

# Study on the Influence of Innovation and Reform of Accounting Policies on the Impairment of Commercial Bank Credit Card

LIU Guorong<sup>1,a,\*</sup>, YANG Chen<sup>2,b</sup>

<sup>1</sup>School of Management and Engineering, Nanjing University, Nanjing 210093, China

<sup>2</sup>School of Management and Engineering, Nanjing University, Nanjing 210093, China

<sup>a</sup>295133479@qq.com, <sup>b</sup>yangchennju@126.com

\*Corresponding author

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**Abstract.** On March 31, 2017, China's Ministry of Finance issued the “Chinese Version of IFRS 9”, making significant changes in the provision for impairment of financial assets. This paper constructs a theoretical model of the impairment of financial assets in accordance with the new accounting standards, and proposes the method system for the impairment of credit card business under the new accounting standards. Based on the credit card data of a large commercial bank, this paper studies the influence of the IFRS 9 on the impairment of credit card business. The results show that, compared with the IAS 39, under the implementation of the IFRS 9, both the asset scale of credit card business needing to be impaired and the provision for impairment of assets significantly improve, but the reserve ratio of the impairment is reduced.

## 1. Introduction

The outbreak of the global financial crisis in 2008 triggered a worldwide criticism of International Accounting Standard (IAS 39), which is based on the incurred loss model to calculate the impairment of financial assets. In July 2014, the International Accounting Standards Board (IASB) issued the final version of International Financial Reporting Standards 9: Financial Instruments (referred to as IFRS 9), which completely replaced IAS 39 and stipulated that it would come into force on January 1, 2018. On March 31, 2017, the Ministry of Finance of China revised and promulgated three new accounting standards for financial instruments, namely, Accounting Standards for Enterprises No. 22, No. 23 and No. 24, known as the “Chinese version of IFRS 9”, whose main contents are basically consistent with IFRS 9. Under this background, the innovation and reform of financial instrument accounting policy in China, will have a wide and far-reaching impact on financial institutions and related enterprises’ impairment of financial assets, accounting and risk management.

Compared to IAS 39, IFRS 9 has undergone three major changes: classification and measurement of financial instruments, impairment of financial assets and hedging accounting. Among them, the expected credit loss model replacement of the incurred loss model has the greatest impact on the impairment of financial instruments, which is a fundamental change in the way of impairment of financial assets, and is expected to completely realize the transformation of accounting principles from “looking back” to “looking forward”. In addition, commercial banks are the largest financial institutions with financial assets in China, so the implementation of the new accounting standards will have the greatest impact on commercial banks.

As is well known, with the rapid development of China's economy, the consumption level of Chinese has significantly improved, and the concept of credit consumption has gradually penetrated into the hearts of the people. Thus, credit loans, formed by credit consumption, now account for a large proportion of commercial banks’ financial assets, and maintain a high growth rate. But it can’t be ignored that with the rapid development of credit card business, credit risk of credit card business is also rising rapidly. Recently, the “Overall Operation of the Payment System in the Third Quarter of 2018” released by the People's Bank Of China shows that the total amount of credit card loans overdue for half a year increased from 7.689 billion yuan in 2010 to 88.098 billion yuan in the

first quarter of 2018, an increase of more than 11 times. Therefore, the impairment of credit card financial assets, especially under the background of the implementation of IFRS 9, is especially important for commercial banks financial assets quality and risk management. Thus, it is of great important theoretical and practical significance to investigate the quantitative impact of IFRS 9 implementation on commercial banks' business impairment.

Based on the basic requirements of IFRS 9, this paper tries to construct a theoretical model of the provision for impairment of financial assets. Combining with the characteristics of credit card business, we present a method system for the provision of impairment of financial assets for credit cards, and compare the impairment of credit cards under IFRS 9 and IAS 39 through the historical data of a large state-owned commercial bank. Last, this paper puts forward some suggestions to improve the impairment readiness of credit card business under the new standards, which will benefit the risk management of credit card business of commercial banks in China and the supervision department to improve the supervision policy.

