest cover ratio, main business cost rate, and accounts payable turnover rate as input indicators, and the total asset return rate and the Tobin Q as output indicators to analyze the CSR efficiency of the coal industry (Song, 2013). Bian et al. adopt the DEA-Malmquist model to analyze the investment efficiency of social responsibility of listed companies in the food manufacturing industry from both static and dynamic aspects, and propose relevant recommendations (Bian, 2015). From the existing literature, the academic community has attempted to use the DEA method to analyze the CSR efficiency from the input-output perspective, but there is still a certain degree of subjectivity in the process of quantifying input indicators. And from an overall perspective, the existing research is mainly focused on industries with high corporate social responsibility issues, such as excess capacity companies and food and pharmaceutical companies. As an important part of the current supply of funds in the process of economic transition, the commercial banks will be able to achieve harmonious development mutual benefit and long-term coexistence of their own, environment and economy. It will directly or indirectly affect the economic stability and the security situation of the entire country. The current research on corporate social responsibility of commercial banks is mainly focused on the research on the corporate social responsibility of commercial banks from the perspective of green finance (Sun, 2009), the research on corporate social responsibility evaluation standards and mechanisms of commercial banks (Zhu, 2008), and the relationship between corporate social responsibility and sustainable development of the commercial banks (Guo, 2009). However, it has not been fully valued by the academic and practical communities to focus on the efficiency of the corporate social responsibility performance of commercial banks and their promotion strategies from the perspective of efficiency. However, the study of efficiency of commercial banks' CSR performance of and their promotion strategies from the efficiency point of view have not been fully valued by the academic and practical communities.

2.3 Research on CSR，SD and corpus analysis

The Corporate Social Responsibility Report (also referred to as the Sustainability Report) refers to the disclosure of the social responsibility that the company undertakes, which mainly includes environmental, social, economic, stakeholder, and volunteer activities. (Dahlsrud, 2008)

The studies of CSR reports are mainly based on the perspective of economics and business management which adopt content analysis method to select indicators from CSR reports to study the relevance of CSR implementation and the company's operating efficiency as well as the concept of sustainable development connoted in company's CSR report. Some study analyses the relationship between the complexity of corporate social responsibility (CSR) disclosure and actual CSR performance by using several readability and disclosure size measures from computational linguistics, and finds that increased CSR disclosure and more readable CSR reports are associated with better CSR performance. (Nazari& Hrazdil, 2017) Li (2010) maintains that the textual analysis techniques developed in computational linguistics (e.g. Jurafsky et al., 2000) are useful tools for evaluating managerial intent. Cho et al. (2010) analyses the content of a small sample of U.S. companies to investigate if linguistic constructs suggestive of 'optimism' and 'certainty' used in CSR disclosure can provide a signal for actual CSR performance. Fuoli (2016) adopts corpus-based analysis to investigate how companies use stance expressions to construct and promote a positive corporate identity in their annual and CSR reports to gain the trust of the stakeholders. Carroll starts from the perspective of cultural differences and conclude that people in different countries have different perceptions of CSR which will cause different content preference when compiling CSR reports. (Carroll, 2004) From the per-

spective of linguistic genre, Bhatia proposed that in addition to the basic information disclosure function, CSR report also carries the function which help company to advocate its economic effectiveness and self correct negative news, so as to provide readers with a reference through reading the CSR report to perceive the corporate image(Bhatia，2012). Fuoil introduced appraisal theory to compare CSR reports of BP and IKEA. Through evaluating the use of different vocabularies in the CSR report, he analyzed the information the two companies wanted to pass to the reader and found out the difference between the two in shaping their own corporate image(Fuoil，2013). As for the research on corporate's concept of sustainability, some scholars have used close reading and other forms of qualitative analysis to analyze how "sustainable development" was constructed in a given text (Porter, 2005; Sandstrom, 2005). Huang and Zhu (2017) makes a study on Chinese corporations' conception of sustainable development based on an innovative view of corpus analysis, and finds out that Chinese companies should enhance their concept of sustainable development in business transactions.

All in all, the academic community has studied the CSR report from the perspective of linguistics and corpus, but there are still deficiencies in the number of studies and the depth of research. The existing research is mainly from the perspective of linguistics, using corpus tools to analyze the language features of CSR reports, summarizing the concept of sustainable development of the company, and providing suggestions for the writing of CSR reports and reading of stakeholders' CSR reports. It does not provide suggestions on how to improve company's CSR input efficiency and achieve sustainable development from the perspective of the combination of qualitative and textual analysis. Thus taking China major commercial bank as the research target, this paper firstly evaluates the CSR input efficiency of commercial banks and classify them into the CSR efficient bank and inefficient bank. Then the comparative textual analysis of CSR efficient banks' CSR report and CSR inefficient banks' through corpus tool are conducted and keyword features of DEA efficient commercial banks' CSR report relative to DEA inefficient banks' are examined through Corpus retrieval tool Antconc. In addition, according to the assessment criteria of commercial banks' sustainable development in previous study and specific semantic context in CSR report, causes of the DEA efficient and inefficient banks are inferred and suggestions for China major commercial banks' improvement of CSR input-out efficiency and achievement of sustainable development are given in the end. Different from the previous single linguistic perspective of CSR report, this study uses corpus tool for text analysis on the basis of empirical research on economic efficiency model. The combination of the two can avoid the subjectivity of traditional linguistic research, making the results of text analysis can more effectively serve the improvement of CSR investment efficiency of commercial banks in order to to achieve better sustainable development. At the same time, this research also enriches the study of business discourse analysis such as CSR reports.

