

Company Bankruptcy Prediction

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Abstract: Following the founding and operation of a corporation, the biggest challenge it faces is the risk of bankruptcy, so how to prevent, controlling, and analyze the causes of bankruptcy is one of the most critical tasks for every company. As we all know, many factors affect corporate bankruptcy, and most studies are based on a unilateral or small range of factors set to study its impact on bankruptcy. Based on the data provided by Taiwan Economic Journal from 1999 to 2009, this paper adopts univariate and multivariate analysis models to analyze the data. A 3Comparative analysis, Normality test, T-test, non-parametric test, ANOVA test, Factor analysis and logistics were carried out using SPSS auxiliary tools Regression (Regression) controls relatively comprehensive factors that affect a company's bankruptcy from an overall perspective. It aims to demonstrate the selection of bankruptcy factors and analysis ideas. After analysis, we conclude that through the research and analysis, we have a new understanding of the causes of corporate bankruptcy. We find the four most important factors affecting corporate bankruptcy. Namely, ROAC before interest and depreciation before interest, Liability to Equity, Total assets to GNP price, and No credit interval, In addition, many single factors may have no impact on a company's bankruptcy. However, when they coexist with other factors, they will have a chain effect, resulting in even multiple amplification of the risk of bankruptcy. Therefore, different from the specific analysis of the impact of single factors on the bankruptcy of a company, this paper extracts the primary factors and takes the analysis of the relationship between individual factors as a specific example by showing the research perspective of innovation to propose the actual operation of a company from the macro and micro aspects, that is, to clarify which departments and decisions to pay special attention to in daily operation.

Keywords: binary classification, univariate study, multivariate study, cause analysis

1. Introduction

Experts and scholars from various countries analyzed and studied the methods of predicting company bankruptcy. Based on the binary classification, various bankruptcy prediction models and theories were established and discovered by referring to various econometric indicators. From the initial univariate analysis to the multivariate model established based on market information in the 20th century, prediction models' accuracy has continuously improved.

At present, many experts and scholars will study the impact of a single factor on corporate bankruptcy but lack a macro perspective to extract the analysis of the factors that cause corporate

bankruptcy and the relationship between them. As we all know, a company's bankruptcy is not caused by a single factor, and many risk factors are similar. Mastering the solution to one of these factors can be extended to preventing and controlling this kind of factor, which can tremendously increase the efficiency of the prevention and control of enterprise bankruptcy risk. In the process of data browsing, we found that when analyzing the cause of each factor, there was a general lack of definition of a specific date range for the factor. Therefore, enough attention should be paid to the daily operation of an enterprise.

The research is mainly conducted from the macro perspective of the overall factors. Based on the provided data set, the comprehensive factor distribution table is analyzed, the overall reasons are divided according to different conditions, and the leading causes affecting the company's bankruptcy are summarized to make the conclusion more objective and comprehensive. The aim is to illustrate a new studying angle for predicting company bankruptcy risk in the future. In addition, rational analysis is carried out with individual factors as reference examples. Working capital and cash turnover rates are mainly taken as the primary research factors to make the research and analysis more vivid and specific.

2. Selection of Bankruptcy Prediction Model

2.1. Selection of Model Samples

In this paper, the corresponding relationship between the bankruptcy of some enterprises and the value of each factor is mainly found in Taiwan Economic Journal from 1999 to 2009, which is used as the supporting material for data analysis. Whether the bankruptcy of enterprises conforms to the binary classification problem is taken as the classification standard for directional research.

2.2. Selection of Univariate Analysis Models

To determine the impact of individual enterprise development elements on the overall development of the firm based on the micro perspective and analyze the impact of individual factors on the bankruptcy of the company in a more detailed and specific way, this paper conducted a separate analysis of individual factors, using ANOVA analysis, namely analysis of variance, also known as variable analysis. Its essence is the quantitative analysis of the causes of the observed variation, which is an essential tool in scientific research.

