

Antidumping case in the China's textile industry: A model building approach

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Abstract

Anti-dumping instruments among trading partners have been the subject of research by both academicians and practitioners. This study attempts to establish an early-warning model of anti-dumping against Chinese textile exporting companies, which have suffered from anti-dumping regulations and got arbitration awards. After reviewing theories of anti-dumping arbitration, early-warning and relationship marketing, the measuring items and relationship marketing model of Chinese textiles exporters are investigated. Empirical methods are selected based on early-warning theories of companies. Eighty percent of 156 valid questionnaires by surveys and interviews are used as training data via Binary-Logistic regression while the other twenty percent are validated in the model. As a result, a proper early-warning model has been established.

Keywords Anti-dumping, Textile industry, Model Building

1. Introduction

China has long been a target of anti-dumping measures. Since the quota of textiles was cancelled by WTO in 2005, the textile industry has suffered from more trade friction. At present, researchers on an early warning system of anti-dumping are leaning toward macro-warning of a country or an industry. On the other hand, there is a paucity of literature on companies. Not many studies focus on anti-dumping arbitration early-warning system. The Western economists have done a lot of work on why antidumping cases around the world increased greatly for recent decades (Knetter & Prusa, 2003; Blonigen & Prusa, 2002; Harald, 2005; Sohn, 2005). These studies mainly investigate the question from the perspective of importing countries, however, try to explore how economic,

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political and institutional factors affect company's antidumping petition.

Compared with this line of research, the literature on the early warning system of antidumping cases are relatively few. With the proliferation of antidumping filings against China in recent decades, the issue about early warning system of antidumping has gradually drawn the attention of the companies and governments. Therefore, the current study is to construct an early warning model for Chinese exports. This paper aims at building an early warning system of anti-dumping arbitration by theoretical analysis and statistical data to assess the possibility of the potential outcome of the import country and to provide timely alerts.

2. Background

Extant literature on antidumping can be classified into two categories: one is antidumping behavior dealing with economic, political and institutional factors' effects on company's antidumping petitions and governments' antidumping investigation including decisions (Prusa, 2001; Czinkota & Kotabe, 1997; Krupp 1994; Blonigen & Prusa, 2002; Harald, 2005; Sohn, 2005). The other is economic and social welfare effects on related countries (Wang, Wang, & Li, 2017; Jianguo, 2006; Prusa 2001). We mainly deal with the literatures that are concerning about antidumping petition and early warning system of antidumping filings.

The main line of research in this context has been focusing on the industry damage and anti-dumping cases. Harald (2005) noted the specificity of the European Union, focusing on how to balance the interests of members of various relations among the allies. Feaver and Wilson (2004) emphasized the significance of the factors of politics and society and so on, introducing many dummy variables to the anti-dumping arbitration model.

Table 1 Feaver and Wilson's Early Warning Index

Index	Content
Political Economy	Trade economic index, unemployment rate, nature of country , level of industrialization, level of economic development, region
Industry Economy Pressure	Total number of industry-cluster, level of industry concentration, type of product processing, employment of the industry
Regulatory Bias	Dumping margin, consistency of determination, the success ratio of antidumping lawsuit, authority of the applying company

At present, there is some research on an early warning system for anti-dumping in China's textile industry. Based on the economy, politics and society, Xiang et al. (2011) proposed an Antidumping Early-Warning Index Evaluation System. It was a case of evaluating the Early-Warning Index

System of the Chinese textile exporters, which was employed panel data logit method.

3. Designing early warning system indexes

3.1 The relationship marketing model of export-oriented textile companies

The five-market model of industrial firms which is proposed by Payne et al. (2005) is used in our study. Their five-market model proposes that there are five major market relations of industrial firms, as shown in Figure 1 below. The five interrelated and mutually affected interest markets together constitute the relationship marketing model of export-oriented textile companies in the context of anti-dumping.

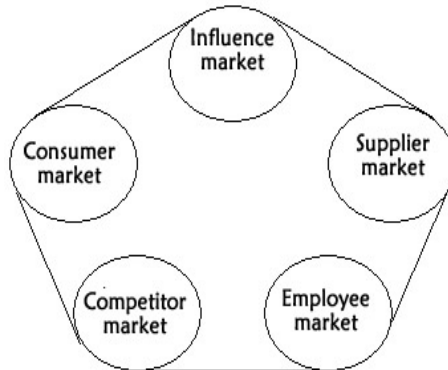


Figure 1 The relationship marketing model of export-oriented companies

3.2 Designing the anti-dumping arbitration indicator system

The indicator system design is based on the relationship marketing model. Influence market means all the impacting factors of politics. First, influence of related policies should be identified. Generally, there are two categories of policy indicators. One category is the trade policies of the importing country: 0 refers to the importing countries that have not introduced policies against China's exports during a certain period; 1 refers to the importing countries that have introduced policies against China's exports; 2 refers to the importing countries that have introduced policies which will promote trade between the two countries. The other category is significant laws and regulations related to textile trade. The abolition of the textile quota provided by the WTO has significant impact on textile export companies of China. Thus, 1 refers to suffering anti-dumping complaints after January 1, 2005, while all others are 0.

