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Measurement of China's Financial Stress Index Based on AHM-EWM-GM (1, N)

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Abstract:
In recent years, the increasing uncertainty of China's financial system, the gradual accumulation and dominance of financial risks covered by the rapid economic growth, the measurement of financial pressure, and the prevention of financial risks focus on deepening financial supervision. Based on the AHM (Attribute Hierarchy Model) - EWM (Entropy Weight Method) model, this paper constructs the financial stress index of China and uses the GM (1, N) model to predict the financial stress. The results show that: China's total financial stress index aggregation frequent volatility is evident and the overall trend of rising, in a short period of high risk, low risk for a long time. The simulation results of the GM (1, N) model are in good agreement with the measured data, which verifies the effectiveness of the model in forecasting the financial stress index in China.

Keywords: *AHM-EWM model; GM (1, N); financial stress index; financial risk*

1. Introduction

The total value of China's systemic financial risk index is approaching the peak value in history, and it is facing great risk shortly soon. [1] The relevant departments have proposed to guard against systemic financial risks and maintain financial security and stability. Because of this, it is of great significance to effectively measure and guard against systematic financial risks.

Financial stress index is a comprehensive index composed of a series of indicators reflecting the stress status of various subsystems of the financial system, which can better reflect the overall risk stress level of the financial system due to uncertainty and expected loss changes and is a more appropriate indicator for measuring systemic financial risks in China [2]. The index was first proposed by Illing and Liu [3], which used data from banks, currencies, bonds, stocks, and other markets to build the Canadian Financial Stress Index based on a variety of weighting methods and successfully measured Canada's financial risks. Subsequently, many domestic and foreign scholars use different index systems and weighting methods to construct the financial stress index. Hakkio [4] and others used the principal component method to construct the famous Kansas City Financial Stress Index. Lai Juan et al. [5] Construct the financial stress index based on the equal weight method of credit institutions and capital markets. Chen Shoudong and Wang Yan [6] construct the financial stress index by adding the insurance market into the index system of previous research by the equal-variance weighted method. In recent years, with the dynamic characteristics of risks in the financial system, recent research has begun to use the dynamic weighting method. Deng Chuang et al. [7] has constructed an index based on the dynamic CRITIC weighting method, and Ding Hui et al. [8] has synthesized China's financial stress index from four aspects, namely, currency, bond, stock, and foreign exchange, based on dynamic correlation coefficient and dynamic credit weighting method. Nevertheless, there is no clear evidence of its superiority. Generally speaking, domestic and foreign literature has made some important achievements in the construction of the financial stress index, but there is still room for further development and improvement.

There is no conclusion on the construction of the financial stress index at present. Most of the previous literature focused on using objective methods, but due to changes in the actual situation, the importance of indicators will change. Relying solely on objective methods does not accurately reflect. Based on this, this paper adopts the subjective and objective integration of the method of the index weight. Considering the reasonableness of the index selection and the scientificity of the synthetic method, this paper selects 20 related indexes from bank market, macro-finance, bond and insurance, stock market, external market, and real estate market. Based on the AHM-EWM method, we construct the financial stress index of China and use the GM (1, N) model to forecast the index.

2 Financial stress index system of China

2.1 Selecting China's Financial Stress Index

Considering the availability of the data and the robustness of the index, this paper chooses different indexes with objective value to construct the financial stress index from the sources of banking, bond, insurance, real estate, and external financial risks. Specific indicators are shown in table 1.

Table 1 Basic index system of China Financial Pressure Index

Submarket	Meindicator name	Unit No	The relationship with financial pressure	Variable name
The Bank Market (A1)	TED spreads	%	Forward direction	X_1
	The 7-day interbank repurchase rate	%	Forward direction	X_2
	non-performing loan rate	%	Forward direction	X_3
	Inventory ratio	%	Forward direction	X_4
Macro-Financial Market (A2)	GDP growth rate	%	Reverse this way	X_5
	M2 growth rate	%	Forward direction	X_6
	CPI year-on-year	%	Forward direction	X_7
Bond & Insurance Markets (A3)	Negative maturity spread	%	Forward direction	X_8
	yield to maturity of treasury bonds	%	Forward direction	X_9
	Loss ratio	/	Forward direction	X_{10}
The Stock Market (A4)	stock market value/GDP	RMB 100 million yuan	Forward direction	X_{11}
	The volatility of the CSI 300 index	%	Reverse this way	X_{12}
	Market yield	%	Forward direction	X_{13}
The Real Estate Market (A5)	The real estate grew year-on-year	%	Forward direction	X_{14}
	Commercial housing sales area growth rate year on year	%	Forward direction	X_{15}
	the change rate of the national housing prosperity index e	/	Reverse this way	X_{16}
The External Market (A6)	the fluctuation of the exchange rate between the US dollar and the RMB	/	Forward direction	X_{17}
	the growth rate of foreign exchange reserves	%	Reverse this way	X_{18}
	the vulnerability of exchange rate index	/	Reverse this way	X_{19}
	PMI	%	Reverse this way	X_{20}

