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# MATHEMATICAL MODEL TO PREDICT FIXED TIME AND PRICE RATE OF MACHINE PRODUCT IN A COMPETITIVE MARKET

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Predicting a time price of machine product in competitive market has been thoroughly expressed, evaluation of this product on its prices rate is imperative because the quality of the product determine the rate of demand by consumers in competitive market, fixed time and prices of machine were express mathematically to monitor the influences from other brown including consumer behaviour that are reflected on the fixed time and prices of the product, the developed model expressed various conditions that influences fixed time and prices of the product, fixed time are establish base on the competitive rate of the brown with others, more so fixed time are establish base on the demand of the brown, this implies that it is equally competing very well with other brown in the market, the efficiency of machine and its durability product are the basic concern of consumers in the market, therefore the express derived model considered this products in different conditions as it is expressed in the system, they are reflected on four basic dimensions of marketing products, the derived model will definitely improve monitoring of machine product on its fixed time and prices in competitive market.

**Keywords**: mathematical model, fixe time, price, machine product, and competitive market

## INTRODUCTION

In recent years, a model of how firms compete, which is unique to the field of strategic management, has begun to emerge. Known as the 'Resource-Based View', it is regarded by some as having momentous potential as a paradigm for our field. Others wonder whether this emergent model provides much additional insight over traditional understandings. Admittedly, resource-based work is consistent with and rooted squarely in the policy research tradition. The notion that firms are fundamentally heterogeneous, in terms of their resources and internal capabilities has long been at the heart of the field of strategic management. The classic approach to strategy formulation, for example, begins with an appraisal of organizational competencies and resources (Andrews, 1971; Margaret, 2003: Connors, 1991). Those which are distinctive or superior relative to those of rivals may become the basis for competitive advantage if they are matched appropriately to environmental opportunities (Andrews, 1971; Thompson and Strickland, 1990). Those ideas may be thought of as the basic principles upon which resource-based research continues to build. While the model is still in the developmental stage, it has deepened our understanding regarding such topics as how resources are applied and combined, what makes competitive advantage sustainable, the nature of rents, and the origins of heterogeneity. The work of Penrose (1959) is considered a very influential force. Other notable contributions include Lippman and Rumelt (1982), Teece (1980, 1982), Nelson and Winter (1982), Rumelt (1984, 1987), Wernerfelt (1984), Barney (1986, 1991), Dierickx and Cool (1989), Castanias and Helfat (1991), Conner (1991), and Mahoney and Pandian (1992). Rumelt (1984) coined the term 'isolating mechanisms' to refer to phenomena which protect individual firms from imitation and preserve their rent streams. These include property rights to scarce resources and various quasi-rights in the form of lags, information asymmetries, and frictions which impede imitative competition (Rumelt, 1987). Of particular interest is the notion of causal ambiguity (Lippman and Rumelt, 1982). Rumelt (1984) describes isolating mechanisms as an analog of Caves and Porter's (1977) mobility barriers, which are themselves an extension of Bain's (1956) concept of entry barriers. l% ability barriers, however, serve to isolate groups of similar firms in a heterogeneous industry, while

entry barriers isolate industry participants from potential entrants. Yao (1988; Margaret, 2003).) has distilled a set of factors more basic than the list of entry barriers suggested by Porter (1980) and Bain (1956). He contends that failures of the competitive market are due more fundamentally to production economies and sunk costs, transaction costs, and imperfect information. Ghemawat, 1986; Margaret, 2003).) suggests a different categorization, with more of a firm than a market orientation. He argues that inimitable positions derive from size advantages, preferred access to resources or customers, and/or restrictions on competitors' options. Dierickx and Cool (1989) offer a unique perspective on the topic of limits to imitation. They focus on factors which prevent the imitation of valuable but nontrade able asset stocks. They maintain that how imitable an asset is depends upon the nature of the process by which it was accumulated. They identify the following characteristics as serving to impede imitation: time compression diseconomies, asset mass efficiencies, and interconnectedness of asset stocks, asset erosion, and causal ambiguity. Dierickx and Cool's (1989) paper is a particularly important piece of work because it focuses precisely on those kinds of resources and capabilities which are of central concern to resource based theory: nontrade able assets which develop and accumulate within the firm (Margaret, 2003).