First, it can analyze the various factors that cause variation one by one, make a quantitative estimation, and then identify which factors play a significant role, which factors play a minor role, and make a reasonable sequence arrangement for the company bankruptcy risk forecast. Secondly, it can make full use of the message shown by the data to estimate the random error caused by accidental factors in the experiment without bias, which significantly improves the correctness of the analysis of the test results and provides a scientific theoretical basis for the reliability of the statistical hypothesis.

2.3. Selection of Multivariate Analysis Model

From our real life, we can know that there are many factors causing company bankruptcy, and it can be concluded from the data set that there are many factors involved. A multivariate analysis model is adopted to find out the factors affecting company bankruptcy more comprehensively, mainly including comparative analysis, logistic regression analysis and factor analysis.

3. Practical Analysis of Enterprise Bankruptcy Prediction Model

3.1. Comparative Analysis

Comparative analysis is one of the most used basic methods: comparing two relevant statistical indicators to reflect the quantitative difference or change according to the objective connection between phenomena. T-tests and nonparametric tests are mainly used in this paper.

3.1.1. Test of Normality

By studying the distribution characteristics of the data set, we can see that it is continuous variable data, so it is necessary to conduct the first step of primary processing of the data to provide a basis and reference for different types of data selection test methods. Four factors were selected as research examples: current liability to assets, working capital to total assets, Revenue per person and Cash Turnover Rate. As shown in Table 1, in the column of significance, it is found that working capital to total assets is 0.051, and current liability to assets is 0.052, both of which are greater than 0.05, so they conform to normal distribution.

Table 1: Test of normality.

	Bankrupt	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig	Statistic	df	Sig
Allocation rate per person	0	.513	6599	.000			
	1	.522	220	.000	.041	220	.000
Working Capital to Total Assets	0	.033	6599	.000			
	1	.034	220	.000	.987	220	.051
Quick Assets Total Assets	0	.043	6599	.000			
	1	.103	220	.000	.947	220	.000
Current Assets Total Assets	0	.035	6599	.000			
	1	.066	220	.021	.970	220	.000
Cash Total Assets	0	.184	6599	.000			
	1	.240	220	.021	.650	220	.000
Quick Assets Current Liability	0	.508	6599	.000			
	1	.296	220	.000	.317	220	.000
Cash Current Liability	0	.521	6599	.000			
	1	.516	220	.000	.221	220	.000
Current Liability to Assets	0	.065	6599	.000			
	1	.036	220	.200	.988	220	.052
Operating Funds to Liability	0	.171	6599	.000			
	1	.267	220	.000	.380	220	.000

Data source: <https://www.kaggle.com/datasets/fedesoriano/company-bankruptcy-prediction>

3.1.2. T-test

Conducting a T-test analysis only for factors that pass the standard test is meaningful, so further data analysis will be conducted for both. As shown in Table 2, it can be found that the significance of the two variables is 0.000, both of which are less than 0.05, so it can be known that the statistical difference is significant. From this, we can find that in the factor analysis of working capital to total assets, there is a big difference between the value that causes company bankruptcy and the value that does not cause company bankruptcy. That is to say, the internal data of the factor working capital to

total assets changes significantly and has a more significant impact on the non-bankruptcy of the company. In other words, appropriately increasing the ratio of working capital to total assets helps reduce the risk of enterprise bankruptcy. Therefore, it can be concluded that the current liability to assets has the same conclusion. However, the difference is that it has a more significant impact on corporate bankruptcy, which means that a higher ratio of current liability to assets will bring a higher bankruptcy risk to the enterprise. Therefore, the results obtained will be further analyzed for specific reasons in the following paragraphs.

Table 2: T-test group statistics.

