THE POSSIBILITIES OF PRACTICAL IMPLEMENTATION OF REGRESSION ANALYSIS IN LOCATION CHOICE

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Abstract

"Location, location, location" is a well worn catch phrase of the real estate industry. Invest in a property in the right location and watch your investment soar in value. The same catch cry may or may not hold true for the restaurant (hotel) industry, open a restaurant in the right location and are you on the way to become a winner? The question is: Did the best locations for a restaurant (hotel) automatically mean that the restaurant (hotel) is profitable? The intention of this paper is to show if there is positive correlation between the best location and restaurant's (hotel's) profitability.

Key words: efficiency, gross sales, location, multiple regression analysis.

JEL classification: C10, L83, M10.

1. INTRODUCTION

From the resource management point of view the restaurants (hotels) are heterogeneous, implying different sources of competitive advantage. Differences in location and differences in the service quality, over a variety of dimensions, may create competitive conditions for some hotels or restaurants. Those two aspects of business, service quality and location, affect their technical and locative efficiency. Technical efficiency is usually called efficiency, and represents utilization of restaurant's (hotel's) resources. It is one of the topics in (daily) management operations. Locative efficiency is usually called effectiveness, and represents the level of efficiency in the resources' location. It is one of the main topics in strategic management. While technical efficiency is connected to service quality, locative efficiency is connected to destination (location) choice.

Successful companies are the ones that are capable to make effective strategic decisions and have adequate information available to decision makers (managers). The formulation of the strategy strengthening restaurant or hotel operations, and upgrading the quality of service has become essential not only for profitability, but also for a hotel's survival (Chen, 2007, p. 696-702.). Though service quality is important, it can be changed or improved relatively easy comparing to location. Location affects effectiveness, and it is very hard and expensive to be changed, so it demands careful choice. This paper shows how one of statistical methods (regression analysis) can be used for determining restaurant's (hotel's) location.

2. FACTORS OF RESTAURANT'S (HOTEL'S) EFFICIENCY: BUSINESS CULTURE AND APPLICATION OF STATISTICAL METHODS

While efficiency (technical efficiency) can be improved with a daily management, effectiveness (locative efficiency) can be improved through decisions under strategic management. Though those aspects of business performance are different, they have, at least, two common things. The first one is business culture, based on mutual respect and trust among the employees and managers. The relationship between managers and their subordinated employees can be described as "friendship on the distance". It means that employees are free to ask their managers anything that concerns their tasks, but also to explain the failures of the existing way of doing activities and to propose ideas and present a possible new way of doing the same activities. In that way employees are not just machines, which accept orders from managers and realize them without asking any questions and without thinking about them. They realize committed activities "thinking" about the way they are structured and performed, and not "without thinking". Besides internal communication (among employees, between employees and managers, and among managers themselves), a very important segment of business culture is external communication. External communication is essential for creating relationship with external stakeholders, especially customers. In modern conditions, every employee has to act as salesman, no mater in what organization unit is engaged. Though marketing function provides an answer to the question of how to attract guests under conditions of ever growing competition, guests' satisfaction and the long-term survival in the hotel industry, imply that every employee must perform activities in the way that satisfies "the next employee

in the line" or the guests (clients) themselves. Every employee, especially when it is about hotel industry, has to know that quality of his work has influence on customers' or clients' satisfaction. In that way, there is indirect connection between all employees (except ones employed in sales department, which are directly connected to customers) and customers. Through external communication managers and employees can find out what are the customers' needs and expectations. This kind of information can help the manager to take decisions which have influence on locative efficiency or effectiveness. On the other hand, internal communication is very important for processes' improvement realization, because every employee has to strive to accomplish expectations of "the next one in the line". In that way, internal communication represents the significant factor of technical efficiency. If business culture is "friendly" it means that it is acceptable for anyone to make mistakes and not to be punished for that. In order to find out what the causes of mistakes are, and who has made them, instead of punishing the "guilty" ones, managers has to introduce statistical methods.

