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Risks analyzing of bank's facilities (Case Study: Private Bank of Noor)

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Abstract

The design of a credit risk measurement model in the monetary and banking system will play an important role in increasing profits and optimizing the allocation of banking resources. This paper uses credit regression models (Linear, Logit and Probit) and Z Altman to determine and predict the credit risk of providing facilities to legal entities in a private bank. The variables studied in this research include qualitative variables (company life, collateral, experience of managers, type of company) and financial variables (working capital in total assets, book value of equity to book value of debt, total sales to Total assets, accumulated profits to total assets, profit before interest and taxes on total assets). The results of this research show that the use of validation models, despite all the technical and statistical considerations, can accurately determine the credit status and credit risk of customers. All of the models used exceeded 80% of the correct predictions, which is a significant figure in the real business environment. But in the Logit model, with a slightly better difference than the rest of the models, about 83% of its predictions were correct.

Keywords: Credit Risk; Public and Private Companies; Linear Regression Model (LPM); Logit.

Riscos de análise das instalações do banco (Case Study: Private Bank of Noor)

Resumo

A concepção de um modelo de medição de risco de crédito no sistema monetário e bancário desempenhará um papel importante no aumento de lucros e na otimização da alocação de recursos bancários. Este artigo utiliza modelos de regressão de crédito (Linear, Logit e Probit) e Z Altman para determinar e prever o risco de crédito de fornecer instalações a entidades jurídicas em um banco privado. As variáveis estudadas nesta pesquisa incluem variáveis qualitativas (vida da empresa, garantia, experiência de gerentes, tipo de empresa) e variáveis financeiras (capital de giro no total de ativos, valor contábil do patrimônio líquido para o valor contábil da dívida, vendas totais para ativos totais acumulados lucros no total de ativos, lucro antes de juros e impostos sobre o total de ativos). Os resultados desta pesquisa mostram que o uso de modelos de validação, apesar de todas as considerações técnicas e estatísticas, pode determinar com precisão o status de crédito e o risco de crédito dos clientes. Todos os modelos utilizados excederam 80% das previsões corretas, o que representa uma figura significativa no ambiente comercial real. Mas, no modelo Logit, com uma diferença ligeiramente melhor que o resto dos modelos, cerca de 83% de suas previsões estavam corretas.

Palavras-chave: Risco de crédito, Empresas públicas e privadas, Modelo de regressão linear (LPM), Logit.

Riesgos que analizan las instalaciones del banco (Estudio de caso: Private Bank of Noor)

Resumen

El diseño de un modelo de medición del riesgo de crédito en el sistema monetario y bancario desempeñará un papel importante en el aumento de los beneficios y la optimización de la asignación de los recursos bancarios. Este documento utiliza modelos de regresión de crédito (Linear, Logit y Probit) y Z Altman para determinar y predecir el riesgo de crédito de proporcionar instalaciones a entidades legales en un banco privado. Las variables estudiadas en esta investigación incluyen variables cualitativas (vida de la empresa, colateral, experiencia de gerentes, tipo de empresa) y variables financieras (capital de trabajo en activos totales, valor en libros del patrimonio al valor en libros de la deuda, ventas totales a Activos totales, acumulado ganancias a activos totales, ganancias antes de intereses e impuestos sobre activos totales). Los resultados de esta investigación muestran que el uso de modelos de validación, a pesar de todas las consideraciones técnicas y estadísticas, puede determinar con precisión el estado crediticio y el riesgo crediticio de los clientes. Todos los modelos utilizados superaron el 80% de las predicciones correctas, que es una cifra significativa en el entorno empresarial real. Pero en el modelo Logit, con una diferencia ligeramente mejor que el resto de los modelos, aproximadamente el 83% de sus predicciones fueron correctas.

Palabras clave: Riesgo de crédito; Empresas públicas y privadas; Modelo de regresión lineal (LPM), Logit.

1 Introduction

Borrowing from the group is considered to be the most important and most valuable assets of the bank, and most of the bank's income can be realized through the provision of facilities, but the circulation of money and capital in society threatens the financial institution with all kinds of risks Puts it. The variety of these risks, and sometimes their severity, is such that, if a financial institution fails to properly manage and manage them, it will disappear and even go bankrupt (Asli, 2011).