		Bankrupt	N	Mean	Std.Deviation	Std.Error Mean				
Working Capital to Total Assets	0		6599	.8162069635	.0578572634	.0007122276				
	1		220	.7516808358	.0605998160	.0040856388				
Current Liability to Total Assets	0		6599	.0888870143	.0490249229	.0006035008				
	1		220	.1442380840	.0578536420	.0039004917				
Independent Samples Test										
		Levene' Test for Equity of Variance					t-test for Equality of Means		95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig.(2-tailed)	Mean Difference	Std.Error Difference	Lower	Upper
Working Capital to Total Assets	Equal variances assumed	1.094	.296	16.248	6817	.000	.0645261277	.0039714016	.0567409415	.0723113140
	Equal variances are not assumed.			15.559	232.506	.000	.0645261277	.0041472536	.0563551280	.0726971275
Current Liability To Total Assets	Equal variances assumed	14.054	.000	-16.371	6817	.000	-.055351070	.0033810261	-.061978936	-.048723203
	Equal variances are not assumed.			-14.024	229.607	.000	-.055351070	.0039469037	-.063127850	-.047574289

Data source: <https://www.kaggle.com/datasets/fedesoriano/company-bankruptcy-prediction>

3.1.2.1. Working Capital to Total Assets

Working capital to total assets as a percentage directly reflects an enterprise's importance to working capital and its management ability. A favourable working capital management policy is conducive to

promoting the development of an enterprise and reducing the risk of bankruptcy. The net working capital available for use and turnover in an enterprise is known as working capital, so most companies have a large amount of cash invested in working capital and a large number of short-term payables as a source of financing. Therefore, for the vast majority of companies, working basic administration is an important allotment of their banking management.

The value of working capital to total assets directly affects a company's capacity to manage working capital, which is directly proportional to its profitability. It involves balancing profitability and risk, affecting the company's value. Corporate decisions that tend to access advantage advance to added risk, admitting decisions that focus on abbreviation accident advance to lower abeyant profitability. It can be concluded that working capital is vital for company development and bankruptcy prevention.

Receivable accounts and inventories are two essential components of working capital and represent an important part of a company's assets. Therefore, there are good reasons to support the necessity of holding active working capital.

The inventory portion of working capital goes directly into the production function. For example, companies hoard materials to reduce the likelihood of shortages that could slow production. They also use work-in-process inventory to achieve economies of scale by running large volumes. Other components of working capital, such as trade credits and inventories of manufactured goods, boost sales. In particular, accounts receivable affect sales to customers whose own liquidity is limited. Finally, cash, equivalents, and current liabilities affect costs through the firm's liquidity. For example, compensating cash balances can reduce financing costs, and adequate cash stocks allow firms to take advantage of discounts for prompt payment [1]. In addition, beyond inventories, abate accumulation costs and amount volatility, and prevent disruptions in the assembly action and accident of business due to artefact shortages. They additionally accredit companies to bigger serve their barter and abstain from aerial assembly costs due to aerial fluctuations in production.

On the other hand, granting trade credit may also increase a company's sales because it can effectively reduce the price; encourages customers to buy when demand is low; strengthens long-term supplier and customer relationships; allow buyers to verify the affection of articles and casework afore authoritative payments. Therefore, it reduces the information asymmetry between buyers and sellers. It is also worth mentioning that working basic can additionally serve as an asset of necessary liquidity; accoutrement allowance adjoins approaching banknote shortfalls.

Another essential of alive basic is accounts payable. Accounts receivable represents an ample allotment of best firms' as-sets. Investments in accounts receivable, decidedly for accomplishment companies, represent a cogent allotment of concise banking management. Firms typically sell goods and services on both cash and credit basis. Firms would rather sell for cash than on credit, but competitive pressures force most firms to offer credit. The extension of trade credit leads to the establishment of accounts receivable. Receivables represent credit sales that have not been collected [2]. Delaying payments to suppliers allows companies to appraise the affection of their affairs and can be a bargain and adjustable antecedent of financing. On the other hand, if the company offers an abatement for aboriginal payment, the cost of paying invoices late can be very high.

Therefore, we can see that appropriately increasing the ratio of working capital to total assets of enterprises is conducive to reducing enterprises' bankruptcy risk. Therefore, improving the administration's ability to work capital is the awareness and ability that enterprise managers should have. Managers can actualize the amount for their shareholders by abbreviation the cardinal of canicule accounts receivable and inventories to a reasonable minimum. The negative relation between accounts payable and profitability is consistent with the view that less profitable firms wait longer to pay their bills [3].