2.2 Dimreduction dimension reduction based on factor analysis

The accuracy of the evaluation results was affected to ensure the rationality and robustness of the construction of the index, which is used to prevent the excessive dilution of the weight setting of the essential index variables. By performing the significance test of the primary election, the practical financial pressure evaluation index variables were selected. In this paper, a selected factor-analysis model was used to test the relationship between different categories of indicators, with data selection of overall national data from January 2010 to March 202 1 (data from each year China Statistical Yearbook, Wind database, China Banking, and Insurance Regulatory Commission), and the analysis results are shown in Table 2.

Table 2 Significance test of China's financial pressure evaluation index System

Primary indicators	Secondary indicators	Factor load	Number of public factors	Factor contribution rate	Select the metrics
The Bank Market (A1)	X_1	0.918	2	89.974%	X_1 X_3
	X_2	0.870			
	X_3	0.919			
	X_4	0.893			
Macro-Financial City (A2)	X_5	0.862	2	86.586%	X_5 X_7
	X_6	0.822			
	X_7	0.913			
Bond & Insurance Markets (A3)	X_8	0.781	2	83.675%	X_8 X_9
	X_9	0.949			
	X_{10}	0.780			
The Stock Market (A4)	X_{11}	0.749	2	81.619%	X_{12} X_{13}
	X_{12}	0.830			
	X_{13}	0.869			
The Real Estate Market (A5)	X_{14}	0.434	2	86.999%	X_{15} X_{16}
	X_{15}	0.758			
	X_{16}	0.656			
The External Market (A6)	X_{17}	0.901	2	82.711%	X_{17} X_{20}
	X_{18}	0.801			
	X_{19}	0.845			
	X_{20}	0.761			

3.AHM-EWM model build

3.1AHM Calculation Step

AHM (Attribute Hierarchy Model) is a simple subjective empowerment method, The AHM empowerment steps are as follows:

The STEP1: determines the evaluation metric weights. In this paper, the Saaty scaling is used to obtain the n order AHP discriminant matrix $K=\left(k_{ij}\right)_{n\times n}$, and has the following properties:

$$\begin{cases} k_{ij}>0 \\ k_{ii}=0 \\ k_{ji}=1/k_{ij} \end{cases} \quad (1)$$

STEP2: constructs the property discriminant matrix.

$$\begin{cases} 2m/(2m+1) & k_{ij}=m\ , i\neq j \\ 1/(2m+1) & k_{ij}=1/m, i\neq j \\ 0.5 & k_{ij}=1, i\neq j \\ 0 & k_{ij}=1, i=j \end{cases} \quad (2)$$

STEP3: calculates the relative attribute weights for each metric.

$$\sigma_i=\frac{2}{n(n-1)}\sum_{j=1}^{n}l_{ij} \quad (3)$$

3.2EWM Calculation Step

EWM (Entropy Weight Method) An objective assignment method based on analyzing the degree of variation between the eigenvalues of each evaluation metrics. Specific calculation steps are as follows:

STEP1:matrix of the characteristic value of the evaluation index X is as follows:

$$X=\left(X_{ij}\right)_{m\times n}=\begin{pmatrix} X_{11}\cdots\cdots X_{1n} \\ \cdots\cdots\cdots\cdots \\ X_{m1}\cdots\cdots X_{mn} \end{pmatrix} \quad (4)$$

$$X'_{ij}=\left(X_{ij}-\min\left(X_{ij}\right)\right)/\left(\max\left(X_{ij}\right)-\min\left(X_{ij}\right)\right); \quad (5)$$

$$X'_{ij}=\left(\max\left(X_{ij}\right)-X_{ij}\right)/\left(\max\left(X_{ij}\right)-\min\left(X_{ij}\right)\right). \quad (6)$$

