

Feedback of Green Credit of Listed Banks in the Haze Governance

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Abstract

Frequent haze weather seriously affects the travel of the public, threatens people's health, and it is even more harmful than water pollution. In the national policy and legal framework, commercial banks develop green credit to limit enterprises in "high energy consumption, high pollution" to loan, while support and promote the development of enterprises devoted to ecological protection and construction. With its implementation by commercial banks, green credit plays an increasingly important role in haze governance. This paper attempts to conduct regression analysis of panel data based on the profitability of commercial banks, number of good air quality days, the reputation of commercial banks and other indicators to establish a model which explores the role green credit plays in the governance process of haze. This article focuses on the analysis of the feedback effects haze governance has to commercial banks. First of all, commercial banks can form their green reputation through the issuance of green credit for haze governance which will increase the profitability of commercial banks. Then they will increase the intensity of the implementation of green credit, which will finally form a virtuous cycle. There is a certain practical significance in the research of this paper.

Keywords: green credit, reputation, haze governance, panel data, regression analysis

INTRODUCTION

In recent years, the number of days struck by haze in China has displayed an increasing tendency in general. In December 2013, a devastating haze affected 25 provinces and over 100 mid/large-sized cities, which expanded from a few cities to several million square kilometers of land (Table 1). In 2013, the national average number of days stuck by haze is 29.9, greater than that of any other year in the last 52 years. Generally, haze consists of fog and smog; fog refers to the weather condition where water vapor condensates, resulting in a visibility less than 1 kilometer, while haze is caused by particulate matters (PM) and certain weather conditions. Sulfur dioxide and nitrogen oxides from emission and the burning of coal transform to sulfates and nitrates through chemical reactions, which are smaller particles, and also more harmful contaminants, to the environment and to human beings.

Green credit is essentially policies made for ecological protection and construction, which aim to scientifically deal with the relation between the financial industry and sustainable economic development. It limits the credit of enterprises or projects that do not meet industrial or environmental standards, while promotes the credit of those involving environmental protection, new energy and contamination control. Promoting green credit on the one hand helps to supervise enterprises to lower their energy consumption and to include environmental protection in their routine business activities, and on

the other hand limits and eliminates enterprises with "high energy consumption and heavy pollution" under political guidance, urges them to focus on long-term interests, speeds up the adjustment and update of the industrial structure.

In August 2013, the Ministry of Environmental Protection issued "Technical Guide to Sources of Atmospheric Particles (Trial)" (hereinafter referred to as the "Guide"), "Guide" shows that among the sources of atmospheric particulate matter, dust ranks first, followed by industrial emissions and motor vehicle emissions; in addition, secondary pollution caused by the chemical reactions of pollutants emitted into the atmosphere can not be ignored. Dust is mainly generated by construction sites and road traffic; industrial emissions mainly refer to waste gas and a large number of manufacturing paint emitted into the atmosphere by so-called "two highs" corporates; motor vehicle emissions refers to automobile exhaust. Therefore, the role of commercial bank green credit in haze governance is accordingly reflected in strictly controlling the size of loans for the above-mentioned companies within the policy and legal framework and in cancelling credit support for environmentally non-compliant companies; while vigorously supporting loans involving energy conservation, clean energy development and promotion of advanced environmental technology, etc., with appropriately preferential interest rates.

Commercial banks use green credit to control different levels of credit of the enterprises, achieving the indirect governance of haze by urging enterprises to adjust their roles and the industrial structure. In

return, whether or not commercial banks could benefit from haze governance will be the focus of this paper.

Table 1 Part of the provincial capital cities of AQI* index from 1/12/2013 to 15/12/2013

DATE	Shanghai	Nanjing	Hangzhou	Hefei	Jinan	Shijiazhuang	Tianjin
1/12/2013	243	215	118	148	134	248	139
2/12/2013	275	209	147	188	179	356	284
3/12/2013	181	231	152	211	273	270	221
4/12/2013	148	377	257	374	143	290	288
5/12/2013	264	327	278	342	205	183	125
6/12/2013	416	325	305	363	130	289	115
7/12/2013	193	365	402	328	258	400	316
8/12/2013	154	318	393	263	382	419	294
9/12/2013	216	209	233	242	128	75	38
10/12/2013	99	100	90	148	124	134	126
11/12/2013	137	128	126	145	80	84	69
12/12/2013	119	151	158	175	111	121	83
13/12/2013	145	163	193	242	118	135	78
14/12/2013	70	150	183	244	271	237	118
15/12/2013	113	209	178	234	376	345	164