Second, impacts during the election period should be identified. Some accidental and unexpected factors can have a big impact on business, such as the presidential election in the United States or an election of representatives. During the investigation period, whether the anti-dumping arbitration has been subject to the influence of political election should also be taken into account. The indicators are allocated as follows: 0: no election period; 1: election period.

Third, the type of importing country needs to be identified. Whether to raise an anti-dumping complaint or not is not decided by the status of economic development of a country but by various interests of different countries. Therefore, what type of importing country the client belongs to should be taken into account when establishing the early warning indicator system of anti-dumping. These indicators are allocated as follows: The United States 0; European Union 1; Turkey 2; India 3; and others 4.

Fourth, non-market economy status needs to be identified. Currently, many western countries including the United States still do not formally recognize China as a market economy, which has a serious impact on China's foreign trade. Although the European Union is beginning to recognize China as market economy status, it admits only that China's market economy is still in a transition period. This indicator is positively correlated with the anti-dumping arbitration of the importing country. These indicators are allocated as follows: 0: recognizing textile export companies of China as a market economy; 1: Not recognizing textile export companies of China as a market economy.

Fifth, GDP growth rate also needs to be identified. The GDP growth rate includes both the GDP growth rate of the exporting country and the importing country. This indicator is a flow indicator used to measure a country's macro-economic climate index. The GDP growth rate of the exporting country is negatively correlated with the result of anti-dumping arbitrations of the importing country. The impact of the GDP growth rate on the importing country is opposite to the impact on the exporting country.

Sixth, inflation/deflation rate of importing country needs to be identified. When the importing country is experiencing deflation, the domestic distribution of commodities will certainly be affected. As a consequence, the corresponding business of its domestic companies will be troubled. Therefore, more attention shall be paid to the sales of competitors in the market, which will likely lead to anti-dumping complaints.

Seventh, import growth rate of the importing country needs to be identified. The rapid import growth rate of the importing country will be prone to lead to complaints from the government of the importing country and domestic companies. Then, the government will take the so-called "legal measures" to retaliate via an anti-dumping lawsuit.

Eighth, the proportion of China's exports of the importing country's total imports needs to be noticed. This indicator reflects the position of China's export products in the markets of importing

countries. The higher the proportion, the more easily it draws attention.

Ninth, the export growth rate of China needs to be noticed. This indicator reflects the export situation of China. Generally speaking, the higher the index value, the bigger the risk of anti-dumping complaint according to past experience.

Tenth, the fluctuation of China's foreign exchange rate or the value of RMB needs to be noticed. The change of China's foreign exchange rate and the value of the RMB have certain impact on the foreign trade of China. For example, following the fluctuation of the RMB exchange rate in 2005, the textile trade friction is decreasing.

Eleventh, unemployment rate of the importing country needs to be noticed. This indicator of the importing country is positively correlated with the number of anti-dumping lawsuits.

Twelfth, the relationship between companies and domestic industry association needs to be noticed. This indicator is negatively correlated with the results of anti-dumping arbitrations of the importing country. These indicators are allocated as follows: 0-6 stands for the degree of closeness of companies and industry association. 0 refers to no contact, 1 refers to less contact, 2 refers to contact only when taking part in activities, 3 refers to frequent contact, 4 refers to invite the leader of the industry association to be the consultant of companies, 5 refers to leader of the company is the med-level leader of the industry association, 6 refers to leader of company who is also the high-level leader of the industry association.

Thirteenth, the abilities of the industry association of the exporting country need to be noticed. This indicator refers to the abilities to produce organization and export pricing of an industry association. If the industry association of the exporting country is strong, it has a strong control of its export prices, export capacity and organizing companies to defend against anti-dumping lawsuits. Thus, the strength of the industry association of the exporting country is positively correlated with the result of anti-dumping arbitrations of the importing country. The indicators which show the ability of an industry association are: the structure and the regulation of the industry association; the history of the industry association to initiate anti-dumping lawsuits and respond to anti-dumping complaints. 0-6 stands for the degree of strength of the industry association.

Fourteenth, whether similar kinds of products are targets of the anti-dumping by other countries should be considered. There exists a "domino" effect in anti-dumping. This indicator is assigned from 0 to 6, according to the severity of anti-dumping.

Fifteenth, the number of anti-dumping lawsuits against China's textiles needs to be noticed. China's textile industry suffers from anti-dumping most frequently, and the number of anti-dumping lawsuit against it is increasing every year. The increasing number of anti-dumping

lawsuits gives the importing country as an excuse to initiate more lawsuits, however, just as a vicious snowball effect grows more difficult to control.

