

## "Belt and Road" financial risk assessment

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**Abstract:** In the context of the continuous in-depth promotion of the "Belt and Road" construction, the "Belt and Road" along the national infrastructure construction, Chinese enterprises "going out", trade financing and other strategies need a lot of financial support, and financial links to the "Belt and Road" construction of all aspects. Therefore, due to many uncertainties outside and within their own, the countries along the route more or less have certain financial risks. Therefore, according to the entropy method, this paper makes an empirical analysis, and then evaluates the financial risk of the Belt and Road.

### 1. Introduction

The Belt and Road route involves a large number of countries, although the developing countries as the main body, but also among the developed economies and backward countries, so the economic development and social development of the countries along the line is uneven. Therefore, the assessment of the financial risk of the Belt and Road is a problem that cannot be ignored in the construction of the Belt and Road. Against this background, 10 specific indicators are selected from the three dimensions of economy, finance and society as indicators to measure financial risks, taking 36 countries along the Belt and Road route as the sample objects. Using its 2018 panel data, this paper uses the entropy method to measure the size of financial risks in each sample country, and analyzes the empirical results.

### 2. Financial risk assessment of countries along the line based on the entropy right law

However, if the financial risks of countries along the Belt and Road are to be more objectively assessed, the construction of a financial risk assessment system is paramount. This paper learns and learns from Han Lin's fuzzy evaluation method used in "China's Financial Security Situation Research" (2010) to analyze the methods and ideas of financial risks in countries along the Belt and Road. The result of fuzzy evaluation is a vector, which can more accurately evaluate the risk values of various countries.

#### 2.1 Model Building

Fuzzy evaluation analysis is based on the empowerment law, which can be divided into subjective empowerment law and objective empowerment law. In the past, many scholars' research mainly used subjective empowerment method to give different weights to the indicators, and the subjectivity was strong. Therefore, in order to make the research more objective, this paper adopts the entropy right method in objective empowerment method to construct the national financial risk assessment system along the Belt and Road.

##### 2.1.1 Entropy Right Law

In this paper, the theory of information entropy is used to evaluate the financial risks of the countries along the Belt and Road, and information entropy is popularly speaking the weight of the index. The theory of information entropy defines information as the degree of systematic order, and entropy measures the probability of information occurrence and the quantity and quality of information. The entropy method gives different weights to the indicators, and then constructs the

target model.

Probability P of the uncertainty function F is a monotonic ally function. The uncertainty created by independent information equals the sum of the uncertainties, i.e.:  $F(P_1, P_2) = F(P_1) + F(P_2)$ . The function F that meets both conditions at the same time is a number function, i.e.:

$$F(P) = \log \frac{1}{P} = -\log P$$

In the source of information, the probability of a specific indicator occurring is not measured, but the average uncertainty of all what may happen to the indicator. If the information officer indicator has an n-in-value:  $U_1, U_2, \dots, U_n$ , the corresponding probability is  $P_1, P_2, \dots, P_n$ , and the indicators are independent of each other. The average uncertainty of the source of information - the average of  $\log P_i$  is the entropy of the information, i.e.:

$$H(U) = E[-\log P_i] = -\sum_{i=1}^n P_i \log P_i$$

We can draw the following conclusion: the amount of information of the indicator is inversely proportional to the entropy of the information, the smaller the average uncertainty, the greater the amount of information, the smaller the information entropy.

Because the relevant indicators of economic statistics have positive and negative points, in order to eliminate the difference between the indicators, this paper on the positive and negative indicators to do the following data processing, standardized indicators  $v(i, j)$ .  $V(i, j)$  represents the value of the national i indicator j, max represents the maximum value, min represents the minimum value,  $r(i, j)$  represents the risk value of the country i indicator j.

$$\text{For positive indicators, the risk value } r(i, j) = \frac{[V_{\max}(i, j) - V(i, j)]}{[V_{\max}(i, j) - V_{\min}(i, j)]} \times 100$$

$$\text{For negative indicators, the risk value } r(i, j) = \frac{[X(i, j) - X_{\min}(i, j)]}{[X_{\max}(i, j) - X_{\min}(i, j)]} \times 100$$

In order to facilitate the representation of generalization, this paper uses  $H'(U) = \frac{H(U)}{\log(n)}$ , where n represents the number of data, and  $W(U)$  represents the information entropy weight value of information U, i.e.  $W(U) = 1 - H'(U)$ .

### 2.1.2 Indicators

The indicators selected in this paper are divided into three main categories, namely, economy, finance and society. Economic indicators, including GDP growth rate, Inflation rate, Debt repayment rate and Current account balance/GDP, measure a country's economic development level and national credit level and other aspects of the comprehensive level. Financial indicators include the NPL ratio of banks, Ratio of bank capital to assets and M2/GDP, which reflect the financial prosperity and stability of a country. Social indicators, including Life expectancy, Unemployment and Proportion of the female labor, reflect a comprehensive level of social development and the degree of stability. As follows:

Table 1 Model index and classification

	Indicators	Serial number	Indicators nature
Economics	GDP growth rate	$X_1$	+
	Inflation rate	$X_2$	-
	Debt service rate	$X_3$	-
	Current account balance/GDP	$X_4$	+
Finance	NPL ratio of banks	$X_5$	-
	Ratio of bank capital to assets	$X_6$	+
	M2/GDP	$X_7$	+
society	Life expectancy	$X_8$	+
	Unemployment rate	$X_9$	-
	Proportion of female labor	$X_{10}$	+

