A Research on Macau Tourism Prosperity Index

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Abstract. Researchers have adopted prosperity index to forecast tourism supply and demand for a destination. However, selection of indicators and cycle selection pose challenge when researchers attempt to include them in the forecasting model. In this paper, the composite index method is used to construct and evaluate tourism prosperity index in Macau from 2006 to 2015 and predicts its future development. The prediction results were consistent with the realistic development situation.

1. Introduction

Currently, tourism consumption has become the most dynamic sector of Macau consumption structure. However, this industry is easily affected by emergencies. Tourism prosperity index is an effective industry monitoring tool. It’s very urgent to carry out researches on tourism prosperity index with the rise of Macau position among tourist destinations in world tourism. Overseas scholars’ analyses and researches on tourism prosperity concentrate on the empirical aspect. Sheldon predicted the number of inbound tourists with the empirical research method [1]. Wong predicted the number of international tourists through business circle, clarifying various methods for tourism prediction [2]. Turner introduced exchange rate, per capita income of the country of source and other indexes to predict future development of Australian tourism industry by employing the composite index. As for researches on tourism prosperity indexes [3], domestic researches focused on studying: Ni Xiaoning determined the weights of indexes with the coefficient of variation and then calculated China’s tourism market prosperity indexes with composite index method [4]. Dai Bin took use of the empowerment indicate of the coefficient of variation to establish travel agency prosperity index system, getting the travel agency industry prosperity index in China [5]. Dai Bin et al. proposed China Hotel Industry Prosperity Index [6]. Zhang Hongxian and Ma Yaofeng predicted the number of China’s inbound tourists through multiple regression analysis [7]. Lei Ping adopted the external impact detection TRAMO/SEATS Model to effectively collect the information of the sequence data, thereby predicting the number of China’s inbound tourists[8]. Wang Xinfeng constructed the measure method and measure model for tourism prosperity based on the variable weight idea [9]. Tang Chengcai set up the heritage site tourism measure model and completed the comparative study of three tourism heritage sites, i.e., Huangshan Mountain, Zhangjiajie and Chengde [10]. Overall, in the selection of indicators, there is a logical disorder of the subordinate between the research results. In the determination of the weight, there is a lack of effective integration of various methods.

The organization of this paper is as follows: Section 2 weight the indexes and introduces the composite index method, Section 3 describes the data and presents the results of preliminary data analysis. Finally, Section 4 discusses the findings and draws conclusions.

2. Methodology

2.1 Tourism Prosperity Index System

Tourism prosperity index evaluation generally includes 3 categories, leading, coincident and lagging indexes. Leading index reflects income and consumption level of the tourist market of the
year; coincident indicator indicates the prosperity of the tourist market of the year; lagging indicate reveals the investment heat of the tourist market of the year. This paper constructs a composite index that consists of leading, coincident and lagging indicators.

Combined with existing research results of experts and scholars, this paper removes indicators with no or few statistical data from 64 primary indicators related to China’s tourism development and conducts correlation analysis of every secondary indicator under first-level indicator after nondimensionalization.

Table 1. The index system and weight of Macau tourism prosperity.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Index</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leading indicator</td>
<td>Macau GDP</td>
<td>0.3122</td>
</tr>
<tr>
<td></td>
<td>PGP of local residents in Macau</td>
<td>0.2325</td>
</tr>
<tr>
<td></td>
<td>Total per capita income of Macao per capita</td>
<td>0.2374</td>
</tr>
<tr>
<td></td>
<td>Consumption expenditure of local residents in Macau</td>
<td>0.2179</td>
</tr>
<tr>
<td></td>
<td>Number of employees in Macau tourism-related industry</td>
<td>0.0807</td>
</tr>
<tr>
<td></td>
<td>Macau tourism-related industries and places</td>
<td>0.0139</td>
</tr>
<tr>
<td></td>
<td>Macau tourism-related industries revenue</td>
<td>0.3496</td>
</tr>
<tr>
<td></td>
<td>Macau tourism-related industry total value added</td>
<td>0.3781</td>
</tr>
<tr>
<td></td>
<td>Number of visitors arriving in Macau</td>
<td>0.0236</td>
</tr>
<tr>
<td></td>
<td>Macau Per Capita Consumption</td>
<td>0.0090</td>
</tr>
<tr>
<td></td>
<td>Number of residents in Macao by travel agency service</td>
<td>0.1452</td>
</tr>
<tr>
<td>Consistent indicator</td>
<td>Fixed capital formation</td>
<td>0.1804</td>
</tr>
<tr>
<td></td>
<td>Money supply</td>
<td>0.2132</td>
</tr>
<tr>
<td></td>
<td>Fiscal Expenditure</td>
<td>0.1999</td>
</tr>
<tr>
<td></td>
<td>Total foreign direct investment</td>
<td>0.3242</td>
</tr>
<tr>
<td></td>
<td>Total import and export trade in goods</td>
<td>0.0821</td>
</tr>
<tr>
<td></td>
<td>Exchange rate</td>
<td>0.0002</td>
</tr>
</tbody>
</table>