3 Research Design

3.1 Research Questions

According to the review and analysis of previous literature, this study mainly examines 4 issues:

What are the DEA efficient and non-efficient banks respectively?

What are the salient features of the keyword list of DEA efficient banks' CSR reports reference to non-efficient banks' CSR reports?

Why do keyword list of DEA efficient banks' CSR reports have such feature?

How does China major commercial bank to improve their CSR input efficiency in order to achieve sustainable development better?

3.2 Research Tools

3.2.1 DEA Model

Performance measurement refers to the relationship between inputs and output. Evaluating the efficiency of organizational units is usually a difficult problem, especially when the multiplicity of inputs and outputs is required to be considered (Cook and Seiford, 2009; Wu, 2006) Date Envelopment Analysis(DEA) model is used in this paper to analyze commercial bank's multi-dimensional CSR performance measurement system in order to calculate the rank of CSR efficiency of each bank. The data envelopment analysis (DEA) is a nonparametric method to measure relative efficiencies of multiple decision-making units (DMUs), which has been recognized as a valuable analytical instrument and a practical decision support tool for dealing with the task of business performance assessment. The basic principle of DEA is to evaluate the relative effectiveness of multiple input, output -multiple decision-making units (DMUs)-commercial bank in this paper through the use of linear programming. Especially, DEA has no need to explicitly specify a mathematical form for the production function, and it can analyze and quantify the inefficiency of every DMU. DEA has been applied extensively to evaluate the performance for a variety of sectors including banks.

CCR model are used in this paper to examine the technical efficiency(TE) which is the comprehensive CSR input-output efficiency of commercial banks. The DEA CCR model (Charnes et al., 1978) assumed that there are n DMUs, with m inputs and s outputs, while the efficiency evaluation model of DMU can be defined as following: x_{ij} represents the ith input value for jth DMU and the y_{rj} represents the rth output value for jth DMU. Thus, the vector of the total input factor and the output element of the jth decision unit DMU_j can be recorded as:

$$X_j = \begin{bmatrix} x_{1j} & x_{2j} & \cdots & x_{mj} \end{bmatrix}^T, j = 1, 2, \cdots, n \text{ and } Y_j = \begin{bmatrix} y_{1j} & y_{2j} & \cdots & y_{sj} \end{bmatrix}^T, j = 1, 2, \cdots, n$$

The whole CCR model can be defined as following:

$$(1)$$

$$\min \theta$$

$$s.t. \quad \begin{aligned} & \sum_{j=1}^{n} X_j \lambda_j + s^- = \theta X_0 \\ & \sum_{j=1}^{n} Y_j \lambda_j - s^+ = Y_0 \\ & \lambda_j \geq 0 \\ & s^+ \geq 0, s^- \geq 0 \\ & j = 1, 2, \cdots, n \end{aligned}$$

Where s^- is the input slack variable and s^+ is the output slack variable. λ_j is the weight of the jth DMU and θ means the the jth banks' technical efficiency value (TE). If $\theta = 1$, and $s^- = 0$, $s^+ = 0$, DMU_{j_0} is DEA efficient which means those commercial banks has achieved the biggest outcome via their current CSR input；If $\theta < 1$, then DMU_{j_0} is DEA inefficient.

3.2.2 Corpus Tool

This paper mainly adopts the third generation corpus tool---Antconc's keyword function. Keyword analysis is one of the core techniques of corpus linguistics which refers to a word that is more important to a text or a culture than another text or culture (Hu, 2015). Using a reference corpus maybe useful in revealing those words that are under-represented in the observe or the target corpus. Antconc gives a list of all the negative keywords-list which did not occur in the target corpus, but much less frequently than would be expected by chance alone when compared to the reference corpus. (Baker, 2006) For example, if a word oc-

curs comparatively more often in, say, a corpus of modern English children's stories, when compared to the British National corpus, we conclude that such a word has high saliency, keyness in the genre of children's stories and is worth investigating in further detail. According to the purpose of the study, this paper uses the CSR report of CSR efficient commercial bank as an observation corpus, and the CSR report of CSR inefficient commercial bank as a reference corpus, and compares the two to find out the salient or significant word---the keyword used in CSR efficient commercial banks' CSR.