STEP2: calculates p_{ij} :

$$p_{ij}=X'_{ij}/\sum_{j=1}^{n}X'_{ij}; \quad (7)$$

STEP3: calculates the entropy of the i evaluation index e_i :

$$e_i=-\frac{1}{\ln n}\sum_{j=1}^{n}p_{ij}\ln p_{ij} \quad (8)$$

STEP4: calculates the entropy weight of the i evaluation index a_i :

$$a_i=\left(1-e_i\right)/\sum_{j=1}^{m}\left(1-e_i\right). \quad (9)$$

3.3 The Lagrangian is based on the coupling weights

this method is used to find the coupling weight， w_i as the weight after coupling.

$$w_i=a_i\sigma_i/\sum_{i=1}^{m}a_i\sigma_i. \quad (10)$$

3.4GM (1, N) grey predictive model construction

The GM (1, N) model represents the model is the 1 order equation with a grey system model containing N variables. The specific steps are as follows:

STEP1: performed level tests to analyze the feasibility of modelling. Set the time series to:

$$X_i^{(0)}=\left(x_i^{(0)}(1),x_i^{(0)}(2),\cdots,x_i^{(0)}(n)\right) \quad (11)$$

Then calculate and judge the level of $\sigma(k)$ the calculation formula such as formula (12), when the level $\sigma(k)\in\left(e^{-\frac{2}{n+1}},e^{\frac{2}{n+1}}\right)$, the selected sequence can be done GM (1, N) modelling.

$$\sigma(k)=x_i^{(0)}(k-1)/x_i^{(0)}(k) \quad (12)$$

STEP2: calculates the 1-AGO (of primary data once cumulative generated) sequences adjacent to the mean sequence. The sequence of characteristic value and the sequence of influencing factors are:

$$X_i^{(0)}=\left(x_i^{(0)}(1),x_i^{(0)}(2),\cdots,x_i^{(0)}(n)\right) \quad (13)$$

$X_i^{(0)}$ 1-AGO sequence is the formula (14), the calculation formula of $x_i^{(1)}(k)$ is the formula (15)：

$$X_i^{(1)}=\left(x_i^{(1)}(1),x_i^{(1)}(2),\cdots,x_i^{(1)}(n)\right) \quad (14)$$

$$x_i^{(1)}(k)=\sum_{m=1}^{k}x_i^{(0)}(m) \quad (15)$$

The immediate mean value sequence of $X_1^{(1)}$ is formula (16), and the calculation formula of Y $z_1^{(1)}(k)$ in Formula (17) :

$$Z_1^{(1)}=\left(z_1^{(1)}(2),z_1^{(1)}(3),\cdots,z_1^{(1)}(n)\right) \quad (16)$$

$$z_1^{(1)}(k)=0.5x_1^{(1)}(k)+0.5x_1^{(1)}(k-1) \quad (17)$$

STEP3: determines the model. The GM (1, N) model is the formula (18), a is called the system development coefficient, $b_ix_i^{(1)}(k)$ is the driving term, b_i the driving term coefficient, and the shadow equation of the above equation are the differential equation:

$$x_1^{(0)}(k)+az_1^{(1)}(k)=\sum_{i=2}^{m}b_ix_i^{(1)}(k) \quad (18)$$

$$\frac{dx^{(1)}}{dt}+ax_1^{(1)}=\sum_{i=2}^{m}b_ix_i^{(1)} \quad (19)$$

STEP4: compute the parameter column $\hat{a}=\left[a,b_1,b_2,\cdots,b_m\right]^T$. The parameter column $\hat{a}$ can be satisfied by the principle of least squares calculation $\hat{a}=\left(B^TB\right)^{-1}\times B^T\times Y$:

$$B=\begin{pmatrix} -z_1^{(1)}(2) & x_2^{(1)}(2)\ \cdots & x_m^{(1)}(2) \\ -z_1^{(1)}(3) & x_2^{(1)}(3)\ \cdots & x_m^{(1)}(3) \\ \vdots & & \vdots \\ -z_1^{(1)}(n) & x_2^{(1)}(n)\ \cdots & x_m^{(1)}(n) \end{pmatrix} \quad (20)$$

$$Y=\begin{pmatrix} x^{(0)}(2) \\ x^{(0)}(3) \\ \vdots \\ x^{(0)}(n) \end{pmatrix} \quad (21)$$

