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Research on systemic financial risk early warning index system in China

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ABSTRACT

The main idea of this paper is to deal with the subjective randomness of index selection in the construction of financial risk early warning index system, which can improve the scientific nature and rationality of the indexes' constructs. Therefore, the author analyzes the influencing factors of the Chinese financial risk and then preliminarily selects systemic financial risk early warning indexes from four aspects, which are macroeconomic operation, medium financial markets, micro banks and external shocks factors. After that, on the basis of the comprehensive and representative principles, this paper further screens the primary indexes by using the methods of identification analysis and correlation analysis and constructs the Chinese systemic financial risk early warning index system with 18 indexes, which is different to the previous work. At last, the paper verifying this index system is the most appropriate one that can reflect Chinese economic and financial practice better by testing the robustness of the index with the data from January in 2000 to December in 2013.

KEYWORDS

Systemic financial risk; Early warning; Index system.

INTRODUCTION AND LITERATURE REVIEW

Increasing economic globalization and financial liberalization not only promote the development of the world economy but also reveal more clearly the liability, linkage and destructiveness features of the systemic financial risk. With the transition period of China's accession to the WTO coming to an end and the further opening to the outside world of domestic financial industry, the possibility of the systemic financial risk increased significantly. An early-warning index system guarantees the effective operation of a systemic financial risk early warning system; therefore, building a scientific systemic financial risk early warning index system of China bears great practical significance.

Foreign academic research on financial risk early warning system dated back to the mid and late 1970s, when the outbreak of the financial crisis caused widespread attention in the finance field. As early as in 1979, John f. Bilson released the leading idexes of devaluation in Columbia Journal of World Business, innovating the financial risk early warning research. After the American subprime crisis, systemic financial risk early warning gets more and more attention of relevant institutions and scholars. The following are the most representative. The world bank (1999) put forward the financial sector assessment (FSAs) and the risk rating model by the national department of credit to measure the systemic financial risk[1]; Goldstein, Kaminsky and Reinhart (2000) presented an early warning index system including 24 indexes specifically for emerging market countries, with the synthetic financial risk measure index can describe the general picture of the overall financial risk[2]; The IMF (2002) built two representative index systems, i.e. the financial macro-prudential indexes (MPIs) and financial soundness indicators (FSIs), which provided reference for later study[3]; Borio & Lowe (2002) constructed the index system of financial imbalance from the perspective of credit gap, asset price gap and investment gap[4]; Illing & Liu (2006), basing on the possible loss, risk and uncertainty variables, prepared a financial pressure index to measure the systemic financial risk according to the data of Canadian Banks, foreign exchange, bond and stock markets[5]; Borio and Drehmann (2009) included the indexes of the private credit and GDP ratio, the actual asset prices, exchange rate and investment, commercial and residential real estate price into the systemic financial risk index system[6]; Duca and Peltonen (2011) built a financial distress index to make an early warning for the systemic financial risk[7].

There are many studies in China involve the construction of financial risk early warning index system, but most of them mainly focus on currency risk, bank risk, and the research of systemic financial risk index system is scarce. The existing research can be summarized from the following three aspects: (1) According to the perspective of dimensions, the financial risk index can be divided into three levels: the macroscopic financial risk index, medium financial risk index, and the micro financial risk indexes. Representative studies in this aspect are He jianxiong (2001), Dong Xiaojun (2004), Gao Hongzhen (2005), Sun Lihang (2012), etc[8-11]. (2) According to the domain and the scope of management, studies of systemic financial risks generally fall into five aspects: the macroeconomic environment, the banking system, the bubble risk, the risk of foreign capital impact, and the debt risk. The representative include the index systems built by shou-dong Chen, f. o. &boli-bennett, etc. (2006), Wu Chengsong (2010), and liu xia, Siu Gwan Chan etc. (2013)[12-14]. Their indexes are approximately the same in structure, but choices of indexes are slightly different. In addition, there are also some scholars made slight change basing on this framework, for example: Liu Chuanzhe, Zhang Lizhe (2000) constructed a financial crisis early warning index system from six aspects i.e. the national economy, fiscal finance, international payments, investment, currency and living[15]. Chen song-lim. (2001) added into the early warning index system some indexes choosing from the aspects of information security of network and technology, as well as policy system, public confidence and credit environment[16]. (3) Other relative representatives are: Gu Haibing (1999) measured the state of China's financial risk from 5 aspects: the degree of the currency value stability, the exchange rate stability, the stock index stability, the severity degree of external debt and the degree of non-performing assets[17]; Xu Di-long and Li Zhenghui (2001) built index systems from the cause types of financial risks, which include the induced type, the choosing type, and the spontaneous type[18]; Wu Mingfeng (2005) divided early-warning indexes into the leading index, the synchronous index and the lagging index and established a financial