0–50 excellent; 51–100 good; 101–200 poor; 201–300 serious pollution; >301 severe pollution

* AQI: Air Quality Index ;Data Sources: <http://www.weather.com.cn/>

LITERATURE REVIEW

There is yet no studies conducted regarding the specific interactions between commercial banks green credit and haze governance, in and outside China. Existing research literature focuses one-sidedly on either green credit or haze, i.e., studying the green credit itself and the corresponding social responsibility from the perspective of commercial banks, or researching the formation and governance of haze from the perspective of environmental protection. Internationally, the Equator Principles (EPs) for standard banking green credit is formed; the nature of the Equator Principles is the environmental principles financial institutions should follow while financing projects, which makes the vague environmental and social responsibility standards appear clear and intuitive. Scholtens and Dam (2007) found that financial institutions that adopt the Equator Principles do not do so for decorative reasons, their corporate social responsibilities are significantly higher than that of financial institutions who do not adopt the Equator Principles, while their social reputation is also higher than the latter. Bing (2010) believe that the adoption of the Equator Principles will help improve the bank's reputation in the community, promote the formation of good corporate governance mechanisms, and further improve the quality of financial risk management. Meanwhile, under the constraints of the Equator Principles, commercial banks are more fully committed to social responsibilities, promoting environmental protection and the harmonious

development of society. In the research of corporate reputation, Weigelt and Camerer (1988) believe that corporate reputation is a series of attributes its past activities brought. Herbig and Milewicz (1993) believe that the judgment of the public got from enterprises' past behavior forms its reputation. Fombrun (1996) considered the company's reputation which formed from its past activities to make it more competitive than its competitors. Fombrun and Riel (1997) showed that good corporate reputation can increase consumers' trust in the purchase decision-making process of product and service. Fombrun (2004) pointed out that companies with stronger reputation can better attract customers and create quantifiable business value while establishing the reputation. Huang (2005) studied the relationship between corporate reputation and financial performance of the company, using factor analysis to 15 financial indicators of listing Corporation classified as shareholders, suppliers, creditors and other 5 factors, through regression analysis to determine the degree of influence of each factor on the reputation of the company.

During the research process of this paper, the reputation commercial banks gain by implementing green credit is treated as the tie that associates their profitability and haze governance.

THE RESEARCH MODEL

This paper studies the feedback effect of commercial banks' green credit in haze governance, which is the

impact the green reputation commercial banks gain in the course has on the profitability of these banks. This is similar to the sensitivity analysis models Todd and Milbourn (2003) established regarding the CEO's personal reputation and stock-based compensation, we have made some modifications on the basis of the Todd and Milbourn's (2003) model to conform the purpose of this research.

First, construct commercial banks' green reputation index which estimate is given by λ_1 , where $\lambda_1 \sim N(\bar{\lambda}_1, \sigma_{\lambda}^2)$. Managers get the green reputation through the issuance of green credit, which size is unknown. Stock market participants observe that the signal which commercial banks implement green credit is divergent, given by

$$s = \lambda_r + v \quad (1)$$

Where λ_r represents the green reputation commercial banks have gain, Based on this signal, if

$\lambda_2 < \lambda^c$, commercial bank managers give up

implementing green credit policy, where λ^c is the critical value of green reputation commercial banks have gain, and λ_2 is posteriori estimation of the green reputation. In order to facilitate research, when commercial bank managers give up implementing green credit policy, the estimate of its green reputation is λ_0 , where $\lambda_0 \sim (\bar{\lambda}_0, \sigma_{\lambda_0}^2)$

and $\bar{\lambda}_0 = 0$,

$$E(\lambda | s, \lambda_1) = \lambda_2 \quad (2)$$

$$\lambda_2 \sim N\left(\frac{\sigma_{\lambda_1}^2 \bar{\lambda}_1 + \sigma_{\lambda_2}^2 s}{\sigma_{\lambda_1}^2 + \sigma_{\lambda_2}^2}, \frac{\sigma_{\lambda_1}^2 \sigma_{\lambda_2}^2}{\sigma_{\lambda_1}^2 + \sigma_{\lambda_2}^2}\right), \text{ var}(\lambda_2)$$

$\text{var}(\lambda_1)$, λ_2 is got in a series of signal observation, and its variance is less than the variance of λ_1 . The variance of estimate of the green reputation becomes small over time.