STEP5: calculated the myopia responsiveness for the GM (1, N) model. When the range of $X_i^{(1)}(i=1,2,\cdots m)$ change is minimal, The grey

constant is $\sum_{i=2}^{m} b_i x_i^{(1)}(k)$:

$$\hat{x}_1^{(1)}(k+1)=\left(x_1^{(1)}(0)-\frac{1}{a}\sum_{i=2}^{m} b_i x_i^{(1)}(k+1)\right)e^{-ak}+\frac{1}{a}\sum_{i=2}^{m} b_i x_i^{(1)}(k+1) \quad (22)$$

STEP 6: The reduced model formulas of GM (1, N) are as follows:

$$\hat{x}_1^{(0)}(k+1)=\hat{x}_1^{(1)}(k+1)-\hat{x}_1^{(1)}(k) \quad (23)$$

4. Construction and Prediction of China Financial Pressure Index Based on AHM-EWM-GM (1, N) coupling (Empirical Study)

4.1 Construction and identification of China Financial Index based on AHM-EWM

By conducting the significance test of the Chinese financial pressure evaluation indicators in the primary election, 12 financial pressure evaluation indicators were finally determined from the six financial sub-markets. Saaty scale and expert scoring method constructed the AHP judgment matrix for the primary and secondary indexes, respectively. The first-level index judgment matrix is

$$\begin{pmatrix} 1 & 6 & 5 & 2 & 4 & 3 \\ \frac{1}{6} & 1 & 3 & \frac{1}{6} & \frac{1}{4} & \frac{1}{5} \\ \frac{1}{5} & \frac{1}{3} & 1 & \frac{1}{5} & \frac{1}{3} & \frac{1}{4} \\ \frac{1}{2} & 6 & 5 & 1 & 4 & 3 \\ \frac{1}{4} & 4 & 3 & \frac{1}{4} & 1 & \frac{1}{3} \\ \frac{1}{3} & 5 & 4 & \frac{1}{3} & 3 & 1 \end{pmatrix}$$

The secondary index judgment matrix A 1, A 2, A 3, A 4, A 5, A 6 is successive as follows:

$$\begin{pmatrix} 1 & 5 \\ \frac{1}{5} & 1 \end{pmatrix} \quad \begin{pmatrix} 1 & 3 \\ \frac{1}{3} & 1 \end{pmatrix} \quad \begin{pmatrix} 1 & 2 \\ \frac{1}{2} & 1 \end{pmatrix} \quad \begin{pmatrix} 1 & \frac{1}{2} \\ 2 & 1 \end{pmatrix} \quad \begin{pmatrix} 1 & \frac{1}{4} \\ 4 & 1 \end{pmatrix} \quad \begin{pmatrix} 1 & 5 \\ \frac{1}{5} & 1 \end{pmatrix}$$

Specific calculations are shown in Table 3.

Table 3 AHM-EWM assignment results and coupling weights

Indicators		AHM weights calculate (σ_i)			EWM weights calculate (a_i)			AHM-EWM (w_i)	
Primary indicators	Secondary indicators	Level I index weight	Secondary index weight	AHM	Information entropy value e_i	EWM		Level I index weight	Secondary index weight
						Primary indicators	Secondary indicators		
A1	X_1	35.41%	83.33%	29.51%	0.96	19.28%	6.88%	40.13%	24.04%
	X_3		16.67%	5.90%	0.93		12.40%		8.67%
A2	X_5	5.72%	75.00%	4.29%	0.99	7.70%	1.97%	2.59%	1.00%
	X_7		25.00%	1.43%	0.97		5.73%		0.97%
A3	X_8	4.22%	66.67%	2.82%	0.98	16.12%	3.19%	4.00%	1.06%
	X_9		33.33%	1.41%	0.93		12.93%		2.16%
A4	X_{12}	27.79%	33.33%	9.26%	0.96	10.54%	6.40%	17.22%	7.02%
	X_{13}		66.67%	18.53%	0.98		4.14%		9.08%
A5	X_{15}	16.70%	20.00%	3.34%	0.97	21.77%	4.36%	21.37%	1.72%
	X_{16}		80.00%	13.36%	0.89		17.41%		27.54%
A6	X_{17}	10.16%	83.33%	8.47%	0.92	24.60%	14.72%	14.69%	14.76%
	X_{19}		16.67%	1.69%	0.94		9.88%		1.98%

The results showed that the bank market accounted for the largest weight, reaching 40.13%, the real estate market second accounted for 21.37%, while the bond and insurance market, the macro-financial market, accounted for minimal weight 4.00% and 2.59%. The weight results coincide with China's financial markets.

