

# Research on Performance Evaluation of Banking Listed Companies Based on RAROC Model

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**Abstract.** This paper studies how to evaluate the performance of commercial banks scientifically. RAROC model is used to analyze the financial data of 16 listed banks in China for 4 years. Then, this paper clarifies that RAROC (Risk-adjusted Capital Return Rate) is an appropriate index to evaluate the performance of commercial banks. The establishment and application of the index system with RAROC as the core will help to establish the restraint and incentive mechanism of commercial banks in China.

## 1. Introduction

With the gradual internationalization of China's financial industry, foreign banks have entered China and allowed to operate RMB business. Foreign Banks' strong capital strength, advanced management technology, and their rapid acquisition of domestic market resources have greatly impacted the development of China's financial industry. In order to maintain or even improve market share and gain relative competitive advantage in the highly competitive financial market, China's commercial Banks have been carrying out performance appraisal activities, testing the completion of business objectives and evaluating enterprise management ability.

The existing performance evaluation methods of commercial banks in China are mainly financial indicators evaluation method, balanced scorecard evaluation method, efficiency analysis method, economic value-added evaluation method. Although these indicators can reflect the performance level of enterprises to a certain extent, they do not take into account the risk.

This paper attempts to evaluate the performance of enterprises by RAROC index which takes into account the risk, so as to find out the shortcomings of operation and various factors affecting the performance. It provides theoretical support for improving and innovating the performance management mode and incentive mechanism of the company.

## 2. Theoretical Analysis

### 2.1 Theoretical analysis of performance evaluation

In terms of performance, domestic and foreign scholars have given many definitions. The commonly known ones are following: result performance theory, behavior performance theory and ability performance theory [1]. In this paper, performance is defined as the operating results and operating efficiency of an enterprise during a certain period [2]. Operating results refer to the completion of the expected objectives of the enterprise, which measures the results; Operating efficiency refers to the work efficiency of employees in the process of achieving goals, and measures the process. Process and results are mutually complementary and indispensable. If only emphasizing process and paying no attention to result, formalism may arise. If only emphasizing result and paying no attention to process, some relatively important process factors may be neglected, and these factors may play a crucial catalytic role in improving enterprise performance.

For the listed companies in the banking industry, performance evaluation is aimed at developing ability, improving work and increasing bank value.

## 2.2 Feasibility analysis of bank performance evaluation based on RAROC

Compared with other traditional performance evaluation methods, the key of RAROC is to accurately quantify the predictable future risk losses into current costs, adjust current income, and finally measure the size of the risk-adjusted income [3], so that the results are more in line with the actual situation.

RAROC model can accurately determine how much economic capital each business or product needs and how to calculate capital gains based on these needs. In addition, RAROC provides a consistent, reasonable and fair framework for measuring risk-adjusted returns, thus providing more practical information for managers to make risk/benefit trade-off. Compared with RORAA (Risk-adjusted Asset Return Rate) and RAROA (Risk-adjusted Asset Return Rate), RAROC (Risk-adjusted Capital Return) is closer to the bank's reserve withdrawal system, and can be used to evaluate the business activities of commercial banks at all levels, including various branches, business departments, or even specific to a certain bank employee.

## 3. Empirical Research

### 3.1 Sample and data sources

This paper takes 16 listed banks in China as the research object, and uses RAROC model to analyze their financial data for 4 years to draw conclusions. The model used data from the database of Tai'an and the China Securities Regulatory Commission website and accounting firm sites.

### 3.2 RAROC model and index system

RAROC, proposed by Banker Trust in the 1970s, refers to risk-adjusted capital gains. It is usually used to evaluate bank performance and measure the risk of bank credit portfolios. The basic model is as follows:

$$\text{RAROC} = \frac{\text{Income} - \text{Capital costs} - \text{Operating costs} - \text{Expected loss} - \text{Taxes}}{\text{Economic capital}} \quad (1)$$

According to the above equation, there are six main factors that affect the RAROC value:

Table 1 Related variables in the model

Variable	Definition
Income	The total cash flow of commercial banks during their daily operation
Capital costs	The price paid by an enterprise to raise and use funds.[4]
Operating costs	Various administrative expenses incurred in daily business activities
Expected loss	Credit risk, operational risk, market risk and so on during management.
Economic capital	Capital allocated for each loan to cover unexpected losses.[5]
Taxes	Tax arising from daily business includes business tax and income tax.

This paper intends to calculate the five-year rate of return on risk-adjusted capital of 16 listed banks, calculate their mean and standard deviation, and evaluate the performance of commercial banks by economic capital combined with expected losses. RAROC value measures the rate of return after risk adjustment. The greater the RAROC value, the higher the enterprise performance level and the stronger the risk management and control ability; the lower the bank performance level, the weaker the risk management and control ability. RAROC mean and standard deviation reflect the overall situation of banks over the past 4 years. Economic capital and expected loss are two major factors affecting the RAROC value. According to the results of RAROC value and combined with the values of these two indicators, further analysis could be made from what aspects of the bank to improve the performance level of the bank, and then improve the value of the enterprise. Based on the actual situation, the RAROC model is directly simplified to the following equation:

$$\text{RAROC} = \frac{\text{Net profit} - \text{Expected loss}}{\text{Economic capital}} \quad (2)$$

### 3.3 Empirical results analysis

This paper calculates the RAROC value, RAROC mean value and RAROC standard deviation of the 16 listed banks in the past 4 years. The result is as follows:

Table 2 2013~2016 related economic indicators of 16 Commercial Banks (unit: 1 million)