Suppose,

$$X = T + \rho P \quad (3)$$

X is net profit per share of commercial bank, T represents net profit per share excluding the effect of green reputation, P is the price of outstanding shares, and $\rho \in [0, 1]$ represents sensitivity coefficient. According to Todd T and Milbourn (2003) research method, for the sake of simplicity, the cost of the implementation of green credit management is approximately seen as a proxy/effort cost, which

expressed as $\frac{1}{2}k\epsilon^2$. Then the utility of commercial banks can be expressed as

$$U(X, \epsilon) = -\exp\left\{-\gamma\left(X - \frac{1}{2}k\epsilon^2\right)\right\} \quad (4)$$

Where $\epsilon \in [0, \infty)$ represents the level of effort or intent that managers implement green credit policy, γ is risk aversion coefficient, and $k > 0$ is constant representing the conflict on the implementation of green credit.

Next, we study the contribution of green reputation to net profit of commercial banks and the price of outstanding shares.

$$F_1 = e + \lambda_r + \epsilon \quad (5)$$

F_1 represents the increase of commercial bank net profit by implementing green credit policy, and $\epsilon \sim N(0, \sigma_{\epsilon}^2)$, if commercial bank managers give up implementing green credit policy, $E[F_1] = \bar{\lambda}_0 = 0$. According to (1) and (5), s is noise estimate of $(F_1 - \lambda_r)$, that is

$$Y = (e + \epsilon) + \omega \quad (6)$$

Where $\omega \sim N(0, \sigma_{\omega}^2)$ and is independent of ϵ . So the price of outstanding shares can be expressed

$$P = [\mathbf{P}_1 | \lambda_1] \times E[F_1 | Y, \lambda_1] + [\mathbf{P}_2 | \lambda_1] \times E[F_1] + \xi \quad (7)$$

$\mathbf{P}_1$ is the stock price when commercial banks managers carry out green credit policy and $\mathbf{P}_2$ is the stock price when commercial banks managers abandon green credit policy, ξ is independent of ϵ and ω . The expectation of net profit growth take the form

$$E[F_1 | Y, \lambda_1] = [(1 - \beta)E[F_1 -$$

$$\lambda_r] + \beta Y] + E[\lambda | \lambda_2 > \lambda^c]$$

$$= [(1 - \beta)e + \beta(e + \epsilon + \omega)] + [\bar{\lambda}_1 + \frac{\sigma_{\lambda_1} \Phi(\alpha)}{1 - \Phi(\alpha)}] \quad (8)$$

$$\text{Where } \beta = \frac{\text{cov}(\epsilon + \epsilon Y)}{\text{var}(Y)} = \frac{\sigma_{\epsilon}^2}{\sigma_{\epsilon}^2 + \sigma_{\omega}^2}, \alpha = \frac{\lambda^c - \bar{\lambda}_1}{\sigma_{\lambda_1}}, \Phi(\cdot)$$

represents the density function of the standard normal distribution, and $\Phi(\cdot)$ represents the distribution function of the standard normal distribution. So the price of outstanding shares can be expressed as follow

$$P = \Psi(\lambda_1) \{[(1 - \beta)e + \beta(e + \epsilon + \omega)] + [\bar{\lambda}_1 + \frac{\sigma_{\lambda_1} \Phi(\alpha)}{1 - \Phi(\alpha)}]\} + \xi \quad (9)$$

$$\text{var}(P) = [\Psi(\lambda_1)]^2 \beta^2 [\sigma_{\epsilon}^2 + \sigma_{\omega}^2] + \sigma_{\xi}^2 \quad (10)$$

$\Psi(\lambda_1)$ is the probability of commercial banks managers continuing the implementation of the green credit.

According to (3), (4), (9) and (10), the maximum utility function of commercial banks $\max[U(X,e)]$ take the form

$$\max_{e \geq 0} \{p\Psi(\lambda_1)e - \frac{1}{2}ke^2 - \frac{1}{2}\gamma p^2 \text{var}(P)\} \quad (11)$$

$$\text{Result, } e^* = \frac{p\Psi(\lambda_1)}{k}$$

According to the derivation process and results above, the green reputation brought by commercial banks' green credit helps to improve the banks' share prices, the rise in share prices further prompts management to make positive decisions regarding green credit, so that the possibility of continuing the implementation of green credit increases. According to (8), the expectation of net profit growth will increase as well. So we believe that commercial banks through the issuance of green credit for haze governance can form their green reputation which will increase the profitability of commercial banks.