Therefore, considering the increased demand for facilities and the risk involved in these activities, validating facility applicants and providing an appropriate model for

disbursing facilities is one of the most fundamental principles of credit risk management in banks and financial institutions. The use of credit risk management tools, in particular, validation, allows banks to decide more confidently about the granting of facilities.

Islamic Banking, The Importance of Extremely Profitable Contracts, Pay special attention to risk management. Due to financial innovation and the case-existence of contracts in nongovernmental banks, attention has been paid to this risk. Therefore, if it is not possible to calculate the amount of confidence in the future, it is not risk; it is only uncertainty that can be managed and controlled in order to calculate some uncertainty in the form of risk (Rai & Saeidi, 2008).

2 Basics of research

Risk of credit and demand money.

2.1 Credit risk

Perhaps the lack of repayment or repayment with a delay of the principal and the subsidiary facilities granting banks and other debt instruments by the customer is called credit risk. Designing a model for measuring and rating credit risk was first performed by John Murray in 1909 on bonds (Glasts, 2003). In general, the following four traditional factors are widely used to determine the level of credit risk for banks.

The ratio of past due, suspended and doubtful receivables to concessional facilities, the higher the ratio, the higher the credit risk of the institution.

The ratio of past due, suspended, and suspicious claims to assets, which will increase the risk ratio in two periods.

The ratio of the storage of doubtful receipts to eligible facilities that increased the volume of doubtful claims that had been delayed due to increased past and current claims could indicate an increase in credit risk.

The ratio of the storage of doubtful claims to total assets, the increase of which indicates an increase in risk and its reduction is a risk reduction indicator.

2.2 Money Requested Bank

There are two distinct forms of demand, in contrast to the past commitment of the client, and in the requirements of demand banking, it is introduced to the bank's demands from customers for the granting of facilities and the transactions and services provided. Which in:

A) Current claims: Claims that have expired for more than two months. B) Non-current claims: Includes past due, deferred, suspicious, and charged claims. The following figure shows the process of the banking network and their relationship with each other.

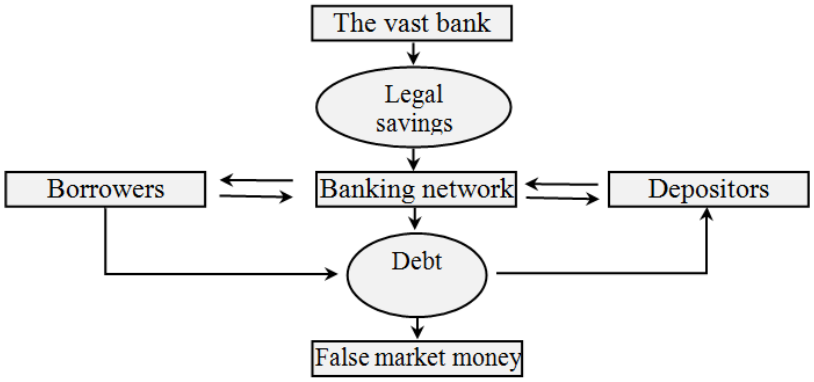

Figure 1
Conceptual model

The increasing demand for the bank's past has led to a reduction in liquidity and, as a result, a reduction in the profitability of banks, which would reduce the stock market value of banks and their market value due to the high demand for deferred loans (Borhani, 2010). The depreciation of banks' shares also increases the risk of bank credit and increases the risk and lower the bank's rank on the international level.

When high credit risk can be very difficult to borrow from international sources, this reduces capital adequacy ratio and reduces the access and use of international resources. The amount of bank lending in Iran is about 4 times the annual tax revenues throughout the country. Delays in commercial banks are several times greater than that of specialized banks, which means that the level of corruption in the banking

system is severe. It is noteworthy that private bank delinquents have a higher ratio to government banks. Iran's deferred bank debt is 4 times the global standard and more than 12 times the amount of Iran's blocked dollars in the Geneva agreement ($ 4.2 billion).

Chart 3-3 shows the trend of the change in the level of bank lag in the late 1990s. The explanation is that the amount of debt in 2014 was based on the report of the Minister of Economic Affairs and Finance on June 27, 2014.

The hidden reality in the statistics is that since people pay off debts owed to banks rather than banks, banks have little incentive to try and repay their claims, and so, in the past 10 years, claims have always been bulish.