risk early warning index system with the clustering analysis method[19]; Xu Chuan-hua (2013) selected financial risk early warning indexes from the external and the internal according to the selection principle of context and determined an early-warning index system containing 26 indicators through correlation analysis[20].

Existing research on the early warning index system of systemic financial risks has some shortcomings:

(1) most scholars try to find common factors from financial risk events and build early warning index system on this basis. However, there is little or no risk in China's finance, so it is undesirable to look for early warning indexes simply from key economic variable characteristics under the risk state; (2) the establishment of the existing financial risk early warning index system is commonly based on the qualitative judgment with no quantitative indexes selection, and even if there is a simple screening process, it also has some disadvantages, because of the lack of unified and objective selection criteria. To solve above problems, this paper, on the basis of the analysis of China's financial risk influencing factors, screens indexes with the method of identification analysis and correlation analysis and builds a systemic financial risk early warning index system.

THE CHOICE OF INDEX SCREENING METHOD

In the process of building a financial risk early warning index, in order to avoid problems such as multicollinearity and excessive recognition induced by excessive indexes, it is highly recommended to use scientific methods to select comprehensive and effective indicators. At present, the methods of choosing financial risk early warning indicators mainly include: the noise signal ratio method, the Granger causality test, and the single variable regression method, etc, but all of these methods have some defects.

Based on the above problems, this paper combines the methods of identification analysis and correlation analysis in selecting indexes because of more rationality and superiority; it can effectively balance the contradiction of comprehensiveness and representativeness in an index system. In the process of concrete analysis, the paper uses the standard deviation coefficient to measure indexes' identification and measures the correlation applying the methods of cluster analysis, the nonparametric test, the average correlation coefficient, and multiple correlation coefficients. Specific screening method and process are as follows:

Step one: to classify the primary indexes into four categories according to their connotation.

Step two: the data pretreatment, such as dimensionless processing of indexes, positive treatment of inverse and moderate indexes.

Step three: the discrimination analysis of indexes. Assume that the evaluation index system contains n indexes, $X_1, X_2, \cdots, X_n$, and m evaluation objects. Calculate the standard deviation, coefficient C_i, of every index with formula (1) to. The greater the standard deviation coefficient, the stronger of its identification ability; conversely, the identification ability is bad.

$$C_i = S_i / \overline{X_i}, (i=1,2,\ldots, n) \quad \textbf{(1)}$$

In the formula (1), $\overline{X}$ is the mean, S_i is the standard deviation.

Step four: the correlation analysis of indexes. Make R type cluster analysis to indexes of four categories. Each category has several subclasses, Identify the number of the index, n, contained in each subclass.

If n=1, it means that the index alone in the clustering results belongs in one class, which can be elected directly into the index system.

If n=2, Wald -Wolfowitz runs test is used to determine whether the two indexes have significant differences.

The principle of Wald – Wolfowitz runs test is to arrange the order of two samples according to their size after mixing them; a set of sample observations is a run, and to judge whether two samples are

the same by the number R of runs. In this paper, the data is large, so to judge by means of normal distribution statistics Z then get P values and test results.

$$Z = \frac{R - u_R}{\sigma_R} = \frac{R - \left(\frac{2m_1 m_2}{m_1 + m_2} + 1 \right)}{\sqrt{\frac{2m_1 m_2 (2m_1 m_2 - m_1 - m_2)}{(m_1 + m_2)^2 (m_1 + m_2 - 1)}}} \quad \textbf{(2)}$$

In the formula (2), m_1, m_2 are respectively the number of two samples.

