



Research on early warning system for foreign capital utilization risk

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Abstract

Purpose – The purpose of this paper is to research the impact of foreign direct investment (FDI) on China's economic growth, so as to measure reasonable scales of FDI and the safe coefficient of China's FDI utilization, make timely predictions, and suggest specific foreign capital management and controlling strategies for the policy makers to adopt under various conditions.

Design/methodology/approach – This paper builds early warning systems (EWSs) for China's FDI utilization, applies grey correlation model GM (1,1) to predict early warning indexes, and uses both of the grey correlation and analytic hierarchy process (AHP) to evaluate the weights of the indexes.

Findings – The paper finds that FDI can promote China's economic growth, make great contribution to the technology spillover and improve China's employment environment as well as the quality of employment. But its contribution is less than the domestic capital in the aspects of China's industrial structure, area structure and trade structure adjustment, and more seriously, FDI exacerbates the imbalance of the area distribution in China. Moreover, foreign capital focuses on the occupation and monopoly of the domestic market, which will reduce import and export trade and harm the development of China's economy.

Research limitations/implications – Owing to data constraints, this paper is not detailed and comprehensive enough, and needs further exploration in the empirical work.

Practical implications – Given the strong evidence of the EWS for FDI utilization, this paper finds a precise way to evaluate the influence of FDI on China's economic growth, by which the government can implement different capital management and controlling strategies to smooth the openness process of FDI in China.

Originality/value – This paper applies EWS into the FDI utilization to evaluate the safe coefficient and achieve the warning indexes, which are evaluated by the combination of the grey correlation and AHP.

Keywords China, National economy, Economic development, International investments, Forecasting, Modelling

Paper type Research paper

1. Introduction

Foreign direct investment (FDI) utilization has always been one of the most important strategies for China's economic development since the beginning of the country's reform and opening up. By implementing this strategy, China's government solved the problems of shortage of funds in economic construction, lag in technology and management and so on. The ever-growing import and export scale and the economic growth speed have attracted worldwide attention. However, foreign capital utilization is also a two-edged sword. The improper use of FDI has caused many problems and influenced the smooth development of the economy. Hence, it should be studied by a new method from a fundamental perspective, by which we could determine the comprehensive effects of FDI utilization, and point out clearly different strategies for FDI utilization under various circumstances.

The study of the economic early warning system (EWS) can be traced back to the end of the nineteenth century. The first influential index system was the "Harvard



Index” built up by Professor Persoons (1915) from Harvard University. After that, the index system was renewed by an American statistician Professor Moor (1950), and named the diffusion index and composed of antecedence indicators, coincident indicators and delayed indicators. Many experts have contributed to this field, and advanced numerous academic theories. Among all the theories relating to the EWS, the most influential is put forward by Professors Kaminsky, Lizoondo and Rein (1997); the basic idea of which is to select a series of indexes to determine their critical values according to the historical data. If the critical value is broken through at one period, it gives off a dangerous signal. The greater the number of dangerous signals, the more dangerous the economy will be. This is the theory mostly applied by subsequent researchers in the study of forecasting and EWSs.

The domestic study starts from the 1980s. The experts at home mainly focus on macroeconomic early warning, agricultural early warning and enterprise finance early warning and so on. Based on the early warning mechanism, the early warning methods can be divided into: black warning, red warning, white warning, green warning and yellow warning. The green warning method currently recurs to remote sensing technology mostly; white warning is still in the exploratory stage; and black warning is to find cycle fluctuations of warning sign indexes in time sequence, so as to evaluate the future trend; but the economic development of China’s foreign capital is not showing obvious signs of cycle fluctuation, so the black warning is not suitable for FDI early warning requirements. Red warning means a kind of environment society analysis, attaching importance to qualitative research, not suitable for the early warning requirements of FDI. The yellow warning method is divided into index early warning method, statistic early warning method and model early warning method. Index early warning uses mathematical methods to compound a group of boom indicator (antecedence, accord, lag), and then uses them as the comprehensive rules to measure and analyze the economic fluctuations; then uses antecedence index to forecast the turning points of economic cycle fluctuations, so as to achieve the purpose of early warning. Statistic early warning processes statistically show the relationship between warning signs and warning factors, and then predict the warning degree of warning factors based on the warning grade of warning signs. Model early warning is a kind of further analysis of early warning on the basis of the index early warning or statistical method. Commonly used models are regression (single/multiple linear) prediction model using warning signs such as independent variable, multiple logic model, multiple probability ratio model, artificial neural net model and combining prediction model and so on.

