

## **EXAMINING FACTORS INFLUENCING CREDIT RISK AT VIETNAM BANK FOR SOCIAL POLICIES**

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### **ABSTRACT**

The study uses Binary Logistics regression model to measure the influence of factors on credit risk at Vietnam Bank for Social Policies. The findings prove the impacts on credit risk of the following factors: demographic characteristics, job characteristics, loan characteristics and some factors inside the bank. The research results provide an empirical evidence for managers of Vietnam Bank for Social Policies to make appropriate lending decisions and policies to reduce credit risk.

**Keywords:** Binary logistics; credit risk; borrowers' demographic characteristics; loan characteristics.

### **1. INTRODUCTION**

Vietnam Bank for Social Policies was established according to the decision number 131/2002/QĐ-TTG of Vietnamese Prime Minister on 4<sup>th</sup> Oct 2002 [1]. Based on the reorganization of bank system serving poor people across Vietnam, Vietnam Bank for Social Policies had responsibility for lending to poverty households and other people under preferential treatment policy. Over the last few years, Vietnam Bank for Social Policies has contributed to lending governmental preference capital to every poverty household and this activity has created considerable results in helping those to sponsor for their business activities, improve their means of subsistence, and improve the quality of life of Vietnamese people. However, together with the success, Vietnam Bank for Social Policies are faced with the common difficult situation of Vietnamese bank system as in the evaluation of proposal "Destructing credit institution system in the period 2011-2015" which was approved by the Vietnamese Prime Minister by the decision no 254/QĐ-TTG on 1 March 2012 [2]. As showed by this proposal, the Vietnamese bank system has many limitations such as: high credit risk and liquidity risk, high value and prolonged bad debts. These limitations have substantially affected the business activities of Vietnamese bank system in general and Vietnam Bank for Social Policies in particular. The consequence is that people under preferential treatment policy and suitable customers cannot access to the preference

capital of Vietnam Bank for Social Policies for developing investment, as a result, their quality of life cannot be upgraded.

The typical customers of Vietnam Bank for Social Policies are poor households who do not have properties for mortgage. The fiduciary loan makes high credit risk for Vietnam Bank for Social Policies because unlike other commercial banks, it does not have mortgages to arrange with past-due debts. Therefore, the urgent issue of Vietnam Bank for Social Policies is finding out the reasons for past-due debts to suggest the methods for reducing their credit risk. As of now, research about factors influencing the credit risk of Bank for Social Policies in Vietnam is very limited. The paper uses quantitative tools to systematically examine elements that affect credit risk of Vietnam Bank for Social Policies to propose better management methods in loan recovery in order to lower the credit risk. The rest of the paper proceeds as follows. Section 2 presents theoretical background about credit risk and influence factors. Section 3 describes the research model and research method. The empirical finding is examined in section 4. Section 5 concludes the paper.

## **2. THEORETICAL BACKGROUND ABOUT CREDIT RISK AND INFLUENCE FACTORS**

### **2.1. Definition of credit risk:**

Credit risk is a popular technical term in lending activities or more broadly, in granting credit terms of commercial banks. There are many ways to characterize credit risk. According to Basel committee on banking supervision: "Credit risk is most simply defined as the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms" [3]. According to Anthony et al., "credit risk is the risk that promised cash flows from loans and securities held by Financial Intermediaries may not be paid in full" [4]. In short, credit risk is interpreted by particular incident – borrower has not paid the principle and interest in full amount or on time, as a consequence, this causes the damage on assets and business activities of lender.

### **2.2. Factors influence to credit risk.**

The fact that borrower does not pay sufficient principal and interest amounts on time can be caused by many reasons. These reasons may come from customer, bank or objective macro economy features. In terms of customer, the two individual reasons are the repayment willingness and repayment ability. Willing borrowers will be enthusiastic to pay off the debt whenever they have ability to do it. On the other hand, even with enough money, the unwilling borrowers do not pay back without the force and pressure from lenders. The willingness can be evaluated by features of borrowers like personal characteristics, reputation, etc. Meanwhile, repayment ability is demonstrated by the ability to generate cash flows in the future to pay back

the debt. The cash flow could either come from business activities or other income sources like salary, wage, asset disposal and other incomes. In a challenging economic environment, the ability to generate cash flow of borrowers is not certain, therefore, the repayment of borrowers is uncertain although they are willing to pay off the debts.

