Studies on the evaluation of sustainable competitiveness of listed commercial banks in China

Hong LEI[1,a], Tian-Hang TAO [2,b], Xiao-Jia CHEN[3,c]

[1,2,3]School of business administration, Jimei university, Xiamen, Fujian,361021,P.R.C.

[a]leihong618@163.com, [b]2596855367@qq.com, [c]624630652@qq.com

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Abstract: This paper establishes the evaluation index system of commercial bank sustainable competitiveness, Then selects the relevant data and uses factor analysis to evaluate the sustainable competitiveness of listed commercial banks, according to the research results, the suggestions is put forward on improving the sustainable competitiveness of commercial banks.

Introduction

The commercial banks have always been the pillar of China's financial system. Therefore, it is particularly critical to explore the sustainable competitiveness of commercial banks. Commercial bank sustainable competitiveness refers to "the ability of a bank to compare with another commercial bank, which shows its ability to provide better services and create more profits and wealth" [1], that is, commercial banks as an economic organization should have sustainable profitability and competitive advantage in market competition[2]. At present, the renowned methods on the evaluation of the commercial banks sustainable competitiveness is mainly divided into four categories: the evaluation of rating systems, the evaluation of international rating agencies, the evaluation of the World Economic Forum and the evaluation of the International Institute for Management Development in Lausanne, Switzerland, and the evaluation of professional newspapers and magazines[3,4,5,6].

The sustainable competitiveness is the basis for the survival and development of commercial banks and determines whether commercial banks can be sustained, stable, healthy and long-term development. With the development of financial marketization and the rise of internet finance, the competition among commercial banks in China has become fiercer and fiercer. By reviewing the literature on the sustainable competitiveness of commercial banks at home and abroad, on the basis of comparing the advantages and disadvantages of domestic and foreign research results, using listed commercial banks as a sample, an empirical study on the sustainable competitiveness of commercial banks was conducted.

The construction of index system

indicator choices

The sustainable competitiveness of a commercial bank is gradually accumulating its share in market and its development capabilities. So a more comprehensive evaluation index system for the sustainable competitiveness of commercial banks is constructed, covering a lot of aspects of the competitiveness of China's commercial banks.

A. Profitability indicators. Profitability refers to the ability of a commercial bank to continue to pursue profit maximization. There are four indicators that net profit rate of total assets, return on net assets, operating profit rate, and basic earnings per share to reflect the profitability[7].

B. Operating indicators. Operational capability refers to the ability of commercial banks to use their existing assets to continuously obtain profits. This ability is the main manifestation of the sustainable competitiveness of commercial banks. This ability mainly reflected in cost- income ratio and the turnover rate of the total assets[8].

C. Liquidity indicators. Liquidity is a kind of ability of commercial banks to deal with customers' various needs. The indicators that reflect the liquidity of commercial banks mainly include property rights ratio, asset-liability ratio, and deposit-loan ratio[9].

D. Safety indicators. The security capabilities of commercial banks refer to the ability to protect the bank's property, credit, and income from the loss, the safety of commercial banks mainly reflected in the capital adequacy ratio, core capital adequacy ratio, Non-performing loan rate , and non-performing loan provision coverage rate[10].

E. Market share. Market share is a capability of commercial banks to control the market[11]. The total assets fully reflects the commercial banks' market share; deposits are the most important resources and the basic conditions for obtaining profits and expanding the scale; loans are the main sources of profit for China's commercial banks.

F. Development indicators. The development capability is in fact a kind of sustained viability and potential competitiveness. It includes the deposits growth rate, loan growth rate, and capital accumulation rate, as well as the growth rate of total assets and the growth rate of net profit[12].

G. Innovative indicators. The traditional banking business mainly relies on interest incomes. Other incomes came from the bank's innovation. The innovation capability is reflected in non-interest income ratio[13].

There is an index system of sustainable competitiveness evaluation for commercial banks in China to be constructed in this paper, shown in table 1.

Table 1   Evaluation index system on the sustainable competitiveness of commercial banks

Indicators	Variables	Calculation rules
Net profit rate of total assets	X_1	Net profit/total assets
Return on net assets	X_2	Profit after tax / owner's equity
Operating profit rate	X_3	Operating profit/operating income
Basic earnings per share	X_4	Net profit attributable to common shareholders for the current period/ Weighted average of common shares at outside
Cost-income ratio	X_5	Operating expenses/operating income
Total asset turnover	X_6	Operating income/total assets
Property rights ratio	X_7	Total liabilities/owner equity
Asset-liability ratio	X_8	Total liabilities/total assets
Deposit-loan ratio	X_9	Total loans / total deposits
Capital adequacy ratio	X_{10}	(core capital + subsidiary capital)/weighted risky total assets
Core capital adequacy ratio	X_{11}	Core capital/weighted risk total assets
Non-performing loan rate	X_{12}	(Subprime loans + suspicious loans + loss loans)/ Total loan
Non-performing loan Coverage ratio	X_{13}	(general preparation + special preparation + specify preparation)/ (Subprime loans + suspicious loans + loss loans)
Total assets	X_{14}	Report directly
Share of deposit	X_{15}	Total Deposits / Total Deposits in the Bank's local and Foreign Currency
Loan share	X_{16}	Total Loans / Total Loans in local and Foreign Currency
Total asset growth rate	X_{17}	Total asset growth for the year/total assets at the beginning of the year
Deposit growth rate	X_{18}	Deposit growth for the year/Total deposits at the beginning of the year
Loan growth rate	X_{19}	Loan increase for the year/total loan at the beginning of the year
Net profit growth rate	X_{20}	Net profit growth this year/Total profit at the beginning of the year
Capital accumulation rate	X_{21}	This year's increase in owner's equity/early year owner's equity
Non-interest income ratio	X_{22}	Non-interest income/operating income

