

# The Role of Cash Flow in Financial Early Warning of Agricultural Enterprises Based on Logistic Model

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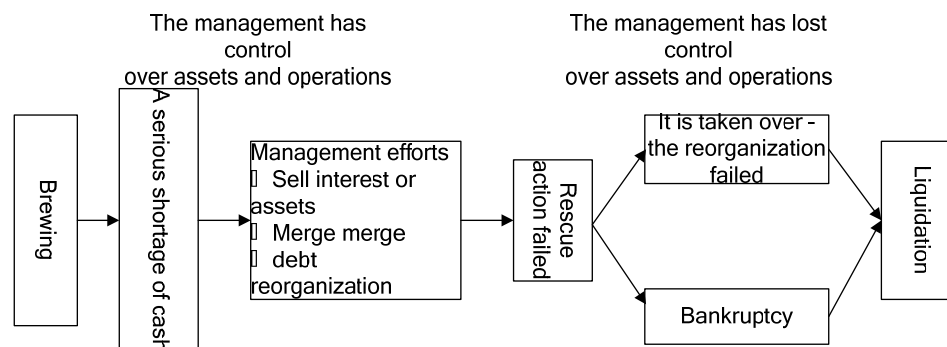
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**Abstract.** This paper chooses the agricultural listed companies as the research object, compares the financial situation of the enterprise and the theory of financial early warning, combines the financial status of the agricultural listed companies, selects the relevant cash flow indicators, discusses the application of the Logistic financial early warning model in the agricultural listed companies, Agricultural enterprises get better development. Research on financial early warning of agricultural listed companies will help the agricultural listed companies to predict the financial crisis. Financial early warning model is simple to establish, operational and strong, the use of financial early warning model, to help enterprises in the financial crisis before taking rapid and effective measures, which can avoid losses. Help enterprises to discover signs of deterioration of the financial situation in time to maintain the sustainable development of agricultural enterprises. In addition, through the financial early warning model, investors can correctly identify the financial situation of agricultural enterprises, and can evaluate the financial situation of agricultural enterprises and to help investors to invest in scientific and rational, beneficial to investors to analyze the safety of investment. But also help the relevant regulatory agencies to effectively monitor the market and promote the healthy and stable development of the market.

## 1. Introduction

In the context of economic globalization, the competition between enterprises has become more and more intense, because the company's financial problems lead to business problems and even bankruptcy examples of endless, so listed companies pay more attention to financial issues. As one of the world's largest agricultural production in China, agriculture has an unshakable position. With the development of modern enterprises, the state is increasingly concerned about the agricultural issues, agricultural enterprises have also been a good development, but in the development of competition at the same time more and more enterprises are facing unprecedented financial risks, so the financial warning Work is imminent. Under normal circumstances the financial crisis will have a deteriorating and can gradually appear in the process of financial data. Therefore, enterprises must take preventive measures, it should be in the daily operation of the financial system throughout the process of tracking the financial operation of enterprises, to timely warning signal, so that enterprises can prepare in advance or take effective means to be able to effectively avoid Or reduce the financial crisis of the difficulties brought about by the enterprise. Therefore, the study of financial early warning model of agricultural enterprises is imminent.





**Figure 1.** The development process of enterprise failure.

## 2. Literature review

China is a big agricultural country, agriculture as a solid position of China's first industry is unbreakable, the status of agricultural listed companies can be said that the agricultural economy weather forecast, the rapid development of China's agricultural enterprises, but because of agricultural enterprises have their own unique mode of operation, By the market and the natural dual pressures, one after another financial crisis, not only their own interests are damaged, but also affected the stakeholders, it is necessary for agricultural enterprises to conduct financial early warning research. Foreign research on multivariate financial early warning model is generally divided into linear decision model, linear probability model and Logistic regression model according to the method. In these models, the most common use of multiple linear decision method, since the 90s of last century, people began to explore new research methods, foreign financial early warning is basically based on corporate financial statements for the financial early warning model verification. Small and medium-sized enterprises mainly on the manufacturing sector financial early warning research, such as Altman and Edmister on the establishment of a financial early warning model. AI Irimia-Diequez compares the nonparametric approach, the regression tree (CART), and the predictive performance of traditional logical regression (LR) by using a large set of corporate data from 1999 to 2008 in the UK. Mu-Yen Chen proposed a method of artificial intelligence; this method may be a short-term than the traditional way to predict the financial crisis more appropriate. Liao Zheai, Liu Xin and Yang Ping have analyzed the financial early warning model at home and abroad. Through the above research can also see the financial early warning model in the future will develop better and better, more scientific and reasonable, not only conducive to the development of their own enterprises, but also conducive to investors to invest properly. However, at present, there is no research on the financial early warning of agricultural enterprises at home and abroad. Therefore, this study focuses on the agricultural enterprises in China. By drawing lessons from the theoretical research and practice results of financial early warning at home and abroad, combining with the financial status of listed companies, Index, to explore the Logistic financial early warning model in the application of agricultural enterprises.