Given that "a keyword is only available to researchers in the form of language, in order to answer specific research questions, researchers must carry out in-depth explanations" (Baker, 2004). Therefore, after the keyword extraction, they should be placed in the context of the CSR report and combined with the concordance function of Antconc to make a qualitative study of quantitative language patterns (Hu, 2015) in order to reveal discourse characteristics of CSR efficient banks' CSR report.

3.3 The selection of indicators of DEA and corpus

3.3.1 The selection of DMUs

Table 1 China Commercial Bank's Total Asset Ranking in 2015

Unit：Million

DMU	Classification of Bank	Total Asset	Rank
Industrial and Commercial Bank(ICBC)	Large state-owned commercial bank	21,034,098	1
China Construction Bank(CCB)	Large state-owned commercial bank	17,890,733	2
Agricultural Bank of China(ABC)	Large state-owned commercial bank	17,686,237	3
Bank of China(BOC)	Large state-owned commercial bank	14,786,678	4
Bank of Communications(BOCOM)	Large state-owned commercial bank	7,014,471	5
China Merchants Bank(CMB)	National joint-stock commercial bank	5,474,978	6
China Industrial Bank (CIB)	National joint-stock commercial bank	5,185,434	7
Shanghai Pudong Development Bank (SPDB)	National joint-stock commercial bank	4,984,518	8
China CITIC Bank (CITIC Bank)	National joint-stock commercial bank	4,884,295	9
China Minsheng Bank(CMBC)	National joint-stock commercial bank	4,357,468	10
China Everbright Bank(CEB);	National joint-stock commercial bank	3,132,315	11
Ping An Bank(PAB)	National joint-stock commercial bank	2,507,149	12
Huaxia Bank (HB)	National joint-stock commercial bank	1,984,821	13
China Guangfa Bank (CGB)	National joint-stock commercial bank	1,836,587	14
Bank of Beijing(BOB)	City Commercial Bank	1,826,404	15
Bank of Shanghai(BOS)	City Commercial Bank	1,433,190	16
Bank of Jiangsu (JSBC)	City Commercial Bank	1,283,454	17
Heng Feng Bank(HFB)	National joint-stock commercial bank	1,063,244	18
China Bohai Bank(CBB)	National joint-stock commercial bank	1,031,650	19
Bank of Nanjing(NJCB)	National joint-stock commercial bank	80,5020	20

From the data in the figure 1, we can see that large-scale state-owned commercial banks and national joint-stock commercial banks are the two types most representative commercial banks with the largest assets in China's banking industry. Therefore, 5 large state-owned commercial banks including Industrial and Commercial Bank, China Construction Bank, Agricultural Bank of China, Bank of China, Bank of Communications and 10 national joint-stock commercial banks including China Merchants Bank, China CITIC Bank, Shanghai Pudong Development Bank, Industrial Bank, Minsheng Bank, Huaxia Bank, Everbright Bank, Guangdong Development Bank, Ping An Bank and Bohai Bank have been selected as the DMU in DEA model.(Heng Feng Bank failed to meet the needs of this study because they did not compile 2015 corporate social responsibility report).

3.3.2. The selection of input indicators for DEA

According to Maignan & Ralson's study, the contents of CSR include philanthropy the listed companies engaged in, charitable donations, volunteer services, compliance with ethical guidelines, quality management, safety plans, and environmental management (Maignan & Ralson, 2001). Therefore, based on the availability and quantification of indicators, this study combines the research results of Maignan et al. and the characteristics of China's commercial banks to select the input indicators for the DEA model which are donation amount, green credit balance, loan balance of small and micro enterprises(SMEs), and cash paid for employees during the year.

In the selection of DEA model output indicators, this paper takes into account the bank's common sense on profitability and asset size in actual operations, and selects net profit and new balance of loans in the current year as a measure of bank profitability and scale expansion capability respectively as the output indicators. As the following table shows.

Table 2 The input and output factors of each commercial bank in 2015

Unit: ten hundred

DMU	X1 (donation amount)	X2 （green credit balance）	X3 （loan balance of SMEs）	X4（cash paid for employee）	Y1（net profit）	Y2（new balance of loans）
ICBC	5,575	70,280,000	188,320,768	10,393,300	26,326,500	86,481,406
ABC	4,867	54,313,100	108,822,798	10,970,700	18,077,900	82,346,233
BOC	5,900	41,231,500	114,571,373	6,892,700	15,219,900	66,288,806
CCB	4,121	73,356,300	127,787,861	8,882,200	22,517,600	99,897,185
BOCOM	2,448	20,479,500	62,445,786	2,325,700	6,357,400	28,757,061
CITIC Bank	1,559	2,369,600	44,198,945	2,048,100	3,967,200	30,191,172
CEB	613	3,870,000	28,843,523	1,264,000	2,914,400	21,641,906
HB	2,273	3,996,000	23,618,731	1,160,000	1,858,100	12,010,895
CGB	917	341,400	16,964,615	899,144	906,397	7,633,865
PAB	1,035	1,640,200	21,899,106	1,287,100	2,186,500	19,116,994
CMB	3,647	15,650,300	58,980,093	2,531,300	5,801,800	30,350,078
SPDB	1,263	17,178,500	51,046,902	1,899,500	5,012,700	21,783,457
CIB	3,959	39,420,000	56,053,934	1,771,500	4,788,000	23,171,130
CMBC	6,500	1,140,400	57,222,675	2,212,500	4,548,500	23,600,248
CBB	235	1,119,100	5,454,063	319,177	568,851	6,930,110