In addition, the management method of banks also creates credit risk. The insufficient appraisal in lending decision leads to the borrowing amount to outweigh the repayment ability, the due obligation does not match the borrower's cash flow... These reasons result in irrecoverable debts for lender.

Based on the previous empirical researches on credit risk, the factors influencing credit risk are follows:

### **2.2.1 Factors influenced to credit risk from borrowers:**

#### **2.2.1.1. Borrower's demographic characteristic: sex, age, marriage status, dependents, career, academic level**

- Gender: Miller (2012) states that female borrower has higher repayment ability because they are more conservative, fewer criminal records and lower ethical risk [5]. The statement had been proven by empirical research of Chapman (1990) [6], Weber and Musshoff (2012) [7] with the finding that bad debt level in female were not as high as male. Similarly, Kinyondo (2009) discovered that if the leader of credit group is female, the ability of repayment is higher [8].
- Age: The empirical research of Chapman (1990) [6] and Kohansal et al. (2009) [9] found the relationship between the borrower's age and the ability of on time repayment.
- Marriage status: this is also in consideration because normally, the married customers are often risk averse and their behaviors are more mature than unmarried customers or divorce customers, as a result, their on time repayment ability is higher. Nonetheless, the empirical research of Chapman (1990) [6], Duygan et al. (2008) [10], Antwi et al (2012) [11] and others did not find this relationship.
- Dependents: The ratio of dependent is assumed to be negatively correlated with debt repayment with the explanation that the borrowers spend large amount of their income on nurturing dependents instead of using their income for debt repayment (Zeller, 1996) [12]. The empirical research of Chapman (1990) [6] also supports this statement. In Vietnam, the research of Truong et al. (2011) [13] concludes that in the borrower's household, the fewer members that can earn for living, the lower probability of on time debt repayment.

- Career: The career characteristic also affects borrower's income for debt repayment. Borrowers with stable career, long term experience, skillfulness will have higher repayment ability because of reliable income. The research of Kohansal and Mansoori (2009) [9] found that the farmer with longer experience will have higher repayment ability. The research of Chapman (1990) [6] accepted that borrower with knowledge career like professor, artist or stable career have higher repayment ability.
- Academic level: Academic level of borrower is focused on loan appraisal process. The customer with high academic level is expected to have higher and stable income in long term. In the same time, their loan is used more efficiently; as a result, the ability to pay debt on time is higher. The research of Truong et al. (2011) [13] and Sileshi et al. (2012) [14] supported this assumption. However, this assumption was not supported by the research of Antwi et al. (2012) [11].

#### **2.2.1.2. Borrower's other characteristics: income level, ethics risk and abnormal spending behavior**

Aside from demographic characteristics, the effects of other features of borrowers such as income level, ethics risk and abnormal spending behavior to credit risk were asserted.

- Income level: Chapman (1990) [6] classifies borrower's income and examines the borrower's income to ability of successful debt repayment. His research found that borrower's ability of successful debt repayment is rated as high income, low income and average income, respectively. The conservatism is explained for low income borrowers because they are aware of their ability of debt repayment. They know that if they misuse the borrowing, the risk of inability for debt repayment is high. The research of Truong and Nguyen (2011) [13] explored the feature of family members' income and concluded that the family with more high income earners would have higher ability of debt repayment. Other researches of Kohansal et al. (2009) [9] and Sileshi et al (2012) [14] also favor for the influence of income factor.
- Ethical risk: Ethical risk in credit risk is using debt for wrong purposes. The borrower uses debt for wrong purposes and the creditor does not control this behavior both will lead to the increase for irrecoverable debt. Kohansal and Mansoori (2009) [9], Truong and Nguyen (2011) [13] included this matter in their survey and found the evidence for that. These authors mention that when the borrowers use debt with wrong purpose intentionally, the probability of late repayment increases. Meanwhile, Kohansal and Mansoori (2009) [9] could not find any evidence for this interrelation for the case of farmers and the authors did not analyze this matter.

- Abnormal spending behaviors: Abnormal spending behaviors that are not in the expenditure planning of borrower will put away the financial resources expected to be used for debt repayment. Therefore, abnormal spending behaviors will increase the irrecoverable debt possibility. Rodrigues et al. (2008) [15] lists several abnormal spending behaviors such as sickness, accident, joblessness that decrease the debt repayment.