If P<0.05, it shows that there are significant differences among indexes, and both indexes are incorporated into the early warning index system. if P>0.05, it shows that no significant difference is detected, so formula (3) and (4) are used to calculate the average correlation coefficient of each index with other indexes in the subsystem; The larger the index's average correlation coefficient, the greater information redundancy in this index, which can be replaced by others. So, indexes with less average correlation coefficients are chosen into the index system.

$$R_{ij} = \frac{\sum_{k=1}^{m} (Z_{ki} - Z_i)(Z_{kj} - Z_j)}{\sqrt{\sum_{k=1}^{m} (Z_{ki} - Z_i)^2 (Z_{kj} - Z_j)^2}} \quad \textbf{(3)}$$

$$\overline{R} = \frac{1}{m \times n} \sum_{i=1}^{m} \sum_{j=1}^{n} R_{ij} \quad \textbf{(4)}$$

In the formula (4), m is the number of samples, n is the number of indexes.

If n>3, Kruskal-Wallis test is used to judge whether there is a significant difference among indexes.

Kruskal Wallis rank-sum test treats all mixed samples as a single sample, ordering from the largest to the smallest, then to replace sequence value with rank values and make variance analysis to this rank sample. To identify by constructing a statistic KW:

$$KW = \frac{12}{m(m+1)} \sum_{i=1}^{k} \frac{R_{i.}^{\ 2}}{m_i} - 3(m+1) \quad \textbf{(5)}$$

In formula (5), k is the sample number; m_i is the number of observation in sample set *i*; m is the total number of observation of all samples; $R_{i.}$ is the rank sum in sample set *i*; R_{ij} is the rank value of observation j in sample set *i*.

If the value of KW P<0.05, it means that indexes have significant differences, so the cluster analysis is remade to this subset until there is no significant difference; if P>0.05, it indicates that there is no significant difference among indexes, then the multiple correlation coefficient ρ^2 of each index in the subset is calculated; according to the maximum independent principle, indexes with smaller ρ^2 are selected into the index system.

CONSTRUCTION OF CHINA'S SYSTEMIC FINANCIAL RISK EARLY WARNING INDEX SYSTEM

Primary choices of systemic financial risk early warning indexes

Before primary choice of warning indexes, influential factors of China's financial risk are analyzed in the first place. We believe that the systemic financial risk is decided by two factors both internal and external. Internal factors mainly cover those in the medium financial market and micro bank

factors while external influence factors include macroeconomic operation factors and external impact factors. As shown in Figure 1