（The above data comes from the annual reports of banks and Guotai Junan Database）

3.2.3 The Selection of Corpora

The corpus of this research is the CSR report of 15 major commercial banks in China in 2015. The source is commercial banks' official website. A CSR report corpus of China's major commercial banks with a total capacity of 497,926 tokens and 29,922 types was established, and the segmentation software Segmenter was used to segment the Chinese corpus which is convenient for Antconc to retrieve.

3.4 Research Steps

According to the four research questions in this paper, this study includes the following steps:

(1).The DEA model is used to study the CSR input efficiency of commercial banks, and the DEA efficient and non-efficient commercial banks are distinguished.

(2).Use the reports of DEA efficient banks (CSR-A) as the observe corpus and reports of DEA non-efficient banks(CSR-B) as the reference corpus in order to examine the former's keyword list with reference to the latter.

(3).Combining with Antconc's concordance function, the keyword the CSR-A corpora against CSR-B corpora were examined in the semantic context of the CSR report, and the underlying causes of the keyness were analyzed based on the evaluation criteria for sustainable development of commercial banks. Qualitative research was conducted and feature of keyword of DEA efficient banks summarized and analyzed from the text.

(4).According to the results of qualitative research, suggestions are made for China commercial banks to increase the efficiency of CSR input in order to achieve sustainable development.

4 Findings and Discussions

4.1 The DEA Empirical Results of the Effectiveness of CSR input of China Major Commercial Banks

Table 3 Effectiveness of CSR input of China Major Commercial Banks based on CCR Model

DMU	Technical Efficiency（TE）	Rank	DEA Effectiveness
China CITIC Bank	1.000	1	efficient
Huaxia Bank	1.000	1	efficient
Guangdong Development Bank	1.000	1	efficient
China Merchants Bank	1.000	1	efficient
Industrial Bank	1.000	1	efficient
Bohai Bank	1.000	1	efficient
Everbright Bank	0.798	7	inefficient
Minsheng Bank	0.684	8	inefficient
Bank of Communications	0.676	9	inefficient
China Construction Bank	0.417	10	inefficient
Industrial and Commercial Bank	0.298	11	inefficient
Bank of China	0.215	12	inefficient
Ping An Bank	0.202	13	inefficient
Agricultural Bank of China	0.173	14	inefficient
Shanghai Pudong Development Bank	0.173	15	inefficient

Through the results shown in the table above, we can see that only 6 of the 15 commercial banks are DEA efficient. They are China CITIC Bank, Huaxia Bank, Guangdong Development Bank, China Merchants Bank, Industrial Bank and Bohai Bank. The remaining nine commercial banks, including the Big Four bank in China, are DEA inefficient. Among them, Bank of China, Ping An Bank, Agricultural Bank, and Shanghai Pudong Development Bank ranked lower, and there is a large gap from the ideal efficiency value.

4.2 Keyword Retrieval and Analysis of Commercial Bank CSR Reports

Based on the above empirical results, the study used the CSR reports of 6 DEA efficient commercial banks as an observational corpus CSR-A containing 135,936 tokens and 10,947 types; The CSR report of 9 DEA inefficient commercial bank is built as a reference corpus CSR-B containing the 361,990 tokens and 18,948 types is established. The size of the CSR-B is about three times that of the CSR-A, which is in line with the scale of the reference corpora.

Calculate keyness by selecting statistical indicators of Log-liklihood in Antconc (we select a p-value of 0.05 as the cut-off point in determining whether a word was key or not) and rank the keyword according to Keyness from highest to lowest. Some proper nouns which contains "Huaxia", "Merchant" etc. and other place names like "Fuzhou", "Shaoxing" are removed and the top thirty keyword are selected. Then we get the following keyword list of DEA efficient banks' CSR reports relative to DEA inefficient banks':

Table 4. The Rank of Keyword list CSR-A against CSR-B

Rank	Freq	Keyness(LL)	Keyword
1	734	83.561	我们
2	307	68.465	为本
3	67	56.503	赤道
4	55	53.370	为您
5	2059	51.463	客户
6	57	44.316	于心
7	54	43.896	实现
8	2098	41.357	社会
9	75	39.777	零售
10	46	38.601	责任
11	87	38.458	战略
12	508	35.231	员工
13	122	29.683	互联网
14	25	28.239	轻型
15	169	25.823	小微
16	36	20.402	市场
17	23	18.074	培训
18	318	14.763	理念
19	18	13.403	社区
20	24	12.079	刷脸
21	79	12.032	绿色
22	180	11.420	成长
23	54	10.629	零售
24	17	9.139	追求
25	126	8.539	和谐
26	58	7.577	努力
27	16	7.232	云闪付
28	373	6.731	服务
29	951	6.234	风险
30	20	6.194	老年人

