Fundamental Study on Relevance of Retail Format Structure and Average Profit Rate of Assets

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Abstract: There are insufficient researches done on the field of retail format structure at present both at home and abroad, and most of these researches focus on qualitative analysis. We put forward that the essence of good and bad structure is an equilibrium problem, and set up the evaluation criterion of the retail format structure according to the equilibrium theory in the paper. We analyze the relevance between the retail format structure and the average profit rate in China, in that we draw a conclusion that the analysis based on format structure equilibrium is an optimal one. [Nature and Science. 2005;3(1):42-44].

1 Foreword

Retail format structure is mainly used to describe retail format state under some certain circumstance. At present, there is not a definite and intact definition. We put forward that the definition of retail format structure should be in two aspects: narrow sense and broad sense, through our summing up and study on a large number of articles at home and abroad. The so-called definition of retail format structure in narrow sense encompasses the numbers of all retail format assets, incomes, profits, every kind of retail format and the according proportional relationship under a specific economic social environment. In broad sense, it defines as all kinds of retail format shops, assets, incomes and profits in every retail format, the according proportional relationship and the space structure of every retail format. It includes kinds and numbers of retail format and their proportional relationship and arrangement relationship. Its epitaxy includes quantity structure, assets structure, sales structure (market structure), profit structure and space structure.

In the following the paper is focused on the relationship between evaluation criterion and average profit rate, which involves improving the retail competitiveness of a district or a nation.

2 Foundation of the evaluation criterion of retail format structure

First, an evaluation criterion of retail format structure should be set up. We think that an equilibrium format structure is good according to the equilibrium theory. The essence of structure evaluation is to evaluate the equilibrium of format structure.

The paper is predominantly based on the equilibrium of Goshen's second theorem, whose basic content is that a consumer must make the utility by spending the last unit of money on each good equal maximize his utility and pleasure with his limited income. Mathematical method can also express the theorem. Suppose there are good A, good B, good C with their marginal utilities and prices M_{uA}, M_{uB}, M_{uC}, P_A, P_B, P_C respectively. Then the theorem can be written as follows:

$$\frac{M_{uA}}{P_A} = \frac{M_{uB}}{P_B} = \frac{M_{uC}}{P_C} \cdots$$

It is obvious that we can substitute a nation for a consumer, national format investment for consumer's purchasing behavior and the purpose of consumer's utility maximization equals national profit maximization. Therefore, the nation can get its maximum profit.

According to the above thought, we propose the correlation between each format asset structure and profit structure as an evaluation criterion of format structure, i.e., correlation coefficient. The more approximate the correlation coefficient is near 1, the

more balanced and the better the format structure is.

Correlation coefficient comes from clustering analysis. In clustering analysis we need classify not only samples but variables as well by using the tool of correlation coefficient. The general definition is as follows:

Suppose that V is a variable set and c is a real function from $V \times V$ to $[1 \times 1]$. If

(1) $c_{xy} = \pm 1 \Leftrightarrow x = ay, a \neq 0$ (constant)

(2) $\forall x, y \in V, \left| C_{xy} \right| \leq 1$;

(3) $\forall x, y \in V, c_{xy} = c_{yx}$

then c_{xy} is the correlation coefficient of x and y.

The more approximate $\left| c_{xy} \right|$ approaches 1, the more closely the relation between x and y is and the larger the correlation is. The most frequent correlation is included angle cosine. Suppose n observed values of index variables I_i and I_j form n-dimension vectors $x_i = (x_{1i}, x_{2i}, \cdots, x_{ni})^T$ and $x_j = (x_{1j}, x_{2j}, \cdots, x_{nj})^T$. We define the correlation coefficient is

$$ C_{ij}(I) = \cos(x_i, x_j) = \frac{(x_i, x_j)}{\|x_i\| \|x_j\|} = \frac{\sum_{k=1}^{n} x_{ki} x_{kj}}{\sqrt{\left(\sum_{k=1}^{n} x_{ki}^2\right)\left(\sum_{k=1}^{n} x_{kj}^2\right)}} $$

The correlation coefficient method in the paper is that we create structure vectors according to the theorem and then work out the correlation coefficient of

every format asset vector and profit vector. After that we evaluate format structure development through observing correlation coefficient. The more approximate the coefficient approaches 1, the more correlated the asset and profit vectors are, the better and the more balanced the structure is. On the contrary the structure is out of balance.