3.1.2.2. Current Liability to Assets

The current liability ratio to assets directly illustrates the pressure on the company to bear current liability. Based on the above data, we can find that higher current liabilities mean a higher risk of corporate bankruptcy.

Firstly, the direct impact of the increase in current liabilities is to increase the repayment pressure of enterprises so that the financial risk of enterprises increases. As can be seen from the repayment sequence of liabilities, short-term liabilities should be repaid first, followed by long-term liabilities, and long-term liabilities should be converted into short-term liabilities before their maturity, which, together with existing short-term liabilities constitute the total liabilities to be repaid in the short term, forming the debt repayment pressure of enterprises. This is because the short-term debt maturity date is close, easy to appear the risk of failure to repay the principal on time. Short-term liabilities are also subject to more significant uncertainty regarding interest costs. If the short-term debt is used to raise funds, the debt must be constantly renewed. After the maturity of the current loan, the interest on the next loan is uncertain, so the financial market uncertainty brings much uncertainty to the enterprise.

Secondly, many current liabilities, such as accounts payable, may affect the reputation of enterprises. Investors will question the management level of enterprises and hesitate or even give up financial support for enterprises, which will further increase the risk of bankruptcy when enterprises encounter financial difficulties. According to general international practice, the maximum maturity of accounts payable is three months, which limits the application period of part of the company's working capital. Especially for some important business partners, the supply and sales will not be timely due to financial problems, which will bring losses to the company's operation and increase the risk of bankruptcy.

In addition, a large amount of dividend payable in current liabilities may shake shareholders' confidence in the company. This will cause dissatisfaction among significant shareholders, and minority shareholders will abandon the shares, which will lead the company's stock price to decline, which is contrary to the company's operational objectives.

3.1.3. Non-parametric Test

Then, as shown in table 3, it is also found that other factors except the two alternating factors are less than 0.05, and the Net Value Per Share A value is 0.03. Net Value Per Share B is 0.02, Net Value Per Share C is 0.04, and others are 0.000 in the standard test analysis.

Table 3: Normality test.

Interest-bearing debt interest rate	0	.528	6599	.000	.		
	1	.526	220	.000	.063	220	.000
Tax rate A	0	.198	6599	.000			
	1	.493	220	.000	.318	220	.000
Net Value Per Share B	0	.150	6599	.000			
	1	.059	220	.064	.978	220	.002
Net Value Per Share A	0	.150	6599	.000			
	1	.058	220	.071	.979	220	.003
Net Value Per Share C	0	.150	6599	.000			
	1	.059	220	.059	.980	220	.004
Persistent EPS in the Last Four Seasons	0	.139	6599	.000			
	1	.128	220	.000	.863	220	.000
Cash Flow Per Share	0	.157	6599	.000			
	1	.155	220	.000	.694	220	.000

Data source: <https://www.kaggle.com/datasets/fedesoriano/company-bankruptcy-prediction>

Therefore, Revenue per person and Cash Turnover Rate were selected as references for non-parametric research and analysis in the normality test data less than 0.005.

Table 4: Nonparametric tests.

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Revenue per person is the same across categories of Bankrupt	Independent-Samples Mann-Whitney U Test	.089	Retain the null hypothesis
2	The distribution of Cash Turnover Rate is the same across categories of Bankrupt	Independent-Samples Mann-Whitney U Test	.088	Retain the null hypothesis

Asymptotic significances are displayed. The significance level is .050.

Data source: <https://www.kaggle.com/datasets/fedesoriano/company-bankruptcy-prediction>

It can be seen from table 4 that the significance is more significant than 0.05, so the original hypothesis is retained. That is to say, in different bankruptcy categories, the distribution of Revenue per person and Cash Turnover Rate is the same. That is to say, there is little difference between the two factors corresponding to whether a company is bankrupt. Therefore, it is possible to conclude that these two factors have little effect on whether a company is bankrupt. This conclusion provides the direction for further analysis of the reasons for a company's bankruptcy.