Sample Data and Empirical Test

According to the foregoing derivation we know that commercial bank green reputation has a certain impact on its profitability. We choose ROE (Rate of Return on Common Stockholders' Equity) as dependent variable and choose haze weather and the impact of a series of indexes of green reputation as independent variable. We establish the following model:

$$(ROE)_{it} = \alpha + \beta_1(AQ)_{it} + \beta_2(DR)_{it} + \beta_3 \ln(SIZE)_{it} + \beta_4(RPT)_{it} + \beta_5(NIS)_{it} + \varepsilon_{it} \quad (12)$$

Among them, ROE is return on equity, equal to the ratio of net profit to average shareholders' equity, which is an important indicator of the profitability of listed companies; AQ denotes the proportion of days throughout the year when air quality reaching Grade II and above (i.e., between AQI 0-100). An air quality of Grade II means the air quality is acceptable, some pollutants have a weak effect on the health of a very small number of sensitive people; DR represents the debt asset ratio of listed commercial banks. Commercial bank lending is

limited by the rate of assets and liabilities and the loan to deposit ratio, green credit scale will also be affected; SIZE is the scale of commercial bank. We take the natural logarithm of total assets at the end of year. Commercial bank size affects its public evaluation and trust in a certain extent; RPT is the reputation commercial banks obtain in the process of green credit; similar to Todd and Milbourn's (2003) approach, the numbers of positive major media articles about the listed banks with respect to green credit are used as these banks' reputation indicators; NIS denotes the level of net interest margin of listed commercial banks. Spread is still the main source of profits of commercial banks. Model selection NIS is to contrast green reputation and spread contribution to the level of profitability of commercial banks is different; ε_{it} is the residual which is normally distributed.

Considering the endogeneity between variables, we establish the model as follows:

$$\begin{aligned} (ROE)_{it} = & \alpha + \beta_1(AQ)_{it} + \beta_2(DR)_{it} + \\ & \beta_3 \ln(SIZE)_{it} + \beta_4(RPT)_{it} + \beta_5(NIS)_{it} + \\ & \beta_6(AQ)_{it} * (RPT)_{it} + \beta_7(DR)_{it} * \ln(SIZE)_{it} + \\ & \varepsilon_{it} \end{aligned} \quad (13)$$

In this paper we collected the data of 16 listed banks in the year 2003-2012 for this study, while some data with missing entries were excluded. Meanwhile we collected the proportion of days per annum with Grade II air quality or above in Beijing, Shanghai, Wuhan, Zhengzhou and Shijiazhuang from the year 2003 to 2012, as a measure of the national average (Table 2), we also included a greater range of research data of Guangzhou, Chongqing, Xi'an and other cities, which produced results consistent with the following results. The RPT indicators were obtained from the "China Economic News Library" in the "China Infobank Database". (Table 3)

Table 2 Days per annum with Grade II air quality or above in different cities

	Beijing	Shanghai	Wuhan	Zhengzhou	Shijiazhuang	Days(AV)	Percentage (%)
2012	281	343	321	319	322	317.2	86.68
2011	286	337	306	318	320	313.4	85.86
2010	286	336	284	318	319	308.6	84.56
2009	285	334	301	322	318	312	85.48
2008	274	328	294	325	301	304.4	83.36
2007	246	328	276	313	289	290.4	79.58
2006	241	324	273	306	287	286.2	78.4
2005	234	322	271	300	283	282	77.24
2004	229	311	247	298	279	272.8	74.7
2003	224	325	246	308	211	262.8	72

Data Sources: China Statistical Yearbooks Database

Table 3 The numbers of positive major media articles about the listed banks

	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
SPDB	16	10	2	7	1	0	0	0	0	0
HXB	1	1	0	1	0	0	1	2	0	0
CMSB	0	1	1	1	0	0	0	0	0	0
CMB	4	2	0	1	0	0	0	0	0	0
NanJ	0	0	0	0	0	0	0	0	0	0
IB	12	1	3	1	1	3	0	0	0	0
BOB	3	1	2	1	1	0	0	0	0	0
ABC	21	3	6	8	2	2	0	0	0	0
ICBC	13	11	12	10	11	3	0	0	0	0
CTB	10	3	1	1	3	0	0	0	0	0
CEB	0	0	1	0	0	0	0	0	0	0
CCB	6	6	11	2	1	0	0	0	0	0
BOC	3	0	11	1	2	0	0	0	0	0
CITIC	0	0	1	0	1	0	0	0	0	0
PB	0	0	0	0	0	0	0	0	0	0
NingB	0	0	0	0	0	0	0	0	0	0