To construct the financial pressure index reflecting the actual situation of the Chinese financial market, this paper constructs the Bank of China Market Pressure Index (BFSI), Macro Market Pressure Index (MFSI), Macro-Financial Market Pressure Index (MFSI), Bond and Insurance Market Pressure Index (IFSI), Stock Market Pressure Index (SFSI), Property Market Stress Index (RFSI) in combination with the above weights (FFSI). The specific formula is the formula (22), FSI_t which represents the financial pressure index in the

period t , x_{it} representing the i variable of the financial pressure index, w_{it} representing the weight corresponding to the i variable quantity.

$$FSI_t = \sum_{i=1}^{n} w_{it} x_{it} \qquad (24)$$

The changing process of financial pressure is transmitted by a series of transactions in the various sub-markets of the financial system and cannot be reflected only by the individual sub-markets. Therefore, in this paper, combining the above sought primary index weights, the six financial sub-market indexes synthesize total China's financial pressure index, $CFSI_t$ indicating total China's financial pressure index W_{it} , indicating the weight of the sub-market.

$$CFSI_t = \sum_{i=1}^{n} W_{it} FSI_t \qquad (25)$$

The size of the $CFSI_t$ is the size of financial pressure. The less the pressure, the smaller the risk of the financial system and the good overall operation. On the contrary, it shows that the greater the financial pressure, timely measures need to take appropriate supervision and measures to ensure the smooth operation of the financial economy. The financial pressure index of Chinese financial sub-markets is calculated according to formula (22), and the results are reflected by a line chart as shown in Figure 1.

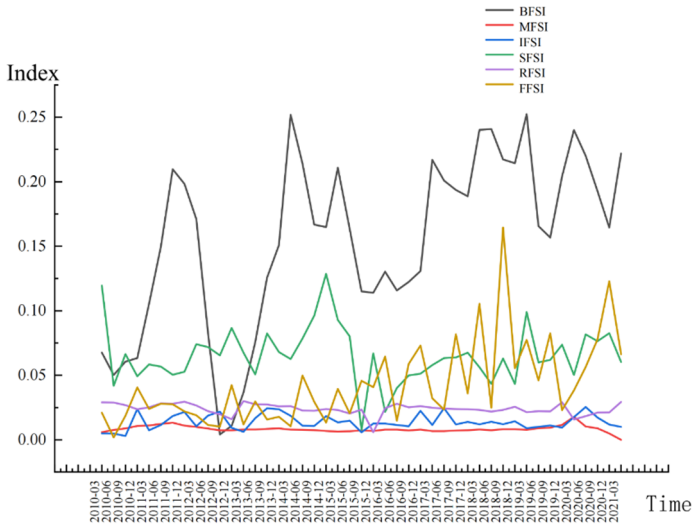

Figure 1 Financial pressure index of various financial submarkets in China

From Figure 1, the fluctuation of the financial pressure index in China's financial sub-market is mainly reflected in the bank market, stock market, and foreign exchange market. It also coincides with China's financial markets. In the banking market, to 2010 to the impact of the financial crisis, the Chinese government adopted a favourable fiscal policy and loose monetary policy, led to structural inflation, from the second half of 2010, financial pressure rising, in 2011 continue to raise deposit reserve and benchmark lending in 2011, liquidity tightening, commercial banks facing greater financial pressure, increased financial risk. In 2014 and 2015, local debt defaults and shadow banking problems increased financial pressure in the banking industry and reached a peak in a short period. In 2016, bank financial pressure briefly bottomed out. From 2017 to 2018, due to the Chinese economic structure adjustment and regulation of the real estate market, financial pressure in the bank market began to rebound again and maintained an upward trend after that.