### **2.2.2. Factors from bank**

In addition to factors from borrower, credit risk is also created by bank. The loan characteristic like loan amount, interest rate, maturity term and lending procedure have been proven to have relationship with the credit risk as followed:

- Loan amount: Chapman (1990) [6] provided the statistical result which shows that small loans often have the highest risk, next is large value loans, followed by loans with average amount. Kohansal and Mansoori (2009) [9] found out the positive relationship between loan size and repayment ability. Sharma and Zeller (1997) [16] concluded that the larger loan amount, the less likely it is to be uncollectible. It is explained by authors that loans with big amount make it easier for borrowers to create values in comparison to small ones.
- Interest rate: Ugbomeh et al., (2008) [17]; Deiniger and Liu (2009) [18] and Onyeagocha et al., (2012) [19] have explored the interest rate factor. Their finding is that the higher it is the higher possibility that borrowers do not pay back the debts on time.
- Maturity period: Empirical research showed that maturity also affects repayment ability. Chapman (1990) [6] concluded that short – term debts (at most 1 year) have higher possibility of repayment than long – term loans. This is contrary to the viewpoint that the long maturity, the higher repayment ability. Onyeagocha et al. (2012) [19] did not find the impact of this factor to repayment ability in their study.
- Lending procedure: Apart from loan characteristics, lending procedure also has effects on credit risk. Incompetent or careless employees and collusion with borrowers can lead to improper credit assessment process. Similarly, incorrect or inefficient credit rating system can also increase the risk of improperly assessing repayment ability of borrowers. However, they are just assumptions suggested by Macana (2006) [20] and not yet proven by empirical results.

### 3. RESEARCH MODEL AND METHODOLOGY

#### 3.1. Research model

In order to build up a model for analyzing factors affecting credit risk at Vietnam Bank for Social Policies – Danang Branch, the study uses Binary logistics regression and refers to some empirical previous studies to select factors to put in the model. However, Vietnam Bank for Social Policies has some limitations on customers’ information disclosure so some of the factors suggested are not included in the model. The model used in this study is presented by the following formula (1.1):

$$\text{Ln} \left[ \frac{P(Y=1)}{P(Y=0)} \right] = \beta_0 + \sum_{i=1}^7 \beta_i X_i + \sum_{j=1}^8 \beta_j D_j + U \quad (1.1)$$

In which:

$P(Y=1) = P_0$ : Possibility that credit risk does not exists, which is the case that customers pay back the principal and interest on time.

$P(Y=0) = 1 - P_0$ : Possibility that credit risk exists, which is the case that customers do not pay back the principal and interest in full amount or on time.

$X_i, D_j$ : Independent variables corresponding with factor influence to credit risk.

$U$ : Residual value

According to the theory of Binary logistics regression,  $P_0$  is determined by formula (1.2):

$$P(Y=1) = \frac{\exp(\beta_0 + \sum_{i=1}^7 \beta_i X_i + \sum_{j=1}^8 \beta_j D_j)}{1 + \exp(\beta_0 + \sum_{i=1}^7 \beta_i X_i + \sum_{j=1}^8 \beta_j D_j)} \quad (1.2)$$

According to (1.2), when dependent variable  $X_i$  ranges from  $-\infty$  to  $+\infty$ ,  $P_i$  ranges from 0 to 1.

**Table 1.1: Describing variables used in model 1.1**

<b>Sign</b>	<b>Variable</b>	<b>Description</b>	<b>Type</b>
<b>Y</b>	Credit risk	Dummy variable, get 1 if credit risk exists (customers do not pay principal and interest in full amount or on time); 0 if there is no credit risk (customers pay principal and interest in full amount or on time)	Dependent variable
<b>D1</b>	Gender	Dummy variable, get 1 if the borrower is male, 0 if female.	Customers' demographic characteristics
<b>D2</b>	Marriage status	Dummy variable, get 1 if the borrower is currently married, 0 if others (widow, divorced, single...)	
<b>X1</b>	Age	The customer's age (Current year – Customer's year of birth)	
<b>X2</b>	Dependent rate	Number of people without income in the family/ Total number of family members	
<b>X3</b>	Income	Average monthly income of borrower (million Vietnam dong per month )	Job characteristics
<b>D3</b>	Working place	Dummy variable, get 1 if the borrower works in state-owned organization, 0 if for others.	
<b>D4</b>	Manufacturing loan	Dummy variable, get 1 if the loan is for manufacturing activities, 0 if for other purposes.	Loan characteristics
<b>D5</b>	Employment loan	Dummy variable, get 1 if the loan is for solving unemployment, 0 if for other purposes.	
<b>D6</b>	Student loan	Dummy variable, get 1 if the loan is for supporting students, 0 if for other purposes.	
<b>D7</b>	Consumption loan	Dummy variable, get 1 if the loan is customers' consumption, 0 if for other purposes.	
<b>X4</b>	Loan amount	Total cash disbursements to customer (million Vietnam dong)	
<b>X5</b>	Interest rate	Interest rate stated in the loan contract	
<b>X6</b>	Maturity period	Time length from first cash disbursement to the loan contract disposal date	
<b>X7</b>	Credit score	Credit score of loan group given by bank officer	Lending procedure of bank
<b>D8</b>	Gender of loan group's leader	Dummy variable, get 1 if gender is male and 0 if gender is female.	