Our paper contributes to the existing literature in three aspects. First, to our best knowledge, it is the first paper to provide the theoretical model and practical method system for credit card business. Second, compared to most study focusing on the qualitative research, we investigate the quantitative impact of IFRS 9 on the commercial bank's credit card business, using the empirical data from a large state-owned bank. Third, our results show that compared to IAS 39, IFRS 9 will result in more provision for the impairment of credit cards in the commercial banks, indicating more prudential.

The reminder of the paper proceeds as follows. Section 2 is the literature review. Section 3 presents the theoretical model. Section 4 analyze the empirical results. Section 5 concludes.

## **2. Literature Review**

In 2014, the IASB issued the final version of IFRS 9, which clearly pointed out the use of expected credit loss model (ECL) to calculate financial assets impairment, but the IFRS 9 did not give a specific and complete measurement model, only clarified the basic connotation of ECL, and provided the guidelines for the calculation of financial instrument impairment. Some scholars, such as Brunel et al. (2016)<sup>[1]</sup> argue that the expected credit loss of financial instruments depends on four factors: the outstanding principal, the marginal default probability, the loss given rate and the discount rate. Xu (2016)<sup>[2]</sup> also constructs the ECL model under discrete and continuous conditions, based on the definition of ECL.

Nowadays, there are still some controversies about the impact of IFRS 9 on commercial banks. Z Novotnyfarkas (2016)<sup>[3]</sup> points out that the financial assets which need impairment under IFRS 9 have a wider scope and time range, so the impairment of the financial assets is much more, thus is conducive to the stability of the entire financial system. However, Miu P and Ozdemir B (2017)<sup>[4]</sup> point out that when the economy is in the downward stage and the financial assets in the stage 1 turn to the stage 2, the period of impairment is changed from the next 12 months to the whole life period of financial assets in the future, which will increase the pro-cyclicality and volatility of impairment of financial assets.

Chinese scholars' research on IFRS 9 is also increasing gradually, but most of them focus on qualitative analysis at the overall level, and very few use commercial banks' public earnings data to calculate the specific impact quantitatively. Pan (2011)<sup>[5]</sup> shows that the impact of IFRS 9 on China's financial institutions mainly focuses on equity instruments and the measurement of fair value of financial assets. Wang et al. (2015)<sup>[6]</sup> summarize that the development process of IFRS 9, and propose that the implementation of the new accounting standards will put forward higher requirements for risk management of financial institutions in China. In addition, a few literatures estimate the impact of IFRS 9 on commercial banks based on public data. Li and Wu (2015)<sup>[7]</sup> find that, based on the data of five major commercial banks' financial statements, the application of the ECL model will enhance the reserve of commercial banks and reduce the net profit of banks, but the overall estimation method is relatively rough and simple. To sum up, there are relatively few studies on IFRS 9 in China at present, which focus on qualitative analysis and rough quantitative estimation.

The theoretical model construction and empirical research on this issue are relatively scarce. Therefore, this study has important theoretical and practical significance.

### 3. Theoretical Modeling

#### 3.1 Analysis on theoretical modeling

According to New Accounting Standard No. 22, the ECL refers to the weighted average value of credit loss of financial instruments weighted by the risk of default. Credit loss refers to the difference between all cash flows expected by a financial instrument in the future and contractual cash flows. Taking calculating the ECL of a financial instrument throughout its life cycle as an example, we denote  $t=0$  as the reporting date and  $T$  as the contract term of the financial instrument. According to the definition given in the accounting standards, the expected credit loss of the financial instrument satisfies during the whole life period as follows:

$$ECL = E \left[ \sum_{t=1}^T \frac{(CF_t - CR_t)}{(1 + EIR)^t} \right]. \quad (1)$$

