Research on Market Selection Decision for New Cigarette—Taking the New Supper Slim Cigarette in China as Example

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Abstract. To capture the opportunity and improve the marketing efficiency of new cigarette product, this paper studied market selection decision for the new cigarette quantitatively. By fully considered the market structure and the product characteristics, an evaluation system of cigarette market was built. Then, the sales data from 33 areas in China during Jan-Aug 2017 was collected. With this data, TOPSIS method was used to measure the market state. The results show that the evaluation score of the 33 sale areas is between 0.05 and 0.5 and there are huge differences among them. Thus, the cigarette company should select partial areas to launch the new supper slim cigarette gradually.

Introduction

With the change of consumer demands, the current market competition changes from incremental competition to stock competition, and the demand for diversification and individualization of consumers has become increasingly prominent. As a result, new cigarette products have become the main growth point in the market. Therefore, under the constraints of resources such as limited financial resources, material resources and human resource, it is an important part of decision-making for industrial enterprises' managers and for practice to choose the appropriate delivery area. The decision will actively cultivate new product, quickly capture the market and gain opportunities. Kan Dongcheng, Wang Yu and others [1-8] discussed the delivery decision for new cigarettes mainly from the aspects of market environment, marketing strategy, brand building and so on. However, they did not research how to choose specific and suitable markets in combination with real data. Most of the quantitative researches focus on the sales volume or increase rate, which leads that the analysis dimension is relatively simple. In fact, cigarette sales market is a complex system. Multi-dimensional factors will affect the market decision of new products, such as the market environment, consumers’ mental model, enterprise strategy and new product characteristics. Thus, based on the complex system of cigarette market, this paper mainly focuses on quantitative analysis and constructs the index set of influential factors in a segment market, and then combine topsis method and use the date in 2014 To August 2017 item from the Tobacco Database “No.1 Project” to evaluate market performance of market for new supper slim cigarette in fisrt class. Finally, give some advices of market choice decision for the new supper slim cigarette in items from the result of evaluation.

Market Selection Design Model for New Product

Constructing Indicators Set for Segment Market

In different segment market, the factors influencing decision-making of market choice are different. For a specific segment market, combining the resource advantages of enterprises and the characteristics of new products, the research constructs decision-making indicators set from the dimensions of market capacity, value contribution, profitability, consumer behavior, brand influence and product attributes. At present, cigarette industry in China has established a "tobacco project" database. The data can be shared in the industry and easy to access. The data includes the
cigarette brands and specifications of the market and product information, it is convenient to constructs the index set, which can include multi-dimensional information, such as production, market sales, sales revenue, inventory, sales-to-inventory ratio, product attributes (such as price, manufacturer, packaging characteristics, color, cigarette scale, etc.). Therefore, it is feasible to make the factors in the Tobacco Database "No.1 Project" as an index set, which is accessable. For the other data that can not be obtained directly, the index can be added according to the actual situation which the enterprise pays attention to.

Establishing the Evaluation Model of Market Performance

**Data Normalization.** Suppose there are \( m \) provinces (or prefectures) participating in the evaluation, and \( n \) indicators for evaluating the performance of a certain type of market segments. Let \( x_{ij} \) denote the value of the \( j \)th indicator of market performance of the \( i \)th province (or prefecture). The original matrix of \( n \) evaluation indexes of the market performance of \( m \) provinces (or prefectures and cities) is:

\[
X = \begin{bmatrix}
    x_{11} & x_{12} & \cdots & x_{1n} \\
    x_{21} & x_{22} & \cdots & x_{2n} \\
    \vdots & \vdots & \ddots & \vdots \\
    x_{m1} & x_{m2} & \cdots & x_{mn}
\end{bmatrix}
\]  

(1)

If there are both positive and negative indicators in the evaluation index, first need to deal with the original matrix with the same trend, make it a normalized matrix \( X' \) that can be compared with each other. The same with the trend of treatment is as follows\(^{[11-12]}\):

\[
X' = \begin{cases}
    \frac{x_{ij}}{x_{ij}^{\max}}, & \text{Positive indicators processing} \\
    \frac{x_{ij}^{\min}}{x_{ij}}, & \text{Negative indicators processing}
\end{cases}
\]  

(2)