### **3.2. Research hypotheses**

The general hypotheses (01) are made to test the existence of model (1.1):

- + Hypothesis  $H_{1,0}$ : model (1.1) does not exist: All factors in the model do not affect repayment ability of customers or all coefficients of the model (1.1) equal 0.
- + Hypothesis  $H_{1,1}$ : model (1.1) exists: There is at least one factor affecting repayment ability of customers or at least one coefficient of the model (1.1) differs 0.

The pair hypotheses (02) are made to test whether the model is properly formatted:

- + Hypothesis  $H_{2,0}$ : model (1.1) is properly formatted.
- + Hypothesis  $H_{2,1}$ : model (1.1) is not properly formatted.

In order to assess the influence of each factor investigated to repayment ability of customers at Vietnam Bank for Social Policies, the following hypotheses are developed:

- +  $H_{01}$ : credit risk of Vietnam Bank for Social Policies is not affected by gender of customers.
- +  $H_{02}$ : credit risk of Vietnam Bank for Social Policies is not affected by married status of customers.
- +  $H_{03}$ : credit risk of Vietnam Bank for Social Policies is not affected by age of customers.
- +  $H_{04}$ : credit risk of Vietnam Bank for Social Policies is not affected by dependent rate of customers.
- +  $H_{05}$ : credit risk of Vietnam Bank for Social Policies is not affected by average monthly income of customers.
- +  $H_{06}$ : credit risk of Vietnam Bank for Social Policies is not affected by working place of customers.
- +  $H_{07}$ : credit risk of Vietnam Bank for Social Policies does not differ between customers with manufacturing purpose and other purposes.
- +  $H_{08}$ : credit risk of Vietnam Bank for Social Policies does not differ between customers with employment purpose and other purposes.
- +  $H_{09}$ : credit risk of Vietnam Bank for Social Policies does not differ between customers with student loan and others.
- +  $H_{10}$ : credit risk of Vietnam Bank for Social Policies does not differ between customers with consumption purpose and other purposes.
- +  $H_{11}$ : credit risk of Vietnam Bank for Social Policies is not affected by loan amount of customers.

- + H<sub>12</sub>: credit risk of Vietnam Bank for Social Policies is not affected by interest rate.
- + H<sub>13</sub>: credit risk of Vietnam Bank for Social Policies is not affected by maturity period of customers.
- + H<sub>14</sub>: credit risk of Vietnam Bank for Social Policies is not affected by credit score given by bank staffs.
- + H<sub>15</sub>: credit risk of Vietnam Bank for Social Policies is not affected by gender of savings and lending team's leader

### **3.3. Data collection**

Data set used in this study is obtained from documents of Vietnam Bank for Social Policies during the period 2012-2016 which includes 350 observations. Hair et al. (1998) [21] suggested the minimum sample size of 50 or better at 100; Gorsuch (1983) [22] said that in order to use regression, sample size must be at least 200. Therefore, the sample size of 350 can ensure the representativeness of the population, sample result of testing and estimation can be generalized to the whole population.

## **4. RESEARCH RESULTS AND DISCUSSION**

### **4.1. Research results**

To explore the influence of these above factors on credit risk of Vietnam Bank for Social Policies, the study use Binary Logistics regression model. The research result is tested and estimated first time by Enter method to investigate the effect of all independent variables to dependent variable and Backwald – Conditional method is used next to examine the impact of affected variables to credit risk of Vietnam Bank for Social Policies. The non-affected variables will be declassified from the model.