Where  $CF_t$  represents the cash flow according to the contract.  $CR_t$  denotes the actual cash flow at time  $t$ , and  $CF_t - CR_t$  represents the difference of cash flow at time  $t$ . ECL is the expected value of the discount value of all future cash flow differentials. Assuming the default time of the financial instrument is  $\tau$ , then the equation (1) can be written as follows:

$$ECL = E \left[ \sum_{t < \tau} \frac{(CF_t - CR_t)}{(1 + EIR)^t} + \sum_{t \geq \tau} \frac{(CF_t - CR_t)}{(1 + EIR)^t} \right]. \quad (2)$$

Before default, the actual cash flow that the bank can receive should be equal to the cash flow stipulated in the contract. At this time, the formula  $\sum_{t < \tau} \frac{(CF_t - CR_t)}{(1 + EIR)^t}$  is equal to 0, which means that equation (2) can be rewritten as follows:

$$ECL = E \left[ \left( \sum_{t \geq \tau}^T CF_t \frac{\frac{1}{(1 + EIR)^t}}{\frac{1}{(1 + EIR)^\tau}} - \sum_{t \geq \tau}^T CR_t \frac{\frac{1}{(1 + EIR)^t}}{\frac{1}{(1 + EIR)^\tau}} \right) \frac{1}{(1 + EIR)^\tau} \right]. \quad (3)$$

Assuming  $EAD(\tau) = \sum_{t \geq \tau}^T CF_t \frac{\frac{1}{(1 + EIR)^t}}{\frac{1}{(1 + EIR)^\tau}}$ , indicating the outstanding principal at default day, the

above formula may be rewritten as follows:

$$ECL = E \left[ EAD(\tau) \left( 1 - \sum_{t \geq \tau}^T CR_t \frac{\frac{1}{(1 + EIR)^t}}{\frac{EAD(\tau)}{(1 + EIR)^\tau}} \right) \frac{1}{(1 + EIR)^\tau} \right]. \quad (4)$$

Further, we assume  $LGD(\tau) = 1 - \sum_{t \geq \tau}^T CR_t \frac{\frac{1}{(1 + EIR)^t}}{\frac{EAD(\tau)}{(1 + EIR)^\tau}}$ ,  $DF(\tau) = \frac{1}{(1 + EIR)^\tau}$ , indicating the loss

given default and discount factor, respectively. Then the formula can be written as:

$$ECL = E[EAD(\tau) LGD(\tau) DF(\tau)]. \quad (5)$$

Because the default time of financial instrument is random, for a financial instrument with discrete repayment time, the expected credit loss of the financial instrument is as follows:

$$ECL = \sum_i^T EAD(t_i) LGD(t_i) DF(t_i) PD(t_i, t_{i+1}). \quad (6)$$

Where  $PD(t_i, t_{i+1})$  is the marginal default probability of the financial instrument. To sum up, the ECL of a financial instrument depends on the exposure at default  $EAD(t_i)$ , default probability value  $PD(t_i, t_{i+1})$ , loss given default  $LGD(t_i)$  and discount factor  $DF(t_i)$ .

### 3.2 Three stage division of financial assets

New Accounting Standards for Enterprises No.22 stipulates that the provision for impairment of financial assets should be calculated according to the expected credit loss model. Firstly, the financial assets needing to be impaired should be divided into three stages according to the credit risk status of financial assets. It also clearly points out that enterprises can use overdue information to judge whether the credit risk of financial assets has increased significantly, and then divide financial assets into three stages. Accordingly, considering practical operability of credit card business of commercial banks, this paper uses overdue information as the main basis for the three-stage division of credit card business. Specific criteria are as follows: for stage 2, the criteria are set as: 31 to 90 overdue days; for stage 3, the criteria are 91 overdue days or more.

### 3.3 Forward-looking Adjustment

New Accounting Standards for Enterprises No.22 points out that enterprises should take forward-looking information into account when evaluating the changes of credit risk of financial instruments. In short, they should consider the impact of risk factors of future macroeconomic changes on the expected cash flow that enterprises can receive. According to the theoretical model deduced above, we should focus on the impact of future macroeconomic risk on default probability and loss given default.