**THEORETICAL BACKGROUND**

In today global market, commodities are are base on several factors. This implies that today's structure definitely deal with dynamic and uncertain environments. In order to be successful, the developed structure in marketing strategy are under the influences of the four arms of marketing, although this has been expanded through other experts as there more developed philosophy that restructure the strategy of marketing commodities or products, Organizations must be tactically aware. They must comprehend how changes in their competitive atmosphere are unfolding. They should energetically look for opportunities to exploit their tactical abilities, adapt and seek improvements in every area of the business, this include structure on awareness and understanding of current strategies and successes. Organizations ought to be intelligent to act speedily in reaction to opportunities and barriers. Base on this factors in global competitive marketing strategies, Managers functioning in organizations carry out a number of activities in global competitive marketing by planning and organizing, strategizing on any brown of their product reflecting in prices that are determined by the planning strategy to meet up with other brown competing in the global market, more so they must developed more professional skill to ensure that there is a lay down baseline on effective communication with their subordinates, motivating them, controlling what happens and evaluating results. Effective decisions by managers have a strategic impact and contribute to strategic change to ensure effective strategies are developed for the product. In the fixed prices of the product, the role of organizational structure is one of the factors on fixed prices of products and it rate of competitors in the global market; more so in an industry and to a greater or lesser degree these competitors will be affected by the decisions thus competitive strategies and innovation of the others. The decision will definitely reflect on the strategy to manage fixed prices of the product meeting in competitive market. These inter-dependencies are crucial and consequently strategic decisions should always involve some assessment of their impact on other companies, and their likely reaction. To succeed long term, organizations must compete effectively and out-perform their rivals in a dynamic environment. To accomplish this, they must find suitable ways for creating and adding values for their customers. Strategic management is a highly important element of organizational success. The need to know what the business is about, what it is trying to achieve and which way it is headed the basic requirement for determining the effectiveness of every member's contribution. Every successful entrepreneur has this business self-awareness and every successful business seems to have this clarity of vision, even though it does not arise from a formal planning process.

3. Governing Equation

The expression based on Algebraic expression are expressed in this form

$$f = P + P(r - y)$$

Integrating it in derivative function

$$f\frac{dP}{dt} = \frac{dP}{dt} + \frac{dP}{dt}(r - y)$$

The fixed time and rate of machine in a competitive market are expressed mathematically to evaluate the variation on the price rate with respect to time.

$$f\frac{dP}{dt} = \frac{dP}{dt} + \frac{dP}{dt}(r - y) \qquad - \quad - \quad - \quad - \quad (1)$$

Several concepts has been applied to monitor fixed prices of machine product in global competitive market, there lay down structure that are applied by other experts in the field, this is to establish some conceptual framework to ensure that the product fixed time and price are within the competitive level in global market, the governing equation were developed to monitor the rate of the brown competition level in global market.

Applying physical splitting techniques on equation (1), we have

$$\frac{dP_1}{dt} = \frac{dP_1}{dt} \quad - - - - \quad (2)$$

$$\left.\begin{aligned} t &= 0 \\ P_{(o)} &= 0 \\ \frac{dP_1}{dt}\Big|_{t=0} \end{aligned}\right\} \quad - - - - \quad (3)$$

$$f\frac{dP_2}{dt} = \frac{dP}{dt}\, r - y \quad - - - - \quad (4)$$

$$\left.\begin{aligned} t &= 0 \\ P_{(o)} &= 0 \\ \frac{dP_2}{dt}\Big|_{t=0} &= 0 \end{aligned}\right\} \quad - - - - \quad (5)$$

$$\frac{dP_3}{dt} = -\frac{dP_3}{dt}\, r - y \quad - - - - \quad (6)$$

$$\begin{aligned} t &= 0 \\ P_{(o)} &= 0 \end{aligned} \quad - - - - \quad (7)$$

Apply direct integration on (2)

$$f\frac{dp}{dt} = P + K_1 \quad - - - - \quad (8)$$

Again, integrating equation (8) directly, yields

$$fc = C_t + K_1 + K_2 \quad - - - - \quad (9)$$

Subject to equation (3), we have

$$fP_o = K_2 \quad - - - - \quad (10)$$

And subjecting equation (8) to (3)