Sixteenth, the export product characteristics of China's textile industry need to be considered. The product characteristics of the exporting country are negatively correlated to the results of anti-dumping arbitrations. The allocations of the characteristics of export products are as follows: 0 refers to raw materials; 1 refers to semi-finished products; and 2 refers to finished products.

At the same time, customer market should be recognized as the followings: the ability of agents of the importing country, cooperative relations between clients of the importing country and companies of China, and brand awareness of exporting companies. Competitor market needs to include the followings: monopoly power of the importing country, the total number of textile industries in the importing country, the position of the industry in the importing country, equipment utilization rate of the importing country's textile industry, annual export growth rate of China's textile companies, low-price competition of China's exporting companies, the relation to industry associations of the importing country, concentration of China's textile industry, the cooperation level between industry and companies, and positive degree of domestic textile companies responding to anti-dumping lawsuits.

4. Anti-dumping arbitration model indicator system identification

In this study, the expert questionnaires were sent by mail, fax, e-mail and so on. Among the total of twenty eight questionnaires sent, twenty four valid ones were collected. The response rate was 85.7% and finally twenty questionnaires were identified valid as shown Table 2.

Table 2 Expert questionnaires

Field	Number	Position	Number
College researchers	5	Directors (president) or general managers	4
Lawyers and related consultants	3	(Associate) Professors/lecturers	3
Company staff	8	Mid-level managers	7
Government/association officials	4	Junior staff	6
Qualification	Number	Title	Number
Graduate and above	8	Advanced	6
Undergraduate	8	Intermediate	9
Tertiary	4	Primary	5

4.1 Indicator weight calculation based on AHP

Based on AHP model, early warning indicators have been identified. Those indicators include macro environmental influencing factors such as political, economic and social ones, customers, competitors, suppliers and within the companies. We selected the first 20 factors through the method of bottom out to set up the early-warning indicators in anti-dumping arbitration system as shown the table below:

Table 3 The list of early-warning indicators by AHP

Primary index	Secondary index
Influencing Factors	C1 The abolition of the quota provisions of WTO
	C2 Category of importing countries
	C3 Political elections or major events in importing countries
	C4 Introduction of new laws and regulations in importing countries
	C5 MES (Market Economy Status)
	C6 GDP growth rate of the importing country
	C7 China's GDP growth rate
	C8 The inflation rate of importing country
	C9 Import growth rate of the importing country
	C10 The proportion of China's exports accounting for the total imports of the importing countries
	C11 China's export growth rate
Customers	C12 Maintaining long-term cooperative relations with clients
	C13 Annual export growth rate of China's textile companies
Competitors	C14 The relationship with China's textile industry associations
	C15 The positive degree of China's textile companies responding to anti-dumping
Suppliers	C16 Industry and trade integration in export companies
Within the companies	C17 Extent of companies concerned about the export information
	C18 Business strategy of company managers
	C19 The normalization of company's financial statements
	C20 The extent of companies possessing the sense of anti-dumping

5. Method

5.1 Sample

As the purpose of this study is to build an early warning model of anti-dumping arbitration of China's textile export companies, the samples are required to meet the following three criteria:

first, they should belong to China's textile exporting companies; second, they had been subjected to certain types of textile anti-dumping complaints; and third, they already got the result of anti-dumping arbitration.

Based on current sources, the 158 samples in this study are selected among China's textile export companies that had been subject to certain types of textile anti-dumping complaints. These companies are divided into different groups by whether the result of the arbitration is win or lose.

Macro data collection was completed through the WTO, IMF, respective countries' websites, China's trade related website, the textile industry website in China and abroad. Micro data collection was done through conducting a survey such as interviews and questionnaires from the list of textile export companies and textile industry associations. The indicators were evaluated through the first two steps to make them quantifiable and qualitative indicators were evaluated on a 7 points scale according to their features.

5.2 Factor analysis of early warning of anti-dumping arbitration

The current study employs Binary-Logistic regression to identify the result of anti-dumping arbitration. The samples selected in modeling are the companies that had been subject to certain types of anti-dumping complaints. There are 158 companies in total, of which 126 were involved in model analysis and 32 were used in model validation analysis.

We define the responding result(Y) as:

If succeed, then $y=1$: Ending with no damage, ending investigation or low anti-dumping tariff.

If fail, then $y=0$: Unified tariff or independent high tariff.

Table 4 shows the list of evaluations for each indicator.