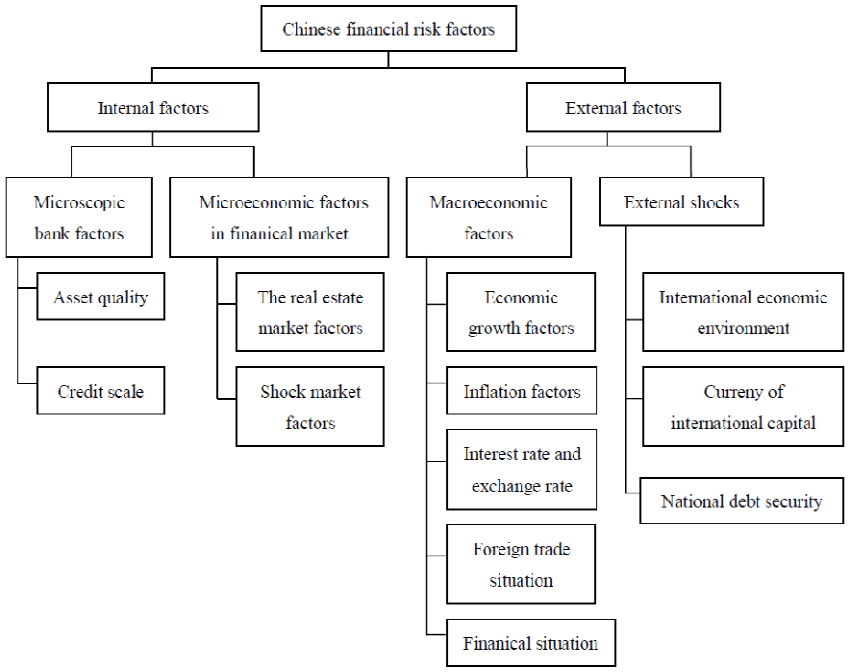

Figure 1: Influential factors of China's financial risks

This paper follows the principles of combining normativity and maneuverability, comprehensiveness and representativeness, scientificity and sensitivity, adaptability and complementarity, timeliness and openness. Based on the analysis of the influential factors of financial risk in China, primary selection of indexes are made with a total of 35 indexes are selected into the alternative index system. As shown in TABLE 1.

Data source and processing

(a) The data source

This paper selects monthly data from January 2000 to December 2013 for the empirical analysis. Because the monthly data is a kind of high frequency data which can describe financial risk more within a given time period. The data mainly come from the web sites of Chinese bureau of statistics, the people's bank of China, WIND database, Chinese economy online database, and the Fed's economic database. The growth rate data of each index are compared with the data of the same period last month.

(b) The index processing

following steps of processing are needed in order to get the complete data of primary indexes: (1) Using Eviews to converse quarterly data into monthly data; (2) for missing monthly data, SPSS software is used to supplement by the method of smoothing; (3) Census X12 in Eviews is applied to adjust time series data with seasonal factors.

Meanwhile, in order to assure the data are comparable, indexes are processed to be standard and positive. (1) Positive treatment of indexes. According to the nature of indexes, the early warning indexes are divided into positive, negative and moderate ones. As shown in TABLE 1. (2) Dimensionless treatment of indexes. The method of range is used in this paper to process indexes into dimensionless. Assume X_{ij} is the dimensionless value of index j of object i; xij is the value of index *j* of object *i*. The dimensionless formula of positive indexes is as formula (6).

$$X_{ij} = \frac{x_{ij} - \min(x_{ij})}{\max(x_{ij}) - \min(x_{ij})} \quad \textbf{(6)}$$

TABLE 1: Primary selected early-warning indexes of Chinese systemic financial risk

subsystem	type of index	index name	unit	Index properties
Macro economic operation	Growth factors	growth rate of GDP (A_1)	%	moderate
		growth rate of added value of industrial (A_2)	%	positive
		growth rate of Investment in fixed assets (A_3)	%	moderate
		growth rate of M2 (A_4)	%	moderate
	Inflation factor	rate of inflation (A_5)	%	negative
	Interest rate and exchange rate	real interest rate (A_6)	%	negative
		real effective exchange rate index (A_7)	--	negative
	Foreign trade situation	growth rate of export (A_8)	%	moderate
	Balance of the fiscal	The fiscal deficit /GDP (A_9)	%	negative
		Fiscal revenue /GDP (A_{10})	%	positive
Medium financial market factors	The real estate market factors	change rate of real estate index (B_1)	%	positive
		growth rate of real estate investment (B_2)	%	positive
		Housing sales price index (B_3)	--	positive
		Commercial housing sales area/completion area (B_4)	%	negative
	The stock market factors	Stock p/e ratio (B_5)		negative
		Stock market capitalization /GDP (B_6)	%	negative
The micro bank factors	Asset quality	The ratio of deposits and loans (C_1)	%	negative
		Medium and long term loan growth (C_2)	%	negative
		Short-term loan growth (C_3)	%	negative
	The credit scale	The loan /GDP (C_4)	%	negative
		A savings account /M2 (C_5)	%	negative
		M2/GDP (C_6)	%	negative
		M2/M1 (C_7)	%	negative
		Domestic credit /GDP (C_8)	%	negative
The national debt security	The international economic environment	The dollar index (D_1)	--	negative
		BDI index (D_2)	--	positive
	International capital	Current account balance /GDP (D_3)	%	negative
		Net assets abroad /GDP (D_4)	%	negative
		interest-rate spread at home and abroad (D_5)	%	negative
		FDI/GDP (D_6)	%	negative
		Foreign exchange reserves/M2 (D_7)	%	negative
		growth of foreign exchange reserves (D_8)	%	negative
	The national debt security	Foreign exchange rate (D_9)	%	negative
		Short-term foreign debt / total amount of debt (D_{10})	%	negative
		The total amount of debt /GDP (D_{11}) X_{36}	%	negative