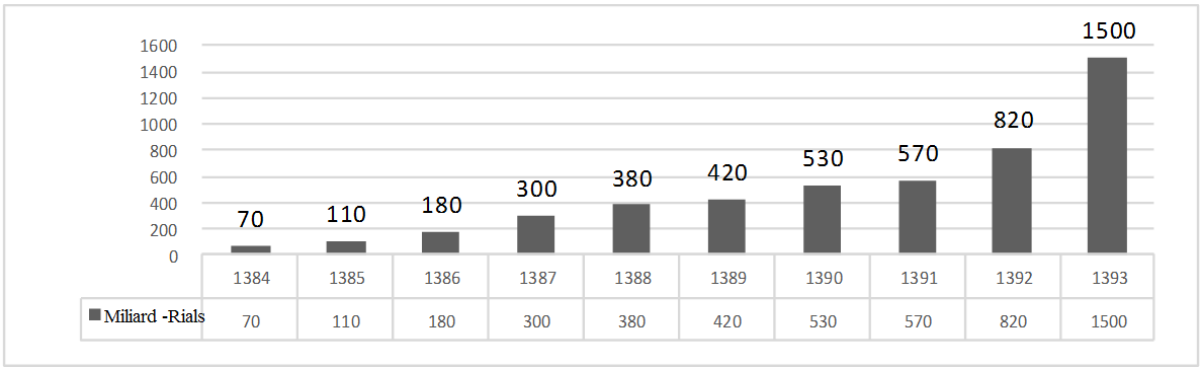

Figure 2
Data

3 Background Research

Investigating the Factors Affecting Debit Claims in Banks, A Case Study of Bank Mehr of the East Azarbaijan Province Using the analysis of information gathered from client's customer records, it was concluded that factors such as type of collateral, amount Facility, type of facility, credit repayment period, use of facilities and type of economic activity are effective in creating deferred bank claims (Rezaei and Mohammadi, 2010).

The effect of macroeconomic shocks on bank lagged claims in Iran was based on self-regression model. In this study, they concluded that monetary agents had an important role in creating financial crises, and the direct involvement of the central government or the central bank in macroeconomic conditions, such as a change in the

interest rate on liquidity facilities and inflation, would increase the bank's deferred receivables Heyri et al. (2010).
The reasons for the emergence of deferred claims and its solutions in Chinese commercial banks have examined the causes of the deferred claims in Chinese commercial banks and classified the factors that are affecting the emergence and increase of this problem in two categories: 1. Non-standard external factors And 2 - non-systemic roots of deferred claims. He finally spelled out solutions to deal with outstanding claims (Guinnying Ning, 2007).

The assessment of credit risk structure in private and public banks shows that a major difference between the views of bankers with regard to their internal credit policies in the regulation of rules and guidelines and procedures and procedures in the policies related to There is no credit risk (Muhina and Singh, 2015).

3.1 Research method

Inference and correlation; and in terms of purpose, it is applicable. The statistical population of this study is all legal clients of Credit Institution Noor, 10% of which about 400 of them are considered as statistical sample that received facilities from 2012 to 2014. In this research, credit risk model including linear probability model, probit, logit and Z Altman have been used.

3.1.1 Linear Probability Model (LPM)

This model is based on linear regression and estimates the likelihood of non-repayment of facilities by using a number of quantitative variables (accounting, financial statements) and qualitative (managerial form, economic environment). Independent variables and dependent variables are defined and selected in the previous section. The linear probability regression model is defined as:

$$\hat{Y} = E(Y_i / X_i) = \beta \circ + \sum_{i=1}^{n} \beta_i X_i = P_i$$

When the dependent variable (Y: decision outcome) is zero, there is no problem.
When the dependent variable (Y: decision outcome) is equal to one, the problem has arisen.

Modeling the failure and bankruptcy of Altman Z Altman, in 1968, selected multiple ratios of 22 ratios, combining the ratio 5 as the best predictor of bankruptcy. After years of using the model, critiques by credit analysts, accountants and even the companies themselves were introduced to the model, they believed that the model was only for firms with commercial and marketable entities The stock exchange can be used.

In 1983 Altman made a modification to the model. This amendment included the replacement of the book value of the stock instead of its market value, and then the modification of the coefficients and range of bankruptcy of the model. In 1995, Altman analyzed the specification and accuracy of the model, regardless of the ratio of sales to total assets, due to Altman's elimination of the proportion of sales to total assets, which would minimize the potential impacts of the industry.