Table 4 Evaluation for each indicator of the warning sign

Indicator of the warning sign	Evaluation for each indicator
X1 The abolition of the quota provisions of WTO	0, 1
X2 Introduction of new laws and regulations in importing countries	0, 1, 2
X3 Political elections or major events in importing countries.	0, 1
X4 Categories of importing countries	0, 1, 2, 3, 4
X5 Recognition of the full market economy status	0, 1
X6 GDP growth rate of the importing countries	Observed number of data in period of survey
X7 China's GDP growth rate	Observed number of data in period of survey
X8 Inflation rate of the importing countries	Observed number of data in period of survey
X9 Import growth rate of importing countries	Observed number of data in period of survey

Indicator of the warning sign	Evaluation for each indicator
X10 The proportion of China's exports accounted for the total imports of the importing countries	Observed number of data in period of survey
X11 China's export growth rate	Observed number of data in period of survey
X12 Maintaining long-term cooperative relations with clients	0~6
X13 Annual export growth rate of China's textile companies	Observed number of data in period of survey
X14 The relationship with China's textile industry associations	0~6
X15 The positive degree of China's textile companies responding to anti-dumping	0~6
X16 Industry and trade integration in export companies	0, 1
X17 Extent of companies concerned about the export information	0~6
X18 Business strategy of company managers	0~6
X19 Normalization of company's financial statements	0~3
X20 The extent of companies possessing the sense of anti-dumping	0~6

Through the establishment of log-linear regression model of the factors of anti-dumping arbitration, using the main parameters in this model, such as the estimated value of the regression coefficient (elasticity coefficient), significant difference level, accuracy of discrimination and validity of this model, we can evaluate the main factors and the degree of influence.

5.3 Statistical description of samples

Based on the results, the indicator of introduction of new policies and political elections would account for the majority when the proportion of successful defenses is equal to that of failed ones. It indicates the phenomenon that companies subjected to anti-dumping have something to do with the dynamic political situation in certain countries and the ever-changing trade policy environment. The EU and India were the first two countries subjected to the largest number of anti-dumping arbitration about textile companies. It is realistic that the evaluations of other sequenced indicators also appear to have "both ends being small and the middle being large."

5.4 Initial regression analysis of anti-dumping based on Binary-Logistic regression

Logistic regression is employed to select the most reasonable indicators that are able to account for the variation from the 20 independent variables. The number of samples that have entered the regression analysis is 126, 100% of the total samples, which are training samples, or they are

selected to set up Logistic regression model. After modeling, the new model would identify the 126 samples once again. Independent coding of samples is shown in the following table.

Table 5 Coding of independent variables

Signification starter	Code
Failure in responding	0
Success in responding	1

This table shows the explanation of corresponding variables: “0” represents that the samples belong to default group, “1” shows that the samples belong to non-default group. The code of dummy variables in multi-classification variables on independent variables is shown in the following table.

Table 6 Evaluation code of dummy variables in multi-classification variables

		Frequency	Situation of parameters value			
			(1)	(2)	(3)	(4)
Country	U.S.A	19	1	0	0	0
	Others	24	0	1	0	0
	EU	50	0	0	1	0
	India	23	0	0	0	1
	Turkey	10	0	0	0	0
Introduction of new laws	Policy inclined to trade protection	57	1	0		
	Policy inclined to free trade	55	0	1		
	None	14	0	0		
The abolition of the quota provisions of WTO	No	66	1			
	Before	60	0			
Political elections	Yes	81	1			
	No	45	0			
Industry and Trade Integration or not	Yes	79	1			
	No	47	0			

Table 7 shows the classification of the initial samples before the analysis of Binary-Logistic regression.

Table 7 Classification of the initial sample

Observation groups			Predicted		
			The result of anti-dumping arbitration		Proportion
			Failure in responding	Success in responding	
Step 0	Result of anti-dumping arbitration	Failure in responding	66	0	100
		Success in responding	60	0	0
Total proportion					52.4

In addition, Table 7 also shows the probability of a cut-off point when setting up the prediction of model. It means that this model would predict the dependent variables through this very point. The cut-off point in this model is “0.5”, that is, when the probability is above 0.5, the sample would be predicted as “Failure”. On the other hand, the sample would be predicted as “Success”, when the probability is lower or equal to 0.5.

5.5 Final regression analysis of anti-dumping arbitration

This study use principle of input method-conditional parameter estimation (Forward: Conditional). Whenever the independent variables are embeded into the model to conduct regression step by step, the variables that are not significant are cancelled. Another method is to estimate the “similarity” between model and sample. According to existing parameters, the probability of the result is called “likelihood ratio”.

Based on Hosmer-Lemeshow test, the result of goodness of fit and -2Log likelihood test is as follows:

Table 8 Goodness of fit test

Step	Chi-square	df	Sig.
1	10.285	5	0.068
2	8.850	8	0.355
3	4.709	7	0.695
4	7.976	7	0.335
5	5.715	7	0.573
6	2.666	7	0.914

If Sig.>0.05 , we accept the hypothesis that these is no significance between the observed data

and the predicted data, that is the fitting of the data is good. The sig. for the 6 steps are all above 0.05 , i.e., goodness of fit of this model is pretty good.