## 3. Data and research methods

### 3.1. Sample selection

This paper chooses 88 listed companies in China's agricultural enterprises (industry code A01) as the empirical analysis object, select the relevant financial data of these companies in 2015 as the original data, all data in this article are derived from Wind information.

### 3.2. Choice of Financial Early Warning

After filtering the samples, the next step is to select the financial early warning indicators. The financial indicators to meet the conditions are more, but in order to have a more comprehensive range of options, this paper chooses the enterprise solvency indicators, profitability indicators, operational

capacity indicators, revenue quality indicators and cash flow growth indicators of these four financial indicators as cash flow financial warning indicators, as shown in Table 1:

**Table 1.** Cash flow financial early warning index.

project	variable	Indicator name	Calculation formula
Solvency index	X1	Cash ratio	(End of the period of monetary funds + available financial assets at the end of the period) / end of the current liabilities
	X2	Interest protection multiple	(Total profit + interest expense) / interest expense
	X3	Operating cash flow liabilities ratio	Net cash flow from operating activities / Total liabilities
	X4	Operating cash flow ratio	Net cash flow from operating activities / current liabilities
Profitability index	X5	Operating index	Net cash flow from investing activities / cash inflows from investing activities
	X6	Cash recovery of all assets	Net cash flow from operating activities / total assets
Revenue Quality Indicators	X7	Sales cash ratio	Net cash flow from operating activities / sales
	X8	Surplus cash protection multiple	Net cash flow from operating activities / net profit
	X9	Operating index	Net cash flow from operating activities / operating profit
Cash flow growth indicator	X10	Operating index	(Net cash flow for operating activities during the period - Net cash flow growth during the previous period) / Net cash flow from operating activities during the period Net growth rate
	X11	Net cash flow of investment activities	(Net cash flow of investment activities in the current period - Net cash flow growth during the previous period) / Net cash flow growth in the previous period
	X12	Net cash flow of financing activities	(Net cash flow growth in current financing activities - Net cash flow growth for the previous period) / Net cash flow for the previous period
	X13	Sales cash growth rate	(Net cash sales for the current period - net cash on the previous period) / net cash sales for the previous period

### 3.3. Model selection

Principal component analysis (PCA) is a multivariate statistical analysis method that selects a number of important variables by selecting multiple variables. Principal component analysis is to remove duplicate variables in all the pre-selected variables, resulting in fewer new variables, and these new variables are unrelated to each other, and almost always maintain the original information in reflecting the information.

Logistic regression is a generalized linear regression analysis model, the independent variables can be continuous, and it can be classified. Logistic regression model is a multivariate quantitative analysis method applied to the regression analysis of the bivariate dependent variable (ie,  $y = 1$  or  $y = 0$ ). Let  $P$  be the probability of occurrence of a matter,  $0 \leq P \leq 1$ ,  $1-P$  ( $1-P$ ), that is, logit conversion to  $P$ , that is,

logitP, then the logitP value from the  $-\infty$  to  $+\infty$ . Using logitP as the dependent variable to establish the regression equation:

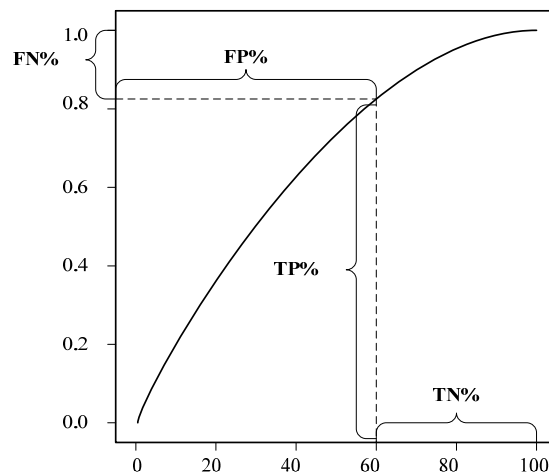
$$\text{logit}P = a + b_1x_1 + b_2x_2 + \cdots + b_mx_m \quad (1)$$

Further available:

$$p = \frac{1}{1 + \exp(a + b_1x_1 + b_2x_2 + \cdots + b_mx_m)} \quad \text{or} \quad p = \frac{\exp(a + b_1x_1 + b_2x_2 + \cdots + b_mx_m)}{1 + \exp(a + b_1x_1 + b_2x_2 + \cdots + b_mx_m)} \quad (2)$$

The model is a logistic regression model.

The ROC curve is used. The area under the curve of the two early warning models is output using the SPSS software. This paper confirms that the indicators selected in this paper have a good early warning effect, on the other hand also shows that the regression model can achieve better results.



**Figure 2.** ROC curve.

\* In Figure 2, FP% is  $FPR = FP / (FP + TN)$  and TP% is  $TPR = TP / (TP + FN)$ .

## 4. Empirical analysis

### 4.1. Principal component analysis

Before the principal component analysis, the original data of the 88 selected companies are standardized by the standardized formula. And then the KMO statistics and Bartlett spherical test, the purpose is to test whether the standardized data is suitable for principal component analysis, the test can be seen  $KMO > 0.5$ , Bartlett test statistic corresponding to the probability of 0.000, so these financial data is suitable for Principal component analysis.