The dimensionless formula of negative indexes is as formula (7).

$$X_{ij} = \frac{\max(x_{ij}) - x_{ij}}{\max(x_{ij}) - \min(x_{ij})} \quad \textbf{(7)}$$

The dimensionless formula of moderate indexes is as formula (8).

$$X_{ij} = \begin{cases} 1 - \dfrac{L_1 - x_{ij}}{\max[L_1 - \min(x_{ij}), \max(x_{ij}) - L_2]} & (x_{ij} < L_1) \\ 1 & (L_1 < x_{ij} < L_2) \\ 1 - \dfrac{x_{ij} - L_2}{\max[L_1 - \min(x_{ij}), \max(x_{ij}) - L_2]} & (x_{ij} > L_2) \end{cases} \quad \textbf{(8)}$$

In formula (8), $[L_1, L_2]$ is the best value range of moderate indexes.

Screening early warning indexes of systemic financial risk

(a) Screening indexes by means of identification analysis

First of all, identification analysis is carried out on the primary index system. According to formula (1), the standard deviation coefficients of indexes in four categories are calculated separately. According to the experience of related research and the operability principle, the critical value of index standard deviation coefficient is set as 0.3; when the standard deviation coefficient is greater than the critical value, it means that the index has high ability of identification, can well measure systemic financial risk in China, and should be included in the index system; on the contrary, the index should be removed because it shows limit ability to identify systemic financial risk. Specific results are shown in TABLE 2.

TABLE 2: Identification analysis results of each index

Macroeconomic operation	C_{Ai}	Medium financial markets	C_{Bi}	The micro bank factors	C_{Ci}	External impact factors	C_{Di}
A_1	0.401	B_1	0.403	C_1	0.666	D_1	0.425
A_2	0.331	B_2	0.373	C_2	0.385	D_2	0.029
A_3	0.168	B_3	0.386	C_3	0.575	D_3	0.408
A_4	0.304	B_4	0.119	C_4	0.368	D_4	0.697
A_5	0.366	B_5	0.378	C_5	0.573	D_5	0.763
A_6	0.505	B_6	0.325	C_6	0.390	D_6	0.244
A_7	0.403			C_7	0.234	D_7	0.746
A_8	0.348			C_8	0.349	D_8	0.535
A_9	0.237					D_9	0.750
A_{10}	0.659					D_{10}	0.674
						D_{11}	0.372

As it shows in TABLE 2, in the column of macroeconomic operation, the standard deviation coefficient values of A_1, A_2, A_4, A_5, A_6, A_7, A_8, A_{10} are above the critical value 0.3, so they are kept; whereas the standard deviation coefficient values of A_3, A_9 are under the critical value, therefore, they should be removed. In the same way, For indexes in other three aspects, i.e. the medium financial market, micro bank factors and external shocks, keep the indexes with standard deviation coefficient greater than 0.3 and eliminate those which are less than 0.3. In this way, after the first round of index identification analysis, six indexes are cut out. The final systemic financial risk early warning index system contains 29 indexes. As shown in TABLE 3.

TABLE 3: Index system after identification analysis

	The index code
Macroeconomic operation operoperation	A_1, A_2, A_4, A_5, A_6, A_7, A_8, A_{10}
Medium financial markets	B_1, B_2, B_3, B_5, B_6
The micro bank factors	C_1, C_2, C_3, C_4, C_5, C_6, C_8
External impact factors	D_1, D_3, D_4, D_5, D_7, D_8, D_9, D_{10}, D_{11}

(b) Screening indexes by means of correlation analysis

(A) Screening indexes on the macroeconomic operation level

Make correlation analysis to the rest eight indexes on the macroeconomic operation level, The results are shown in TABLE 4.