On the whole, the study abroad on the EWS and early warning method is mature enough to be applied in many fields. While the research at home, which began in the 1980s, has also made great progress in the application of EWS into a specific field, it has still been in a state of exploration. Meanwhile, most of the researches at present concentrate on the positive or negative influence of FDI on China’s economy or on the empirical study of the influence of FDI on a specific field of the economy. This is not adequate, especially in the study of the scale of FDI. This paper points out that an early warning method should be introduced into the study of the comprehensive effect of FDI on China’s economic safety, which is the fundamental perspective in the research of FDI’s effect.

Therefore, after the above review of foreign and domestic studies, this paper attempts to introduce a theoretically significant and practically effective EWS to the existing research relating to the impact of FDI on China’s economic security.

2. EWS Theoretical analysis of FDI EWS

2.1 FDI early warning's elements

The extensive literature on EWS at home or abroad shows from theoretical or empirical perspectives that FDI EWS's elements include warning condition, warning affair, warning omen, warning limit and warning degree.

Warning condition is what can be detected and predicted when early warning happens. As China's economic security involves many aspects, an FDI EWS can only be predicted with a comprehensive numerical index instead of a single index.

Warning affair refers to one or more factors that affect the change of warning condition.

Warning omen is the refined result of warning affair.

Warning limit refers to the fluctuation range of a warning omen, which is also called warning grade of warning omen. The FDI EWS includes dependent dangerous warning limit, favorable no warning limit and crowding-out dangerous warning limit, all of which are also known as warning grade.

Warning degree is the degree of warning conditions. Warning degree forecasting is the early warning indexes and warning grade standards calculated synthetically by a number of warning omens, and it is the estimation of warning conditions. In order to predict directly the warning degree, China's FDI utilization EWS is divided into five early warning intervals, which is similar to traffic lights: red light (serious warning); yellow light (light warning); green light (good); shallow blue light (light warning); and blue light (serious warning) to express different levels of warning degree. Figure 1 gives the warning degree partition diagram.

2.2 Risk early warning methods

Based on the early warning mechanism, the early warning methods can be divided into black, red, white, green and yellow warnings. Yellow warning includes statistic early warning, which processes statistically the correlativity between warning omen and warning affair; and then predicts warning degree of warning affair based on the warning grade of warning omen. The other four early warning methods are not suitable for this paper.

As explained above, considering the characteristics of FDI economic impact, this paper chooses the statistic method in the yellow warning system as FDI EWS's design foundation, which can show the rise and fall of economy, reflect the consolidated results of the indexes, monitor the fluctuations of overall economic activities of each index and in the end clearly point out the goals and directions of regulation.

3. Establishment of the EWS of China's FDI utilization

3.1 Choice of warning omen index

The most important task in the establishment of China's FDI utilization EWS is to establish an early warning omen index system, which can reflect the impact of FDI on

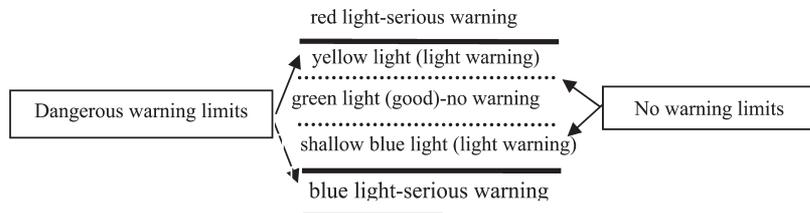


Figure 1.
Warning degree partition diagram

China's economy from different aspects. In this paper, the selected indexes are mostly derived from the previous research and stand to the principles of comprehensiveness, typicality and acquirability, as well as the principles of rapidity and accuracy. The index system is shown in Figure 2.