## 4. Empirical results and analysis

The data in this paper come from the credit card business data sampled by a large state-owned commercial bank on December 31, 2016. The credit card business studied in this paper includes credit card overdraft consumption business and credit card special staging business.

### 4.1 Estimation of model parameters

#### 4.1.1 Default probability

The default probability PD in ECL model is a point-in-time default probability, that is, the marginal default probability at t-time. This paper uses the commonly used Logit model to construct the default probability model of credit card business. According to the requirements of New Accounting Standards for Enterprises No. 22, the calculation of default probability should be forward-looking, that is, the risk of future macroeconomic changes should be taken into account when modeling default probability. Therefore, macroeconomic variables are introduced into the default probability model. Considering representativeness, this paper mainly introduces three indicators: GDP, CPI and PPI. For the future value of macroeconomic variables, it is mainly based on autoregressive model to forecast.

$$\begin{aligned} perdefault_{i,t} = & \beta_0 age_{i,t} + \beta_1 edu_{i,t} + \beta_2 career_{i,t} + \beta_3 income \log_{i,t} + \beta_4 marriage_{i,t} \\ & + \beta_5 gender_{i,t} + \beta_6 home_{i,t} + \beta_7 delay_{i,t} + \beta_8 GDP_{i,t} + \beta_9 CPI_{i,t} \\ & + \beta_{10} PPI_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (7)$$

$perdefault_{i,t}$  denotes a dummy variable indicating whether a default occurs or not.  $income \log_{i,t}$  represents the logarithm of customer revenue.  $marriage_{i,t}$  represents the marital status of the customer, which is divided into four categories: unmarried, married, divorced and others, corresponding to mari1, mari2, mari3 and mari4, respectively.  $gender_{i,t}$  denotes the gender of the customer, with 1 denoting the male and 0 denoting the female.  $home_{i,t}$  represents housing, which is divided into five categories: rental, mortgage, non-mortgage, dormitory and others, corresponding to hos1, hos2, hos3, hos4 and hos5, respectively.  $GDP_{i,t}$  denotes the current economic growth rate;  $CPI_{i,t}$  denotes the current inflation rate;  $PPI_{i,t}$  denotes the current production price index. Of course, in order to avoid multiple collinearity, the last dummy variable is omitted for each category.  $age_{i,t}$  indicates the age of the customer.  $edu_{i,t}$  represents the customer's educational background, which is divided into four levels: junior high school and below, senior high school or secondary school, junior college or undergraduate, graduate students and above, corresponding to dummy variables edu1, edu2, edu3 and edu4 respectively.  $career_{i,t}$  represents the occupation of customers, which is divided into six categories: government workers, financial industry practitioners, legal workers, real estate practitioners, manufacturing industry practitioners and practitioners in other industries, corresponding to ind1, ind2, ind3, ind4, ind5 and ind6, Empirical regression results show that the main influencing factors of personal credit card default are age, education level, marital status, housing, industry and other personal characteristics. Macroeconomic variables have no significant impact on it.

Table 1. Logistic regression estimation of default probability

variable	coefficient	standard deviation	Wald	P-value
Intercept	13.1382	20.3584	0.4165	0.5187
age	0.00676**	0.00309	4.7774	0.0288
edu1	1.3292**	0.5632	5.5702	0.0183
edu2	0.2774	0.1863	2.2172	0.1365
edu3	0.2543	0.1821	1.9487	0.1627
incomelog	0.1562	0.6452	0.0586	0.8086
mari1	0.4599***	0.1758	6.8442	0.0089
mari2	0.1173	0.1689	0.4824	0.4873
mari3	0.292	0.2694	1.1746	0.2785
gender	-0.2014***	0.0476	17.9089	<.0001
hos1	-0.0368	0.0949	0.1502	0.6984
hos2	-0.0699	0.0648	1.1646	0.2805
hos3	-0.1378**	0.0582	5.6176	0.0178
hos4	0.0731	0.1068	0.4686	0.4936
ind1	0.4785***	0.0854	31.4139	<.0001
ind2	0.1267	0.4552	0.0775	0.7807
ind3	0.0509	0.3125	0.0265	0.8707
ind4	-0.427	0.5945	0.5157	0.4727
ind5	0.1471***	0.0548	7.2173	0.0072
gdp	-3.2345	5.8763	0.303	0.582
ppi	-0.0751	0.1771	0.1799	0.6715