TABLE 4: Index screening process on the level of macroeconomic operation

indexes	code	Clustering analysis	Nonparametric test	The average correlation coefficient / Multiple correlation coefficient
The growth rate of GDP	A_1	(A_1, A_4, A_8)	P=0.092, no significant difference	ρ^2_{A1}=0.794, ρ^2_{A4}=0.961, ρ^2_{A8}=0.872, A_1 is selected
Growth rate of industrial added value	A_2	(A_2, A_7)	P=0.531, no significant difference	$\bar{R}_{A2}$=0.959, $\bar{R}_{A7}$=0.826 A_7 is selected
growth rate of M2	A_4			
The rate of inflation	A_5	A_5, included in	——	——
The real interest rate	A_6	(A_6, A_{10})	P=0.018, significant	——
The real effective exchange rate index	A_7		difference, selected	
Export growth rate	A_8			
Fiscal revenue /GDP	A_{10}			

The results of cluster analysis in TABLE 4 indicate that index A5 is a separate class which can be elected directly; A_1, A_4, A_8 are of a class. The Kruskal-Wallis test result is P=0.092>0.05, and there is no significant difference, then the multiple correlation coefficient is calculated, with index A_1 has the smallest multiple correlation coefficient, so it is included; A_2, A_7 are of a class. The Wald-Wolfowitz runs test shows P=0.531>0.05 no significant difference; the average correlation coefficient is calculated, with index A7 has the smallest average correlation coefficient, so it is included in; A_6, A_{10} are of a class; the Wald-Wolfowitz runs test result is P=0.018<0.05, and there is significant difference, so A_6, A_{10} are all selected.

(B) Screening indexes on the middle finance market level

Make correlation analysis to the rest five indexes on the medium financial market level. The results are shown in TABLE 5.

The results of clustering analysis in TABLE 5 show that index B_6 is a separate class which can be directly elected; B_1, B_2 are of a class, and the Wald-Wolfowitz runs test result is P=0.359>0.05, with no significant difference, and index B_1 has the smallest average correlation coefficient, so it is included in; B_3, B_5 are of a class, and the Wald-Wolfowitz runs test result is P=0.02718<0.05, and there is significant difference, so both B_3, $B_5$are included in.

(C) Screening indexes on the micro bank level

Make correlation analysis to the remaining seven indexes on the level of banks. The results are shown in TABLE 6.

TABLE 5: Screening process of indexes on the medium financial market level

indexes	code	Clustering analysis	Nonparametric test	The average correlation coefficient / Multiple correlation coefficient
Real estate index change rate	B_1	(B_1, B_2)	P=0.359, There was no significant difference	$\bar{R}_{B1}$=0.718, $\bar{R}_{B2}$=0.845 B_1 included in
growth rate of real estate investment	B_2			
Housing sales price index	B_3	(B_3, B_5)	P=0.027, There was significant difference, included in	——
Stock p/e ratio	B_5			
Stock market capitalization /GDP	B_6	B6, included in	——	——

TABLE 6: Screening process of indexes on the bank level

indexes	code	Clustering analysis	Nonparametric test	The average correlation coefficient / Multiple correlation coefficient
The ratio of deposits and loans	C_1	(C_1, C_3)	P=0.294, no significant difference	$\bar{R}_{C1}$=0.809, $\bar{R}_{C3}$=0.934 C_1 selected
Medium and long term loan growth	C_2	C_2, selected	——	——
Short-term loan growth	C_3			
The loan /GDP	C_4	(C_4, C_6, C_8)	P=0.083, no significant difference	ρ^2_{C4}=0.896, ρ^2_{C6}=0.778, ρ^2_{C8} =0.702, C_8 selected
A savings account /M2	C_5	C_5, selected	——	——
M2/GDP	C_6			
Domestic credit /GDP	C_8			

The results of clustering analysis in TABLE 6 show that C_2, C_5 are of two classes separately and are elected directly; C_1, C_3 are of a class. The Wald-Wolfowitz runs test result is P=0.294>0.05, with no significant difference, and index C_1 has the smallest average correlation coefficient, so it is included in; C_4, C_6, C_8 are of a class, and the Kruskal-Wallis test result is P=0.083>0.05, with no significant difference, and index C_8 has the smallest multiple correlation coefficient so it is included in.