Exactly the other thing that connects efficiency and effectiveness is the use of statistical methods in order to improve business decisions. There is a huge spectrum of statistical methods that can be used in order to improve efficiency. Nowadays, dealing with operational management's problems can not be imaged without statistics. Statistical process control is especially valuable, since functional organization is replaced with process organization. Flow chart, Bar chart, Process chart, Control chart, Pareto diagram, Fish-bone diagram, Process capability, Hypothesis testing, and Regression analysis, are the most popular statistical tools which are applied under operational management, for efficiency improvement. Though the use of statistical tools is usually connected to operational management, there are some that can be used at strategic management level. In this paper the focus is on regression analysis, as tool for determining hotel's location.

3. MULTIPLE REGRESSION MODELS AS A TOOL IN LOCATION CHOICE

Statistical modelling methods, such as stepwise multiple regression analysis, are extensively used by retailers and restaurant chains that serve highly segmented or hard-to-measure markets. Thanks to personal computers, the application of these methods has become dramatically easier and more cost-effective in recent years. However, as a result of this, statistical forecasting models are also frequently misapplied because they involve crucial underlying assumptions that must be observed (and often are not).

Statistical modelling reduces the degree of subjectivity in developing a sales forecast but does not remove it. By definition, all models are simplifications of reality and can never consider all the factors affecting the gross sales of a new restaurant.

Multiple regression models (the most commonly applied statistical modelling method) are produced from an analysis of existing restaurant performances that identifies those variables (such as demographics and competition) which are significantly correlated (positively or negatively) with variations in gross sales. These key variables and their associated equations are then used to predict sales at a new restaurant.

The major problems in developing these models are their complexity and the need for a rare combination of statistical experience and practical experience. It is also important to understand that, depending on the form of their equations, multiple regression models provide only a static picture of restaurant performance and the factors affecting it. Ongoing changes in competition, product ranges, pricing and restaurant formats usually limit their relevance and effectiveness.

4. THE APPLICATION OF REGRESSION ANALYSIS IN RESTAURANT LOCATION CHOICE

Although there are no hard and fast rules for conducting econometric research, most investigators commonly follow a standard method for applied regression analysis. The steps in this procedure are necessary in order to achieve a successful analysis. The choice of dependent variable is determined by the purpose of the research. Once a dependent variable is chosen, the next steps are:

1. Review the literature and develop the theoretical model.
2. Specify the model: Select the independent variables and the functional form.
3. Hypothesize the expected signs of the coefficients.
4. Collect the data. Inspect and clean the data.
5. Estimate and evaluate the equation.
6. Document the results.

The purpose of suggesting these steps is not to discourage the use of innovative or unusual approaches, but rather to develop in the users a sense of how regression ordinarily is done by professional economists and business analysts.

If someone wants to determine the best location for the next restaurant (hotel) in the chain, he can build a regression model to explain the gross sales volume for each restaurant (hotel) in the chain as a function of various descriptors of the location in that

branch. Given the data on land costs, building costs, and local building and restaurant municipal codes, the owners of restaurants will be able to make a right decision.

1. *Review the literature and develop the theoretical model*. The first step in any applied research is to get a good theoretical grasp of the topic to be studied. It's virtually impossible to build a good regression model without a solid understanding of the topic that is analyzed. Although writing literature is considered as very significant, talking to various experts within the firm is considered even more valuable. They were the source of ideas about the attributes of a location that contributes to success at doing business. The experts can tell that all the chain's restaurants (hotels) are identical and that all the locations are localized in the so called „suburban, retail or residential environments". In addition, discussions with the people in the company's strategic planning department have lead to the conclusion that price differentials and consumption differences between locations are not as important as it is the number of customers that a particular location attracts. That means, the variable which was planned to study originally, gross sales volume, would vary as prices changed between locations. Then, it is possible to specify dependent variable as the number of customers served in a given location in the most recent year for which complete data are available.

2. *Specify the model: Select the independent variables and the functional form*. The most important step in applied regression analysis is the specification of the regression model. After selecting dependent variable, the specification of the model involves choosing the following components:

- the independent variables and how they should be measured,

- the functional (mathematical) form of the variables, and

- the type of the stochastic error term.