at $\frac{df_1}{dt}\Big|_{t=0} = 0 \quad P_{(o)} = P_o$

Yield

$$0 = C_o + K_2$$

$$\Rightarrow K_1 = -C_o \quad - - - - \quad (11)$$

So that, we put (10) and (11) into (9), we have

$$fP_1 = P_{1t} - P_{ot} + fP_o \quad - - - - \quad (12)$$

$$fP_1 - P_{1t} = fP_o - P_{ot} \quad - - - - \quad (13)$$

$$\Rightarrow P_1[f - t] = P_o[f - t]$$

$$P_1 = P_o \quad - - - - \quad (14)$$

Hence equation (14) entails that at any given time T, we have a constant fixed price of the commodity in the system. Time factor is one of the variables that is express in the study, fixed time are determined by the demand rate of the product in the market, the quality of the product determine the competitive level of the commodity. Market prices help to achieve stability involving the quantity of a resource society demand and the supply of that resource. Prices adjust frequently (with a change in price in one market foremost to changes in prices in other markets) to ensure that demand is always balanced with deliver commodities. This is expressed in equation [14] [Iyoha et al 2003].

$$f\frac{dP}{dt} = \frac{dP}{dt}\, r - y \quad - - - - \quad (4)$$

We approach this system, by using the Bernoulli's method of separation of variables

i.e. $P_2 = XT$ - - - - (15)

$$\frac{dP_2}{dt} = XT^1 \quad - - - - \quad (16)$$

$$\frac{dP_2}{dt} = XT^1 \quad - - - - \quad (17)$$

Put (16) and (17) into (15), so that we have

$$fXT^1 = XT^1 r - y \quad - - - - \quad (18)$$

i.e. $$f\frac{T^1}{T} = \frac{T^1}{T} r - y - \lambda^2 \quad - - - - \quad (19)$$

Hence

$$f\frac{T^1}{T} + \lambda^2 = 0 \quad - - - - \quad (20)$$

i.e. $T + \lambda^2 = 0$ - - - - (21)

and $r - yT^1 + \lambda^2 T = 0$ - - - - (22)

From (21) $$T = ACos\frac{\lambda}{\sqrt{f}}t + BSin\frac{\lambda}{\sqrt{f}}t \quad - - - - \quad (23)$$

And (16) gives

$$T = C\ell^{\frac{-\lambda^2}{f}t} \quad - - - - \quad (24)$$

By substituting (23) and (24) into (15), we get

$$P_2\left[ACos\frac{\lambda}{f}t + BSin\frac{\lambda}{\sqrt{f}}t\right]C\ell^{\frac{-\lambda^2}{f}t} \quad - - - - \quad (25)$$

Subject equation (25) to condition in (5), so that we have

$$P_o = AC \quad - - - - \quad (26)$$

Equation (26) becomes

$$P_2\ P_o\ell^{\frac{\lambda^2}{f}t}\ Cos\frac{\lambda}{\sqrt{f}}t \quad - - - - \quad (27)$$

Again at $$\left.\frac{dP_2}{dt}\right|_{t=\ 0,\ B} = 0, \quad t = 0$$

Equation (27) becomes

$$\frac{dP_2}{dt} = \frac{\lambda^2}{P}\ P_o\ell^{\frac{-\lambda^2}{f}t}\ Sin\frac{\lambda}{f} \quad - - - - \quad (28)$$

i.e. $$0 = -P_o\frac{\lambda}{\sqrt{f}}\ Sin\frac{\lambda}{\sqrt{f}}0$$

$$P_o\frac{\lambda}{\sqrt{f}} \neq 0$$

Considering the market values that generates the growth price rate of the commodity at a fixed time. Market prices assist buyers to resolve how various units of a given resource should operates in order to derive the highest fulfillment from expending their limited income. If the price of a resource (good) increases, for example, buyers may decide to buy less of it and more of another [Iyoha et al 2003].

$$0 = -P_o \frac{\lambda}{\sqrt{f}} \; Sin \frac{\lambda}{\sqrt{f}} 0 \quad - - - - \quad (29)$$

$$\Rightarrow \frac{\lambda}{\sqrt{f}} = \frac{n\pi}{2} \; n = 1,2,3 \quad - - - - \quad (30)$$

$$\Rightarrow \lambda = \frac{n\pi\sqrt{f}}{2} \quad - - - - \quad (31)$$

So that equation (27) becomes

$$P_2 = P_o \ell^{\frac{-n^2\pi^2 f}{2r-y}t} Cos \frac{n\pi\sqrt{f}}{2\sqrt{f}} t \quad - - - - \quad (32)$$

$$\Rightarrow P_2 = P_o \ell^{\frac{-n^2\pi^2 f}{2r-y}t} Cos \frac{n\pi}{2} t \quad - - - - \quad (33)$$