(D) Screening indexes on the external shock level

The clustering analysis results in TABLE 7 show that D_1, D_5, $D_{11}$are of a class seperately, and they are directly elected; D_3, D_8 are of a class, and the Wald-Wolfowitz runs test result is P=0.2414>0.05, with no significant difference, and index D_3 has the smallest average correlation coefficient after calculation, so it is included in; D_4, D_7, D_9, D_{10} are of a class, and the Kruskal-Wallis test result is P=0.351>0.05, with no significant difference, and index D_7 has the smallest multiple correlation coefficient, so it is included in.

Results of index screening

After the above tests and selection, the final early warning index system of systemic financial risk in China is constructed with 18 indexes, as shown in TABLE 8.

TABLE 7: Screening process of indexes on the external shock level

indexes	code	Clustering analysis	Nonparametric test	The average correlation coefficient / Multiple correlation coefficient
The dollar index	D_1	D_1, included in	——	——
Current account balance /GDP	D_3	(D_3, D_8)	P=0.241, no significant difference	$\bar{R}_{D3}$ =0.910, $\bar{R}_{D8}$ =0.975 D_3 included in
Net assets abroad /GDP	D_4			
interest-rate spread at home and abroad	D_5	D_5, included in	——	——
Foreign exchange reserves//M2	D_7	(D_4, D_7, D_9, D_{10})	P=0.351, no significant difference	ρ^2_{D4} =0.942, ρ^2_{D7} =0.794, ρ^2_{D9} =0.858, ρ^2_{D10} =0.826, D_7 included in
growth of foreign exchange reserves	D_8			
Foreign exchange rate	D_9			
Short-term foreign debt / total amount of debt	D_{10}			
The total amount of debt /GDP	D_{11}	D_{11}, included in	——	——

TABLE 8: Early warning index system of China's systemic financial risk

subsystem		index name	code
early warning index system of China's systemic financial risk	Macroeconomic operation	growth rate of GDP	X_1
		rate of inflation	X_2
		real interest rate	X_3
		real effective exchange rate index	X_4
	Medium financial market factors	Fiscal revenue /GDP	X_5
		change rate of real estate index	X_6
		Housing sales price index	X_7
		Stock p/e ratio	X_8
		Stock market capitalization /GDP	X_9
	The micro bank factors	The ratio of deposits and loans	X_{10}
		Medium and long term loan growth	X_{11}
		A savings account /M2	X_{12}
		Domestic credit /GDP	X_{13}
	External impact factors	The dollar index	X_{14}
		Current account balance /GDP	X_{15}
		interest-rate spread at home and abroad	X_{16}
		Foreign exchange reserves /M2	X_{17}
		The total amount of debt /GDP	X_{18}

CONCLUSIONS

The construction of systemic financial risk index system is currently the primary part of constructing China's early warning system of financial risk. Due to the particularity of China's financial markets, with no large financial risk and crisis events happen before, so a financial risk early warning index system set up in the countries where major financial crisis happened past may not be applicable to China. Therefore, considering from another perspective, with the current situation analysis of the influence factors of China's financial risk as the basis, this paper established an early warning index system of China's systemic financial risk with quantitative analysis method.

Based on the analysis of influencing factors of China's systemic financial risk, this paper screened primary early warning indexes of financial risk from four aspects, i.e. the macro economic operation, medium financial markets, micro banks, and external shocks; then the method of identification analysis and correlation analysis in combination is used for further index screening, and by empirical analysis with China's monthly data from January 2000 to December 2013, this paper constructed an early warning index system of China's systemic financial risk containing18 indexes of four categories. The early warning index system of systemic financial risk, constructed by means of combining qualitative analysis and quantitative analysis, can effectively balance the contradictions of comprehensiveness and representativeness in an index system, and it has scientific nature and rationality and provides a new train of thought for the construction and optimization of systemic financial risk early warning index system.

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