Settings to the control variable

In order to make the empirical results as objective and accurate as possible, this paper selects control variables as follow: the natural logarithm of the total assets at end-of-year to reflect the asset size (SIZE), asset-liability ratio (LEV) that reflects the capital structure, and basic earnings per share (EPS) which reflects the profitability.

Empirical Analysis of the sustainable Competitiveness of　Commercial Banks in China

Sample Selection and Data Sources

The sample in this paper is based on relevant data from the listed commercial banks in 2015-2017, as well as the annual reports, audit reports, and the processing information about the illegal and non-compliance events of listed commercial banks in 2015-2017.　The annual report is mainly downloaded from the Wind database, and the audit report is mainly obtained from GuoTaiAn database. The illegal and irregular information is mainly checked from the official website of the China Securities Regulatory Commission.

Model settings

There are many methods to evaluate the sustainable competitiveness of commercial banks. In order to avoid subjective uncertainty and to reduce the errors caused by the correlation of various indicators, factor analysis method is selecting as calculating model.

The basic formula as follow: $$\bar{Z} = A\bar{X} + \bar{e} \tag{1}$$

Here $\overset{\shortmid}{X} = (X_1, X_2, \mathbf{L}, X_{22})$ is a vector of variables, $\overset{\shortmid}{Z}$ is the common factor vector, $\overset{\shortmid}{e}$ is a random vector, A is a factor load matrix. The calculations Realized with SPSS9.0.

Data Preparation and test

A. Data Preprocessing. Many of the indicators in table 1 are inverse indicators, Firstly making the inverse indicator to positive with $x_k{}' = \frac{1}{x_k}$, and then normalizing all indicators with the Z-score method.

B. Moderation test. After data preprocessing, KMO and Bartlett spherical tests are performed. Results shown that KMO=0.632> 0.5, Sig<0.001, indicating that the data in this paper is suitable for factor analysis method.

C. Commonness test. The common variance of most variables is above 0.8 in table 2, It means that information loss of those variables is less, retains of information is sufficient, and shows that the results of factor analysis are valid.

Table 2　　Common factor variance of sample data

Index	Symbol	Initial	Extract	Index	Symbol	Initial	Extract
Net profit rate of total assets	X_1	1.000	.936	Non-performing loan rate	X_{12}	1.000	.697
Return on net assets	X_2	1.000	.921	Non-performing loan Coverage ratio	X_{13}	1.000	.901
Operating profit rate	X_3	1.000	.934	Total assets	X_{14}	1.000	.863
Basic earnings per share	X_4	1.000	.824	Share of deposit	X_{15}	1.000	.913
Cost-income ratio	X_5	1.000	.918	Loan share	X_{16}	1.000	.892
Total asset turnover	X_6	1.000	.822	Total asset growth rate	X_{17}	1.000	.845
Property rights ratio	X_7	1.000	.966	Deposit growth rate	X_{18}	1.000	.921
Asset-liability ratio	X_8	1.000	.903	Loan growth rate	X_{19}	1.000	.917
Deposit-loan ratio	X_9	1.000	.891	Net profit growth rate	X_{20}	1.000	.833
Capital adequacy ratio	X_{10}	1.000	.879	Capital accumulation rate	X_{21}	1.000	.689
Core capital adequacy ratio	X_{11}	1.000	.887	Non-interest income ratio	X_{22}	1.000	.725

Extracting factors

The cumulative contribution rate of the variance of factor 1-6 is 85.706% in table 3, and each eigenvalue is greater than 1, so the factor 1-6 can be extracted to explain the original 22 variables, they are recorded as $Z_k(k = 1, 2, \mathbf{K}, 6)$.

