

MANAGERIAL ECONOMICS AND THE EFFECTIVENESS OF QUANTITATIVE ANALYSIS FOR PROFIT MAXIMIZING COMPANIES IN AFRICA

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ABSTRACT

Quantitative analysis uses mathematical and statistical tools to quantify information for effective managerial decision-making. Past experiences have shown that, lack of planning and appropriate managerial skills are some of the reasons why companies struggle to remain competitive in the market. This study is based on the premise that, quantitative analysis strongly assists senior-managers in making decisions that contribute to the growth of the company. Numerous studies have used quantitative analysis to predict productivity, maximize profit culminating to managerial decision-making. Profit maximizing companies have relied on the effectiveness of quantitative analysis methods to plan for future activities. These companies are able to collect monthly data on their production costs. They are also in a position of keeping track of their production and make comparative analysis that will guide them in making the necessary changes depending on the problems identified. Using the Cobb Douglas production function, this study was able to review this theory and analyze data from various plants generated by the regression equation. Which is why, this paper has strongly argued that, the implication of quantitative approach is useful in managerial decision-making.

KEYWORDS: *Decision-making, growth, quantitative analysis, profit-maximizing, Cobb Douglas production function*

JEL CLASSIFICATION: *C69, M21*

1. INTRODUCTION

Managerial economics is an areas of economic that deals with managerial decision-making process which forms part of the broader strategy used by top management in planning for future activities. Prior to demonstrating that, quantitative analysis is useful in managerial decision-making, it is important to review the role of management in the economy in general and business in particular. Management involves using people skills within the company for the running of day to day business in order to achieve the company objectives. This is achieved through decisions by top managers who then decide to plan according to well defined targets. Top managers are required to understand international economies, how markets function and the political economy of global governance in order to assure the company effectiveness. There are three level of management that initially includes Top Management. This level of management comprises decisions-makers; these include the board of director and the Chief Executive Officer (CEO). The CEO is tasked with the implementation of decisions taken at board level. He is in charge of the company. It is at this level that, policies and strategic plans are developed to achieve the company's objectives. The next level

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involves Middle Management who at this level are in charge of running the departments and reporting to top management. They are in charge of implementing decisions from the CEO. The success of the company therefore depends on the course of action taken by capable managers. The last level in this organizational structure involves Front Manager or first level managers where supervisors are tasked to dispatched work to employees working in the plants; they are tasked to check on the quantity and quality of production that are very important components in the maximization of profit.

The Management of business is therefore related to the management of the company through sound leadership that involves controlling, monitoring, organizing and planning (Drucker, 2004).

However it is important to retain that, past studies have convincingly demonstrated that companies failed in their first five years because of lack of capacity and technical abilities of top and middle managers to manage, design and implement effective group and intergroup work as well as information related systems. These types of managers are usually unable to drive the vision of the company because of lack of planning and managerial skills. They failed to translate plans into action, failed to pay due attention to decision-making process leading to poor communication which jeopardizes the company opportunities. Planning is thus an important component in the success of any company. Three categories of planning are to be taken into consideration if a company strives for the organization effectiveness and success.

These include: a) Strategic planning where top management and the board decide on long terms plans. These plans are broken down into yearly work plans to include activities that are to be implemented by specific departments that all contribute to achieve the vision and the organization goals based on specific targets b) tactical planning is another form of strategy that is applied in a shorter terms to correct unachieved tasks within a certain period of time so that the goals and objectives of the company are not put at risk. This is where the company may be in need of well-trained decision-makers who are well equipped enough to keep the company in the market and maintain its competitiveness. C) The last form of planning may be viewed as contingency planning. This form of planning is very useful for decision-makers who may test a number of alternatives before choosing one that may assist the company to achieve its organization effectiveness (Charles, 2005).