The SPSS software was used to analyze the principal component of the sample data, and the eigenvalues and contribution rates of the principal components were calculated. The results are shown in Table 2. This paper selects the first five principal components that contain 66.22% of the original information content (cumulative contribution rate). The contribution rates of the five principal components after maximum variance were 21.71%, 33.76%, 45.56% and 56.90% respectively. The composition matrix of the five principal component factors is shown in Table 2. Table 4 shows that X4 is higher than other components in principal component 1, which mainly represents the strong solvency of the firm. In principal component 2, X11 is significantly larger than other Composition, representing the level of corporate cash flow is relatively high; the main component 3, X7 slightly

higher than other indicators, representing the enterprise's relatively high quality of income; main component 4, X6 higher than other indicators, representing the enterprise Profitability is strong; the main component 5, X10 is much higher than other indicators, representing the level of corporate cash flow is relatively slightly higher.

**Table 2.** Explain the total variance.

Ingredients	Initial eigenvalue			Extract squares and load			Rotate squares and load		
	total	Variance %	accumulation %	total	Variance %	accumulation %	total	Variance %	accumulation %
1	3.260	25.079	25.079	3.260	25.079	25.079	2.822	21.711	21.711
2	1.622	12.476	37.556	1.622	12.476	37.556	1.566	12.050	33.761
3	1.467	11.281	48.837	1.467	11.281	48.837	1.535	11.807	45.568
4	1.141	8.778	57.615	1.141	8.778	57.615	1.473	11.332	56.900
5	1.119	8.605	66.220	1.119	8.605	66.220	1.212	9.320	66.220
6	0.995	7.653	73.873						
7	0.955	7.349	81.222						
8	0.801	6.163	87.385						
9	0.534	4.111	91.496						
10	0.442	3.398	94.894						

According to the factor score matrix, we can derive the linear expression of the principal component (denoted by F) for each financial indicator:

$$\begin{cases} F_1 = 0.374 X_3 + 0.368 X_4 + 0.242 X_6 + 0.045 X_7 \\ F_2 = 0.526 X_2 + 0.575 X_{11} \\ F_3 = -0.175 X_1 - 0.012 X_8 \\ F_4 = 0.112 X_9 - 0.3322 X_{12} \\ F_5 = 0.185 X_5 + 0.722 X_{10} + 0.485 X_{13} \end{cases} \quad (3)$$

According to the above formula to calculate F1, F2, F3, F4, F5 the five principal component values, and then Logistic regression model analysis, the split point of 0.5.

#### 4.2. Logistic regression analysis

Using SPSS software to continue the logarithmic analysis of the five principal component values of agricultural enterprises as a new index, the value of non-ST Company is 0 at the time of analysis, and the value of ST company is 1, the result is shown in Table 3:

**Table 3.** Variables in the equation.

		B	S.E.	Wals	df	Sig.	Exp(B)
Step 1	F1	3.778	4.716	0.642	1	0.423	43.743
	F2	-0.034	0.031	1.258	1	0.262	0.966
	F3	92.637	45.832	4.085	1	0.043	1.705E40
	F4	0.022	0.145	0.022	1	0.881	1.022
	F5	0.035	0.024	2.168	1	0.141	1.036
	constant	0.451	1.140	0.157	1	0.692	1.570

Through Table 3 can be drawn p value is greater than 0.05, so the coefficient of each indicator is not significant. So it can be concluded that cash flow indicators in the agricultural business financial crisis prediction ability is relatively poor.

## 5. Conclusion

In this paper, the principal component analysis (PCA) is used to analyze the principal cash of the agricultural enterprises in China. The principal component analysis (PCA) is used as the new variable, and then the logistic regression model Analysis, so as to judge the financial status of agricultural listed companies. According to the previous research and the empirical analysis of this paper, the cash flow indicator has a certain ability of forecasting. However, the forecasting ability of the cash flow index is uncertain in the industry. In the agriculture and forestry industry, the cash flow index relatively weak, more difficult to predict the financial risk of enterprises.

In summary, the selected samples in this paper are reasonable and comprehensive, and according to industry classification and the size of the total assets of the pairing. But there are some shortcomings in the selection of research variables of financial crisis early warning. The variables are cash-based financial indicators. Some non-financial indicators and other financial crisis-sensitive indicators, so the study of variables may not be able to fully reflect the company's financial situation; In addition, the research data in this article ST only three, largely affected the analysis results; Third, The research data of this paper are from China's agricultural listed companies, the results of the study is poor forecasting ability, but according to previous studies can know that the role of cash flow indicators for financial early warning is important, but this is the opposite. In view of the above shortcomings, in the future research as much as possible to expand the scope of the selection of variables, in particular, some cannot quantify the indicators, so as to improve the prediction accuracy of the model and the purpose of early warning stability to ensure the normal operation of agricultural listed companies. At the same time, we should also some non-listed agricultural enterprises to conduct financial early warning analysis.

## Acknowledgments

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