Besides, indicators with much overlapping information are removed. Finally, 17 indicators are screened, including 4 leading indicators, 7 coincident indicators and 6 lagging indicators, specifically in Table 1.

This paper, based on previous researches, chooses to combine subjective endowment and objective endowment to give a comprehensive evaluation, i.e., Delphi Method and Entropy Method are adopted to determine the weight of indicators, which are specified in Table 1.

2.2 Tourism Prosperity Composite Index

The internationally agreed prosperity indexes include Diffusion Index (DI) and Composite Index (CI). DI can effectively analyze and predict turning points of economic fluctuation, but cannot describe its degree. Hence, CI is used to forecast prosperity index [11]. These steps are described as follows.

Step 1: Symmetrical Change Rate and Standard of Single Index

Calculating the formula of symmetrical change rate:

\[
C_{it} = \frac{d_{it} - d_{it-1}}{d_{it} + d_{it-1}} \times 100 = \frac{200(d_{it} - d_{it-1})}{d_{it} + d_{it-1}}
\]  \(1\)

\[
A_i = \sum_{t=2}^{N} \frac{|C_{it}|}{N-1}
\]  \(2\)

\[
S_{it} = C_{it} - A_i
\]  \(3\)

where, \(C_{it}\) is the symmetric change rate of the ith indicator in the tth year; \(d_{it}\) is the actual indicator value of the ith indicator in the tth year; \(A_i\) is ordinal average of \(C_{it}\) sequence and \(N\) is the standardized number of period; \(S_{it}\) is the standardized value of the ith indicator’s \(C_{it}\) in the tth year.
Step 2: Determining weighted average of standardized multi-index symmetric change rate

\[ R_t = \sum_{i=1}^{k} S_i \cdot \left( \frac{W_i}{\sum_{j=1}^{k} W_j} \right) \]  

(4)

where, \( R_t \) is the value of the composite average symmetrical change rate of the leading indicator or lagging indicator in the \( t \)th period; \( W_i \) is the weight of the \( i \)th indicator, \( i = 1, 2, \ldots, k \) refers to the number of indicators.

Step 3: Standardizing the average change rate by the synchronization index

The standardization factor \( F \) can be obtained as follows:

\[ F = \left[ \frac{\sum_{t=2}^{N} |R_t|}{N-1} \right] / \left[ \frac{\sum_{t=2}^{N} |P_t|}{N-1} \right] \]  

(5)

\[ r_t = \frac{R_t}{F} \]  

(6)

where, \( P_t \) is the value of the composite average symmetrical change rate of the coincident indicator in the \( t \)th period of the time sequence; \( r_t \) is the average change rate of the synchronic index standardization \( t = 2, 3\ldots, N \) refers to the number of period.

Step 4: Calculating the CI

First, calculating the original chain index. With \( I_1 = 100 \), the calculation formula is:

\[ I_{t-1} = \frac{I_t (200 + r_t)}{200 - r_t} \]  

(7)

\[ CI_t = \frac{I_t}{I_0} \times 100 \]  

(8)

where, \( I_0 \) is the average value of the chosen benchmark year and \( CI_t \) is the CI.