cpi	-244.2	176.9	1.9069	0.1673
Chi-square	247.71	-	-	-
Wald	242.07	-	-	-

Note: \*\*\*, \*\*, \* represent significant levels of 1%, 5% and 10%, respectively.

#### 4.1.2 Loss given default

At present, there are multiple regression models and LossCalc models for default loss rate modeling, but these models rely on a large number of default loss clearance data to accurately estimate the model. Due to the limitation of the research data, this study classifies credit cards into five categories according to the five-level loan classification principle. Based on each kind of historical data, the historical mean is used as the estimated value of future loss given default.

Table 2. Estimate of loss given default for Special staging business

Product category	Five level classification	Average LGD
Special staging	Pass	26.16%
	Special mention	44.32%
	Sub standard	42.80%
	Doubtful	28.69%
	Loss	54.74%

Table 3. Estimate of loss given default for overdraft consumption business

Product category	Card Type	Five Level Classification	Average LGD
Overdraft Consumption	Personal Card	Pass	35.91%
		Special Mention	28.44%
		Sub Standard	40.89%
		Doubtful	28.02%
		Loss	67.62%
	Corporate Card	Pass	29.69%
		Special Mention	24.54%
		Sub Standard	26.89%
		Doubtful	40.42%
		Loss	41.59%

#### 4.1.3 Exposure at default

EAD(Exposure at default) is the core variable of ECL model calculation. It represent the risk exposure value of this financial asset at each repayment time in the future according to the outstanding principal, repayment period and repayment interest rate stipulated in the financial contract.

#### 4.1.4 Discount factor

In this paper, the interest rate of credit card business by stages is used as the basis for calculating the discount factors of credit card business. The specific discount rate is 9% annually, which can be converted to the monthly discount rate. In addition, unlike other financial assets, credit cards do not have a clear contract term. Therefore, in this study, the average duration of the first expiration of a customer's credit card to the cancellation of such credit card is used as the lifetime of such credit card.

## 4.2 Three-stage Classification of Credit Card Assets

As mentioned above, in this study, when the credit card is opened, it is considered to be in stage 1; when the credit card is overdue for one to three periods (that is, 31 to 90 days), it is in stage 2; when the credit card is overdue for more than three periods (that is, more than 91 days), it is considered to



be in stage 3. As shown in Table 4, the credit card business of the commercial bank mainly focuses on personal credit overdraft consumption. The majority of credit card overdraft consumption business belongs to stage 1, stage 2 and stage 3 account for a small proportion.

Table 4. Three-stage Classification of credit card business

	Stage 1	Stage 2	Stage 3	Sum
Overdraft Consumption	23547.97	98.74	284.94	23931.65
Special Staging	3193.13	66.29	67.03	3326.42
Sum	26741.06	165.03	351.94	27258.06

### 4.3 Expected credit loss and reserve rate

As shown in Table 5, the ECL of overdraft consumption business and special staging business mainly concentrates on Stage 3, and Stage 2 was the least. The credit card business in Stage 3 is in the stage of substantive default, and there is clear evidence of impairment of assets, so the expected credit loss is the largest. The remaining principal of the credit card business in stage 1 is the largest. Even if the credit risk is the lowest, more expected credit loss value is still calculated.