These two factors and similar factors have a common characteristic, that is, they have a two-sided attribute, that is, too high or too low data level will not be conducive to the development of enterprises.

3.2. Anova Test

Among all the factors recorded in the data set, the four factors mentioned above are still taken as references, and the primary analysis is carried out using ANOVA analysis. The results are shown in table 5, table 6, table 7 and table eight below. Current liability to assets and working capital to total assets and no data is shown in the column of significance. It can be inferred that when factors similar to these two variables exist alone, there is no research value on the impact of corporate bankruptcy. Such factors only have excellent research value when co-existing with other factors. As for Revenue per person and Cash Turnover Rate, we can see that the difference is relatively insignificant. It can be inferred that the difference in the value of such factors will not affect whether the company goes bankrupt. It can also be inferred that when a class of factors similar to these two factors exist, there is no practical research significance on whether the company is bankrupt, which confirms the rationality of the non-parametric test results introduced above. The effect of Revenue per person and Cash Turnover Rate on the company's risk can be obtained. The single factor anova test above clarifies the research direction and judgment criteria and avoids unnecessary investment.

Table 5: Current liability to assets ANOVA.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	212.902	6818	.031		
Within Groups	.000	0			
Total	212.902	6818			

Data source: <https://www.kaggle.com/datasets/fedesoriano/company-bankruptcy-prediction>

Table 6: Working capital to total assets ANOVA.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	212.902	6818	.031		
Within Groups	.000	0			
Total	212.902	6818			

Data source: <https://www.kaggle.com/datasets/fedesoriano/company-bankruptcy-prediction>

Table 7: Revenue per person ANOVA.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	177.402	5666	.031	1.106	.368
Within Groups	35.500	1152	.031		
Total	212.902	6818			

Data source: <https://www.kaggle.com/datasets/fedesoriano/company-bankruptcy-prediction>

Table 8: Cash Turnover Rate ANOVA.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	107.447	4013	.027	.712	1.000
Within Groups	105.455	2805	.038		
Total	212.902	6818			

Data source: <https://www.kaggle.com/datasets/fedesoriano/company-bankruptcy-prediction>

From the above analysis, it can be concluded that Revenue per person and Cash Turnover Rate are factors of the exact nature of the development of enterprises, so Cash Turnover Rate is taken as an example to carry out a specific analysis. Through analysis, it can be assured that banknote about-face has no abundant appulse on the company's profitability; that is, the appulse on the aggregation's defalcation is small.

Cash turnover is the amount of cash a company has to fund operating activities, pay corporate debts, and hold new investments in the anatomy of anchored assets or accumulated growth. This indicates that banknote about-face will affect the ability of accumulated profitability. If the company can optimize the use of cash, profitability will increase. According to the after-effects of this study, banknote about-face has no cogent aftereffect on profitability. This may be due to fluctuations in cash developments from year to year. If there is a bad debt, the company must compensate for the loss caused by the bad debt. The company also USES cash to purchase raw materials. As a result, cash flow is not profitable in the short term. As a result, cash flow cannot generate profits in the short term. Cash is the element of working capital with the highest level of liquidity; if cash turnover is higher, the faster the cash inflows to the company. However, if the cash turnover becomes lower, the slower cash goes to the company. This can positively affect the company's revenue. This study's results align with the research conducted by Hendro (2015), which states that cash turnover does not significantly affect profitability [4].

Moreover, a company's cash flow can change dramatically yearly from the data collected. Although the cash turnover rate is overly high or too low in a given period, it does not appear to have abiding access or decrease but shows desperate changes. That is to say; whether it is a large, stable company or a small company on the verge of bankruptcy, this instability is not the source of business failure risk.

The slight effect of cash flow on enterprise bankruptcy shows that the company has relatively low efficiency in cash management. Everyone inside the company hopes not to manage too little or too much cash flow by paying more attention to the budget process. It is an important management tool

to plan, monitor and control the company's finances. Management should estimate the company's income and expenditures for a fixed period. Budgeting can serve several important purposes, such as Monitoring the income and expenditures over a year, Helping to determine if adjustments need to be made in achieving targets and goals, and forecasting income and expenses for projects, including the timing and the availability of income (such as additional grant funds) that will help management in managing cash so that cash turnover will meet the need of the company's operational activities [5].