In the stock market, from 2010 to 2014, the state implemented a loose monetary policy. Although the stock market fluctuated, the overall trend was stable. In 2015, the stock market was affected, the stock market was impacted, and the financial pressure increased. In the external market, under the background of the continuous opening of China's external market, the volatility of the external market is enhanced, so the financial pressure in the external market shows an upward trend. In late March 2014, as the central bank announced the daily volatility of the yuan against the dollar, the financial pressure in the short term in April 2014. In 2018, the trade war between China and the US broke out, and the US trade friction intensified, resulting in external panic, increased volatility, increased financial pressure, and reached its peak. In the context of China's market, the real estate market, the bond and insurance market, the macro-financial market fluctuation risk is small, relatively stable, the financial pressure is low, and remains stable.

The total index size of Chinese financial pressure is calculated by the formula (23), and a line diagram in Figure 2 reflects the results.

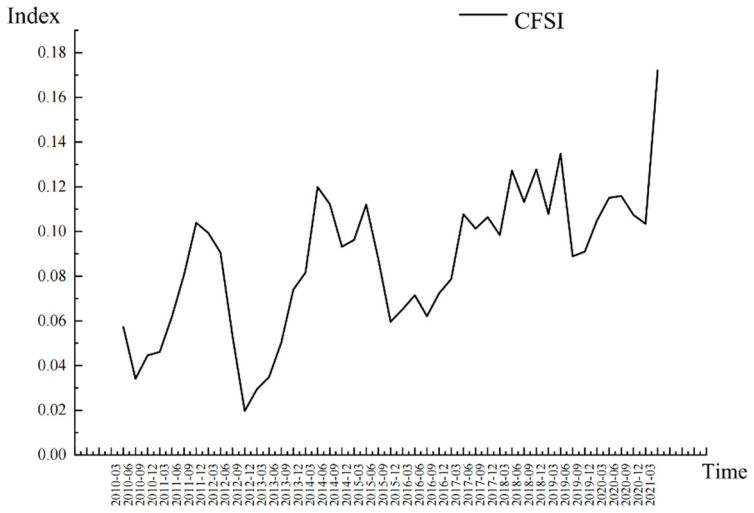

Figure 2 China's Financial Pressure Index

As shown in Figure 2, China's financial pressure index shows an upward volatility trend, which further shows that China's potential financial risks are constantly increasing. This conclusion is consistent with previous studies in the literature [9]. From August to December 2011, the debt crisis broke out in Europe, and the overall economic recovery process in Europe was affected. Under the background of increasing uncertainties in the global financial markets, China's financial market stability was impacted, which promoted the rise of China's financial pressure index and reached a short-term peak. At the beginning of 2012, China's economy entered a period of "new normal", and the economy shifted to medium-high growth and had a high level of financial pressure. Later, with the implementation of relevant stability policies, financial pressure began to decline. In June 2013, the liquidity shortage in China's banking industry intensified, the "money shortage" occurred, the short-term interest rates soared, rising financial pressure, and reached its highest value in March 2014, before it began to decline.

In November 2014, the double reduction in the deposit reserve ratio and the benchmark deposit and loan interest rate released sufficient liquidity, increasing stock market capitalization and financial pressure. In 2015, due to the excessive liquidity outbreak of the stock market crash, the RMB depreciated, the residents' wealth was impacted, and the financial pressure increased. In 2018, the trade war between China and the United States broke out, financial instability factors increased, external market fluctuations intensified, financial risks accumulated, and financial pressure increased significantly. In 2019, commercial banks' primary business came from mortgage loans and high real estate prices, accumulating the risk for the financial system, and the financial pressure maintained an upward trend. In 2020, in the context of the COVID-19 epidemic, the overall economic activity was a downturn, so the financial pressure was relatively low. Since the second half of 2020, the COVID-19 epidemic came under control, the economy recovered, and financial pressure recovered. According to the above analysis, it can be seen that the changes of the financial pressure index coincide with the period of major financial events at home and abroad, thus explaining the feasibility of the financial pressure index constructed in this paper to measure the systemic financial risks in China.

The agglomeration of China's total financial pressure index has apparent frequent volatility and an overall upward trend, indicating that the vulnerability of China's financial system has been further strengthened. Therefore, Chinese regulatory authorities must compile effective financial pressure indicators to reflect the financial system's operating status and risk status, provide forward-looking information, and enable relevant departments to take timely measures. As can be seen from the figure, although the total index of financial pressure is relatively volatile, it is in a short high-risk period and a low-risk state for a long time.