The same with the trend after the treatment of the indicator matrix \( X' \)is:

\[
X' = \begin{bmatrix}
    x'_{11} & x'_{12} & \cdots & x'_{1n} \\
    x'_{21} & x'_{22} & \cdots & x'_{2n} \\
    \vdots & \vdots & \ddots & \vdots \\
    x'_{m1} & x'_{m2} & \cdots & x'_{mn}
\end{bmatrix}
\]  

(3)

And then use the formula (4) to normalize the index matrix with the trend of normalization:

\[
r_{ij} = x'_{ij} / \sum_{l=1}^{m} x'_{lj} \quad (i = 1,2,\cdots,m; j = 1,2,\cdots,n)
\]  

(4)

The normalized index matrix \( R \) is:

\[
R = \begin{bmatrix}
    r_{11} & r_{12} & \cdots & r_{1n} \\
    r_{21} & r_{22} & \cdots & r_{2n} \\
    \vdots & \vdots & \ddots & \vdots \\
    r_{m1} & r_{m2} & \cdots & r_{mn}
\end{bmatrix}
\]  

(5)

**Market Performance Evaluation Model.** This paper uses Topsis\(^{[9]}\) method to build the market performance evaluation model of market segments. The core idea of Topsis analysis\(^{[10]}\) is to consider the indicators of \( N \) impact evaluation results as \( N \)-dimensional axes, thus constructing an \( N \)-dimensional space. In this way, each object to be evaluated can be depicted as a single coordinate point in \( N \)-dimensional space. Then select the best value and the worst value from all the objects to be evaluated, and draws the optimal point and the worst point in the \( N \)-dimensional space. Obtain the \( n \)-dimensional Euclidean distance \( L^+ \) and \( L^- \) of the points to be evaluated to the optimal point and the worst point respectively, the evaluation reference value \( Y \) was obtained by \( Y = L^- / (L^+ + L^-) \). The larger the \( Y \) value, the better the evaluation result.

The optimal solution and the worst solution of the evaluation value sets are:
\[ A^+ = \{ r_1^+ r_2^+ \ldots r_n^+ \} = \{ \max r_{ij} \mid j \in J_i, i = 1,2,\ldots,m \} \]  
(6)

\[ A^- = \{ r_1^- r_2^- \ldots r_n^- \} = \{ \min r_{ij} \mid j \in J_i, i = 1,2,\ldots,m \} \]  
(7)

\( J_1 \) is the set of the best values of all the evaluation indexes; \( J_2 \) is the set of worst values among all the indicators. The Euclidean distance between the market performance evaluation value and the optimal evaluation value set, the Euclidean distance between the market performance evaluation value and the worst evaluation value set can be calculated using the following n-dimensional Euclidean distance formula:

\[ L^+_i = \sqrt{\sum_{j=1}^{n} (r_{ij} - r_{ij}^+)^2}, (i = 1,2,\ldots,m) \]  
(8)

\[ L^-_i = \sqrt{\sum_{j=1}^{n} (r_{ij} - r_{ij}^-)^2}, (i = 1,2,\ldots,m) \]  
(9)

Through the following formula to calculate the provinces (or cities) market performance comprehensive evaluation value. According to the evaluation value of different provinces (or prefectures) general class of cigarette market performance evaluation and sorting.

\[ Y_i = \frac{L^-_i}{L^+_i + L^-_i}, Y_i \in [0,1](i = 1,2,\ldots,m) \]  
(10)

Case Analysis

Overview of Supper Slim Cigarette Market

With the diversified development of consumer demand in the cigarette market, the supper slim cigarettes have been scraping all over the country in China and become the new trend of cigarette consumption. The supper slim cigarettes are no longer marginal categories. The cumulative sales volume of supper slim cigarettes in 2017 increased by about 2.16 million boxes compared with in 2014, in an average increase of 103.58%. Among the 33 sales areas in China, there are 15 areas (Guizhou, Chongqing, Hunan, Yunnan, Henan, Jiangxi, Anhui, Guangdong, Hainan, Fujian, Hubei, Shenzhen, Guangxi, Shanghai and Sichuan) where their sales growth is more than 100%. For a new cigarette product, under the conditions of limited resources such as human resource, material and financial resources, how to choose the targeted market in step-by-step has become an urgent problem to be solved for enterprises.