The result of -2Log likelihood test is as follows:

Table 9 -2 times likelihood ratio test

Step	- 2 times likelihood ratio test	Cox & Snell R ²	Nagelkerke R ²
1	146.290	0.200	0.267
2	130.377	0.295	0.393
3	115.689	0.372	0.497
4	97.649	0.456	0.609
5	69.340	0.566	0.755
6	53.597	0.617	0.823

Based on the 6 steps shown, there is no statistically significant difference between the observed data and the predicted data across at a significant larger than 0.05, suggesting that the model was fit. “Cox & Snell R²” and “Nagelkerke R²” are used to evaluate the model fits, which is similar to the R² in the linear regression model.

$$\text{Cox \& Snell } R^2 = 1 - \left(\frac{L(0)}{L(B)} \right)^{\frac{2}{N}} \quad \text{Equation 1}$$

In the equation 1, L (0)and L (B)are the likelihood functions for the intercept-only model and full model, respectively, while N is the sample size. As Cox & Snell R² value can exceed 1.0, Nagelkerke R² was proposed to use as it rescaled the Cox & Snell R² model to cover the full range from 0 to 1.

$$\text{Nagelkerke } R^2 = \frac{R^2}{R_{Max}^2} \quad \text{Equation 2}$$

Table 9 shows the 6 steps of model regression. As the independent variables introduced are changed in the model, the values of 2 likelihood ratio tests are gradually decreased. For example, in the step 2, when an independent variable was added, the 2 likelihood ratio value dropped to 130.377 from 146.290 in the step 1. Overall, comparing with the Cox & Snell R² and Nagelkerke R² values from 0.2 and 0.267 (Step 1) to 0.617 and 0.823 (Step 6), we found out that the model was significantly more appropriate.

As the independent variables introduced are changed in the model, the prediction result of the initial sample and the accuracy rate of prediction are also changed. The detailed information is shown in the table below.

Table 10 Six steps of model regression to predict the accuracy rate

Observed result	Prediction of result		
	Anti-dumping arbitration		Accuracy Rate(%)
	Failure	Success	
Step 1 Anti-dumping arbitration	48	18	72.7
Failure	17	43	71.7
Success			
Total percentage			72.2
Step 2 Anti-dumping arbitration	47	19	71.2
Failure	13	47	78.3
Success			
Total percentage			74.6
Step 3 Anti-dumping arbitration	53	13	80.3
Failure	10	50	83.3
Success			
Total percentage			81.7
Step 4 Anti-dumping arbitration	53	13	80.3
Failure	10	50	83.3
Success			
Total percentage			84.1
Step 5 Anti-dumping arbitration	60	6	90.9
Failure	7	53	88.3
Success			
Total percentage			89.7
Step 6 Anti-dumping arbitration	61	5	92.4
Failure	6	54	90.0
Success			
Total percentage			91.3

With the gradual introduction of new variables, the accuracy of model also gradually improves. The analyses of each parameter values are shown in the table below, which represents the results of Logistic regression analysis. At Logistic regression, the B value that cannot be a true reflection of the situation can only serve as the basis to judge.

Table 11 Steps on variables entering regression model

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1	Attitude of China's textile companies against lawsuits	0.581	0.125	21.621	1	0.000	1.788
	Constant Term	-2.683	0.604	19.754	1	0.000	0.068
Step 2	Attitude of China's textile companies against lawsuits	0.500	0.132	14.269	1	0.000	1.649
	Normalization of company's financial statements	1.194	0.331	12.997	1	0.000	3.301
	Constant Term	-4.870	0.966	25.435	1	0.000	0.008
Step 3	GDP growth rate of China	-0.370	0.128	8.382	1	0.004	0.691
	Attitude of China's textile companies against lawsuits	0.539	0.144	13.929	1	0.000	1.715
	Normalization of company's financial statements	1.122	0.361	9.673	1	0.002	3.070
	Constant Term	-4.503	1.057	18.155	1	0.000	0.011
Step 4	GDP growth rate of importing country	-0.727	0.190	14.653	1	0.000	0.483
	Chinese GDP growth rate	-0.949	0.269	12.475	1	0.000	0.387
	Attitude of China's textile companies against lawsuits	0.709	0.172	16.943	1	0.000	2.032
	Normalization of company's financial statements	1.513	0.444	11.600	1	0.001	4.538
	Constant Term	3.192	2.457	1.687	1	0.194	24.337
Step 5	Category of the importing country			15.191	4	0.004	
	Category of the importing country (1)	-7.063	2.107	11.231	1	0.001	0.001
	Category of the importing country (2)	-8.923	2.433	13.447	1	0.000	0.000
	Category of the importing country (3)	-4.158	1.610	6.667	1	0.010	0.016
	Category of the importing country (4)	-5.119	1.896	7.289	1	0.007	0.006
	GDP growth rate of importing country	-1.479	0.374	15.663	1	0.000	0.228
	GDP growth rate of China	-1.583	0.595	7.090	1	0.008	0.205
	Attitude of China's textile companies against lawsuits	0.817	0.212	14.826	1	0.000	2.263
	Normalization of company's financial statements	2.539	0.630	16.252	1	0.000	12.671
	Constant Term	12.385	6.156	4.048	1	0.044	239181.018
Step 6	Category of the importing country			15.575	4	0.004	
	Category of the importing country (1)	-7.003	2.474	8.014	1	0.005	0.001
	Category of the importing country (2)	-13.139	3.376	15.150	1	0.000	0.000
	Category of the importing country (3)	-6.911	2.174	10.106	1	0.001	0.001
	Category of the importing country (4)	-7.002	2.383	8.632	1	0.000	0.001