Table 5. The three-stage ECL of credit card business

	Stage 1	Stage 2	Stage 3	Sum
Overdraft Consumption	79.75	1.47	265.19	346.41
Special staging	22.69	0.84	61.84	85.38
Sum	102.44	2.31	327.03	431.81

The ratio of ECL to risk exposure is used to calculate the reserve ratio. According to the statistical results of business types, the reserve rates of overdraft consumption business and special staging business are only 1.45% and 2.57% respectively, which are relatively low. From the perspective of three-stage business division, the reserve rates of stage 1 and stage 2 are lower, while the expected credit loss of stage 3 is higher.

Table 6. The three-stage reserve rates of credit card business

	Stage 1	Stage 2	Stage 3	Sum
Overdraft Consumption	0.34%	1.49%	93.07%	1.45%
Special staging	0.71%	1.27%	92.26%	2.57%
Sum	0.38%	1.40%	92.92%	1.58%

Table 7 shows the comparative analysis of credit card business impairment based on IFRS 9 and IAS 39, respectively. Under the new IFRS 9 accounting standards, the original value of credit cards which need to be prepared for impairment increased by 18.331 billion Yuan, an increase of 205.36%, compared with that under IAS 39. Under IAS 39, only credit card business with impairment evidence is required to prepare for impairment, while credit card business without clear evidence of impairment is required to use MM model to prepare for combined impairment. IFRS 9 s requires impairment of all credit card business, resulting in a significant increase in the scope of credit card financial assets that need impairment under the new standards. Under the IFRS 9, credit card business impairment provision increased by only 75 million Yuan, an increase of 21.26%. Therefore, the deduction ratio of credit card business under the new standards is 1.58%, which is 2.41% lower than that under the old standards.

Table 7. Comparisons of credit card impairment reserve between IFRS 9 and IAS 39

	IFRS 9	IAS 39	Difference	Growth rate
Original Value	27258.06	8926.45	18331.61	205.36%
Allowance for Impairment	-431.81	-356.09	-75.72	21.26%
Net Value	26826.25	8570.36	18255.89	213.01%
Estimated Proportion	1.58%	3.99%	-2.41%	-60.29%

## 5. Conclusions

On March 31, 2017, the Ministry of Finance of China launched the Chinese version of IFRS 9, which has made significant innovations in the classification and measurement, impairment and hedging accounting of financial instruments. This paper focuses on the impact of IFRS 9 on the impairment of credit card business in commercial banks. The results show that the implementation of the new standards will greatly increase the total credit card business scale, which needs to be prepared for impairment, by 205.36%. Under the new standards, the provision for impairment of credit card business mainly comes from the credit card financial assets in the stage 3, followed by the credit card business assets in the stage 1. Compared with IAS 39, the provision for impairment of credit card business assets under IFRS 9 has increased slightly to 21.26%, but the reserve ratio has decreased from 3.99% to 1.58% due to the large increase in the size of credit card business assets requiring impairment. Generally speaking, credit card business needs more provision for more impairment in order to resist future macroeconomic fluctuation risks, reflecting a stronger macro-prudence.

Naturally, the implementation of the new standards will inevitably change the accounting methods, processes and systems of credit card business, and then affect the management and implementation details of credit card business risk management. This paper holds that under the background of the new accounting standards, commercial banks should start from the following aspects. First, commercial banks should improve the theoretical modeling ability. Modeling default probability and loss given default are the core of the ECL theoretical model. Commercial banks should strengthen the collection of the basic information of cardholders, historical default clearance data and macroeconomic data and so on, improve the database construction within the business, and set up model research and development teams. Second, we should improve the system of recovering the overdue debt. Due to the short term and fast turnover of credit card business itself, commercial banks should further complete the overdue collection work ahead of time, and improve the corresponding procedures and working methods.

In addition, this study shows that the implementation of IFRS 9 will significantly increase the assets impairment of credit card business, and then impact and influence the net profit and capital adequacy of commercial banks. Therefore, commercial banks should further respond in advance, smooth the impact of the new accounting standards on the net profit of banks, and strengthen the capital management within banks. Future studies can further explore whether the implementation of IFRS 9 has counter-cyclical effect on impairment provision using longer period data.

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