Table 3　　The total variance of sample data interpretation

Variable	Initial eigenvalue			Extract squared loaded			Rotation squared loaded		
	Total	Variance (%)	Accumulation (%)	Total	Variance (%)	Accumulation (%)	Total	Variance (%)	Accumulation (%)
1	7.004	29.961	29.961	6.484	29.961	29.961	4.389	20.431	20.431
2	4.57	20.115	50.076	4.320	20.115	50.076	3.690	17.151	37.582
3	3.103	11.449	61.525	2.523	11.449	61.525	3.195	14.612	52.194
4	2.032	8.898	70.423	1.852	8.898	70.423	2.943	13.858	66.052

5	1.852	8.082	78.505	1.673	8.082	78.505	2.360	11.205	77.257
6	1.489	7.201	85.706	1.479	7.201	85.706	1.753	8.449	85.706
7	.897	3.697	89.403						
8	.654	2.357	91.760						
9	.621	2.172	93.932						
10	.479	1.731	95.663						
11	.351	1.218	96.881						
12	.253	1.008	97.889						
13	.219	.704	98.593						
14	.181	.689	99.267						
15	.118	.392	99.659						
16	.069	.176	99.835						
17	.026	.066	99.901						
18	.005	.027	99.928						
19	.004	.023	99.966						
20	.003	.015	99.981						
21	.002	.012	99.993						
22	.001	.007	100.000						

Calculating score for Common Factor

The score of the sustainable competitiveness of the listed commercial bank on the common factor is calculated by Formula (2).

$$Z_k = a_{k1}X_1 + a_{k2}X_2 + \mathbf{K} + a_{k22}X_{22}, k = 1,2,\mathbf{K},6 \tag{2}$$

Coefficients $a_{k1}, a_{k2}, \mathbf{K}, a_{k22}$ $(k = 1,2,\mathbf{K},6)$ in formula (2), respectively corresponds to the data in columns 1, 2... 6 in table 4.

Table 4 The coefficient matrix of factor score for sample data

Index	Symbol	Z_1	Z_2	Z_3	Z_4	Z_5	Z_6
Net profit rate of total assets	X_1	-.041	.031	-.011	.234	.130	.021
Return on net assets	X_2	-.015	.085	.056	-.073	.284	-.143
Operating profit rate	X_3	-.126	.145	-.032	-.014	.203	.015
Basic earnings per share	X_4	.135	.266	-.013	-.027	.204	-.160
Cost-income ratio	X_5	.031	.120	-.047	-.113	.080	.033
Total asset turnover	X_6	.119	.204	-.043	.002	.062	-.036
Property rights ratio	X_7	.039	-.198	-.024	.018	.100	.162
Asset-liability ratio	X_8	.182	.139	.012	.078	-.021	.172
Deposit-loan ratio	X_9	.172	-.104	.043	.036	-.018	.078
Capital adequacy ratio	X_{10}	.532	.456	.083	.030	-.056	.031
Core capital adequacy ratio	X_{11}	-.126	-.130	.079	.430	.116	.156
Non-performing loan rate	X_{12}	.163	-.027	.107	.040	.109	-.045
Non-performing loan coverage ratio	X_{13}	.152	.025	.086	.040	.137	.024
Total assets	X_{14}	-.085	-.062	.175	.035	.085	.142
Share of deposit	X_{15}	-.210	-.089	-.066	.193	.082	.252
Loan share	X_{16}	-.206	-.061	-.131	.022	.009	.272
Total asset growth rate	X_{17}	.042	-.057	.102	.124	.013	.079
Deposit growth rate	X_{18}	.077	.037	-.071	.118	-.106	-.045
Loan growth rate	X_{19}	.023	.148	-.074	.294	-.010	-.041
Net profit growth rate	X_{20}	-.057	.037	.047	.063	-.012	-.039
Capital accumulation rate	X_{21}	-.046	-.019	.258	.071	.056	.034
Non-interest income ratio	X_{22}	.116	.029	.249	.167	-.016	.032

Rankings of the sustainable Competitiveness of Listed Commercial Banks in China

The variance of the rotation squared sum is used to calculate the weighted sum of the common factors, and the comprehensive score Z of the sustainable competitiveness of the listed commercial bank is calculated and ranked based on this score. The rankings shown in table 5.

$$Z = 0.20431\ Z_1 + 0.17252\ Z_2 + 0.14612\ Z_3 + 0.13858\ Z_4 + 0.11205\ Z_5 + 0.08449\ Z_6 \tag{3}$$

Table 5   Results and rankings on the sustainable competitiveness of listed commercial banks

Bank name	2015		2016		2017	
	Comprehensive score	Ranking	Comprehensive score	Ranking	Comprehensive score	Ranking
China Construction Bank	.6615	1	.7947	1	.6683	1
Everbright Bank	.6306	2	.0672	6	-.1709	11
Bank of China	.6206	3	.1287	4	.2378	5
Minsheng Bank	.3444	4	.1021	5	.0721	7
ABC	.3039	5	.0216	7	.3087	4
Bank of Communications	.2724	6	-.0738	9	-.1059	8
Industrial Bank	.2423	7	-.1342	11	.1183	6
Huaxia Bank	.1440	8	-.6375	16	-.5762	16
Shanghai Pudong Development Bank	.1335	9	-.1264	10	-.1578	10
ICBC	.0875	10	.3245	3	.5327	2
Bank of Beijing	.0622	11	-.3009	14	-.3199	14
China CITIC Bank	-.0871	12	-.4154	15	-.2942	13
Ningbo Bank	-.1091	13	-.0298	8	-.2205	12
Ping An Bank	-.1405	14	-.1689	13	-.3865	15
China Merchants Bank	-.3329	15	-.1484	12	.3624	3
Nanjing Bank	-.3635	16	.6969	2	-.1369	9

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