	B	S.E.	Wald	df	Sig.	Exp(B)
GDP growth rate of the import country	-1.727	0.406	18.122	1	0.000	0.178
GDP growth rate of China	-1.704	0.609	7.833	1	0.005	0.182
Attitude of China's textile companies against lawsuits	1.741	0.449	15.029	1	0.000	5.704
Normalization of company's financial statements	2.912	0.717	16.508	1	0.000	18.390
China's textile companies with annual export growth rate	-0.380	0.118	10.283	1	0.001	0.684
Constant	15.444	6.363	5.892	1	0.015	5098218.73

No matter which variables out of the equation would result in significant change. Therefore, entering variables into the model finally according to the order are as follows:

- step1 : Attitude of China's textile companies against lawsuits
 - step2 : Normalization of company's financial statements
 - step3 : GDP growth rate of importing country
 - step4 : GDP growth rate of China
 - step5 : Category of the importing country
 - step6 : Export growth rate of China's textile companies
- Finally, Binary-Logistic regression model is as follows:

$$P = \frac{1}{1 + \exp(-7.003x_{(4)1} + -13.139x_{(4)2} - 6.911x_{(4)3} - 7.002x_{(4)4} - 1.727x_6 - 1.704x_7 + 1.741x_{15} + 2.912x_{19} - 0.38x_{13} + 15.444)}$$

where :

- X_{15} Attitude of China's textile companies against lawsuits
- X_{19} Normalization of company's financial statements
- X_6 GDP growth rate of importing country
- X_7 GDP growth rate of China
- X_{13} Export growth rate of China's textile companies
- X_4 Category of the importing countries

In order to show the intuitive model with the predictive accuracy rate, the following graph is displayed. The graph shows only the first and the final step selections to reduce unnecessary duplication of graphics

Step 1 :

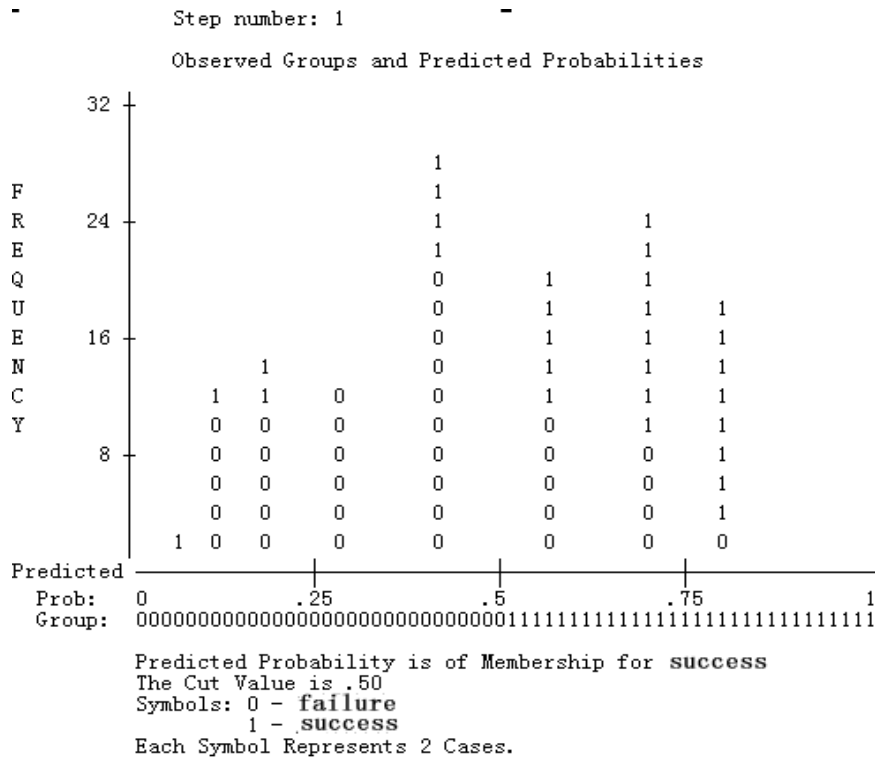


Figure 2 The first step regression model

Step 6 :

Figure 2 shows the classification of training samples by the first model (or step 1). In the figure, “0” stands for “A company that failed to respond to a lawsuit”, “1” stands for “A company that successful to respond to a lawsuit”, and the horizontal axis represents the default probability calculated from the model. Each “0” (or “1”) represents a company. According to the default standard (that is, the standard I set), we can divide it into two parts from 0.5. From the figure, we can notice intuitively that 0 and 1 have been separated better, but still need to be further improved. This corresponds to the accuracy of the first model in training sample classification. The accuracy of the first model for training sample classification has reached 72.2%. Each of the previous steps (or models) corresponds to a predictive classification map. Here, we will not show it one by one. We will only discuss the sixth model, which is also the best prediction and judgment model, and also the model recommended in this study.

