Analysis of credit card risk management of commercial banks in China

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I. Introduction

In many developed countries and regions, such as the United States, Japan and Hong Kong, the profits made by credit card business has an important share in the proportion of bank income .But in China, the credit card business profit of banks is still loss at present, and the bank's overall business still need to be improved. In order to promote the healthy and development of credit card business, it is necessary to study the credit card risk management in our country.

II. Problems of Credit Card Risk Management in China

There are several problems of China's credit card risk management. Firstly, personal credit system is imperfect, it is difficult for the bank to judge the customer's property, income and repayment intention according to the credit information database, so that the credit risk level of the customer cannot be evaluated effectively. Secondly, the construction of laws and regulations are lagging behind. In order to protect personal privacy, laws and regulations fight against credit card crime need to be improved. Thirdly, there is the problem of information asymmetry. When apply for a credit card, cardholders will conceal some information which is not conducive to the application. So the bank will increase the interest rate of repayment, which is unfair to the customer whose credit risk is less, and it is easy to make adverse selection risk. Fourthly, the bank's internal credit risk control did not do well. When managing credit card risk, banks always focus on external risk prevention, but internal control mechanism is relatively weak, so it is easy to produce operational risk.

III. An Empirical Study on Credit Card Risk Management Based on Logistic Model

3.1 Basic Principle of Logistic Model

In this paper, Logistic regression model is used as the research tool. Logistic model is a mathematical model which transforms the dependent variables into 0 and 1 through the specific probability function, introduces multiple independent variables, and transforms by the logarithmic function. Credit card risk includes two cases. IF the cardholder defaults, assigns it to 0, if not default, assigns it to 1. Assume that the probability of default is (1- P), the probability of non-default is P.

The linear function with P as the dependent variable is as followed.

$$P = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_n X_n + \varepsilon \qquad (1.1)$$

Place P into the Logistic model and we can get the following results.

$$\log istic(P) = \ln\left(\frac{P}{1-P}\right) \qquad (1.2)$$

$$\ln\left(\frac{P}{1-P}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_n X_n + \varepsilon \qquad (1.3)$$

$\frac{P}{1-P}$ Is the occurrence of the ratio, β_n is the regression coefficient，X_n is the explanatory variable，α is a constant term，ε is a random error term.

On the left side of the formula is the logarithm of the customer's performance, the higher the value, the higher the likelihood that the customer will perform. Banks can compare this value with the set-in rate to determine the amount of credit to the client

3.2 Sample and Hypothesis

This article selected gender, age, marital status, income, education level data of 220 customer from the Industrial and Commercial Bank of China in Anhui Province in 2016 randomly, gender, age, marital status, income, education level. The assumptions for the explanatory variables are as follows.

Firstly, for sex, as women become more and more active in the workplace, their level of thinking and economic independence are also strong, so we can assume that sec has no effect on credit risk. Secondly, for age, the age is divided into three levels: younger than 30, 31 to 45 years, and older than 45. We assume that the older cardholder have the smaller probability of default. Thirdly, for the degree of education, the education level is divided into the following levels: Master and above, undergraduate, college, high school, secondary school and below. We assume that the cardholders who have higher degree of education, the probability of default is smaller. Fourthly, for the marital status, the customer is divided into two categories: married and unmarried. We assume that marriage can reduce the cardholder's credit risk. Fifthly, for income, the scope of customer income is divided into three categories: less than 3 million, 3 to 8 million, more than 8 million. Assume that the higher the income, the less the probability of default.

Table 1 Variable Description

Variable	Description
Sex	1:Male
	2:Female
Age	1: Under 30 years old
	2: 31 to 45 years old
	3: Over 46 years old
Edu	1: Master and above
	2: Undergraduate or college
	3: High school, secondary school, and below
Mar	1:unmarried
	2:married
Income	1: 3 million or less
	2:3 to 8 million
	3:More than 8 million

3.3 Empirical Test
3.3.1 Granger Causality Test

This paper Use the Granger causality test to see if the variables have an impact on the compliance rate. In the Granger test，this paper set the default period as 2, and set the significance level as 5% and 10%. As we can see from the table below, when the significance level is 5%, only P value of Edu2 and Inc2 is greater than 5%, the remaining P values are less than 5%, so refused the original hypothesis. When the significance level is 10%, the P value of all items is less than 10%, so reject the original hypothesis, means that gender, age, education, marital status, income will affect the default rate.

Table 2 Granger Causality Test Results

Sample: 1   220
Lags: 2

Null Hypothesis	Observation	Probability
Sex does not Granger P	218	0.0358
P does not Granger Cause Sex		0.0354
Age1 does not Granger Cause P	218	0.0448
P does not Granger Cause Age1		0.0422
Age2 does not Granger Cause P	218	0.0345
P does not Granger Cause Age2		0.0312
Edu1 does not Granger Cause P	218	0.0421
P does not Granger Cause Edu1		0.0483
Edu2 does not Granger Cause P	218	0.0549
P does not Granger Cause Edu2		0.0538
Mar does not Granger Cause P	218	0.0305
P does not Granger Cause Mar		0.0486
Inc1 does not Granger Cause P	218	0.0454
P does not Granger Cause Inc1		0.0037
Inc2 does not Granger Cause P	218	0.0764
P does not Granger Cause Inc2		0.0693

3.3.2 Regression Analysis
The above explanatory variables are brought into the Logistic model

$$\ln\left(\frac{P}{1-P}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_n X_n + \varepsilon$$

Get a regression model.

$\ln(Y) = \alpha + \beta_1 * Sex + \beta_2 * Age_1 + \beta_3 * Age_2 + \beta_4 * Edu_1 + \beta_5 * Edu_2 + \beta_6 * Mar + \beta_7 * Inc_1 + \beta_8 * Inc_2$ P is the compliance rate, 1-P is the default rate, Y is the compliance occurred rate.
Set the sample data into the eviews software, the following regression equation can be obtained：

$$Ln(Y) = 2.3562 + 0.5038 * Sex + 2.0912 * Age_1 + 4.2611 * Age_2 - 3.7246 * Edu_1$$

$$-0.4325 * Edu_2 - 1.4218 * Mar + 6.4211 * Inc_1 + 7.9875 * Inc_2$$

IV. Conclusion

If the coefficients of the explanatory variables in the regression equation are positive, then the customer compliance rate will increase; if the coefficient is negative, the customer default rate will increase. So we can get the following conclusions.

Firstly, gender will affect the customer's default rate, but not the decisive factor. Secondly, the 45-year-old customer fulfillment rate is greater. Because as age increases, knowledge and work experience gained, the probability of being able to perform on time is greater. Thirdly, the coefficient of education level is negative, and Edu2 is significantly greater than Edu1. This shows that the lower the degree of education, the greater the probability of default. This has a lot to do with their ideological and moral, social responsibility. Fourthly, the coefficient of marriage is negative, indicating that unmarried customer's default rate is higher than married. This is because after marriage, people's family and social responsibility will be strengthened, will pay more attention to their credit. Fifthly, the coefficient value of Inc2 is greater than the coefficient value of Inc1, which indicates that the higher the customer's income, the greater the probability of performance, because they have sufficient repayment ability.

Acknowledgments

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