2. RATIONALE FOR DECISION MAKING PROCESS

The choice of wrong decisions is at the centre of companies' failure to maximize profit exposing them to become less competitive in the market. The failure could be related to wrong decision on the quality of the product and the cost attached to this. If that is the case then, this aspect of decision could be related to what Taguchi called loss function. Taguchi (1988) actually explains loss function comprehensively as the impact on quality cost of not meeting the required targets. The above might have a negative implication in the maximisation of profit. Taguchi went onto developing a quadratic model describing the cost of quality (Aikens, 2011:120). This model is expressed as the following:

$$L(x) = k(x-T)^2 \quad (1)$$

In this equation:

X= an actual measurement of a quality feature

L(x)= loss as function of the output

T= target value of the quality feature which is generally nominal

K= which is a constant depending on orders of magnitude, units of measures, and loss function monetary units

In Aikens, (2011:120) Taguchi further inferred that, the quality of processing, screening or inspection cannot support poor design. He further argued that, an appropriate design assist manufacturing processes to minimize cost including variability scrap, rework and downtime while facilitating flow. The planning process should therefore take the above aspect into consideration. For all aspects of planning to contribute effectively on decision-made, information should be quantified to assure accuracy and efficiency. Decision-makers can choose among the strategies that offer better options in profit maximisation. A pure competitive market is guided by the law of supply and demand to forecast market prices since the market price is dictated by the forces of supply and demand.. To stay competitive in this market, all three forms of planning are to be taken into consideration. Therefore, for the purpose of this paper, the supply and demand functions are the key elements that motivate for the production of goods and services. Companies use the basic principles of the law of supply and demand to assess and estimate the quantity of goods to supply in market. The above allows decision-makers to understand different scenarios that affect the markets, its total production, and labour as well as the capital utilised to run the business.

The scenarios that are readily available for decision-makers in a pure competitive market are classified under the following circumstances: when demand is greater than supply there is scarcity (shortage) in the market and this might cause the increase in price as more money will be chasing for the few goods available in the market, but when supply is rather greater than demand, there is surplus and this might lead to prices cut prompting the company to reduce productivity by bringing it at an acceptable level where the company might not experience heavy lost. The market is cleared when the quantity of goods sold are equal to the quantity of good demanded. From the above, it is equally possible to analyze the elasticity of demand and revenue which are critical elements for profit maximization.

Other economic tools equally assist the companies for making appropriate decisions for the growth and the stability of the organization. Numerous companies have thus used quantitative analysis to predict productivity, maximize profit culminating to managerial decision-making. Profit maximizing companies have relied on the effectiveness of quantitative analysis methods to plan for future activities. These companies are able to collect monthly data on their production costs. They are also in a position of keeping track of their production and make comparative analysis that will guide them in making the necessary changes depending on the problems identified. Using the Cobb Douglas production function, this study was able to review it theory and analyze data generated from various plants and calculate a regression function and discuss the various characteristics of the results as well as the estimated production for each plant.

3. THE IMPACT OF QUANTITATIVE METHODS AND ITS USEFULNESS FOR DECISION-MAKERS

The field of social science is becoming more and more complex and decision-makers are increasingly using quantitative techniques to make considerable decisions after defining the problem and identifying specific and clear objectives while looking into possible alternatives. While assessing these alternatives, it is always important to measure the risk involve before deciding on the implementation process.

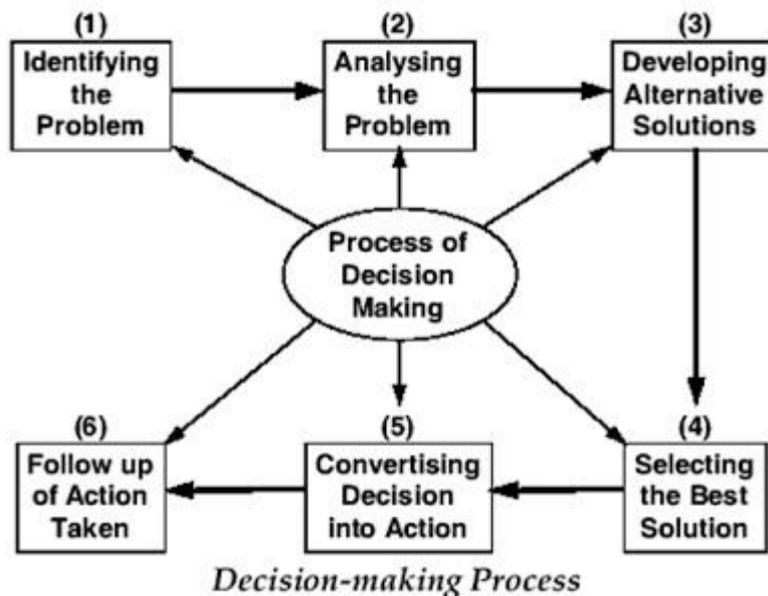


Figure 1. Decision - making process

Source: Gaurav Akrani, 2010³

Decision making is a course of action that decision-makers take in order to solve the problem at hand by using the necessary information that are available. For instance since financial statements provide information about the state of finance in an organization, Financial Managers make decisions in line with the financial situation of the organization. Economists rely on past and current data to explain the macro and micro situation of the economy. Based on this information, economists are able to predict the rate of unemployment, the rise in price of commodity through the consumer price index etc.