## 2.2 Empirical Analysis of Financial Risk Assessment

### 2.2.1 Empirical Process

If  $i$  represents a country, with a total of  $n$  countries, and if the  $j$  is identified as an evaluation indicator and a total of  $m$  indicators,  $v(j, i)$  represents the indicator value of country  $i$  of the  $j$  indicator.  $d(j, i)$  represents the absolute dispersion of the value of the  $i$  country indicator of the  $j$  indicator:

$$d(j,i)=|v(j,i)-\frac{\sum_i v(j,i)}{\sum_i}|$$

The degree of dispersion is defined as the absolute value of the difference between the indicator value and the average value of the indicator.  $P(j,i)$  represents the relative probability value of the value of the  $i$  country indicator of the  $j$  indicator, i.e. the normalized probability value.

$$P(j,i)=\exp(-d(j,i))/\sum_i \exp(-d(j,i))$$

$H'(j)$  represents the information entropy of the  $j$  indicator, as can be seen from the above:

$$H'(j)=\frac{E[-\log(p(j,i))]}{\log(\sum_i)}=\frac{\sum_{i=1}^n p(j,i)*\log(p(j,i))}{\log(\sum_i)}$$

$W(j)$  represents the weight of the first indicator, then:

$$W(j)=\frac{1-H'(j)}{\sum_j(1-H'(j))}$$

In this paper, a total of 36 countries,  $m=10$  indicators, according to the above calculation steps, 36 countries in 2018 indicators of the weight of the calculation, you can get the data in Table 2.

Table 2 Weight value of each index in 2018

	average value	Information entropy	Information entropy weight	Relative weight value
$X_1$	4.61	0.856	0.144	0.049
$X_2$	2.47	0.839	0.161	0.054
$X_3$	6.13	0.721	0.279	0.094
$X_4$	0.57	0.719	0.281	0.095
$X_5$	7.19	0.597	0.403	0.136
$X_6$	10.26	0.841	0.159	0.054
$X_7$	79.05	0.348	0.652	0.220
$X_8$	73.80	0.811	0.189	0.064
$X_9$	5.94	0.796	0.204	0.069
$X_{10}$	39.41	0.508	0.492	0.166

$R(i)$  represents the  $i$  country, which involves a total of  $j$  indicators of the combined risk value, such as  $j$  values 1, 2, 3, 4, which indicates that the risk value of the  $i$  country is measured under the four indicators, in this case the economic risk value.

$$R(i)=\frac{\sum_j r(i,j)*w(j)}{\sum_j w(j)}$$

According to the above formula, through the selection of 36 countries in 2018 indicators, we can find the "Belt and Road" along the country's different indicators of the risk value, and then according to the results of analysis (considering the length of the results, this article does not list the results).

### 2.2.2 Analysis of Empirical Results

Through the weighted calculation of the comprehensive risk value, economic risk value, financial risk value and social risk value of the countries along the Belt and Road, the following conclusion can be drawn by the entropy right method:

The financial risk in the process of "Belt and Road" practice is "universal". "Universality" refers

to the existence of financial risk is not transferred by the will of the people, which is not related to the size of the value of financial risk, each country will face certain financial risks, it is the inevitable product of financial activities under the conditions of modern market economy. From the empirical results, it can be seen that the financial risks of countries along the Belt and Road are generally higher, and the combined risk value of 30 of the 36 countries studied was greater than 40, accounting for 83.33% of the total.

Financial risks are "difference" in the practice of "Belt and Road". "Difference" refers to the similarity of the types of financial risks faced by each country, but the degree of financial risk varies from country to country. From the empirical results, it can be seen that the comprehensive risk of sand saline of countries along the Belt and Road is very different, and the risk value ranges from 24.369 to 71.992. Of the 36 countries, only 6 have a lower overall risk (Singapore, China, Vietnam, Thailand, Israel and Bulgaria) with a combined risk value below 40, with a ratio of 16.67 percent.

Financial risks are "closely related" in the practice of "Belt and Road". "Close correlation" refers to the financial risk in addition to affecting the development of the financial industry itself, but also has the possibility of chain outbreaks between different regions and industries. From the empirical results, it can be seen that the economic risk value is greater in The Southeast Asian region, the financial risk value is greater in West Asia, North Africa and Central Asia region, the social risk value is greater in West Asia and North Africa region, the risk value of these regions has a greater similarity. With the progress of economic globalization, the "conduction" of financial risk in international financial practice will show a wider range, faster speed and deeper influence.

### 3. Conclusion

From the empirical point of view, in the practice of further promoting the construction of the Belt and Road, the coordinated development of multilateral finance provides opportunities for all countries at the same time, it also produces the joint risk, which has a negative effect on the "capital finance communication" under the framework of "Belt and Road". Therefore, it is particularly important to construct the mechanism of financial risk prevention under the framework of "Belt and Road".

### References

- [1] Chen Yuan, Qian Yingyi: *"Belt and Road" Financial Strategy*, (CITIC Publishing Group, China,2016).
- [2] Weng Dongling: Discussion on the risks of financial support and cooperation in the construction of "Belt and Road" . Northeast Asia Forum.2016 (6)
- [3] Information on: [http://www.ccpit.org/Contents/Channel\\_4128/2016/0606/654798/content654798.htm](http://www.ccpit.org/Contents/Channel_4128/2016/0606/654798/content654798.htm)
- [4] Han Lin: *China's financial security condition-based on empirical analysis of fuzzy integrated evaluation*(MS, Tianjin University of Finance and Economics, China,2012)
- [5] Jiang Yu: *Research on Financial Risk and Its Prevention Mechanism in the Construction of "The Belt and Road"* (MS, Lanzhou University, China,2018)