3.2 Confirmation of the index weight

The processes of the confirmation of FDI warning omen's indexes with grey correlation and analytic hierarchy process (AHP) are shown as follows.

First, calculate the correlation degree between indexes and FDI. The impact of FDI on the economy shows in the aspect of economic aggregate.

Therefore, the correlation coefficients used in the analysis of the correlation degree are selected as follows: the reference sequence is represented by the total amount of actually utilized foreign capital, and the comparison sequences are described by the listing indexes in the index system. Correlation degree calculation formulae are:

- Determine parameter series X_0 and comparative series X_i .
- Preprocess the raw data and eliminate dimension. The raw data should be preprocessed into the dimensionless ones by the methods of initial value process, equalization and interval relative value process before the correlation coefficients are calculated. This paper adopts initial value process to make the series dimensionless in order to meet the demand of sharing a public intersection point for all the data series. Thus,

$$X'_{ik} = X_{ik}/X_{i1} \tag{1}$$

- The calculating formula of grey correlation index is:

$$L_{0i}(t) = \frac{\Delta_{\min} + \Delta_{\max} / (h - 1)}{\Delta_{0i}(t) / (t - 1) + \Delta_{\max} / (h - 1)} \tag{2}$$

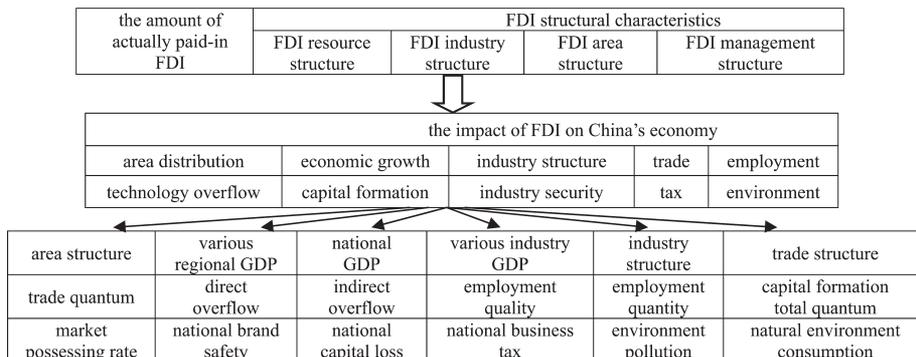


Figure 2.
Index system of the
impact of FDI on China's
economy

- The correlation coefficient calculating formula is:

$$R_{0i} = \sum_{t=2}^m \frac{L_{0i}(t)}{(m-1)} \quad (3)$$

where m is the length of time sequence, h is the time when the maximum D -value appears.

$$\Delta_{\min} = \min_i \min_k |X_{0k} - X_{ik}| \quad (4)$$

$$\Delta_{\max} = \max_i \max_k |X_{0k} - X_{ik}| \quad (i = 1, 2, \dots, n, \quad k = 1, 2, \dots, n) \quad (5)$$

Second, calculate the weights by analytic hierarchy process.

- Name different levels of index system as A, B and C-level, three hierarchical levels in total.
- Construct a judgment matrix. According to correlation degree among indexes, all the indexes in each level of the hierarchy can be determined and assigned to form a judgment matrix based on the importance degrees.
- Carry out a consistency test. The verification shows the results of AHP and the grey correlation analysis can all pass the consistency test.

3.3 Definition of warning limits indexes

The definition of warning limits indexes is needed after selecting indexes of warning omen. By partitioning the early warning interval, this paper cannot only evaluate whether FDI can affect the economy, but also judge whether the FDI scale is appropriate based on warning limits. The so-called appropriate use scale of FDI refers to the period when the foreign capital scale can promote economic development without causing economic overheating or inflation pressure in a certain period under the control of the state.