Quantitative analysis is important in that it is using scientific methods to facilitate the understating of fact based on empirical evidence, this is why the current study chose the Cobb Douglas Production function in order to show through his equation how it is possible to estimate production and costs over a given period of time.

4. THE THEORY OF PRODUCTION AND COBB DOUGLAS PRODUCTION FUNCTION

The production function can be defined as the relationship between productive inputs and outputs of products per unit of time. Cobb-Douglas relied on this definition to introduce the production function which is still more accurate in the field of economics in modern time. However, the involvement of Cobb-Douglas on issues related to production function has inspired other rising social scientist who has used this theory to predict production. This is the case of, ⁴Bao Hong, Tan (2008) who convincingly explained that, Cobb-Douglas production function was initially proposed by Knut Wicksell (1851 - 1926) and then tested against statistical evidence by Charles Cobb and Paul Douglas in 1928.

Bao further explained that In 1928 Charles Cobb and Paul Douglas published a study in which they modelled the growth of the American economy during the period 1899 - 1922. They considered a simplified view of the economy in which production output is determined by the amount of labor involved and the amount of capital invested. He argued that, even though a number of facture may

³ <http://kalyan-city.blogspot.com/2010/06/decision-making-process-in-management.html>

⁴ Web: <http://www.antiessays.com/free-essays/Cobb-Douglas-Production-Function-408497.html>

affect economic performance, their model is still considered as one of the best in this field. A two inputs production function introduced by Cobb-Douglas took into consideration Labour (L) and Capital (K). The following equation was therefore used to estimate production:

$$Q = mL^nK^{1-n} \quad (2)$$

- ❖ Q= Total Production
- ❖ L= Quantity of Labour
- ❖ K= Quantity of Capital
- ❖ m,n are the constant in the equation, they are output elasticities of labour and capital

A number of characteristic made this equation very popular and more reliable in determining total production.

- a) The Cobb-Douglas equation is an exponential function that could be translated into a linear equation

$$Q = mL^nK^z \quad (3)$$

This exponential function could be translated as follow:

$$\log Q = \log m + n \log L + z \log K \quad (4)$$

Since the original equation $Q = mL^nK^{1-n}$

It should be noted that the outputs elasticities measure the reactions of output to a change in the levels of labor or capital used in the production, other factor remaining constant. Meaning if $n = 0.25$, a 1% increase in labor would lead to approximately a 0.25% increase in output.

$$\text{Therefore if : } n+z = 1 \quad (5)$$

This means that the production function is under constant return to scale meaning output increases by the same proportional .Returns to scale can be viewed as characteristics of production that look into the variations in output as a result of a proportional change in well-defined inputs. If output increases by that same proportional change then there are constant returns to scale (CRTS),

$$(6) \text{ If } n+z > 1$$

there is an increase in return to scale which is a clear indication that there is perfect completion because input increases more.

$$(7) \text{ If } n+z < 1$$

this is an indication that output increases by less than the required proportional change, meaning there are decreasing returns to scale (DRS).

These assumptions are therefore important in that they are more explanative in that, the Cobb-Douglas equation allows probing the marginal product for any factor while holding others constant Paul G Keat *et al* (1996).