In 2006, in order to recognize the banks that take social, environmental, and corporate governance goals into account in business operations and play a leading and innovative role in these aspects, the "Financial Times" of the UK and the International Finance Corporation (IFC) jointly established the "Sustainable Banking Award". The purpose of this award can be seen as the elaboration of the bank's sustainable development connotation. The Industrial Bank of China has won this award twice. Regarding the measurement and evaluation of sustainable development of finance and banking, Zhou designs a set of evaluation index system of banking financial situation based on sustainable development from six dimensions, which are safety, liquidity, profitability, development, environmental responsibility, and social responsibility. And he uses the analytic hierarchy process to determine the weight of each index. In addition, the measurement of bank competitiveness and comprehensive evaluation also have important reference value for the analysis of the factors that influence the sustainable development of commercial banks (Zhou, 2008). The "China Commercial Bank Competitiveness Evaluation Research Group" of "The Banker" magazine (2006) proposes the competitiveness model of China's commercial banks and defines the competitiveness process as core competence in seven areas, including development strategy, corporate governance, products and services, information technology, risk management, human resources, and market influence. In terms of ways and strategies for commercial banks to achieve sustainable development, He proposes that the driving force for sustainable financial development comes from financial reforms, financial innovations, and financial incentives (He, 2000). Sun & Li believe that the bank's sustainable development strategy should be implemented by integrating the green concepts and requirements of environmental protection, energy conservation and emission reduction into the bank's main business operations and investment decisions (Sun & Li, 2011). The former Agricultural Bank of China's President Xiang believes that, "to achieve the sustainable development of commercial banks is to follow the general trend of financial globalization, liberalization, and comprehensive development, and actively promotes the pace of business transformation from various areas such as the development strategy, business processes, business structure, financial innovation seek to improve their competitiveness". According to academic research's connotation, evaluation methods and implementation of sustainable development of commercial banks, the performance of commercial banks in terms of profitability, operation and management, development mode, innovation capability, governance structure, and corporate culture is the determinant factors of the capabilities of the sustainable development.

Based on the above analysis, this paper finds that the keywords of CSR efficient commercial banks versus inefficient commercial banks in Table 4 coincides with key factors determining the sustainable development of commercial banks. To facilitate the following text analysis, the above 30 keywords are divided into the following 6 categories according to their semantic domains and the connotation and principles of sustainable development, as shown in Table 5. Therefore, this paper considers that commercial banks with efficient CSR input have achieved a better sustainable development in terms of corporate culture, stakeholders, marketization level, application of science and technology, innovative business, and external supervision mechanisms, compared to ineffective commercial banks.

Table 5. The keywords list of CSR report of the DEA-efficient commercial banks

Classification	Keyword
Corporate culture	We, root, heartedly, `value`, achieve, pursue, for you, sincerely, the aged, endeavor, service
Stakeholders	Employee, client, growth, harmony, training, community, society
Marketization level	Market, risk, strategy, light
Technology applications	Internet、`face swiping`、cloud payment
Innovation business	Green, small and micro, retail
External monitoring mechanism	Equator

4.2.1 Keywords analysis of corporate culture

CSR efficient banks integrates in its corporate culture and service philosophy into its CSR value that rewards stakeholders, which will have a profound impact on banks' sustainable management and development. From table 4 we can see the keyword "we" ranked the first with the keyness of 83.561in CSR efficient banks' CSR report against the inefficient banks'. "we" and the forth ranked keyword "for you" (keyness:53.370) belongs to the self-mention and engagement markers of interactional metadiscourse. Metadiscourse refers to "language resources used to organize texts and indicate the author's position on the content of the discourse and the reader's position."（Hyland, 2005）The interactional metadiscourse is evaluative and interventional. It directly affects the closeness of the relationship between the author and the reader and the expression of the author's attitude.The self-mention "we", the The high frequency of self-mention "we"-first-person pronouns appeared in the CSR report of DEA efficient commercial bank, showing that such banks have narrowed the distance with stakeholders through CSR reports, formed alliances with stakeholders, and viewed the needs of stakeholders as their own needs. High-frequency use of the first-person pronoun "we" is a reflection of the interpersonal meaning in this type of CSR report. Callow believes that the first person indicates that the author is passing on beliefs rather than facts, which will reduce the veracity of the text, but it will help establish a relationship between the company and the reader (Callow, 1998). For example, Bohai Bank's CSR report mentioned: It can be seen that Bohai has actively worked hard to establish a positive, responsible and credible corporate citizenship through the use of the first personal pronoun "we" in the CSR report.

"我们积极投身灾难救助，捐款援助天津"8·12"爆炸事故牺牲、受伤消防战士和受灾群众，发挥金融企业优势支持善后工作；"

It can be seen that Bohai Bank has actively worked hard to establish a positive, responsible and credible corporate citizenship through the use of the first personal pronoun "we" in the CSR report.