3 Empirical analysis on the correlation of retail format structure and average profit

According to the equilibrium theory above, we can evaluate retail the format structure in every district. First we evaluate retail format structures in the whole country (China) and 9 districts and then set up the following index variables.

(meaning of signal: GM_i for the *ith* format assets; LY_i for the *ith* format profit; t for time)

1. Asset structure vector $\overrightarrow{GM} = \{GM_1, GM_2, GM_3, GM_4\}$

2. Profit structure vector $\overrightarrow{LY} = \{LY_1, LY_2, LY_3, LY_4\}$

3. $C(GL)_t = \cos(\overrightarrow{GM}, \overrightarrow{LY})_t$ ($C(GL)_t$ for the correlation coefficient of asset and profit)

According to the study on the cross-section data of retail format in each district in 1999, we get the correlation coefficients between the format assets and profits as follows:
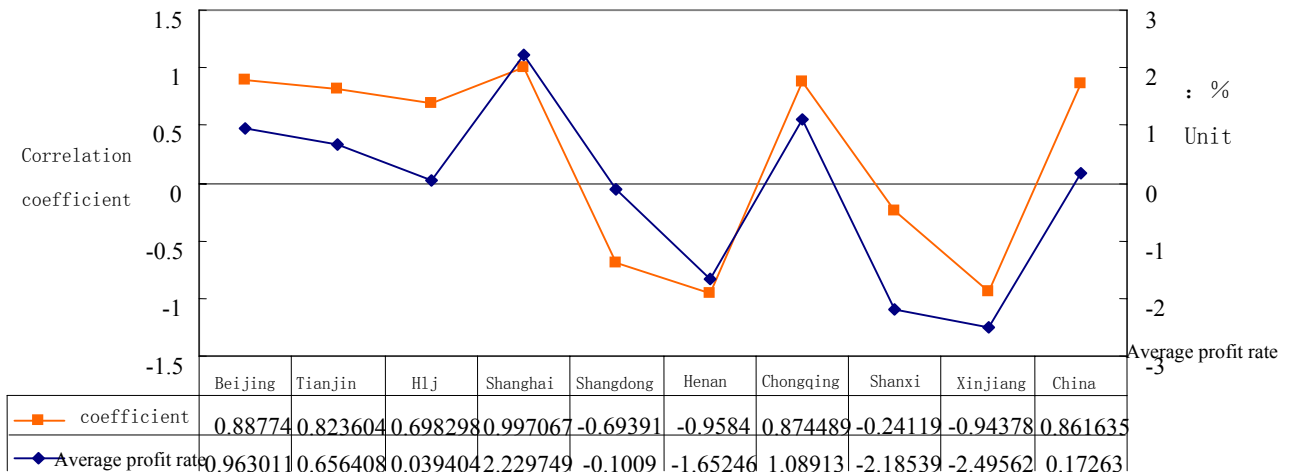

	Beijing	Tianjin	Hlj	Shanghai	Shangdong	Henan	Chongqing	Shanxi	Xinjiang	China
coefficient	0.88774	0.823604	0.698298	0.997067	-0.69391	-0.9584	0.874489	-0.24119	-0.94378	0.861635
Average profit rate	0.963011	0.656408	0.0394042	2.229749	-0.1009	-1.65246	1.08913	-2.18539	-2.49562	0.17263

Figure 1. Retail format structure and profit rate in 9 districts in 1999

But does structure equilibrium really mean high profit rate? We make our further empirical research on correlation between format structure and average profit rate and we get correlation coefficient between format structure and average profit rate $r = 0.83214$

$$t = \frac{0.83214\sqrt{10-2}}{\sqrt{1-0.83214^2}} = 4.24 .$$ When the level of

significance is 0.01, $t_{\alpha/2} = 3.3554$, $t > t_{\alpha/2}$, which

means that *r* passes significance test, i.e. the correlation coefficient between format structure and average profit rate is highly linearly dependent.

4   Conclusion

Through our research, we verify the essence of whether a structure is good or bad is the problem of structure equilibrium. Balanced format structure can create higher profit rate. Consequently it is optimum one. Afterwards we can judge whether the retail format structure in a district is good or bad through measuring its correlation coefficient and then adjust it to improve retail industry competitiveness in the district.

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