3.3. Factor Analysis

According to the data distribution of the lithograph, it can be seen that most of the first nine factors have been covered. Therefore, the number of factors was readjusted, and KMO and Bartlett's experiments were conducted. After the KMO calculation, the value was 0.542, more significant than 0.5, so it can be concluded that this data is suitable for factor analysis. Then Bartlett's experiment was conducted, and the result was that the significance was 0.000, which was less than 0.05. Therefore, it was concluded that there was a significant correlation between the two experimental data and that these abstracts set was acceptable for agency analysis.

From the results of extracting a column from the variance of common factors, we can know from table 9 that the most common factors explain more than 60% of the original data. In the running results of the total variance explanation, we can see four main common factors in the data analysis. The component matrix is flipped to analyze and compare. We can conclude that the four most important factors affecting corporate bankruptcy can be obtained in order of importance: ROAC before interest and depreciation before interest, Liability to Equity, and Total assets to GNP price and No credit interval.

Table 9: Factor analysis.

	1	2	3	4
ROAC before interest stand for depreciation before interest	.931	.121		
Net Income to Total Assets	.917	.166	-.121	
Gross Profit to Sales	.574		.381	
Liability to Equity		-.947		
Net Income to Stockholders Equity	.185	.925		
Total assets to GNP price	-.100		.762	-.253
Equity to Liability		.144	.548	.453
No credit Interval				.774
Degree of Financial Leverage DFL				-.406

Data source: <https://www.kaggle.com/datasets/fedesoriano/company-bankruptcy-prediction>

3.3.1. Liability to Equity

The second most crucial factor is Liability to Equity, which is the only one among the four common factors that are negatively correlated with the possibility of bankruptcy of a company. From the characteristics of this changing trend, we can get analysis ideas. Generally speaking, the high value of the debt-equity ratio means that the company's external financing of financial leverage is more significant, so that the company will take more risks.

As for the financial leverage multiple, we can know that it refers to the multiple of the change rate of after-tax profit of common stock per share relative to the change rate of profit before interest and tax, also known as the degree of financial leverage, which is usually used to reflect the size and effect of financial leverage, as well as to evaluate the size of enterprise financial risk. Financial accident

refers to the added accident incurred by absolute bareback the uncertain approaching allotment. If the enterprise is in good operating condition, the return on investment is greater than the absorption amount on debt, then the positive effect of financial leverage will be obtained; if the enterprise is in poor operating condition, the return on investment is less than the absorption amount on debt, then the negative effect of financial leverage will be obtained, and even the bankruptcy of the enterprise will be caused. This uncertainty is the financial risk that the enterprise undertakes by using debt.

Generally, the greater the financial leverage factor, the greater the elasticity of the sovereign capital return rate to the rate of interest and tax. If the interest and tax rate rises, the sovereign capital return rate will rise faster. If the margin on interest and tax falls, the margin on sovereign capital will fall faster, thus the greater the risk. On the contrary, the less financial risk. The essence of financial risk is that the operational risk of debt is transferred to equity capital.

Therefore, it can be assured from the aloft that the college the debt-equity ratio, the college the accident the action undertakes and the greater the achievability of bankruptcy. However, it is worth noting that the lower the value, the better. Suppose the company's operating bearings are in an advancement trend. In that case, the college debt-equity arrangement indicates that it can accompany more outstanding banking advantage allowances to the aggregation and accept an absolute allurements aftereffect on the company's banal value. Therefore, there should be a reasonable range, not too high but not too low.