Step 6 :

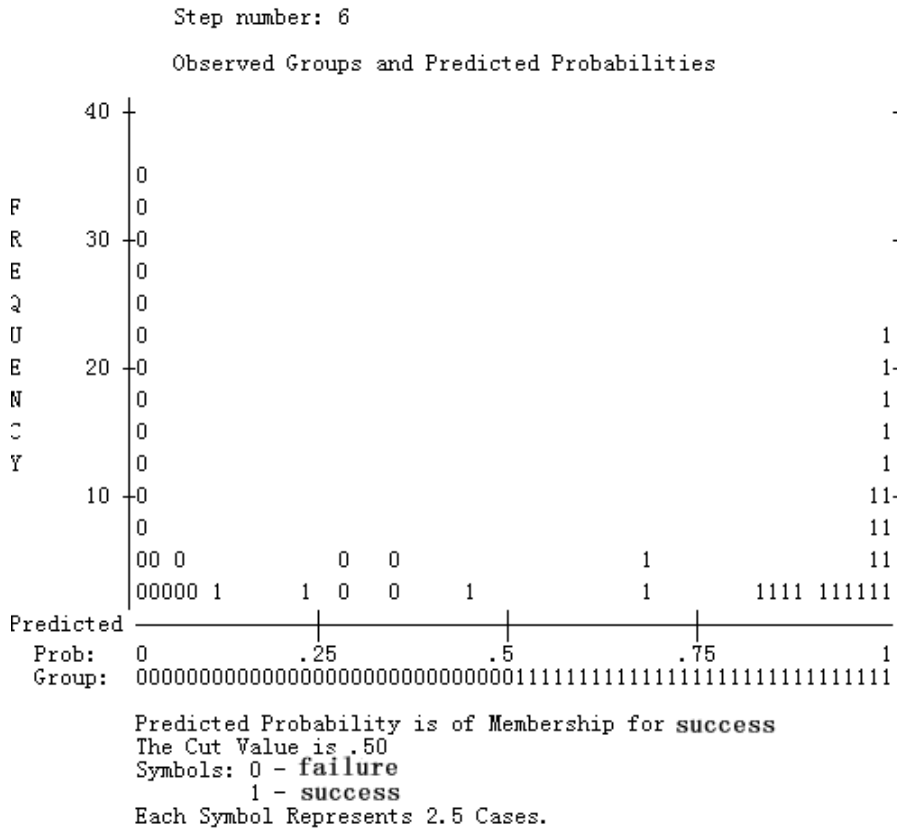


Figure 3 The last step regression model

Figure 3 shows the classification of training samples by the sixth model. From the figure, we can find intuitively that 0 and 1 have been separated very well. This corresponds to the correct classification rate of training samples based on the sixth model. The sixth model used in this study is the Binary-Logistic regression model. From the previous table, we can conclude that the classification accuracy of the sixth model for training samples reaches 91.3%. Based on this result, we can use this model to predict new companies.

6. The Fit of Binary – Logistic regression model

In order to test the model prediction results, we randomly selected 32 companies that have been subjected to anti-dumping textile export. Then, we used the corresponding indicators and conducted the test. Table 12 shows the Logistic regression model of the original sample fit and prediction of the test samples.

Table 12 Accuracy classification of model discriminant

Sorting Results				
Types of anti-dumping arbitration		Prediction group members		Total
		Responding to the failure of group	Responding to the success of group	
Original (Number)	Responding to the failure of group	61	5	66
	Responding to the success of group	6	54	60
	Examination Division	2	30	32
Original (%)	Responding to the failure of group	92.4	10.0	100.0
	Responding to the success of group	7.6	90.0	100.0
	Examination Division	7.25	93.75	100.0

The third column from the Table 12 which is model of the original sample of companies responding to the failure of fitting shows the correct rate of 92.4%. On the other hand, the original sample of companies responding to the success of fitting reveals the correct rate of 90.0%. Among 32 respondents, two companies were forecasted to be responding to the failure. Therefore, the model prediction accuracy rate is 93.75%. By this token, the prediction accuracy rate of the Logistic regression model which this study built is high. This proves that our proposed model is very accurate.