As for the forth ranked keyword "for you" (keyness:53.370)-engagement markers of interactional metadiscourse, "您" is the honorable title of "you" in Chinese culture which shows banks' respective and sincere stance and attitude in front of their stakeholders. The words "for you" and "you" and "sincere", "the aged", "effort", and "service" are keyword in the CSR efficient banks' CSR report. It shows that such banks are striving to strengthen their communication with stakeholders through the concept of "customer first" and differentiated services for different ages and levels of stakeholders which lead to banks' improvement of both CSR and operation efficiency and the achievement of sustainable development. As Huaxia bank and Industrial bank says in its CSR report:

"华夏银行秉持'一心为您'的服务理念，以支持实体经济的健康快速发展作为出发点和落脚点，不断创新金融产品和业务模式，服务国家'一带一路'战略，探索自贸区服务模式，支持中小微企业成长和中国企业'走出去'，推动区域协调发展和产业转型升级，实现地方经济社会的可持续发展。"

"兴业银行始终倡导"寓义于利"的社会责任实践方式，以商业行为承担社会责任。"安愉人生"就是在充分调研老年人需求的基础上，通过商业模式的突破，将履行社会责任与自身业务发展相结合，体现了对老年人的关爱。"

A good corporate culture plays a role in strengthening and reinforcing the concept of social responsibility of commercial banks. The keyword "root", "heartedly" are the reflection of CSR efficient Commercial Bank's business concept and corporate culture ---"Corporate Reward Society". "聚焦于新 履责于行 融责于基 融责于心" are Huaxia Bank's corporate culture advocated in its CSR reports. "以人为本" 也是华夏银行始终坚持的核心思想："我们坚持以人为本，关爱员工发展，健全职工代表大会制度，疏通员工职业发展通道，将银行发展成果多维度惠及员工、股东、客户、社会。" A good corporate culture of the bank will create a sense of "identity" and "a sense of belonging" from the heart of the bank employees which consciously links the individual's future with the bank's future and enables employee develop individual talents actively, and improves service quality. This will effectively promote commercial banks to improve their scientific management, enhance cohesion and creativity so as to achieve sustainable

development. In other words, only when a good cultural atmosphere is established, a commercial bank can actively take various social responsibility obligations in its business activities, and can consciously combine corporate profits with the interests of stakeholders in all aspects of decision-making. (Zhu, 2004)

4.2.2 Keywords analysis about stakeholders

Compared with the DEA-inefficient banks, the DEA-efficient banks in pay more attention to meet the expectations and needs of stakeholders, which can directly and indirectly contribute to the sustainable development of banks. The keyness of "customer" is up to51.463 ranking the fifth in DEA efficient banks' CSR report against the inefficient one and the keyness of stakeholder related keywords "society", "employee" are higher than 30. In addition, keywords such as community, training, and growth are related to commercial banks' stakeholders, and they all reflect the appreciation of the DEA-efficient banks to the interests of stakeholders. According to the theory of stakeholders (Freeman, 1984), the company's main stakeholders are the stakeholders who play a fundamental role in the daily operations of the company, including shareholders, creditors, employees, clients, suppliers, etc, and the secondary stakeholders refers to stakeholders that can influence the main stakeholders, including communities and non-profit organizations. Satisfying the needs of key stakeholders can bring direct benefits to the company when profitability is the basis for the sustainable development of commercial banks. However, satisfying the needs of secondary stakeholders by actively fulfilling corporate social responsibilities can indirectly bring sustainable economic profit to commercial banks. Bohai Bank states in its CSR report that, " 我们倡导快乐工作，幸福生活，促进员工发展，真挚关爱员工，打造优秀企业文化，建设和谐企业 "、" 本行通过完善薪酬激励制度和福利体系，以及建立完备的员工职业生涯发展规划，满足员工获得稳定合理的收入，享有充分的权益保障，以及良好的职业生涯规划和成长机会的价值要求 " 和 " 本行高度重视社会责任管理，面向股东、客户、员工、合作者、社会等利益相关方的期望和要求，形成了自己的社会责任观，明确了责任履行方向和责任实践方向 ". Huaxia Bank states in its CSR report that, " 我行在构建全面覆盖培训的基础上，又提出具有针对性的培训体系，积极培育具有现代管理意识和专业水准的多元化人才队伍 "。