3.3.2.No Credit Interval

Among the four factors, the least influential is the No credit interval. Days without credit interval is an essential measure of liquidity. It is mainly used to assume the length of time a business can fund its operations with its realizable resources before running out of cash when it no longer sells products. When an enterprise no longer sells products and suspends its business, it already suffers a considerable risk of bankruptcy. A company that maintains its operation by cashing out its original property has no economic vitality or research value. Due to its assumptions, the selection range of research enterprises is relatively narrow. It is tough to conduct a simulation for such companies. Hence, the research scope limits the deepening of the research on such factors, which means that such factors have a relatively small impact on the actual operation of the company compared with the factors mentioned above.

3.4. Logistic Regression

After debugging the cut-off value, when the cut-off value is 0.032, as shown in table 10, the percentage difference between 0 and 1 accuracy is relatively small, which can maximize the F1 score and achieve relatively ideal results.

Table 10: Logistic regression classification table.

	Observed		Bankrupt		Percentage Correct
			0	1	
Step4	Bankrupt	0	5485	1114	83.1
		1	21	199	90.5
	Overall Percentage				83.4
Step5	Bankrupt	0	5476	1123	83.0
		1	22	198	90.0
	Overall Percentage				83.2

Table 10: (continued).

Step6	Bankrupt	0	5480	1119	83.0
		1	21	199	90.5
	Overall Percentage				83.3
Step7	Bankrupt	0	5487	1112	83.1
		1	20	200	90.9
	Overall Percentage				83.4
Step8	Bankrupt	0	5478	1121	83.0
		1	19	201	91.4
	Overall Percentage				83.3
		1	20	200	90.9
	Overall Percentage				84.0

Data source: <https://www.kaggle.com/datasets/fedesoriano/company-bankruptcy-prediction>

Using the following formula, $Precision = TP / (TP + FP)$, $Recall = TP / (TP + FN)$ 及 $F1\ Score = 2 * Precision * \frac{Recall}{Precision + Recall} = 2 / (\frac{1}{precision} + \frac{1}{recall})$

A logistic regression test is especially suitable for binary variable data and analysis for prediction purposes. From the results of the operation, we can conclude that the larger the F1 value is, the better the effect will be, which means that 0.032 is taken as the cut-off value in the data we selected to measure the impact on the risk of the company bankruptcy, which has a good representation and is conducive to finding the main risk factors affecting company bankruptcy. This paper guarantees the accuracy of the discussion, analysis, and conclusion. Overall Percentage.

4. Conclusion

Through research and analysis, we have a new understanding of the causes of corporate bankruptcy. We find the four most important factors affecting corporate bankruptcy: ROAC before interest and depreciation before interest、Liability to Equity、Total assets to GNP price、No credit interval. It is also hoped to provide suggestions on the development direction for the overall healthy operation of the company.

We can additionally see that abounding the factors that account for accumulated defalcation are presented in the anatomy of arrangement data, which shows that banking arrangement plays an actual important role in the circadian operation of a company. Many factors are in direct proportion to the degree of risk brought to the enterprise, while some are in reverse proportion, but this does not mean beggarly that the college the amount of an agency is better, or the lower, the better, so it is essential to find the appropriate ratio of the ratio of factors.

Factors above one ratio distort the relationship between independent and independent variables. High rates lead to sample sensitivity and are misleading, so at least a ratio can be chosen instead of each element in the subsequent statistical analysis. Still, the question of which ratio should represent a factor has yet to be resolved. The popular procedure of selecting the ratio with the highest absolute factor loading makes the selection sensitive to the sample. Such a procedure may be satisfactory for data reduction purposes but certainly not for model building or theory construction. A concerted effort should be applied to select the most representative ratios of these factors [7]. The best of the best adumbrative arrangement for one agency is not absolute if the arrangement calls for added factors. Each arrangement contains accepted and different information. Any added arrangement in the factor does not aggregate further advice. Therefore, a set of banking ratios should be called for added assay

so that the ratios abduct the best of the accepted advice independent in their factors and, as a whole, accommodate added further advice than any added ratios.

In addition, we also understand the relationship between variables. When many variables exist in a specific value alone, they will not impact the company's bankruptcy situation. When multiple factors coexist, they form a chain and interact with each other to produce significant effects. However, it proves our data analysis method's correctness and rationality and explains the reciprocity between a single variable and other variables.

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