There are three major determinants of sales (customers). This is the number of people who live near the location, the general income level of the location, and the number of direct competitors close to the location. In addition, there are two other good suggestions for potential explanatory variables. These are the number of cars passing through the location per day and the number of months that the particular restaurant (hotel) has been opened. The exact definitions of the independent variables are:

N – Competition: the number of direct market competitors within a two-mile radius of the chosen location.

P – Population: the number of people living within a three-mile radius of the location

I – Income: the average household income of the population measured in variable P.

3. *Hypothesize the expected signs of the coefficients*. After deciding about which variables to include, hypothesizing signs will be easy to expect. Everyone expects that the more competition, the fewer customers (holding constant the population and income in the area), and also that the more people who live near a particular restaurant (hotel), the more customers (holding constant the competition and income). The expectation is that the greater the income in a particular area, the more people will choose to eat away from home and the more people will choose to eat in a family restaurant instead of lower-priced fast-food chains. However, people from especially high-income areas might want to eat in a restaurant that has more „atmosphere" than a family restaurant like ours. In addition, it's virtually impossible to get zoning clearance to build a 24-hour facility in a „ritzy" residential neighborhood.

As a result, the income variable might be ambiguous in its impact. To sum, the equation is:

$$Y_i = f\left(\overset{-}{N_i}, \overset{+}{P_i}, \overset{+}{I_i}\right) + \varepsilon_i = \beta_0 + \beta_N N_i + \beta_P P_i + \beta_I I_i + \varepsilon_i$$

where the signs above the variables indicate the expected impact of that particular independent variable on the dependent variable, holding constant the other two explanatory variables and ε_i is a typical stochastic error term.

4. *Collect the data. Inspect and clean the data.* Data collection may begin after the specification of the regression model. This step entails more then a mechanical recording of data, though, because the type and size of the sample must also be chosen. A general rule regarding sample size is the more observation the better as long as the observations are from the same general population. They also should have the same frequency (monthly, quarterly, annual, etc.) and time period.

Another area of concern has to do with the units of measurement of the variables. Does it mater if a variable is measured in dollars or thousands of dollars? All conclusions about signs, significance, and economic theory are independent of measurement units.

In given analysis, it is necessary to include every local restaurant in the chain. The final step before estimating equation is to inspect and clean the data.

After inspection, it is possible to conclude that the quality of our data is excellent if: each manager measured each variable identically, each restaurant has been included in the sample and all the information is from the same year.

5. *Estimate and evaluate the equation*. Using the computer program like EViews, or SPSS, or MATLAB regression equation becomes easy to estimate. Typically, estimation is done using Ordinary

Least Squares (OLS). OLS has become so standard that its estimates are presented as a point of reference even when results from other estimation techniques are used. OLS is a regression estimation technique that calculates the regression coefficients in order to minimize the sum of the squared residuals. These residuals are the differences between the actual Ys and the estimated Ys produced by the regression. After estimation, it's necessary to evaluate results in a variety of ways. How well did the equation fit the data? Were the signs and magnitudes of the estimated coefficients what we expected them to be? To predict checks, a proxy for sales at potential new locations, it's possible to obtain the values of N, P and I for each potential new location and then plug them into estimated equation. Once the evaluation is complete, it doesn't mean that is automatically possible to go to step no. 6. It's often worthwhile to estimate additional specifications of an equation in order to see how stable the observed results are. This approach is called sensitivity analysis.

6. *Document the results.* One of the important parts of the documentation is the explanation of the model, the assumptions, and the procedures and used data. The written documentation must contain enough information so that the entire study could be replicated by others.

5. CONCLUSION

Location choice, no matter if it is about the country or a special place in a country, it represents one of the most important decisions for the one that opens the restaurant (hotel), as well as for the one that, as a guest, chooses the restaurant (hotel). Location choice is the function of many factors, like country image accessibility, attractiveness, safety level, etc. It means that restaurant's (hotel's) effectiveness depends, to a large extent, on external factors.

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