Year	2013			2014			2015			2016		
Variable Bank	Net profit	Expected loss	Economic capital	Net profit	Expected loss	Economic capital	Net profit	Expected loss	Economic capital	Net profit	Expected loss	Economic capital
BOC	14552	1	58100	16374	5	54253	17719	4171	72602	17942	61832	79695
CCB	19360	24	72040	21512	203	54608	22824	4192	80571	22889	52404	90537
ICBC	23869	46	73856	26296	4	83857	27628	2321	93181	27772	42859	102534
ABC	14513	7	55490	16621	258	49295	17951	3559	70869	18077	33159	81591
CIB	3492	220	11087	4151	42410	8303	4753	4974	13497	5065	1647	15506
BCM	5847	3	21708	6246	429	27849	6603	2714	29613	6683	29116	32549
SPDB	3431	43	11105	4120	11113	14664	4736	611	16542	5099	742	11105
PAB	1351	479	7039	1523	33813	5312	1980	5138	8812	2186	965	10791
CMB	3830	159	13029	4328	4835	10135	4556	4520	15207	4702	5053	17695
CMBC	4527	70	15855	5174	3750	18459	5604	613	21223	5801	6136	24440
CNCB	3138	14	13806	3971	4092	16334	4145	9291	18663	4174	10566	21708
CEB	2362	3	7528	2675	533	10841	2892	1041	9988	2957	3827	13184
HXB	1279	7	6940	1551	18402	5337	1802	1265	8085	1895	9701	9393
BOB	1168	729	4842	1346	578	3426	1564	30	5814	1688	767	6755
NJCB	404	6	1039	453	73	878	565	25	1454	706	157	2085
NBCB	406	135	1424	484	72	1062	563	11	1782	656	34	2157

Table 3 RAROC value of commercial banks

Year Bank	2013	2014	2015	2016	Mean	Standard deviation
BOC	25.04%	30.17%	18.66%	-35.07%	4.02%	26.55%
CCB	26.84%	39.02%	23.13%	-32.60%	12.92%	28.17%
ICBC	32.25%	31.35%	27.16%	-14.71%	19.70%	20.95%
ABC	26.14%	33.19%	20.31%	-18.48%	13.27%	20.12%
CIB	29.51%	-40.76%	-1.64%	22.04%	-99.58%	31.53%
BCM	26.92%	20.89%	13.13%	-28.92%	-1.42%	23.35%
SPDB	30.51%	-47.69%	24.93%	9.24%	-0.76%	37.36%
PAB	12.38%	-7.84%	-35.84%	11.32%	-86.74%	20.46%
CMB	28.17%	-5.00%	0.24%	-1.98%	8.07%	15.41%
CMBC	28.11%	7.71%	23.52%	-1.37%	14.81%	12.67%
CNCB	22.62%	-0.74%	-27.57%	-29.44%	-7.18%	25.48%
CEB	31.33%	19.76%	18.54%	-6.59%	13.68%	13.84%
HXB	18.33%	-15.72%	6.64%	-8.11%	-65.84%	14.27%
BOB	9.05%	22.42%	26.38%	13.63%	14.90%	8.55%
NJCB	38.24%	43.25%	37.12%	26.37%	31.78%	7.95%
NBCB	19.07%	38.81%	30.96%	28.86%	28.43%	7.22%

By observing the above table, we can find that:

Among the joint-stock commercial banks, the RAROC values of CMBC, CEB and CMB fluctuate less, and their risk management level is more prominent. Their earnings can offset their risks and their profits are more secure. The RAROC value of SPDB and CIB fluctuates greatly. The RAROC standard deviation of CIB in 4 years is 31.53%. The fluctuation of SPDB is more intense, as high as 37.36%. It is the most volatile of 16 commercial banks. As can be seen from the above table, the net profit of SPDB is far less than the expected loss, and its economic capital requirements are higher. The risk-adjusted return on capital of CIB was negative in three of its 4 years, and its expected losses in 2014 were the highest among the 16 banks. In addition, especially the RAROC value of CITIC Bank shows a decreasing trend, so we should find out the problem inside the enterprise and solve it in time.

The RAROC value of the city commercial banks in 4 years is all above 0, especially the Nanjing Bank. But if we only look at the net profit, we find that the Bank of Beijing has the strongest profitability, while its RAROC value is the lowest among the three banks. This also reflects the inadequate risk control ability of the Bank of Beijing and the inefficient allocation of economic capital.

Generally speaking, combined with Table 2 and Table 3, we can find that the economic capital allocation efficiency of listed commercial banks in China is not high, which needs to be further optimized. According to the five-year economic capital allocation and RAROC value changes of each bank, although some listed banks have relatively balanced capital allocation, their risk-adjusted return rate is relatively backward. Therefore, when banks allocate economic capital to all kinds of business, they should not only pay attention to the growth of efficiency, but also pay attention to the balance of business development. Only in this way can we achieve the optimal allocation of economic capital in the true sense.

#### **4. Conclusion**

According to the research on performance evaluation of Listed Companies in banking industry using RAROC method, we can draw the following conclusions:

(1) RAROC performance evaluation method links capital gains to investment risks. The level of RAROC indicators both depends on the level of business development and risk management and control capabilities of enterprises. Using RAROC as a performance evaluation index, the results measured are more in line with the actual situation than traditional performance evaluation methods.

(2) Through the analysis of RAROC indicators of commercial bank performance evaluation, we find that RAROC can not only be used for commercial bank performance evaluation or risk measurement, but also be used to allocate the capital of enterprises. Therefore, an enterprise can analyze how to allocate economic capital to achieve the desired objectives, with setting an expected RAROC value, in order to make full use of enterprise resources and maximize the benefits.

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