Application of Market Performance Model

Constructing Indicators Set. In this paper, take a new supper slim cigarette in first class developed by enterprise A as an example. Through expert interviews, the factors influencing the market decision of new product in enterprise A are mainly determined by three dimensions. Combining with the actual availability of data resources, build the indicators set which enterprise A concerned about the market selection decision index system \( X = [x_1, x_2, x_3] \). The indicators are as follows:

\( x_1 \): Commercial sales volume in the dimension of market capacity

\( x_2 \): Commercial sales increased ratio in the dimension of market growing speed

\( x_3 \): Wholesale price in a box in the dimension of product profitability

Model Application.

(1) Market Data in 33 Areas and Normalization

From January to August in 2017, that the first-class supper slim cigarette data of 33 areas in Chinese market, it shows that the sales volume in Shandong Province is the largest, the largest increase is in Chongqing, and the highest wholesale price of single box is in Shanghai. That is none of 33 areas in each indicator is the best, so it is necessary to evaluate the market performance in a comprehensive method considering the three indicators.
The original index matrix $X$ is normalized by the same treatment, $R$ is the matrix after normalization as follows:

<table>
<thead>
<tr>
<th>No.</th>
<th>Area</th>
<th>Sales volume</th>
<th>Increased ratio</th>
<th>Wholesale price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chongqin</td>
<td>0.1357</td>
<td>0.5002</td>
<td>0.1742</td>
</tr>
<tr>
<td>2</td>
<td>Zhejiang</td>
<td>0.1666</td>
<td>0.1616</td>
<td>0.1667</td>
</tr>
<tr>
<td>3</td>
<td>Yunnan</td>
<td>0.1067</td>
<td>0.2668</td>
<td>0.1731</td>
</tr>
<tr>
<td>4</td>
<td>Xinjiang</td>
<td>0.0626</td>
<td>0.0256</td>
<td>0.1873</td>
</tr>
<tr>
<td>5</td>
<td>Tibet</td>
<td>0.0137</td>
<td>0.1157</td>
<td>0.1817</td>
</tr>
<tr>
<td>6</td>
<td>Tianjin</td>
<td>0.0676</td>
<td>0.129</td>
<td>0.179</td>
</tr>
<tr>
<td>7</td>
<td>Sichuan</td>
<td>0.3123</td>
<td>0.2533</td>
<td>0.1685</td>
</tr>
<tr>
<td>8</td>
<td>Shenzhen</td>
<td>0.048</td>
<td>0.0918</td>
<td>0.1728</td>
</tr>
<tr>
<td>9</td>
<td>Shanghai</td>
<td>0.018</td>
<td>0.0602</td>
<td>0.1906</td>
</tr>
<tr>
<td>10</td>
<td>Shaanxi</td>
<td>0.1667</td>
<td>0.1397</td>
<td>0.1775</td>
</tr>
<tr>
<td>11</td>
<td>Shaanxi</td>
<td>0.1971</td>
<td>0.0675</td>
<td>0.1776</td>
</tr>
<tr>
<td>12</td>
<td>Shandong</td>
<td>0.5376</td>
<td>0.0507</td>
<td>0.1757</td>
</tr>
<tr>
<td>13</td>
<td>Qinghai</td>
<td>0.0305</td>
<td>0.0817</td>
<td>0.1669</td>
</tr>
<tr>
<td>14</td>
<td>Ningxia</td>
<td>0.0459</td>
<td>0.0317</td>
<td>0.1687</td>
</tr>
<tr>
<td>15</td>
<td>Inner Mongolia</td>
<td>0.2831</td>
<td>0.0253</td>
<td>0.1733</td>
</tr>
<tr>
<td>16</td>
<td>Liaoning</td>
<td>0.2553</td>
<td>0.0549</td>
<td>0.182</td>
</tr>
<tr>
<td>17</td>
<td>Jiangxi</td>
<td>0.0516</td>
<td>0.2746</td>
<td>0.1504</td>
</tr>
</tbody>
</table>

### (2) Setting the Best and Worst Evaluation

Determine the best and worst evaluation market performance in 33 areas for the first-class supper slim cigarette. The two evaluations are as follows:

$A^+ = \{0.5376, 0.5002, 0.1906\}$

$A^- = \{0.0137, 0.0253, 0.1504\}$

### (3) Measuring the Market Performance

Calculate separately the Euclidean distance between the object’s evaluation and the best / worst evaluation, the sets of the distances are as follows:

$L^+ = \{0.4909, 0.2055, 0.2598, 0.0613, 0.0957, 0.1204, 0.3762, 0.0781, 0.0534, 0.1929, 0.1902, 0.5251, 0.0612, 0.0377, 0.2704, 0.2456, 0.2522, 0.2942, 0.1595, 0.3470, 0.0496, 0.1611, 0.2181, 0.2568, 0.1857, 0.1243, 0.1273, 0.2538, 0.0685, 0.1732, 0.0885, 0.1409, 0.2248\}$

$L^- = \{0.4022, 0.5029, 0.4903, 0.6715, 0.6499, 0.5990, 0.3349, 0.6378, 0.6808, 0.5174, 0.5507, 0.4498, 0.6578, 0.6794, 0.5391, 0.5273, 0.5373, 0.5022, 0.5760, 0.5158, 0.6627, 0.5907, 0.4906, 0.4930, 0.5871, 0.5890, 0.6058, 0.4961, 0.6462, 0.5422, 0.6223, 0.5807, 0.5119\}$

Then calculate valuation of market performance for supper slim cigarette based on the topsis method, the sets of the results is $Y$.

$Y = \{0.549671, 0.29011, 0.346357, 0.0836239, 0.128339, 0.167347, 0.529057, 0.10908, 0.0727709, 0.271599, 0.256701, 0.538637, 0.0851222, 0.0525216, 0.334, 0.317731, 0.319494, 0.369461, 0.216825, 0.402221, 0.0696856, 0.214348, 0.307786, 0.342514, 0.240251, 0.174242, 0.173638, 0.338444, 0.0958336, 0.242075, 0.12456, 0.195228, 0.305171\}$
According to the results of market performance, sort the 33 areas are sorted as follows:

Table 2. The evaluation of market performance in 33 areas.

<table>
<thead>
<tr>
<th>Area</th>
<th>Evaluation</th>
<th>Ranking</th>
<th>Area</th>
<th>Evaluation</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chongqin</td>
<td>0.549671</td>
<td>1</td>
<td>Hainan</td>
<td>0.240251</td>
<td>18</td>
</tr>
<tr>
<td>Shandong</td>
<td>0.538637</td>
<td>2</td>
<td>Jilin</td>
<td>0.216825</td>
<td>19</td>
</tr>
<tr>
<td>Sichuan</td>
<td>0.529057</td>
<td>3</td>
<td>Heilongjiang</td>
<td>0.214348</td>
<td>20</td>
</tr>
<tr>
<td>Hunan</td>
<td>0.402221</td>
<td>4</td>
<td>Beijing</td>
<td>0.195228</td>
<td>21</td>
</tr>
<tr>
<td>Jiangsu</td>
<td>0.369461</td>
<td>5</td>
<td>Guizhou</td>
<td>0.174242</td>
<td>22</td>
</tr>
<tr>
<td>Yunnan</td>
<td>0.346357</td>
<td>6</td>
<td>Guangxi</td>
<td>0.173638</td>
<td>23</td>
</tr>
<tr>
<td>Hebei</td>
<td>0.342514</td>
<td>7</td>
<td>Tianjin</td>
<td>0.167347</td>
<td>24</td>
</tr>
<tr>
<td>Guangdong</td>
<td>0.338444</td>
<td>8</td>
<td>Tibet</td>
<td>0.128339</td>
<td>25</td>
</tr>
<tr>
<td>Inner Mongolia</td>
<td>0.334</td>
<td>9</td>
<td>Dalian</td>
<td>0.12456</td>
<td>26</td>
</tr>
<tr>
<td>Jiangxi</td>
<td>0.319494</td>
<td>10</td>
<td>Shenzhen</td>
<td>0.10908</td>
<td>27</td>
</tr>
<tr>
<td>Liaoning</td>
<td>0.317731</td>
<td>11</td>
<td>Gansu</td>
<td>0.095834</td>
<td>28</td>
</tr>
<tr>
<td>Henan</td>
<td>0.307786</td>
<td>12</td>
<td>Qinghai</td>
<td>0.085122</td>
<td>29</td>
</tr>
<tr>
<td>Anhui</td>
<td>0.305171</td>
<td>13</td>
<td>Xinjiang</td>
<td>0.083624</td>
<td>30</td>
</tr>
<tr>
<td>Zhejiang</td>
<td>0.29011</td>
<td>14</td>
<td>Shanghai</td>
<td>0.072771</td>
<td>31</td>
</tr>
<tr>
<td>Shaanxi</td>
<td>0.271599</td>
<td>15</td>
<td>Hubei</td>
<td>0.069686</td>
<td>32</td>
</tr>
<tr>
<td>Shangxi</td>
<td>0.256701</td>
<td>16</td>
<td>Ningxia</td>
<td>0.052522</td>
<td>33</td>
</tr>
<tr>
<td>Fujian</td>
<td>0.242075</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the same way, mesure the market performance of various regions in Shandong Province, the result is as follows:

Table 3. The evaluation of market performance in Shangdong.

<table>
<thead>
<tr>
<th>Area</th>
<th>Evaluation</th>
<th>Ranking in province</th>
<th>Ranking in china</th>
<th>Area</th>
<th>Evaluation</th>
<th>Ranking in province</th>
<th>Ranking in china</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yantai</td>
<td>0.41</td>
<td>1</td>
<td>7</td>
<td>Zibo</td>
<td>0.1</td>
<td>10</td>
<td>75</td>
</tr>
<tr>
<td>Qingdao</td>
<td>0.4</td>
<td>2</td>
<td>8</td>
<td>Binzhou</td>
<td>0.09</td>
<td>11</td>
<td>100</td>
</tr>
<tr>
<td>Weifang</td>
<td>0.26</td>
<td>3</td>
<td>22</td>
<td>Rizhao</td>
<td>0.08</td>
<td>12</td>
<td>108</td>
</tr>
<tr>
<td>Jinan</td>
<td>0.22</td>
<td>4</td>
<td>27</td>
<td>Tai'an</td>
<td>0.07</td>
<td>13</td>
<td>131</td>
</tr>
<tr>
<td>Linyi</td>
<td>0.2</td>
<td>5</td>
<td>33</td>
<td>Dezhou</td>
<td>0.06</td>
<td>14</td>
<td>151</td>
</tr>
<tr>
<td>Weihai</td>
<td>0.15</td>
<td>6</td>
<td>48</td>
<td>Zaozhuang</td>
<td>0.06</td>
<td>15</td>
<td>168</td>
</tr>
<tr>
<td>Dongying</td>
<td>0.13</td>
<td>7</td>
<td>51</td>
<td>Liaocheng</td>
<td>0.06</td>
<td>16</td>
<td>175</td>
</tr>
<tr>
<td>Jining</td>
<td>0.13</td>
<td>8</td>
<td>58</td>
<td>Laiwu</td>
<td>0.02</td>
<td>17</td>
<td>296</td>
</tr>
<tr>
<td>Heze</td>
<td>0.12</td>
<td>9</td>
<td>68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Market Selection Decision**

Through the analysis of the supper slim cigarette in 33 sale areas, the market performance scores are between 0.05 and 0.55, it shows that there are obvious differences among the 33 areas'. There are differences for acceptance and purchasing power for supper slim cigarette. It is suitable to gradually select partial area for new product. In the process of market selection, the decision can be according to the ranking of market performance score, and then combing with the actual situation of the company to choose the top province and cities to launch new products. For the supper slim cigarette, according to the evaluation score of each market, it is suggested to select Chongqing,
Yantai, Qingdao and Weifang in Shandong Province, and Chengdu, Luzhou and Mianyang in Sichuan.

Summary
With the increasingly fierce competition in the cigarette market, the research on the market selection for new cigarette is of great theoretical and practical significance to the management decision for the enterprise. From a quantitative point of view, the choice decision in new cigarette market is researched. Based on multidimensional factors, the index of influencing factors which influencing the segment market is built. Then combined topsis method, set up the evaluation model of market performance in the special market is set up. Furthermore, based on the sales date in 33 sales areas from January to August in 2017, take the the new supper slim cigarette in China as an example, and test the each market performance. According to the results, the advices of market choice decision for the new supper slim cigarette and the priority of selected market which has the characteristics of large capacity, high increase and high price is given.

Acknowledgement
This research was financially supported by the independent science and technology projects in Hongyunhonghe Tobacco Group(Contract No. HYHH2015RK01).

References