Data Sources: China Infobank Database

Table 4 Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
company	160	8.5	4.624246	1	16
year	160	2007.5	2.881299	2003	2012
roe	160	16.30706	5.602483	.22	40
aq	160	80.786	4.887069	72	86.68
dr	160	95.33604	3.023328	86.9288	113.7141
size	160	27.77658	1.497773	24.11045	30.49563
rpt	160	1.53125	3.476646	0	21
nis	160	2.518313	.372797	1.6	3.28
aqrpt	160	130.6849	298.5194	0	1820.28
drsize	160	2648.086	165.3204	2177.987	3331.797

RESULTS

We used Stata 12 to conduct fixed effect and random effect regression analysis on model (13). In the fixed

effect model, F statistic and its corresponding P value is not significant. The regression results of random effect model are shown as follows:

Table 5 Random effect model estimated results

Estimated results:	Var	sd = sqrt(Var)
roe	31.38782	5.602483
e	19.76893	4.446226
u	4.511861	2.124114
Test: Var(u)=0	chibar2(01) = 16.23	
	Prob > chibar2 = 0.0000	

We can see the test result is Prob> chibar2 = 0.0000, indicating that the model is very significant. Finally,

through the Hausman test, we select the random effect model.

Table 6 Random-effects GLS regression

roe	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
aq	.5628776	.1096207	5.13	0.000	.348025	.7777302
dr	12.78608	2.548479	5.02	0.000	7.791152	17.78101
size	40.26155	8.508981	4.73	0.000	23.58426	56.93885
rpt	3.101283	6.869191	0.45	0.052	-10.36208	16.56465
nis	2.762079	1.187819	2.33	0.020	.4339969	5.090161
aqrpt	-.0335399	.0798594	-0.42	0.074	-.1900614	.1229816
drsize	-.4356914	.0894971	-4.87	0.000	-.6111025	-.2602802
cons	-1220.041	244.624	-4.99	0.000	-1699.495	-740.5868

And Model (13) can be expressed as

$$\begin{aligned}
 (ROE)_{it} = & -1220.041 + 0.5628776(AQ)_{it} + \\
 & 12.78608(DR)_{it} + 40.26155 \ln(SIZE)_{it} + \\
 & 3.101283(RPT)_{it} + \\
 & 2.762079(NIS)_{it} - 0.0335399(AQ)_{it} * \\
 & (RPT)_{it} - 0.4356914(DR)_{it} * \ln(SIZE)_{it}
 \end{aligned}
 \quad (14)$$

Model (14) shows the regression coefficients of AQ and RPT, which are **0.5628776** and **3.101283** respectively, indicating that a good reputation commercial bank obtained from green credit and their profitability are positively correlated; a good social reputation will help improve profitability of commercial banks, every positive media coverage can increase the profitability of commercial banks by

3.101283 per unit. And the reputation contribution is even more than NIS contribution. Meanwhile, it also shows that the logarithm of proportion of days per annum with Grade II air quality and above (data standardized, without considering the percent sign) and profitability of commercial banks are likewise positively correlated.

To sum up the results above, we believe that the commercial banks achieved indirect haze governance by issuing green credit to limit the "high energy consumption, high pollution" corporates and to support environmentally friendly ones, meanwhile obtaining a good social reputation, thus improving their business performance. With effective haze governance, the number of days of good air quality increased, further enhancing the profitability of commercial banks. Therefore, commercial banks' green credit and haze governance positively affected and promoted each other. During the study period especially after 2007, regulators intensive promulgated relevant laws and regulations of green credit, the influence of the policy change how to affect the logic relationship, also need to be discussed. But the influence of the policy is a complex process. In this paper, we did not consider the impact of policy. In subsequent studies we will consider the relevant policy mechanism.

CONCLUSION

Since the economic reform, China's economic development has made remarkable achievements, but to a certain extent at the expense of damages to resources and the environment. Yang et al (2013) conducted a study on the G20 countries, including China, in which China's air pollution and indoor air pollution ranked second and third respectively among the G20 (95% level of confidence) [8]. Similar studies have shown that every increase of 10 μ g in PM_{2.5} concentration causes the relative risk of death of human to increase by 4 percent, the risk of death due to lung cancer to increase by 8%, and the risk of death due to cardiovascular disease to increase by 6%. Thus, haze governance is extremely urgent. Green credit implemented by commercial banks is able to control the credit scale of haze-related businesses effectively, utilizing the financial leverage to guide enterprises to transform from shortsighted expansion by consuming high amount of resources to sustainable growth. The previous sections show that commercial banks benefit greatly from indirect haze governance, specifically in terms of improved business performance and social reputation. Therefore, the implementation of green credit by commercial banks is required not only to enhance their own competitiveness, accelerate their international development and boost their profitability, but also to fulfill their social responsibilities

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