4.2.3 Keywords analysis about marketization level

The DEA efficient banks have improved the bank's operating efficiency and marketization level through scientific and reasonable governance structures, management mechanisms, strategic objectives, and risk management. Commercial bank as a special public enterprise, its corporate governance structure is not only related to the bank's own business development, but also related to the vital interests of the public, so that commercial banks should implement sustainable development in optimizing the organizational structure and internal control. The keywords such as "market (keyness:20.402), risk(keyness: 6.243), strategy(keyness: 38.458), light(keyness: 28.239), and pursuit (keyness: 9.139) have reflected the higher degree of commercialization of DEA efficient commercial banks.cFor "strategy", Industrial Bank states in its CSR report that" 立行以来，兴业银行一贯秉承市场化的经营导向 ", which reflects the principle that the DEA efficient banks adhere to market-oriented management. Industrial Bank makes the statement that " 进一步完善风险管理组织体系及配套运作机制，全面加强全行风险内控 " 三道防线 "，充分发挥风险管理对业务发展的保驾护航作用 ", which shows that the DEA efficient banks attach importance to the construction of risk management and internal control systems, which is conducive to improving their marketization level. For the "strategy," Industrial Bank states in its CSR report that " 为国家战略重大项目提供多元化融资支持 ", while China Merchants Bank makes the statement that" 我们顺应国家战略要求，支持企业走出去和引进来 ", which shows that the DEA-efficient banks can follow the national strategies in their operations and keep up with the hotspot of the market. For "light", China Merchants Bank states in its CSR report that" 确立了 " 轻型银行 " 的战略方向和 " 一体两翼 " 的战略定位，努力以更少的资本消耗、更集约的经营方式和更灵巧的应变能力，有效动员和配置金融资源，提高金融服务效率 ", which reflects the bank's strategic goal of striving to improve operational efficiency, and it further promotes the improvement of its marketization level. On the whole, the DEA-efficient banks' operations are more

market-oriented than the DEA-inefficient banks. The DEA-efficient banks have achieved sustainable development through rational resource allocation and efficient business processes.

4.2.4 Keywords analysis about technology applications

In order to seize the competition opportunities to promote sustainable development, the DEA-efficient banks in CSR input increase the use of the Internet in business development, actively promote the "Internet+" development model, and create innovate financial service tools and financial service concepts to cope with the challenges of commercial banks in the new situation. The keyness"Internet、brush face、cloud payment"in DEA efficient banks' CSR report is 29.683，12.079、7.232 respectively，among which "Internet" ranks 15th more than most of the keywords related to basic sustainable development concepts. It shows that the use of Internet technology has become an important means for commercial banks to fulfill corporate social responsibility and achieve sustainable development. For example, Industrial Bank makes the statement that" 更深入推进互联网金融、大数据、云服务管理的相关运营管理体系建设，以及社会金融信息和产品流量多渠道对接、线上线下优势互补的相关经营布局，本行集团数字化、信息化、智能化水平有较大提升 "，China Merchants Bank states in its CSR report that" 在互联网金融正在颠覆传统金融业的同时，我们加快推进互联网金融的布局与创新，以 " 网上转账全免费 "、" 刷脸取款 " 等创新创举，为客户提供更实惠、更便捷、更人性化的业务功能和体验 "，and China Guangfa Bank states in its CSR report that" 我们顺应客户生活行为移动化、网络化和碎片化演变趋势，不断升级网上银行服务功能，为业务办理提供便捷；基于 HCE 技术与云端支付技术，推出 " 云闪付 " 服务，丰富移动金融支付体验 "。Through the introduction of advanced internet and mobile payment technologies in daily operations, the DEA efficient banks have effectively reduced operating costs, saved a great deal of manpower and material resources, fulfilled corporate social responsibilities, and increased their efforts in providing more convenient and efficient services to their customers, which helps to achieve sustainable development.

4.2.5 Keywords analysis about innovation business

The DEA efficient banks in CSR input actively innovate the development model of green finance, small and micro credits and inclusive finance, realizing the rational allocation of financial resources in various industries, and promoting the dual sustainable development of commercial banks and the entire society. "Green (keyness: 12.032, SMEs (keyness: 25.823, retail(keyness: 10.625)" those keywords reflect the DEA efficient banks' preference of business areas involving corporate social responsibility fulfillment and sustainable development Green credit is an important measure of fulfilling corporate social responsibility through the implementation of credit policies by commercial banks to promote the development of environment-friendly companies. China Guangfa Bank states in its CSR report that"2015 年，我行专门制定了《2015 年广发银行绿色信贷政策指引》，对我行的绿色信贷项目总体授信策略、客户准入标准和授信要素等做了详细的规范和划分，将绿色信贷列为 " 支持类 " 行业，引导全行增加绿色经济信贷投放 "，which reflects the strong support for green credit. In the context of the government's strong support for the development of small and micro enterprises, to make small and micro loans is the most effective way for commercial banks to support the development of small and micro enterprises, and to solve the problems of employment and social development. China Citic Bank states in its CSR report that "2015 年，为有效改善小微企业金融服务，在小微贷款风险日益高发和多发的形势下，本行始终高度重视小企业金融业务的发展，将小企业金融业务作为普惠金融发展、履行社会责任的重点业务，明确在有效控制授信风险的前提下，按照 " 小微化、标准化、工厂化、网络化 " 的发展思路，稳健推动小企业金融业务发展，持续探索和优化小企业金融服务可持续发展的商业模式 "，which reflects the unremitting efforts of the DEA-efficient banks in supporting small and micro enterprises and advancing inclusive finance. The retail business is the main carrier for commercial banks to provide good services to the public., so that their degree of emphasis directly affects commercial banks' service quality to the public and the sustainable development of commercial banks. Industrial Bank states in its CSR report that " 为满足社区不同客户群体的差异化金融服务需求，社区银行提供了特色鲜明、凸显个性的四大零售业务，使社区居民有了

贴心的金融理财帮手，更是体现了兴业银行立足社区、"便民、利民、亲民"的服务宗旨和服务理念"，which shows its high attention to the development of retail business. The banks mentioned above have increased their performance in fulfilling their corporate social responsibilities by increasing their inclination to key business areas involving corporate social responsibility.