The sig value of Omnibus tests is lower than 5%, as a result, hypothesis H<sub>1.0</sub> of the pair hypotheses (01) is rejected and the hypothesis H<sub>1.1</sub> is accepted. This result verifies that the model (1.1) exists. In the other word, credit risk of Vietnam Bank for Social Policies is influenced by at least one variable of the model (1.1). To increase the precision of the model (1.1), the pair hypothesis (02) is checked by Hosmer and Lemeshow test. The sig value of Hosmer and Lemeshow test is 0.7 > 0.5 demonstrates that there is not enough evidence to reject hypothesis H<sub>2.0</sub> or the model (1.1) is proper formatted. Therefore, the result of estimation and testing of model (1.1) by Binary Logistics regression model is reliable.

**Table 1.2: OMNIBUS TESTS OF (MODEL COEFFICIENTS)**

	Chi-square	Df	Sig.
Step	229.442	15	.000
Block	229.442	15	.000
Model	229.442	15	.000
<i>HOSMER AND LEMESHOW TEST</i>			
	Chi-square	Df	Sig.
Step	5.526	8	.700

The estimation and testing result affected variables to credit risk of Vietnam Bank for Social Policies by Enter method (as show in appendix 1) and Backwald – Conditional method is displayed in table 1.3. From the information of table 1.3, the conclusion for hypothesis system from  $H_{01}$  to  $H_{015}$  of the effect of individual factor in the model (1.1) can be made from Ward testing. The hypothesis  $H_{01}$ ;  $H_{02}$ ;  $H_{04}$ ;  $H_{05}$ ;  $H_{06}$ ;  $H_{07}$ ;  $H_{08}$ ;  $H_{09}$ ;  $H_{011}$ ;  $H_{012}$ ;  $H_{014}$ ;  $H_{015}$  are rejected as the sig value is smaller than 5%, on the other hand, the hypothesis  $H_{03}$ ;  $H_{010}$ ;  $H_{013}$  cannot reject as the sig value greater than 5%. It can be explained that 12 out of 15 factors corresponding to 15 independent variables in the model (1.1) have impacted the credit risk of Vietnam Bank for Social Policies, including: gender, marriage status, dependent rate in customer’s family, customer’s income, working place, manufacturing loan, employment loan, student loan, loan amount, interest rate, credit score, and gender of loan group’s leader. Other non-affecting elements on credit risk of Vietnam Bank for Social Policies are customer’s age, consumption loan and maturity period.

**Table 1.3: The estimation and testing result of model (1.1)**

Variables	B	S.E.	Wald	df	Sig.	Exp(B)
D1	1.669	.388	18.535	1	.000	5.308
D2	-1.687	.356	22.409	1	.000	.185
X2	.037	.008	18.980	1	.000	1.038
X3	-.745	.167	19.860	1	.000	2.107
D3	-2.083	.542	14.772	1	.000	.125
D4	-2.336	.482	23.451	1	.000	.097
D5	-1.185	.544	4.733	1	.030	.306
D6	-1.162	.475	5.972	1	.015	.313

X4	.087	.024	13.462	1	.000	1.091
X5	3.507	1.405	6.228	1	.013	33.344
X7	-.220	.029	57.282	1	.000	.803
D8	-.969	.334	8.402	1	.004	.380
Constant	10.898	2.183	24.935	1	.000	54090.313

Base on the test results, the model to quantify the credit risk of Vietnam Bank for Social Policies can be rewritten as model (1.3):

$$\ln \left[ \frac{P(Y = 1)}{P(Y = 0)} \right] = 10.898 + 0.037X_2 - 0.745X_3 + 0.087X_4 + 3.507X_5 - 0.220X_7 + 1.669D_1 - 1.687D_2 - 2.083D_3 - 2.336D_4 - 1.185D_5 + 1.162D_6 - 0.969D_8 \quad (1.3)$$

## 4.2. Discussion from research result

### 4.2.1. Model predictability

The prediction result of credit risk for Vietnam Bank for Social Policies based on the model (1.3) with a cut-off at 0.5 is exhibited in table 1.4 demonstrated that the predictability of model is 82.9 %. The model can predict exactly 130 out of 164 cases of credit risk with the accuracy rate being 79.3% and 161 out of 186 cases without credit risk with the accuracy rate being- 86%.