The bank market financial pressure index, the stock market financial pressure index, the financial pressure index in the external market have obvious volatility. In contrast, the macro-financial market financial pressure index, the bond and insurance market financial pressure index, and the real estate market financial pressure index have small volatility, and the whole is relatively stable. It can be seen that the fluctuations of China's general financial pressure index mainly come from the bank market, stock market, and external markets. Therefore, China should pay attention to prevent external shocks and ensure the appropriate liquidity released by the central bank. In addition, it is necessary to establish a risk isolation mechanism, improve the financial market information disclosure system, prevent the horizontal spread of certain market risks to other financial markets, avoid mutual infection, and form a vicious circle.

4.2 Prediction based on GM (1, N)

According to the above analysis, financial pressure and financial risks mainly come from the bank, stock, and external markets. This paper constructs a grey system GM (1,3) model to predict China's financial pressure index to better do the early warning of financial risk. The sequence of characteristic values is China's total financial pressure index, and the sequence of related factors is the bank market pressure index, the stock market pressure index, and the external market pressure index. The model was built and solved.

By calculation, the parameter column is obtained $\hat{a}=\left[1.886,0.713,0.529,0.404\right]^{T}$, The development coefficient was a=1.886, the driving term b=0.713; 0.529; 0.404; and the GM (1,3) model was determined as

$$x_1^{(0)}(k)+1.886z_1^{(1)}(k)=0.713x_2^{(1)}(k)+0.529x_3^{(1)}(k)+0.404x_4^{(1)}(k) \quad (26)$$

We can conclude that the mean error of the simulated values of the system feature sequence is 5.38400%, and the sum of residuals is 0.00379. To intuitively analyze the accuracy of the prediction, the measured and simulated values of the actual financial pressure numbers in China are expressed in a fold line diagram, see Figure3.

As can be seen from the figure, the simulation values obtained from the prediction are generally similar to the measured values. They have a high agreement, indicating the feasibility and effectiveness of the grey prediction model GM (1, N) in predicting the financial pressure index in China.

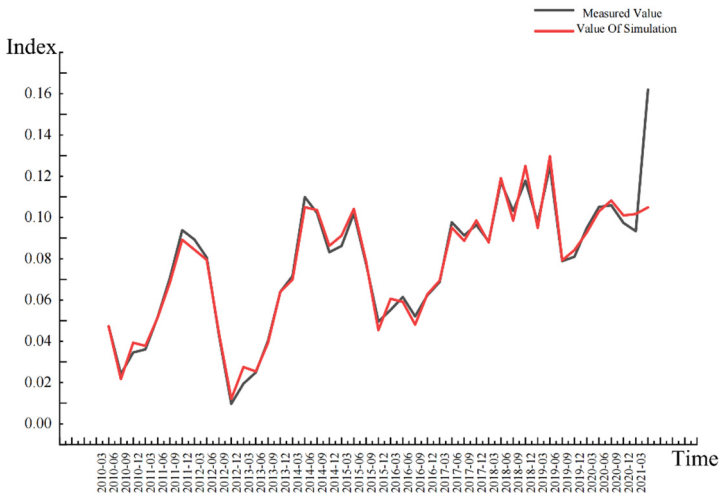

Figure 3 Comparison of the measured and simulated values

5. Conclusions

This paper selects indicators from the financial sub-markets of bank market, macro-finance, bond and insurance, stock market, the external market, and real estate market, performs index dimension reduction based on factor analysis, constructs China's financial pressure index combined with AHM-EWM model, and identifies China's financial pressure. This paper builds a grey system GM (1,3) model to predict China's financial pressure index to better do the early warning work of financial risk. The results show:

Through the identification of typical events in the Chinese financial market and the comparison with previous research and report results, (1) found that the China financial pressure index constructed in this paper can effectively reflect the pressure situation of China's financial market;

(2) The simulated values obtained by GM (1, N) prediction are generally similar to the measured value and have a high agreement, indicating the feasibility and effectiveness of the grey prediction model GM (1, N) in the prediction of Chinese financial pressure index;

(3) China's financial pressure index shows a rising volatility trend, and China's potential financial risks are constantly increasing. The bank market financial pressure index, the stock market financial pressure index, the financial pressure index in the external market have obvious volatility. In contrast, the macro-financial market financial pressure index, the bond and insurance market financial pressure index, and the real estate market financial pressure index have small volatility, and the whole is relatively stable.

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