4.2.6 Keywords analysis about external monitoring mechanism

The subject phrase "Equator" reflects that the DEA-efficient banks in CSR input have accepted more advanced external regulatory mechanisms to promote the sustainable development of commercial banks. The Equator Principles are a set of unofficial and voluntary principles developed by the world's leading financial institutions in accordance with IFC's environmental and social policies and guidelines. They are designed to identify, assess and manage the environmental and social risks involved in the project financing process. Industrial Bank states in its CSR report that "作为我国首家赤道原则银行，本行积极贯彻国家低碳经济政策，将绿色理念贯穿于运营管理的方方面面"，which shows that DEA-efficient banks can improve corporate social responsibility performance through the introduction of international advanced external regulatory mechanisms.

In summary, through the analysis of the keywords of the CSR report of the DEA efficient against DEA inefficient banks', we have found that the DEA efficient banks achieve better sustainable development than DEA inefficient banks in the shaping of corporate culture, optimization of service attitudes, full-service for stakeholders, improvement of marketization level, acceleration of technology applications, development of innovative businesses, and acceptance of external monitoring mechanisms.

5 Suggestions and Implications

Under the background of the "new normal" economic shift, all industries' growth mode and development momentum need to be transformed, and all industries have to increase total factor productivity to support the efficiency and sustainable development of China's economy. As the most important financial intermediary in China, the improvement of commercial banks' management efficiency and CSR input efficiency will not only benefit the sustainable development of commercial banks themselves, but also optimize the supply of capital for both the the element end and the production end of other industries, which in turn promotes sustainable development of the entire society.

By applying the efficiency DEA model and corpus analysis tool Antconc into the analysis of Corporate Social Responsibility report (CSR report) and taking commercial banks' performance of CSR as an input which may bring banks effective output, this research investigates CSR input-output efficiency and the achievement of sustainable development of China's major commercial banks by means of qualitative, quantitative and comparative analysis on the basis of the outcome of DEA empirical study. DEA model finds that the CSR input efficiency of 6 smaller commercial banks including China Citic Bank (CITIC Bank), Huaxia Bank (HB), China Guangfa Bank (CGB), China Merchants Bank (CMB), China Industrial Bank (CIB)and China Bohai Bank(CBB); the other 9 commercial banks including the 4 big banks in China are the inefficient banks. Then 30 keywords and 6 semantic domains of DEA efficient banks' CSR reports are summarized relative to DEA inefficient banks' through corpus tool's keyword analysis. Based on discursive context of CSR reports and characteristics of commercial banks sustainable development, this research finds that DEA efficient banks achieve a better sustainable development than DEA inefficient banks in corporate culture, stakeholder concern, marketization level, application of Fintech, green finance and business innovation reference to exterior supervision mechanism. Finally, based on the research results, combined with the requirements of the supply-side reform under the new normal economy, this article proposes the following suggestions to improve the CSR input-output efficiency of China's commercial bank, so that commercial banks can better achieve sustainable development:

First, commercial banks should improve service quality and attitude by implementing the service con-

cept of "customer first", "employee-centered", and "giving back to society" in the corporate culture. Banks should provide differentiated and innovative financial services for different stakeholders. Second, commercial banks should speed up the process of the marketization, reduce the proportion of national ownership, diversify the ownership structure, and formulate scientific and rational development strategies to achieve maximum utilization efficiency of CSR input. Third, speed up the integration of the Internet and finance. Commercial banks should introduce Internet technologies in financial services and product innovation to reduce costs and increase efficiency. Fourth, the business scope of commercial banks should be tilted toward inclusive finance, green industries, science and technology innovation industries, and small and micro enterprises. Fifth, China's commercial banks should take the initiative to learn from foreign banks that perform social responsibilities well, actively join the international social responsibility organization, adopt the "Equator Principles", and establish an effective external supervision mechanism to improve the level of fulfillment of their social responsibilities.

Although the combination of economic model and corpus technology has added objectivity and scientificity to the text analysis and conclusion of this study, this study also has some limitations and deficiencies. In terms of the selection of research objects, this paper selects according to the level of asset rankings and does not cover some city commercial banks and rural commercial banks that are also actively fulfilling their social responsibilities. In addition, in the selection of input indicators, this study only selected four representative, easily accessible and quantifiable input indicators and did not cover the remaining indicators, which may bias the effectiveness of the DEA efficiency results.

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