As discussed above, this paper attempts to figure out whether the economic impact of FDI is effective and in the end determine the scale of FDI and the range of each economic eigenvalue. The abundant previous studies point out that FDI utilization in China at present has a crowding-out effect on the domestic capital. Therefore, this paper assumes that the FDI's crowding-out effect on China's domestic capital could be made up if FDI has more effective influence on economy than the domestic funds.

Hence, in this paper, the dangerous warning limit of the quantifiable indexes, such as gross domestic product (GDP), industrial distribution, area distribution, trade distribution, technology overflow, employment, capital formation, the state's tax and international payments, can be indentified through comparison of the correlation degree of domestic and foreign capital. Meanwhile, the dangerous warning limits of the qualitative indexes, such as industrial security and resource environment, have to be defined by experts.

3.4 Warning degree confirmation and warning condition analysis

3.4.1 *Warning degree confirmation.* Warning degree confirmation represents the overall consideration of every warning index's grade, fully considering various

economic index weights. That is, the indexes' contribution to the overall economy, processing the raw data to reflect the impact level synthetically and giving different scores to each index in accordance with their present warning grades, and in the end summing up the grades of various weighted indexes based on warning grade scores and index weights worked out before. The final scores are used to determine the lights of the warning degrees as well as the warning conditions. The results are shown in Table I.

3.4.2 Warning condition analysis. Warning condition analysis is used to analyze an economic situation on the basis of economic indexes and integrated warning degree. The procedure of warning condition analysis is first, check the comprehensive warning condition. If it is not safe, take action to manage foreign capital. If it is safe, further examine whether the impact of foreign capital is safe or not, and then make a fine-tuning on the FDI utilization.

3.5 Operational process design of FDI EWS

Input stage includes the selection of initial indexes, the index data collection, and the raw data preprocess. Process stage is the core of EWS, in which we need to finalize index option, index forecasting, index weights, index evaluation and comprehensive judgment. Output stage is the feedback of the above analysis (Figure 3). The risk EWS is designed to warn of potential problems when foreign trade is running by using comprehensive evaluation, to confirm the sort of warning condition lights and in the end to obtain a diagram of the FDI early warning index signal, so as to put forward policy recommendations according to the warning conditions.

4. Empirical research on China's FDI utilization EWS

4.1 Input stage of China's FDI utilization EWS

- According to foreign policy evolution stage, this paper selects FDI data from 2002 to 2006 because of their similar macroeconomic background.
- According to the analysis of foreign capital's impact on China's economy, confirm warning affairs and warning omens.

4.2 Processing stage of China's FDI utilization EWS

The impact of FDI on the economy shows in the aspect of economic aggregate. Therefore, the reference series is represented by the total amount of actually paid-in FDI; the comparison series is represented by roughly selected warning omen indexes. Thus, the economic growth and structural change correlation degrees are calculated in Table II.

The inflation rate X_{10} and the FDI industrial structure impact on the trade structure $X_{1,2}$ and need to be eliminated because of the lower correlation degree. Then, classify

Warning grade	Scores	Light
Serious warning	2 to 3	Red light
Light warning	1 to 2	Yellow light
No warning	0 to 1	Green light
Light warning	-1 to 0	Shallow blue light
Serious warning	-2 to -1	Blue light