In his reforms, he corrected the elimination of the proportion of sales to the total assets, changes in the company's bankruptcy coefficients and limits. The Altman model has the potential for bankruptcy of companies over the next two years. Therefore, the models and variables used are presented.

Table 1
Information on prediction models for financial failure

Model	Model	
$Z_1 - Score = 1/2X_1 + 1/4X_2 + 3/3X_3 + 0/6X_4 + 0/99X_5$ (1)	1968	*Altman Multiple-discriminant analysis*
$Z_2 - Score = 0/717X_1 + 0/847X_2 + 3/1X_3 + 0/42X_4 + 0/998X_5$ (2)	1983	
$Z_3 - Score = 6/5X_1 + 3/2X_2 + 6/72X_3 + 1/05X_4$ (3)	1993	
X1=Turnover Capital to Total Assets x2= Profit (loss) accrued to total assets x3=Profit before interest and taxes (operating profit and loss) to total assets x4=The market value of the equity is at the value of the debt x5=Sales (earnings) net to total assets	Variables	
$SP - Score = 1/03X_1 + 3/07X_2 + 0/66X_3 + 0/4X_4$	1978	*Springate Logit model*
X1=Turnover Capital to Total Assets x2=Profit before interest and taxes (operating profit and loss) to total assets	Variables	

Model				Model	
x3= Profit before tax to current debt x4 = Sales (earnings) net to total assets					
$ZM - Score = -4/513(ROA) + 5/679(FINL) - 0/004(LIQ) - 4/336$				1984	*Zmijewski Probit model*
ROA *FINL* *LIQ*				Variables	
Zmijewski	*Springate*	*Altman*			Model
ZM	Z4	Z3	Z2	Z1	
Increasing the ZM value indicates the probability of increasing the probability of a bankruptcy, but it does not have a defined limit	SP ≤ 0/862	Z3 ≤ 1/1	Z2 ≤ 1/23	Z1 ≤ 1/8	failure
	-	1/1 < Z3 ≤ 2/6	1/23<Z2 ≤ 2/99	1/8 < Z1 ≤2/99	Disability
	SP > 0/862	Z3 > 2/6	Z2 > 2/99	Z1 > 2/99	Good economy

4 Model estimation and data analysis

Estimation of the Logit model and its comparison with the Altman Z model. So, at first, all the important variables that can be used to predict the likelihood of a decommissioning of the facility are compiled and, using them, we estimate the probability of default.

$$y = f(n, e, t, r, co, x1, x2, x3, x4, x5)$$

Therefore, the overall model of this research is as follows: if the file has a credential in the structure, the variable co is 1 and otherwise it will be zero.

Customers who have credit in the bank's portfolio are expected to have more willingness to repay installments at maturity.

- **x1** variable represents the ratio of working capital to total assets. Companies with higher turnover capital, firstly, have near-cash assets and, if they are defaulted, can repay cash deficits by selling them quickly; and, secondly, a high turnover ratio can be a sign A provider of high-level business and high capacity production.

- **x2** variable represents the ratio of accumulated profits to total assets. The higher the value of this variable, the more important the shareholders are to continue the company's activity, and in order to prevent the debt default and reduce the company's power and control the exit from it, a greater amount of its profits in the capital company Reintroduced.

- **x3** variable represents the earnings before interest and taxes on total assets. The higher the ratio, the greater the power of the company and its ability to generate profits and high return on investment in it. Companies with higher ratios are expected to be less likely to be disadvantaged.

4.1 Linear Results

Criteria and Akaic (AIC) estimates the best linear probability model. As can be seen from the table below, good accounting variables (r), good credit and good value of property (co), accumulated profits to total assets (X2), and profit before interest and taxes Total assets (X3) were eliminated from the general model because they did not have a significant effect on the explanation of the dependent variable, ie, the lack of facilities.

After solving the problems of estimating this model, the definition of the threshold for y and the existence of the heterogeneity of the variance of the results will be as shown in Table 2. According to this form, all coefficients except for the width of the source are meaningful, but the coefficients of the book value of equity to book value of liabilities (X4) and total sales to total assets (X5), contrary to Waiting for negative.

