PROFITMAXIMIZATION ACCORDING TO LINEAR PROGRAMMING PATTERN IN PUZZLE COMPANY

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Abstract
The main purpose of this study is evaluating Profitmaximization according to linear programming pattern. The population of study is Puzzle Factory. Its activity is the production of precast concrete parts. All information related to the sales price and the cost of each of the products was extracted from the company's accounting system and some of the information was estimated. Manufacturing planning has been considered for the second half of 2012. One of the methods used to determine the final output value of production factors and determining the minimum or maximum value of an linear function in the presence of multiple constraints, is linear programming model. According to Table 1 results, by comparing the benefits of using the optimal pattern that is equivalent 1,189,782,617 RLS and benefits derived from the application of the current model of the plant is equivalent 780,000,000 RLS. The difference is equivalent 409,782,617 RLS that it is the finest result from using non-optimal solutions in company.

Keywords: Profitmaximization, linear programming pattern, optimal solutions

INTRODUCTION
A central question in development economics is the extent to which the rural environment is characterized by competitive markets. The answer has direct implications for the efficiency of the allocation of resources, for the design of economic policy, and for the choice of appropriate analytic methods. Hence, an important task of empirical development economics is to provide a characterization of the market environment in rural areas of poor countries. Much of the relevant literature has been concerned with the existence of well-behaved labor and land markets (Udry, 1996).

Studying heterogeneity in firm competitive behaviors, such as entry, exit, price rivalry and other types of competitive actions is a central topic in competitive strategy research. Recent work has prominently recognized that differences in firm characteristics are important determinants of variance in competitive actions (Vroom and McCann, 2010).

A firm in a competitive industry cannot charge more than the market price for its output. If it also must compete for its inputs, then it has to pay the market price for inputs as well. Suppose that a profit- maximizing competitive firm can vary the amount of only one factor and that the marginal product of this factor decreases as its quantity increases. Then the firm will maximize its profits by hiring enough of the variable factor so that the value of its
marginal product is equal to the wage. Even if a firm uses several factors, only some of them maybe variable in the short run (Lipsey, 1975).

For nearly a century, the assumption that the firm maximizes profits has been front and center in neoclassical economic theory. Tollison (2003) writes “Recall the extensive debate about whether firms maximize profits in the 1940s and 1950s. This was a useful interlude in economics, but it mostly served the purpose of forcing scholars to be more careful in framing maximization hypotheses, and as a consequence, the profit-maximization hypothesis is basically a non-issue today”.

Indeed, there has been a rich literature on the subject—based mostly around the behavioral view of the firm—that for the most part has remained on the periphery of mainstream economic thought.

That economists would question the methodology of the dominant paradigm is understandable, given that the standard “theory of the firm” is based upon rigid assumptions that do not seem to be particularly realistic. Cyert and Hedrick (1972) note “The unmodified neoclassical approach is characterized by an ideal market with firms for which profit maximization is the single determinant of behavior. Thus predictions can readily be made by combining the description of the market with the results of maximization of the relevant Lagrangian” (Anderson, and Ross, 2005).

A firm’s profit, \( \pi \), equals its total revenue, \( R \), minus its total cost, \( C \), all of which are functions of the firm’s output. In symbols, \( \pi (Q) = R(Q) - C(Q) \). The first-order condition for maximum profit is that the derivative of profit with respect to output is zero. That is, the profit-maximizing level of output solves the equation: \( \frac{d\pi(Q)}{dQ} = \frac{dR(Q)}{dQ} - \frac{dC(Q)}{dQ} = 0 \). The term \( \frac{dR(Q)}{dQ} \) is just marginal revenue, while the following term is marginal cost.

Accordingly, the condition for maximum profits is \( MR = MC \), or more precisely, that marginal revenue and marginal cost are equal at the profit-maximizing output level. In the specific case of competitive markets, the firm’s marginal revenue is equal to price so this condition takes the form \( P = MC \).