Table I.
The specific warning
grades' scores and lights

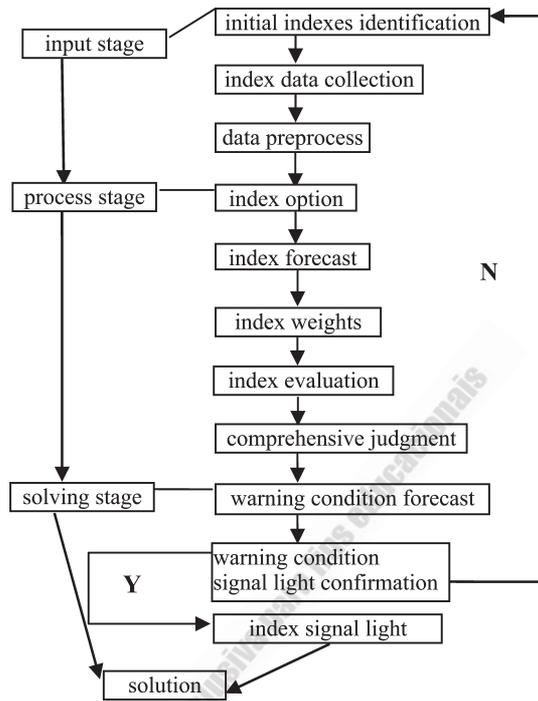


Figure 3.
Operational process
design of FDI EWS

Table II.
Economic growth and
structural change
correlation degree

Comparison series	X_1	$X_{1,2}$	$X_{2,2}$	$X_{2,3}$	$X_{3,1}$	$X_{3,2}$	$X_{4,1}$	$X_{4,2}$	$X_{4,3}$	$X_{5,1}$	$X_{5,2}$	$X_{5,22}$
Y1 correlation	0.984	0.966	0.979	0.988	0.976	0.980	0.980	0.933	0.941	0.962	0.964	0.931
Comparison series	$X_{1,2}$											
Y1 correlation	0.937	0.933	0.930	0.949	0.980	0.964	0.984	0.965	0.826	0.957	0.828	0.547

the rest of the related indexes, remove improper ones, and finally form a four-level index system, as shown in Figure 4.

- (1) *Warning omen indexes forecast.* Predict the value of the indexes with initialized data in index system using GM (1,1) model, and make forecast test.
- (2) *Weights of warning omen indexes.* This paper combines the grey correlation and hierarchy analysis method to confirm weights. Weights are determined by both of the methods. Therefore, D-level's weight is calculated first, and combined with C-level, and then with B-level. The results are presented in Table III.

Then, increasingly rank the correlation degree from B1 to B11 in C-level (as shown in Table IV), analyze synthetically the influence of industrial security, resource and environment on the economy, and add them to the rankings, as shown in Table IV.

impact of FDI on economy (A)	national GDP(B ₁)			
	impact on various industries' GDP(B ₂)	the 1 st industry GDP(C ₁)		
		the 2 nd industry GDP(C ₂)		
		the 3 rd industry GDP(C ₃)		
	impact on various regional GDP (B ₃)	eastern regional GDP(C ₄)		
		middle regional GDP(C ₅)		
		western regional GDP(C ₆)		
	trade (B ₄)	import quantum (C ₇)		
		export quantum (C ₈)		
	employment(B ₅)	employment quantity(C ₉)	number of the 1 st industry practitioners (D ₁)	
			number of the 2 nd industry practitioners (D ₂)	
	number of the 3 rd industry practitioners (D ₃)			
		employment quantity(C ₁₀)	the 1 st industry average value (D ₄)	
			the2nd industry average value(D ₅)	
	the3rd industry average value(D ₆)			
technology overflow(B ₆)	technology and complete sets of equipment import contract amount(C ₁₁)			
		industrial added value rate(C ₁₂)		
total amount of capital formation(B ₇)				
the total foreign exchange reserves (B ₈)				
the total national business tax (B ₉)				
industry security (B ₁₀)				
resource and environment(B ₁₁)				

Figure 4.
Four-level index system

Comparison series	B ₁	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	C ₇	C ₈	B ₁₀	B ₁₁
Correlation degree	0.973	0.961	0.974	0.978	0.977	0.970	0.976	0.901	0.906		
Comparison series	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	C ₁₁	C ₁₂	B ₇	B ₈	B ₉
Correlation degree	0.928	0.924	0.950	0.956	0.985	0.953	0.928	0.964	0.804	0.839	0.966