If the production function is $Q = Q(L, K)$

$$MP_L = \partial Q / \partial L \quad (8)$$

This means in this case that partial derivative of quantity of output with respect to the factor is the marginal product. It is important for managers to become conversant with the marginal benefits as well as costs related to individual plan of action involving the allocation of scarce resources.

a) **Marginal product for Labour**

$$\begin{aligned} &= mnLn-1K1-n \quad (9) \\ &= mnLnL-1K1-n \\ &= nL-1Q \\ &= nQ/L \end{aligned}$$

b) **Marginal Product for capital**

$$MP_L = zQ/K \quad (10) \text{ or alternatively this could be converted as:}$$

$$MP_L = (1-n)Q/K \quad (11)$$

Practicability and effectiveness of the Cobb-Douglas Equation

Ham and Hill (1993) quoted by Selby Smith (2001) convincingly argued that, the decision-making initiative should focus its analysis in three areas that include the process leading to decisions, the sharing of power and those involved in the process of decision-making. Selby Smith (2001) further inferred that others prominent researchers such as Palmer and Short (1994) also shared the view that decision-making goes through a number of stages. This is why planning is so important, because it gives a leeway to decision-makers to plan exactly how and when to apply a particular decision depending on the method of inquiry.

With the above in mind, the Researcher was able to collect data in 10 plants in the SOCAPALM of Mbambou in Cameroon that bottle palm oil for commercial use in Cameroon. The data were collected in September 2013 using cross-sectional methods and cross-sectional analysis was preferred over time series because data were collected for the same time period for all ten plants. Data were related to total production, labour and capital. The researcher then conducted a regression analysis using the Cobb-Douglas Equation as per the following equation:

$$Q = mL^nK^{1-n}$$

The following were the regression output:

Constant	1.170020
Standard error of Y Est	0.02417
R Squared	0.95017
Number of Observation	24
Degree of Freedom	20
Coefficient(s)	0.640131 0.330034

Interpretation of the results

Regression analysis uses statistical, economic and mathematical tools to predict what is at stake with production in a specific period of time. In this case, the aim is to probe whether there is an increase or a decrease in scale, which allows management to decide accordingly by taking into consideration the law of supply and demand. The results from the regression equation allow for a comprehensive interpretation of the characteristics that contribute in explaining the relation between

the endogenous (explained) variable that is represented by total production Q and the exogenous variables that are represented by both direct labour L and capital K. From the results report therefore, the equation generated by the regression equation is formulated as:

$$Q = 1.17 L^{0.64} K^{0.33}$$

From the information generated by the regression equation, R^2 which represents the coefficient of determination is equal to 95%. This value is a clear indication that this coefficient is relatively high; it also means the 95% of deviations are adequately explained. On the other hand, the two coefficients are equal to 0.970 that is (0.64013+0.330034) and are different from zero. With the above information, it is evident that, all the plants are displaying constant returns to scale. The analysis from the result strongly hold that there is a decrease in marginal return since both coefficient are less than one as per equation (7) $n+z < 1$, this clearly reflects the law of diminishing marginal return. It is important to note that, for accuracy purposes, the Cobb-Douglas function is vested with some advantages that make it easier to apply calculus to check for instance whether marginal product decreases or not. In each step, managers are able to take a course of action either to correct by investing more in the existing business through profit made or to lay down some employees working in the ten plants or close it down in case the business is not generating any profit. This is why the current paper views quantitative analysis as an important tool for managerial decision-making.

5. RECOMMENDATIONS

The management of business activities is a very sensitive domain that requires sound knowledge in all areas of business capacities. Top management should be tasked to review failed policies and adapt new ones with the current business environment. The choice of decisions should take into consideration a number of elements that include: a) the market, current competitors, potential buyers and the level of technologies. Top management is strongly recommended to take appropriate decisions. Once these decisions are accepted and adopted, planning should be considered where a number measures could be implemented in line with the vision and goal of the company. For a profit maximization company, top management should invest substantively in research and development (R&D). This department should actually be created to research on issues related to the market; the research outputs in this department should advise top management who are the competitors in the markets what are their strength and weaknesses. All information related, to total production, prices, quantity of good demanded and supplied should be quantified in order to allow managers to take appropriate course of action. Manager is strongly encouraged to used quantitative analysis to forecast demand in line with the market prices.

6. CONCLUSION

The management of a company becomes more efficient if the decisions or course of action taken are strong enough in solving the problems at hand. With the ten plants that bottle palm oil in Cameroon, it was possible to run the regression equation that generated a number of characteristics to guide top management in taking appropriate course of action for either reinvesting the profit into the business or use contingency measures that will allow the company to keep operating. This study therefore believes that, quantitative analysis is useful for managerial decision-making. The fact, the Cobb Douglas equation was able to provide fruitful information related to the return on scale, top management is able to plan for future activities and forecast for the expected production.

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