Since the variable values of time before granting facilities and the default status after the granting of the facility, it seems that many companies that have a good financial and income leverage situation for reasons such as market downturn or Unwillingness to fulfill their obligations. The adjusted adjustment coefficient of the model is 95%, as well as the coefficients of all financial variables and its ratios are statistically significant. It is important to note that, contrary to the behavior of the country's banking network, the past due diligence of legal clients has not had a significant effect on the failure or lack of facilities.

Table 2
Linear probability model results using weight

Dependent Variable: Y
Method: Least Squares
Date: 06/25/17 Time: 12:37
Sample: 1 400
Included observations: 342
Weighting series: 1/W

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.013709	0.020942	0.654628	0.5132
N	0.008377	0.001626	5.151482	0.0000
T	0.213043	0.037991	5.607750	0.0000
E	0.016046	0.002490	6.443391	0.0000
X1	1.211792	0.081576	14.85478	0.0000
X4	-0.136688	0.053933	-2.534402	0.0117
X5	-0.868085	0.082677	-10.49973	0.0000

Weighted Statistics

R-squared	0.654978	Mean dependent var	0.349099
Adjusted R-squared	0.648798	S.D. dependent var	0.449196
S.E. of regression	0.266204	Akaike info criterion	0.211146
Sum squared resid	23.73958	Schwarz criterion	0.289636
Log likelihood	-29.10590	F-statistic	196.3398
Durbin-Watson stat	0.667026	Prob(F-statistic)	0.000000

Unweighted Statistics

R-squared	0.431841	Mean dependent var	0.447368
Adjusted R-squared	0.421665	S.D. dependent var	0.497951
S.E. of regression	0.378683	Sum squared resid	48.03937
Durbin-Watson stat	0.580264		

The power of model prediction and its comparison with other methods. The following table is based on prediction and reality. The results table for yi is greater than 50%, its value is equal to 1, otherwise it is considered zero.

Table 3
Probability models Comparison of predictive values and realistic linear

prognosis

	$y_i = 1$	$y_i = 0$	*Total*
$y_i = 0$	174	26	200
$y_i = 1$	46	154	200
Total	220	180	400

As shown in Table 3, the estimates of the estimated model are valid for 82%.

4.2 Probit Model (Probit)

Optimizing the Mac-Faden and Akaic Index (AIC), the appropriate explanatory variables in the model, well-off variables (r), and accumulated total assets (X2) of the total model are eliminated.

To be According to the results presented in Figure 3-4, the collateral (co) and profit before interest and taxes on total assets (X3) are not statistically significant, and the book value of the equity in the book value of debt (X4), and total sales to total assets (X5) have been negatively offset.

As with the linear probability model, it can be said that because the variables related to the time before granting the facility and the status quo after the granting of the facility are to fulfill their obligations, many companies that have a proper position in terms of financial leverage and income for some reason, there has been a downturn in the market or unwillingness.

Table 4
Model result Probation regressions

Dependent Variable: Y
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 06/25/17 Time: 13:16
Sample: 1 400
Included observations: 400
Convergence achieved after 5 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.365854	0.330127	-7.166491	0.0000
N	0.032376	0.008876	3.647614	0.0003
CO	0.487073	0.255188	1.908684	0.0563
E	0.061612	0.014083	4.375020	0.0000
T	0.978248	0.196118	4.988062	0.0000
X1	5.310041	0.672570	7.895156	0.0000
X3	0.505063	0.585287	0.862933	0.3882
X4	-0.803314	0.287095	-2.798079	0.0051
X5	-3.394692	0.508180	-6.680100	0.0000

Mean dependent var	0.500000	S.D. dependent var	0.500626
S.E. of regression	0.336532	Akaike info criterion	0.752777
Sum squared resid	44.28215	Schwarz criterion	0.842584
Log likelihood	-141.5553	Hannan-Quinn criter.	0.788342
Restr. log likelihood	-277.2589	Avg. log likelihood	-0.353888
LR statistic (8 df)	271.4071	McFadden R-squared	0.489447
Probability(LR stat)	0.000000		

Obs with Dep=0	200	Total obs	400
Obs with Dep=1	200		

Examine the predictive power of the model and compare it with other methods The following table is based on prediction and reality. In this table, if the estimated results of yi are greater than 50%, then the value of yi is equal to 1, otherwise zero is considered.