Table III.
Weights of warning
omen indexes

Index	Correlation degree	Rating
National GDP B ₁	0.973	9
Impact on various industrial GDP B ₂	0.974	10
Impact on various regional GDP B ₃	0.976	11
Trade b ₄	0.904	4
Employment b ₅	0.960	6
Technology overflow B ₆	0.952	5
Total amount of capital formationB ₇	0.804	2
Total foreign exchange reserves B ₈	0.839	3
Total national business tax B ₉	0.966	7
Industry security B ₁₀		8
Resource and environment B ₁₁		1

Table IV.
Ranking of the
correlation degree from
B1 to B2 in C-level

Then, according to the rankings, a judgment matrix can be determined, the result of which is shown in Table V.

Then, calculate the weights of indexes:
 $w = \{0.149, 0.202, 0.275, 0.031, 0.059, 0.043, 0.016, 0.022, 0.080, 0.109, 0.012\}$

Finally, confirm the weights of FDI EWS, as shown in Figure 5.

- (3) *Evaluation of warning omen indexes.* The warning grade of indexes can be calculated by warning limit confirmation method, corresponding with scores and lights, forming the diagram of security situation indexes shown in Table VI.
- (4) *Comprehensive judgment.* According to the analysis above, the authors figure out that the integrated security score is about 0.751, implying no warning green light. It is proved that foreign capital is generally well-functioning in China, and plays an active role in the economic growth.

4.3 Output stage of China’s FDI utilization EWS

- (1) Diagram of warning signals is shown in Table VII.
- (2) Warning condition analysis.

	B ₁	B ₂	B ₃	B ₄	B ₅	B ₆	B ₇	B ₈	B ₉	B ₁₀	B ₁₁
B ₁	1	1/2	1/3	6	4	5	8	7	3	2	9
B ₂	2	1	1/2	7	5	6	9	8	4	3	10
B ₃	3	2	1	8	6	7	10	9	5	4	11
B ₄	1/6	1/7	1/8	1	1/3	1/2	3	2	1/4	1/5	4
B ₅	1/4	1/5	1/6	3	1	2	5	4	1/2	1/3	6
B ₆	1/5	1/6	1/7	2	1/2	1	4	3	1/3	1/4	5
B ₇	1/8	1/9	1/10	1/3	1/5	1/4	1	1/2	1/6	1/7	2
B ₈	1/7	1/8	1/9	1/2	1/4	1/3	2	1	1/5	1/6	3
B ₉	1/3	1/4	1/5	4	2	3	6	5	1	1/2	7
B ₁₀	1/2	1/3	1/4	5	3	4	7	6	2	1	8
B ₁₁	1/9	1/10	1/11	1/4	1/6	1/5	1/2	1/3	7	1/8	1

Table V.
Judgment matrix

impact of FDI on economy (A)	B ₁ =0.149	
	B ₂ =0.202 (0.974)	C ₁ =0.164 C ₂ =0.297 C ₃ =0.539
	B ₃ =0.275 (0.976)	C ₄ =0.539 C ₅ =0.164 C ₆ =0.297
	B ₄ =0.031 (0.904)	C ₇ =0.333 C ₈ =0.667
	B ₅ =0.059 (0.960)	C ₉ =0.333 (0.939) D ₁ =0.297 D ₂ =0.164 D ₃ =0.539 C ₁₀ =0.667 (0.9712) D ₄ =0.297 D ₅ =0.539 D ₆ =0.164
	B ₆ =0.043 (0.952)	C ₁₁ =0.333 C ₁₂ =0.667
	B ₇ =0.016	
	B ₈ =0.022	
	B ₉ =0.080	
	B ₁₀ =0.109	
	B ₁₁ =0.012	