Now we consider equation (6) which is steady fixed price of the commodity in the system

$$\frac{dP_3}{dt} = + \frac{-dP}{dt} r - y$$

Using Bernoulli's method, we have

$$P_3 = XT \quad - - - - \quad (34)$$

$$\frac{dP_3}{dt} = XT^1 \quad - - - - \quad (35)$$

$$\frac{dP_3}{dt} = XT^1 \quad - - - - \quad (36)$$

Put (35) and (36) into (6), so that we have

$$XT^1 = -r - yT^1 \quad - - - - \quad (37)$$

i.e. $$\frac{T^1}{T} = -r - y \frac{T^1}{T} = \varphi \quad - - - - \quad (38)$$

$$\frac{T^1}{T} = \varphi \quad - - - - \quad (39)$$

$$-r - y \frac{T^1}{T} = \varphi \quad - - - - \quad (40)$$

$$\therefore T = A\ell^{\varphi t}$$

And $$T = B\ell^{-\varphi t} \quad - - - - \quad (42)$$

Put (41) and (42) into (34), gives

$$P_3 = A\ell^{\frac{\varphi}{r-y}t} \bullet B\ell^{\frac{\varphi}{r-y}t} \quad - - - - \quad (43)$$

$$P_3 = AB\ell^{(t-t)} \frac{\varphi}{r-y} \quad - - - - \quad (44)$$

Subject equation (44) to (7), yield

$$P_3 = (o) = P_o \quad - - - - \quad (45)$$

So that equation (45), becomes

$$P_3 = P_o \ell^{(t-t)} \frac{\varphi}{r-y} \quad - - - - \quad (46)$$

Now assuming that at the fixed rate, there is no high demand of the commodity, therefore, the fixed price at that period will decrease, because the demand of the product are reflected on the market values of the commodities, so that equation (6) developed an assumption expressing the market values of the commodities to be diminishing, it is denoted

as zero for the time where the market value declined drastically.

$$P_3 = 0 \quad - \quad - \quad - \quad - \quad (47)$$

$$P = P_1 + P_2 + P_3 \quad - \quad - \quad - \quad - \quad (48)$$

We now substitute (14), (33) and (47) into (48), so that we have the model of the form

$$P = P_o + P_o \ell^{\frac{n^2\pi^2 f}{2r-y}t} Cos\frac{n\pi}{2}t \quad - \quad - \quad - \quad - \quad (49)$$

$$P = P_o \, 1 + \ell^{\frac{-n^2\pi^2 f}{2r-y}t} Cos\frac{n\pi}{2}t \quad - \quad - \quad - \quad - \quad (50)$$

One might express industrious factors in use as having intrinsically discrepancy levels of 'efficiency. Some are better to others. Firms endowed with such capital are able to manufacture more economically and/or enhanced satisfy purchaser wants. Heterogeneity means that firms develop change in capabilities thus at the same time are able to compete in the marketplace and, at least, breakeven. Firms with marginal capital can only expect to break-even. Firms with greater resources will receive rents Heterogeneity in an industry, it may echo on the presence of superior productive factors which are in limited supply. They may be fixed factors which cannot be expanded. More often, they are quasi-fixed, in the sense that there that supply cannot be expanded rapidly. They are scarce in the sense that they are insufficient to satisfy demand for their services. Thus, inferior resources are brought into production as well. The high returns of efficient firms cannot be attributed to an artificial restriction of output or to market power. Neither do they depend upon uniqueness or even rarity in the absolute sense. It is theoretically possible for rents to be earned by a number of equally efficient producers, so long as an efficiency differential remains between them and other producers. What is the key is that the superior resources remain limited in supply. Thus, efficient firms can sustain this type of competitive advantage only if their resources cannot be expanded freely or imitated by other firms (Margaret, 2003 Palpulava and Palpulava, 2006).