**Table 1.4: Credit risk predictability of model (1.3)**

Model	Customers with credit risk (164 customers )				Customers without credit risk (186 customers )				Total (350 customers )	
	Exact		Inexact		Exact		Inexact		Exact	
	Number	Rate (%)	Number	Rate (%)	Number	Rate (%)	Number	Rate (%)	Number	Rate (%)
1.3	130	79.3	34	20.7	160	86.6	26	14	290	82.9

### 4.2.2. Analyzing influence of factors to credit risk

#### 4.2.2.1. Demographic characteristics

The research model indicates that 3 out of 4 examined factors of demographic characteristic – gender (D1), marriage status (D2), and independent rate (X2) – affect the credit risk of Vietnam Bank for Social Policies. Factor “age” (X1) is classified as non-affecting factor based on the research result.

- Factor “Gender”: from the table 1.3, it is found that the credit risk for male customer is 5.308% higher than female customer. This finding is consistent with previous studies of Miller (2012) [5], Chapman (1990) [6], Weber và Musshoff (2012) [7]. This outcome fits in the Vietnamese culture where males are often more adventurous than females [23]. At the same time, females are more careful in investment and tend to have more savings than male [24] [25]. These characteristics lead to the higher credit risk of male customers in comparison to female customer in Vietnam Bank for Social Policies.
- Factor “Marriage status”: From the information of the table 1.3, it can be stated that the married customers have lower credit risk by 0.185% as compared to others like widows, divorced or unmarried customers. The result is different from research findings of Chapman (1990) [6], Duygan et al. (2008) [10], Antwi et al. (2012) [11]. However, the outcome meets the feature of Vietnamese people that married people will be more responsible with their own lives, their family and their behaviors are more cautious than single people [26] [27]. As a consequence, the credit risk of married customers will be lower than that of others.
- Factor “Dependent rate”: the factor “dependent rate” has positive relationship with credit risk in Vietnam Bank for Social Policies. The research expresses that if the dependent rate increases by 1%, the credit risk will increase by 1.038%. This finding is similar to the findings of Zeller (1996) [12], Chapman (1990) [6], Truong Dong Loc and Nguyen Thanh Binh (2011) [13]. This is understandable because if the number of people who cannot make their own living in the family is high, a large part of family income will be spent on living expenditure. Therefore, the part of family income that contributes for loan repayment will be low and the credit risk is high with this group of customer.
- Factor “Age”: the research finding shows that factor “age” (X1) does not have effect on credit risk because the sig value is larger than 5% (as in appendix 1). This finding is not the same as empirical research result of Chapman (1990) [6]; Kohansal và Mansoori (2009) [9]. According to the policy of Vietnam Bank for Social Policies, the customer’s age must be ranged from 18 to 60 for males and from 18 to 55 for females. The customers who meet this requirement of Vietnam Bank for Social Policies are in working age [28]. They are also mature enough for their civil liability and behavior [29]. This causes the similarity for credit risk between customers with different age.

#### **4.2.2.2. Job characteristics**

- Factor “Income” (X3): According to Chapman (1990) [6], Kohansal and Mansoori (2009) [9], customer’s income affects customer’s credit risk. Their research results indicate that factor “income” has inverse correlation with credit risk. It means that customer’s income increase the credit risk will decrease. The empirical result based on

model (1.3) presents that if the customer's income of Vietnam Bank for Social Policies gains by 1 (million Vietnam dong), the credit risk will decline by 2.107%. This is reasonable that the gain from customer's income will contribute more for debt repayment, thus at the same time, the credit risk will decrease.

- Factor "Working place" (D3): From the data of Vietnam Bank for Social Policies, the factor "Working place" has proved to affect credit risk. In detail, credit risk of customers working in state-owned organizations is 0.125% lower compared with customers in other organizations. This is explainable because the income of employee in state-owned organization is stable in Vietnam [30] [31]. In addition, according to the survey conducted by Ministry Of Labor – Invalids and Social Affairs in the year of 2016, the average income of employee in state-owned organization is highest in comparison to other organization in Vietnam [32]. Another reason is the payment method of employers. In Vietnam, complying with the Prime Minister's Instruction 20/2007/CT-TTg, the worker who gets salary from government budget must get salary by bank account from the year of 2008 [33]. Other state-owned organizations tend to use bank to pay salary for their employees because of the advantages for both employees and employers [34]. This trend helps banks control cash flows of customers better; as a result, the debt repayment control is better. Meanwhile, customers working for other organizations, especially freelancers with unsecured income, give the cash spending habit in everyday transaction of Vietnam [35] [36] [37], the income control for these customers seem very difficult, as the result, the credit risk is higher.