The second-order condition requires that \( \frac{d^2 \pi(Q)}{dQ^2} < 0 \), or that marginal cost cuts marginal revenue from below. While equating marginal revenue with marginal cost provides a maximum value for the firm’s profits, this maximum may be only a local maximum. Further, the value of profit at this local maximum need not even be positive—that is, it is possible that the best the firm can do is to lose as small an amount as possible. To see if the \( MR = MC \) rule provides a global maximum, we also need to check profits at an output of zero. If output is zero, then revenue and variable cost are also zero. The firm’s profit at zero output equals \( \pi(0) = 0 - (FC + 0) = -FC \); that is, a firm choosing to shut down in the short run loses an amount equal to its fixed costs. Naturally, then, the firm would only select this option if its losses at the \( MR = MC \) output were greater than its fixed costs. Let \( Q^* \) be the output that satisfies the \( MR = MC \) rule. Total profit at this point will be \( \pi(Q^*) = PQ^* - (FC + VC(Q^*)) \). Profit at \( Q = 0 \) will be higher than at \( Q = Q^* \) if and only if \( \pi > \pi(Q^*) \), or \( -FC > PQ^* - (FC + VC(Q^*)) \). Dividing both sides of this inequality by \( Q^* \) and rearranging, the firm minimizes its losses at \( Q = 0 \) if and only if \( P < \frac{VC(Q^*)}{Q^*} \). Note that the right-hand-side term is the firm’s average variable cost at the \( MR = MC \) output level. Since average variable cost is equal to marginal cost at minimum average variable cost, we can state the complete short-run profit-maximizing rule as follows: produce the output for which \( MR = MC \), provided price is greater than minimum average variable cost; otherwise shut down (Wilson, 2011).
Revenue management practices have long been utilized in the hotel industry to maximize financial performance. Hoteliers know that the variable cost of an occupied room, such as housekeeping labor and supplies, room amenities, utilities, etc., are minimal when compared to the room revenue generated from the sale. Even when large discounts are offered against room rate, significant margin will exist with the goal being to generate enough revenue to exceed the fixed costs of running the hotel. Spas operate differently, with variable costs being significant and fixed costs being a smaller factor. Therefore, spas should focus their strategy on profit management instead of revenue management.

Developing a profit management plan for your spa will take time, but if you follow this simple road map you will be able to implement a strategy built on understanding the financial consequences of your operational decisions. We will use the following process to determine the variable components of your cost structure, which will allow you to determine the impact of operational strategies and pricing decisions (Singer and Campsey, 2012).

1. Distinguish between fixed costs and variable costs
2. Separate variable costs into step variable costs and true variable costs
3. Determine the drivers that cause step variable costs and true variable costs to change
4. Implement a process to evaluate the profit impact of changes in business volumes

Before developing and implementing your strategy, it is important to determine the cost structure of your spa. Throughout the process, all necessary information may not be available to you. It is important that your analysis is thorough and accurate. I do advocate, however, carefully weighing the time commitment in studying data to the value it will grant. If making a reasonable estimate will save you a significant amount of time and labor, then use the estimate and proceed. For the purpose of this article, we will focus on breaking costs down into fixed costs, semi-variable costs and variable costs. Additionally, we will separate variable costs into step variable costs and true variable costs. Below are basic definitions for the terms we will be using:

- **Fixed Costs**: Costs that do not vary with changes in business volume. Examples of fixed costs include management salaries and service contracts.
- **Semi-Variable Costs**: Costs which contain both a fixed and variable portion. Examples of semi-variable costs include wages for non-service providers, locker room amenities and operating supplies.
- **Variable Costs**: Costs that are fully dependent on business volumes. Examples of variable costs include wages to service providers (when dependent on a service) and professional supplies.
- **Step Variable Costs**: Costs that are uniform until a specified threshold is reached.
- **True Variable Costs**: Costs that are incurred directly when additional business volume is incurred (Singer and Campsey, 2012).

So, the main purpose of this study is evaluating Profit maximization according to linear programming pattern. For optimal use of the limited resources of each company and the market, the use of scientific methods, including methods for predicting the optimal planning of products is important. This study considers the production and sale of products is due to the limitations of using linear programming company and increase company profit.