## CONCLUSION

The rate of variation in some prices may be very speedy. Some may regulate minute-by-minute, day-by-day while others may adjust, less speedily Market prices, this help buyers to decide how many units of a given resource they should buy in order to derive the highest satisfaction from expending their limited income. When the price of a good is high, for example, it is an indication that resources should be diverted into the production of more of that good. Suppliers (producers) will respond to this signal by increasing the quantity of the good produced and offered for sale.

Increased production by additional efficient producers will shift the supply curve out. This will drive down the equilibrium price, forcing marginal firms to leave the market. Remaining firms will produce at the point where Price equals both marginal cost and average cost. As a result, rents will be dissipated and only normal returns will be earned by efficient (now homogeneous) producers. Such resources may provide both the basis and the direction for the growth of the firm itself. For example, there may be a natural trajectory embedded in a firm's knowledge base. Current capabilities may both impel and constrain future learning and investment activities Regardless of the nature of the rents, sustained competitive advantage requires that the condition of heterogeneity be preserved. If the heterogeneity is a short-lived phenomenon, the rents will likewise be fleeting. Since strategists are primarily concerned with rents over a longer term, the condition of heterogeneity must be relatively durable to add value. This will be the case only if there are in place *ex post* limits to competition as well.

## REFERENCES

Barney J.B. (1989). Asset stocks and sustained competitive advantage: A comment', Management

Barney J.B. (1986). Strategic factor markets: Expectations, luck and business strategy', Management

Barney J.B. (1991).Firm resources and sustained competitive advantage', Journal of Management,

Barney J.B.(1988).Returns to bidding firms in mergers and acquisitions: Reconsidering the relatedness hypothesis', Strategic Management Journal, 9. 71-78.

Castanias R. and Helfat C. (1991). Managerial resources and rents', Journal of Management, 17,155-171.

Cornnor K .(1991). A historical comparison of resources –based theory and five schools of thought within industrial organization economics: Do we have a new theory of the firm. Journal of management

Dierickx I. and Cool K. (1989). 'Asset stock accumulation and sustainability of competitive advantage', Management Science, 35, 1504-1511.

failures, and profitability, Strategic Management Journal, 9, 59-70.

Ghemawat P. (1986). Sustainable advantage', Harvard Business Review, 53-58.

Iyoha M.A, OYefusi, S.A and Orieakhi D.E .(2003 ).An introduction to Morden Economics Mindex Publishing.
Lippman S.A. and Rumelt R.P.(1982). 'Uncertain amiability: An analysis of interfirm differences in efficiency under competition', The Bell Journal of Economics, 13, 418-438.
Mahoney J. and Pandian J. R. (1992). The resourcebased view within the conversation of strategic
Management, Prentice Hall, Englewood Cliffs, NJ, pp. 55&570.
management', Strategic Management Journal, 13, 363-380.
Margaret A.P.(1993) The Cornerstones of Competitive Advantage: A Resource-Based View Strategic Management Journal, Vol. 14, No. 3.179-191.
Nelson R. R. and Winter S. G. (1982). An Evolutionary Theory of Economic Change. Belknap Press, Cambridge, MA.
Palpulava E. and Palulova Z. (2006). Competitive strategy and competitive advantage of small and midsized manufacturing enterprises inslvakia E Leader, Slovakia .
Penrose E. T. (1959). The Theory of Growth of the Firm, Basil Blackwell, London.
Porter M.E. (1980). Competitive Strategy: Techniques for Analyzing Industries and Competitors, The Free Press, New York.
Rumelt R. P. (1984). Toward a strategic theory of the firm'. In R. Lamb (ed.), Competitive Strategic
Rumelt R.P. (1987). Theory, strategy, and entrepreneurship'. In D. Teece, (ed.), The Competitive Challenge. Ballinger ,Cambridge, MA, 137-158.
Science, 42, pp 1231-1241.
Science,V. 35. 1511-1513.
Teece D.J. (1980). Economies of scope and the scope of the enterprise, Journal of Economic Behavior and Organization, 1, 223-247.
Teece D.J. (1982).Toward an economic theory of the multiproduct firm, Journal of Economic Behavior and Organization, 3,.39-63.
V.17. 99-120.
Wernerfelt B. (1984). A resource based view of the firm', Strategic Management Journal, 5,171-180.
Yao D. (1988). Beyond the reach of the invisible hand: Impediments to economic activity, market