PRICING STRATEGY ALGORITHMS FOR PLAYING BUSINESS SIMULATIONS

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INTRODUCTION

The purpose of this paper is to report a theoretical pricing strategy algorithm developed specifically for The Management/Accounting Simulation. The analysis was based on the assumption that game participants have almost perfect knowledge of the simulation. The question arises: if the participants have perfect knowledge of the facts, functions, parameters, and algorithms of a simulation, what pricing algorithm should be used to take full advantage of this knowledge?

THE MANAGEMENT/ACCOUNTING SIMULATION

The Management/Accounting Simulation is a non-interactive total enterprise simulation designed specifically for courses in management accounting. Non-interactive connotes that the decisions of one team do not affect the decisions of another team. The simulated company, called the V. K. Gadget Company, is a manufacturing business and makes a single product called the gadget. The company operates in four territories and each territory has a well-defined demand curve. Graphs of each territorial' demand curve are presented in the Student Manual.

A NON ITERATIVE APPROACH FOR FINDING THE OPTIMUM PRICE

Given adequate information a trial and error approach may be used to find the best price. This approach is somewhat tedious. Also, it does not provide an insight into certain relationships that should be understood. Can a non-iterative approach utilizing a basically simple mathematical equation be found? The answer is yes.

The nature of economic relationships Such as price and quantity and wage rates and productivity are most effectively presented as mathematical functions. In almost all cases, some simplifying assumptions must be made. In order to make the analysis easier to comprehend the following simplifications are assumed:

a. The demand curve can be expressed as a linear equation:

$$P = P_o - K(Q) \quad (1)$$

where: P - Price

P_o - Price which results in zero sales (Y-Intercept price).

K - Coefficient which determines slope of demand curve.

Q - Quantity that can be sold at a given price

Demand is often presented as a straight line sloping downward and to the right as defined by equation (1). A decrease in price results in a measurable increase in quantity demanded.

b. All costs (fixed and variable) can be expressed as a linear equation.

$$TC = F + V(Q) \quad (2)$$

where:

F - Fixed cost

V - Variable cost rate

Q - Quantity

Total revenue mav be defined as:

$$R = P(Q) \quad (3)$$

Income is generally defined as revenue less costs or expenses:

$$I = R - C \quad (4)$$

Then by substitution of equations 2 and 3 into equation 4, income may be defined as:

$$I = P(Q) - V(Q) - F \quad (5)$$

From equation (1) and solving for Q, the demand for the product can be defined as:

$$Q = \frac{P_o - P}{K} \quad (6)$$

Consequently, by substitution of equation 6 into equation 5:

$$I = P\,\frac{P_o - P}{K} - V\,\frac{P_o - P}{K} + F \quad (7)$$

Since our goal is to develop a non-iterative algorithm for determining the optimum price, we can used equation (7) to achieve this objective. given that our objective is to find the price that maximizes net income, the best price is at the point where the slope of the net income line is zero.

The maximum value for I, or income, can be found by using calculus. The first derivative of the equation 7 then is.

$$\frac{1}{K}(P_o - 2P + V) \quad (8)$$

The price that maximizes net income can be found by letting the value of the function be zero and solving for P:

$$\frac{1}{K}(P_o - 2P + V) = 0 \quad (9)$$

The equation for P then becomes:

$$P = \frac{P_o + V}{2} \quad (10)$$

An equation that identifies the best price has now been found. Equation 10 simply requires that the aggregate value for V and the value of price at the Y- intercept be known. The Y-intercept price, P_0, is the price that result's in zero sales.

The simplicity of equation 10 is due to the fact that equations (1) and (2) are linear equation. However, "s can be shown, even if non—linear equations, in fact, exist, equation 10 can be used to arrive at an approximation of the best price.

A very careful' analysis of equation 10 suggests the following pricing algorithm:

1. Determine the variable cost rate by first making those decisions that determine the variable cost rate.
2. Identify price at the Y-intercept.
3. Compute the average of the Y-intercept price and the variable cost rate by dividing by 2.

Equation 10 can be simply illustrated assuming that the decisions, which determine V, the variable cost rate, have been made. In the V. K. Gadget Company, the starting value for V is \$100.62. The Y-intercept value, P, can be estimated to be \$260. Assuming other things equal, that is, no planned changes in decisions, price should be:

$$P = \frac{P_o + V}{2} = \frac{260 + 100.61}{2} = 180.30$$