3. Empirical study

3.1 Empirical results

According to the CI construction method, the statistical software, MATLAB R2016a, is employed. The benchmark year is 2005. The tourism prosperity index of three indicators of the tourism industry in Macau shows a trend of sustained growth on the whole. The prosperity index of the leading indicator rose from 95.28 in 2006 to 103.21 in 2015, with an annual growth rate of 0.83%. The prosperity index of the coincident indicator rose from 95.73 in 2006 to 102.16 in 2012, with an annual growth rate of 0.67%. The prosperity index of the lagging indicator rose from 96.55 in 2006 to 103.36 in 2012, with an annual growth rate of 0.70%.

3.2 Empirical analysis

The leading indicator mainly consists of macro indicators, which are insignificantly affected by emergencies. It fluctuates more gently. The coincident indicator includes income of the tourism industry and number of tourists, which significantly impacted by emergencies. The lagging indicator consists of investment, which is also sensitive to emergencies. Fig.1 to Fig.3 are the prosperity index of the leading indicator, coincident indicator and lagging indicator of Macau tourism industry from 2006 to 2015.

From the perspective of the prosperity index of the leading indicator in Fig.1, during the 10 years from 2006 to 2015, the prosperity index of Macau tourism industry’s leading indicators embodied an increasing trend on the whole. Not until 2015 did it decline insignificantly, which was a result of a drop in per capita income of locals in Macau in 2015. In the view that the leading indicator mainly consists of Macau macro output and income index, the above conclusion was obviously consistent with its local economic development reality. The development tendency in Fig.1 reflected that its growth rate since 2010 was higher than that of 2006-2009, which also indicated Macau economy pursued a prosperous and orderly development in a gradual way.

The prosperity index of the coincident indicator in Fig.2 revealed that it also embodied an increase trend basically during the past decade. However, similarly, the value of 2005 was smaller than that of 2014. In 2014, the revenues of Macau gaming, hospitality and travel agency dropped. The gaming industry’s revenue even sharply reduced about 120.4 billion MOPs, with a decline of 34.1%. At the same time, the revenue of the hotel industry and travel agency decreased by 18.3 billion and 6.5 billion. Besides, a drop occurred in the number of inbound tourists in Macau in
2015, which was the first drop since 2009. The slowdown growth of Chinese economy, tightened inbound regulation and strengthened anti-money-laundry measure led to the depression in Macau gaming industry. In this background, a drop in the prosperity index of the coincident indicator seemed to be justified. It also explained that the existence of some emergencies might not impose an irreversible impact on the regional macro economy, but its impact on the tourism industry was significant. In the aspect of the development trend in Fig.2, the trend of the coincident indicator was similar to the leading indicator, indicating Macau tourism industry gradually stabilized and experienced a sound development state.

From the prosperity index of the lagging index in Fig.3, the growth in 2008 and 2009 stopped and stagnated, which was a result of 2009 global financial crisis. Consequently, it resulted in the only reduction of the cumulative total of FDI during the 10 years and the total import and export trade dropped as well. The lagging effect was quite evident.

The composite prosperity index of Macau tourism industry pointed out that from 2006 to 2015, the composite prosperity index of Macau tourism industry had maintained a stable development tendency. Not until 2015 did it drop slightly. Some emergencies like exchange rate fluctuation, policy adjustments, US subprime mortgage crisis and H1N1 flue did not generate a huge impact on Macau tourism development. Its tourist economy still maintained a generally gradual increase trend.

4. Conclusion

The development of Macau tourism industry embraced a more rational growth space after the explosive growth relied on the gaming industry. Its tourism market is faced with significant and profound changes. To strengthen control over emergencies, increase the ability to resist to risks, promote the diversification of tourist industries, expand the scale and field of tourism industry and improve and extend tourism-related industry chain plays an important role in driving Macau tourist economy to develop healthily.

The construction of Macau tourism prosperity index still stays in the stage of preliminary study, which requires more in-depth exploration. Due to a lack of monthly data and quarterly data, the paper reached the tourism prosperity index based on the study of yearly data. It can preliminarily describe the prosperity of tourism, but its reaction is not sensitive enough. Some short-term slight fluctuations may not be identified. However, with the continuous improvement of statistical data and deepening research of tourism prosperity index, it is believed the construction of Macau tourism prosperity index will be further improved.

Figure 1. Leading indicator prosperity index (2006-2015).

Figure 2. Consistent indicator prosperity index (2006-2015).
5. Acknowledgment

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6. References