7. Discussion

Based on analyses and tests, we can draw the following findings:

The nine indicators that have greater impacts on the results of anti-dumping rulings mainly belong to the internal market of the relationship marketing model of textile export companies, the influencer market and the competitor market. The remaining two stakeholder markets which are the customer market and the supplier market have no indicators to enter the model. On the other hand, these nine indicators have political aspects such as the country of the importing country; economic aspects such as GDP of China; industrial factors such as the growth rate of China's textile exports; and micro-factors such as the attitude of China's textile companies against lawsuits and the normalization of financial statements. Therefore, the index is relatively comprehensive, but the anti-dumping ruling may be closely related to the political, economic and industry environment. Although customers and suppliers are indispensable parts of relationship marketing, however, they

have little influence on anti-dumping decisions.

If we divide the indicators according to whether they are controllable or not, factors beyond the control of companies, such as the economic development of China and importing countries. If China's textile export growth rate is too fast, it will lead to adverse anti-dumping rulings of importing countries, and the results of the rulings vary according to different countries. Controllable factors such as the attitude of China's textile companies against lawsuits and the normalization of financial statements have more influence on the result of adjudication than uncontrollable factors. Companies still have greater initiatives in dealing with anti-dumping lawsuits. Once a company is subjected to anti-dumping, besides the analysis of political and economic factors, it should actively respond to the lawsuit and normalize the materials such as financial statements, and strive to grasp the initiative. In this way, the success of responding to the lawsuit will be more promising.

Binary-Logistic regression entry model and AHP weight calculation based on expert survey have more differences in the importance of indicators. For example, the first index of entry into the model is listed in the table, "the attitude against lawsuits" ranks only 13th in the ranking of AHP weights, and the second ranks only 15th. Therefore, we can only take people's subjective judgment on anti-dumping as a reference for the construction of early warning model. We also need to quantify the model as the model obtained in this study has a high accuracy through testing samples.

In addition, we should make notice of the following circumstances. First, the "type of importing countries" which belongs to the influencer market is the third entry model of political indicators, while the importing country's trade policy and the importing country's electoral indicators have not entered the model. Therefore, it can be concluded that trade policy and political elections also have different effects on anti-dumping rulings because of the different situations of different countries. For example, the political elections in the United States have always had a great impact on trade policy and decision-making on anti-dumping rulings, while the political elections in the European Union and other countries have relatively less influence. Therefore, each country's anti-dumping against China is based on its own considerations: The United States may try to suppress China's politics and economy; the European Union mainly balances the interests of its member nations; while India and Turkey are major exporters of textiles, China is a competitor. Thus, they will proceed from the perspective of trading partners of textiles, and so on. Therefore, it is reasonable for the importing country to enter the early warning model of anti-dumping ruling.

Second, based on the ranking of indicators calculated by AHP method, the index of "the cancellation of quotas stipulated by WTO" which ranked first did not enter the model. There may be two possible explanations for this. First, sample of anti-dumping cases after the abolition of

WTO quotas accounted for a small proportion of the total sample, which may not well reflect the true situation. Second, the cancellation of quotas may not be as expected by the industry, "global anti-dumping will enter a new stage", and it may not have a greater impact on the decision-making of importing countries' anti-dumping rulings in a relatively short period of time. Because the sample size of this study is not enough, it is difficult to make further empirical research on its causes.

Third, market economy status has always been the biggest problem in China's anti-dumping response, which should have a great impact on the results of the model. However, it is not well reflected in this study. The main reason is that all countries did not recognize the market economy status of Chinese companies when they brought anti-dumping lawsuits in the sample of this study. Peru and South Africa, for example, did not recognize China's market economy status until June 2004, so the warning indicators were all 0. In other words, the indicators had lost statistical significance when they returned because they were identical. If we want to investigate whether the recognition of market economy status or not is helpful for companies to respond to anti-dumping lawsuits, we need a longer period of observation and statistical analysis.

8. Conclusion

Based on the antidumping cases against Chinese textile companies, the current study constructs an early warning model for Chinese exporters. Although the model proposed in this research shows higher accuracy rate comparing to previous ones, future studies should improve the following areas.

The regression model of textile export companies suffering from anti-dumping against China by various countries lacks the analysis of time series. The model can only reflect the situation of anti-dumping ruling through the change of index value, which may contain certain errors. The quantitative evaluation of some qualitative indicators lacks stricter criteria. There is certain subjectivity in filling out the questionnaire of company's anti-dumping situation. In the future research, we should standardize the micro-data of companies to avoid the problem of too much subjectivity.

In this research, dummy variable index is introduced to conduct empirical analysis through logistic regression of binary nominal variable. Due to the small sample size, it is difficult to use logistic regression with multi-valued nominal variables. With the increase of samples and the comprehensiveness of data collection, however, multi-value nominal logistic regression or even neural network model can be used to analyze to improve the accuracy of anti-dumping warning model.

The study introduces the theory of relationship marketing to design the early warning index system of anti-dumping rulings. There is no relevant literature to refer to, so the application is not yet mature and needs further development. Anti-dumping early warning theory can be applied to a wider range of fields. Overall, the research on early warning of anti-dumping rulings based on relationship marketing is still in immature stage. There is not yet any perfect system in the exploratory stage. Future research can shed light on this line of study.

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