Figure 5.
Weights of FDI EWS

B-level elements	C-level indexes	Warning grade	Scores	Light
National GDP $B_1 = 0.149$	–	No warning	1.5	Yellow
Impact on various industrial GDP $B_2 = 0.202$	First industry GDP $C_1 = 0.164$	Light warning	1.5	Yellow
	Second industry GDP $C_2 = 0.297$	Light warning	1.5	Yellow
	Third industry GDP $C_3 = 0.539$	Light warning	1.5	Yellow
Impact on various industrial GDP $B_2 = 0.202$	industry structure	No effect	0	–
	Eastern regional GDP $C_4 = 0.539$	No warning	1	Green
	Middle regional GDP $C_5 = 0.164$	Light warning	–1	Shallow blue
	Western regional GDP $C_6 = 0.297$	No warning	0.5	Blue
Trade $B_4 = 0.031$	Area structure	No effect	0	–
	Import quantum $C_7 = 0.333$	Light warning	–1	Shallow blue
	Export quantum $C_8 = 0.667$	Light warning	–1	Shallow blue
Employment $B_5 = 0.059$ $C_9 = 0.333$ $C_{10} = 0.667$	Trade structure	No effect	0	–
	Number of first industry practitioners D_1	No warning	1	Green
	Number of second industry practitioners D_2	No warning	1	Green
	Number of third industry practitioners D_3	No warning	1	Green
	first industry average value D_4	Light warning	1.5	Yellow
	second industry average value D_5	Light warning	1.5	Yellow
	third industry average value D_6	Light warning	1.5	Yellow
Technology overflow $B_6 = 0.043$	Number of technology and complete equipment import contract $C_{11} = 0.333$	No warning	1	Green
	industrial added value rate $D_{12} = 0.667$	No warning	1	Green
	–	Light warning	–1	Shallow blue
	–	No warning	1	Green
Total amount of capital formation $B_7 = 0.016$	–	No warning	1	Green
Total foreign exchange reserves $B_8 = 0.022$	–	No warning	1	Green
Total national business tax $B_9 = 0.080$	–	No warning	1	Green
Industry security $B_{10} = 0.109$	–	Light warning	–1	Shallow blue
Resource and environment $B_{11} = 0.012$	–	No warning	1	Green

Table VI.
Warning degree
partition diagram

It can be seen from the diagram that the light showing the impact of FDI on China's economy is green, meaning that the safe and robust foreign capital economy's development on the whole is positive, and is promoting China's economic development. However, the evaluation of FDI cannot simply be done with indexes. Further analysis of warning omens is also needed. If the impact of FDI on China's economy is not safe, it probably means that some areas of China's economy are overfunded, thus causing the problem of overdependence on FDI, or that the capital invested in some areas are extruded too seriously to keep a balanced economy. Under these circumstances, it is necessary to control and manage the scales and structure of FDI.

The light of GDP gross reflects the impact of FDI on economic growth. If it is within the secure line, it means that FDI can promote economic growth, and not cause the pressure of inflation. If it exceeds the floor level, it means that the cost of the

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Comprehensive effect on China's economy	G
National GDP	Y
Industrial GDP	Y
<i>Regional GDP</i>	
Eastern and western areas	G
Middle areas	SB
Trade	SB
<i>Employment</i>	
employment quantity	Y
employment quantity	G
Technology overflow	G
Capital formation	G
Total foreign exchange reserves	SB
Total national business tax	G
Industry security	SB
Resource and environment	G

Table VII.

Output of early-warning signals

Note: G-green light, Y-yellow light, SB- shallow blue light

introduction of FDI into China is larger than the income, so, it is not efficient to introduce FDI. If it exceeds the upper limit, it means that the introduction of FDI causes an even higher inflation rate and overdependence of economic growth, the result of which is probably the unreasonable scales of FDI. After the analysis, it is found that the light of GDP gross shows as yellow, implying a safe and great promotion of foreign capital on economy.