#### **4.2.2.3. Loan characteristics**

- Factor "Loan purposes" has significantly influenced the credit risk in empirical research of Kohansal và Mansoori (2009) [9] and Truong Dong Loc and Nguyen Thanh Binh (2011) [13] with detailed loan purposes. The same conclusion has been found in the research of Vietnam Bank for Social Policies
  - Factor "Manufacturing loan" (D4): this factor has inverse relationship with credit risk in Vietnam Bank for Social Policies. In other words, customers with manufacturing purpose have credit risk lower than those with other purposes by 0.097%. The loan principal invested in promoting manufacturing activities will help customer create income, as a result, the opportunity to get back these amounts will increase and credit risk will decrease.
  - Factor "Employment loan" (D5): like factor "Manufacturing loan", factor "Employment loan" has inverse relationship with credit risk in Vietnam Bank for Social Policies. Customers with purpose of creating jobs have 0.306% lower risk

as compared to other purposes. This is reasonable because with the new job generated from loan, customer can create cash inflow and pay for the bank

- Factor “Student loan” (D6): Inverse relationship has been found in this empirical research between factor “Student loan” and credit risk in Vietnam Bank for Social Policies. The research result shows that if the customers borrow to sponsor for their study in university, the credit risk will decline by 0.313% in comparison to other purposes, the highest value among purpose factors in this research. The result can be explained by two reasons. The first reason is the maturity day. According to the regulation of Vietnam Bank for Social Policies, students who borrow for their study can pay back their loan after their graduation because they can find job easier than untrained people [38]. Secondly, Vietnamese parent still take care of their children after 18 [39], as a result, they are willing to contribute to the payment for their children’s education loan.
- Factor “Loan amount” (X4): According to the research results of Chapman (1990) [6], Kohansal and Mansoori (2009) [9], Sharma and Zeller (1996), this factor and credit risk has a negative correlation. It means that the bigger the loan amount, the lower credit risk. However, the positive correlation has found in this research: if the average loan amount increases by 1 million Vietnam dong, the credit risks increases by 1.091%. The difference in the research result can be explained by the customer’s characteristics of Vietnam Bank for Social Policies. Most of them are individuals and households, as a result, they manage their business and their capital based on experience. When the loan amount is small, they can manage well, however, when the loan amount is big, they manage it more inefficiently. It leads to the losing of their capital and the payment ability will decrease.
- Factor “Interest rate” (X5): This factor has strongly affected credit risk in Vietnam Bank for Social Policies. On average, if the interest rate rises by 1%, the credit risk will go up by 33.34%. This result is consistent with the research of Deininge and Liu (2009) [18], Ugbomeh et al. (2008) [17], Onyeagocha et al. (2012) [19]. The interest rate increase makes the cost of capital increase at the same time. In short, the ability of the debt repayment will decrease as the interest payment increases.

#### **4.2.2.4. Factors from the bank:**

- Factor “Credit score” (X7): the research demonstrates that credit score and credit risk have inverse relationship. To put it in a different way, if the customer features are good, the credit score is high and the credit risk is low. In Vietnam Bank for Social Policies, if customer’s credit score gain by 1 unit, the credit risk will see a downturn of 0.803%. From this result, the credit score process should be done carefully to minimize the credit risk for Vietnam Bank for Social Policies.

- Factor “Gender of loan group’s leader” (D8): The influence of gender of loan group’s leader on credit risk has been proven in this research. The empirical result shows that the credit score of male loan group’s leader is 0.38% lower than female loan group’s leader. The gender characteristic can clarify this difference. Women are more sentimental than men [40] [41], as a result, their emotion/feeling affects them in making decision of accepting group members. This leads to the increase of credit risk.

## **5. CONCLUSION**

The model result can estimate the possibility of customers not repaying principal and interest on time. From that, the bank can classify customers into safe or warning zone and use suitable methods of lending and collecting debts for different customer groups to reduce credit risk. Besides, Binary Logistics regression can measure the influence of these factors: demographic, job, loan characteristics and some others from the bank, which affect credit risk. Based on the study, Vietnam Bank of Social Policies can come up with some solutions to reduce the risk of uncollectible debts.

The research has limitations as several important factors are not included in the research like educational background, inflation, economic growth rate. In the future, with more data about customer characteristic and macro-economic factor, the research group will upgrade the model to evaluate credit risk better in Vietnam Bank of Social Policies.

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