In this paper we try to answer these questions:

- Is profit maximization can be programmed products to produce and sell to maximize its profits?
- Is the linear programming model in compare with the traditional method leads to the optimal allocation of resources?
METHODOLOGY
The population of study is PuzzleFactory. Its activity is the production of precast concrete parts. All information related to the sales price and the cost of each of the products were extracted from the company’s accounting system and some of the information is to be estimated. Manufacturing planning has been considered to this factory for the second half of 2012.

Information needed to test hypotheses have been established primarily in information and sources with using deductive method as follows:
1. Use to the books and papers in relation with research subject
2. Interviews with company experts and specialists as well as interviews with executives and officials of other similar companies and professor of operations research.
3. Use to the Puzzle’s Company’s accounting and financial documents and books to get basic information about the selling price, demand, and cost... for items of inventory. Products.

One of the methods used to determine the final output value of production factors and determining the minimum or maximum value of a linear function in the presence of multiple constraints, is linear programming model. This study also used this model to track the desired objectives and research hypotheses were tested.

The company has proposed the following linear programming model:

\[
\text{MAX } f = \sum_{i=1}^{6} \sum_{j=1}^{6} d_{ij}p_{ij} - \sum_{i=1}^{6} \sum_{j=1}^{6} (X_{ijk}c_{ijk}) - \sum_{i=1}^{6} \sum_{j=1}^{6} Y_{ij}h_{ij}I - \sum_{i=1}^{6} Y_{0i}C_{i0}
\]

To simplify the model, the Rial value of Balance at end of month, for product was considered \((\frac{3}{4} c_{ij1} + \frac{1}{4} c_{ij2}) = h_{ij}\) that makes error but it's easy to model. Also, \(I = 0.2\) is assumed.

Manufacturing limits for the various products at Puzzle's Company:
Normal time limits:
\[
\sum_{i=1}^{6} a_{i}X_{ij1} \leq (7.25)(60)(60)(24) \quad j = 1,2,3,4,5,6
\]

Timelimits of overtime:
\[
\sum_{i=1}^{6} a_{i}X_{ij2} \leq (2.5)(60)(60)(24) \quad j=1,2,3,4,5,6
\]

Raw materials limitations:
\[
\sum_{i=1}^{6} \sum_{k=1}^{2} b_{rk}X_{ijk} \leq b_{rj} \quad j = 1,2,3,4,5,6 \quad r = 1,2,3,4,5,6,7
\]

Limitations of Demand:
\[
\sum_{k=1}^{2} X_{ijk} - Y_{ij} + Y_{i,j-1} = d_{ij}
\]

\[
i = 1,2,3,4,5,6 \\
j = 1,2,3,4,5,6
\]

\[X_{ijk} \geq 0 \quad Y_{ij} \geq 0\]

RESULTS
To analysis of the model we used the Lingo software. As can be seen in the output Lingo software, software has reached to optimal solution in the sixteenth step.

Total solver iterations: 16

And the optimal value of the objective function (the ultimate benefit producers) equal to 1,189,782,617 rials have been obtained for the half-year study.

Objective value: \(0.1189783E+10\)

In order to achieve the possible profit maximum first must ensure the integrity of the datamodel. Therefore, we has earned confidence properly and scientifically calculated cost of production and the cost that are involved in the production of each product.

Comparison of Manufacturing Optimal Pattern with present model Puzzle Company
Manufacturing products which maximize profits:
The results are shown in Table 1.

<table>
<thead>
<tr>
<th>Traditional Methods</th>
<th>Optimization Methods</th>
<th>Difference</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit</td>
<td>780,000,000</td>
<td>1,189,782,617</td>
<td>409,782,617</td>
</tr>
</tbody>
</table>

According to table 1 results, by comparing the benefits of using the optimal pattern that is equivalent 1,189,782,617 RLS and benefits derived from the application of the current model of the plant is equivalent 780,000,000 RLS. The difference is equivalent 409,782,617 RLS that it is the fines resulting from use of non-optimal solutions in company.

References