The light of trade warning condition is blue, implying a serious warning. The possible reasons could be that: the domestic trade is gradually being substituted by foreign companies' trade; the processing trade takes up a larger proportion in the import and export trade, which puts China at a disadvantage; the trade deficit is growing cripplingly and makes China suffer; the decreasing market-oriented companies and export-oriented industries and the increasing service-domain portion are also leading to lower trade quantum. As a result, the Chinese government should implement strategies to eliminate the adverse effects caused by the improper use of FDI, such as:

- cancel all the preferential treatments to labor intensive companies, in order to decrease their operational costs and weaken their ability to absorb foreign capital;
- increase the importation of advanced technology and optimize the industrial structure in China, so as to optimize the trade structure; and
- encourage the foreign capital enterprises to build export-oriented R&D institutions.

The light of technology overflow is green, which means foreign technology overflow is prominent. But, from the analysis of FDI source structure and operating structure, we can find out that direct overflowing effect of the investment from Hong Kong, Macao and Taiwan is smaller than other foreign investments, which implies that the introduction of investment from Hong Kong, Macao and Taiwan does not play much of a part in the technological upgrading in China; and correspondingly in other foreign-funded enterprises, the direct overflowing is obvious, whereas the indirect is unobvious, which

means that foreign-funded enterprises' high technology helps a lot and its advanced management methods reduce the indirect overflowing. Therefore, the domestic enterprises should increase their ability to learn from doing, trying their best to translate the introduced high technology into independent innovation products. At the same time, more competitors should be introduced to eliminate the monopolization in the market, so as to accelerate the technology overflow from foreign capital companies.

The effect of employment, balance of payments and resources and the environment is normal and safe. The influence of FDI on employment is a two-edged sword. On the one hand, more introduction of FDI can improve the chance of employment after the foundation of the companies. On the other hand, the domestic enterprises will be defeated by the strong foreign capital companies, thus causing a large proportion of unemployment. The results show that the effect of employment of FDI in China is safe, which is good for the Chinese government. And the foreign exchange reserve and the balance of payment are also important to a country's economic safety. The flow of foreign capital will bring potential pressure on the international balance of payments. The government should keep the currency reserve balanced. The light of resources and environment implies that the foreign investors build high-polluting factories in China, and cause an increase in pollution. If this index is warned, then it is the most serious warning, for the economic growth should be sustainable and less polluted.

The light of industrial safety shows as shallow blue light, light warning, meaning that foreign capital is capturing the domestic market, which is harmful to China's economy. The FDI's attack on industrial safety is mainly manifested in two aspects. First, from the macroeconomic view, FDI will attack all industries in a developing country, including industrial structure and regional structure. Second, from the microeconomic view, FDI will strike the pillar enterprise in one country. Since the light shows that industrial safety in China is light warned, the government should pay attention to the legal interest of domestic companies, and make reasonable evaluations of introduced technology, to ensure domestic enterprises compete fairly with the foreign companies.

5. Conclusions

In this paper, the authors present an EWS for China's FDI utilization. Based on the analysis above, this paper puts forward the following conclusions:

- (1) According to characteristics of FDI, this paper establishes an early warning index system using statistic early warning method in yellow EWS, and predicts early warning indexes through the grey correlation model GM(1,1) after comparing various forecasting methods.
- (2) Combining the use of grey correlation and AHP is needed when the weights of the indexes have to be evaluated quantitatively because of the lack of sample data.
- (3) The FDI early warning system is designed into three stages: input stage includes the selection of initial indexes, the index data collection and the raw data preprocess. The process stage is the core of the EWS, in which we need to finalize index options, index forecasting, index weights, index evaluation and comprehensive judgment. Output stage is the feedback of the analysis above, in which we confirm signal light of warning circumstance, and output diagram of foreign capital risk early warning index signal.

- (4) As analyzed and discussed above, the authors find that FDI can promote China's economic growth, make great contribution to the technology spillover and improve China's employment environment as well as the quality of employment. But, its contribution is less than the domestic capital in the aspect of China's industrial structure, area structure and trade structure adjustment, and it is more serious that FDI exacerbates the imbalance of the area distribution in China. Moreover, foreign capital focuses on the occupation and monopoly of the domestic market, which will reduce import and export trade and do harm to the development of China's economy.

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