Table 5
Comparison of predictive values and realistic probit regression models

	$y_i = 1$	$y_i = 0$	*Total*
$y_i = 0$	173	27	200
$y_i = 1$	42	158	200
Total	215	185	400

4.3 Results of Logit Model

It is not significant that the profit before taxes and interest on total assets (X3) is statistically significant, and the book value of equity is valued at the book value of debts (X4) and is negative.

Total sales to total assets (X5) have been negated. Like the linear probability model and probit, it can be said that because the variable values related to the time before granting the facility and the status quo after the granting of the facility are to fulfill their obligations.

Many companies that have a good leverage Financial and income have failed for some reason, such as a downturn in the market or unwillingness.

Table 6
Logit Regression Model Results

Dependent Variable: Y
Method: ML - Binary Logit (Quadratic hill climbing)
Date: 06/25/17 Time: 14:00
Sample: 1 400
Included observations: 400
Convergence achieved after 5 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.358253	0.639947	-6.810335	0.0000
N	0.058233	0.016524	3.524097	0.0004
CO	1.063645	0.471646	2.255176	0.0241
E	0.107996	0.025350	4.260227	0.0000
T	1.767331	0.361328	4.891208	0.0000
X1	9.235343	1.228419	7.518073	0.0000
X3	1.057334	1.062351	0.995278	0.3196
X4	-1.510027	0.540559	-2.793455	0.0052
X5	-5.866466	0.917956	-6.390795	0.0000

Mean dependent var	0.500000	S.D. dependent var	0.500626
S.E. of regression	0.335388	Akaike info criterion	0.749855
Sum squared resid	43.98176	Schwarz criterion	0.839663
Log likelihood	-140.9711	Hannan-Quinn criter.	0.785421
Restr. log likelihood	-277.2589	Avg. log likelihood	-0.352428
LR statistic (8 df)	272.5755	McFadden R-squared	0.491554
Probability(LR stat)	0.000000		

Obs with Dep=0	200	Total obs	400
Obs with Dep=1	200		

Examine the predictive power of the model and compare it with other methods The following table is based on prediction and reality. In this table, if the estimated results are greater than 50%, then the value is equal to 1, otherwise it is considered zero.

Table 7
Logit regression models Comparison of predictive values and real

	$y_i = 1$	$y_i = 0$	*Total*
$y_i = 0$	175	25	200
$y_i = 1$	43	157	200
Total	218	182	400

As shown in the table above, the accuracy of the predicted model is 83%. Z-Altman Model Z-Score As previously stated, the last model of Altman was extracted in 1993 in variables and coefficients.

$$Z_3 - Score = 6/5X_1 + 3/2X_2 + 6/72X_3 + 1/05X_4$$

According to Altman estimates, domain Z is calculated and probability of bankruptcy of companies can be calculated according to table 4. It should be noted that the availability of data has been used. Altman's third model due to the availability of availability.

Table 8
Bankruptcy probability and Z domain in the Altman model

Z	Probability of failure
Z3 ≤ 1/1	failure
1/1 < Z3 ≤ 2/6	disability
Z3 > 2/6	Financial strength

This model, with other models, will take into account the prediction of the model with reality. In this case, if the company's situation was in financial health, it means that the default probability model is equal to 1, otherwise the likelihood of default will be zero.

5 Conclusion

The longer the company lives, the lower the likelihood of a facility losing. This illustrates the experience of the organization and its credibility in the market. The experience of managers (here the chairman of the board) stabilizes the company's position and controls the inflow and outflow of money for short-term and long-term financing.

In this research, the Altman III model was used and the variables of working capital in total assets, accumulated profits to total assets, pre-tax profit to total assets, and book value of equity in value Debt bills were all used with positive coefficients, but in economic modeling models, depending on how each variable contributes to explaining the variation of the dependent variable (here the default or debt default), the model entered and or removed from it. In the Logit model, the ratio of working capital to total assets with a significant and positive coefficient is a straightforward correlation with the default or default of legal customers' debts.

The results of this study, using validation models, despite all the technical and statistical considerations, can accurately determine the credit status and credit risk of customers. All of the models used exceeded 80% of the correct predictions, which is a significant figure in the real business environment. But in the Logit model with a slightly better difference than the Z-Altman model, about 83% of its predictions were correct.

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