APPLYING AN OPPORTUNITY COST GENERAL RULE FOR TRANSFER PRICING

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Abstract

Many different rules, procedures, and techniques have been proposed for determining transfer prices. The purpose of this paper is to demonstrate how an opportunity cost general rule for transfer pricing can be applied in several types of economic markets.

Introduction

General rules for transfer pricing are not new. Hirshleifer (1956, 1964) proposed a marginal cost general rule: "The general rule for the transfer price is to set it at the marginal cost of the internal supplier division" (1964, pp. 425-526). Gould (1964) extended Hirshleifer's general rule to cover markets that were imperfectly competitive with respect to the cost of buying and selling in the intermediate market.

Abdel-khalik and Lusk (1974, 1975) have enumerated the problems of the economic model approach of Hirshleifer and others. Furthermore, none of the economic models is operational. The difficulty, bordering on impossibility, of measuring marginal costs prevents these rules from being used.

Opportunity Cost General Rules

The first opportunity cost general rule (OCGR) was suggested by Cook (1955) who stated "An opportunity cost is probably the best choice, since it reflects the alternative profit opportunities of the whole company. This would be the actual increase in total costs brought on by filling the order, plus any loss in net revenue to the selling division that resulted from transferring rather than using the material for its own products" (p.91)

gested an opportunity cost general rule. Their rule is "the minimum transfer price should be (1) the additional outlay costs per unit incurred to the point of transfer (sometimes approximated by variable costs), plus (2) the opportunity costs per unit to the firm as a whole" (p. 845)

Although neither Cook nor Horngren and Foster attempted to operationalize their opportunity cost general rules, two researchers did. Onsi (1979), using linear programming, analyzed a two-product situation in which one product could be sold only internally while a second product could be sold externally. He showed that when the production facilities used to produce the second product could also be used to produce the first product, the correct transfer price is determined by the opportunity cost of diverting divisional resources to produce internally sold products rather than externally sold products. Onsi's general rule could be stated as follows: The transfer price equals the variable cost of the product produced plus the contribution margin of the alternative product which is not produced. Manes (1979, p. 572), however, has pointed out that linear programming holds little promise for setting transfer prices because "there are too many operational difficulties and conceptual objections". Manes' view is supported by Kaplan (1977-1978, p. 41).

Horngren and Foster (1987) have also sug-

Emmanuel (1977) proposed a market-oriented,

two-part tariff opportunity cost general rule that is an extension of Solomons' more limited two-part tariff rule (1965). Emmanuel's general rule is that the transfer price equals the standard variable cost plus a period cost "equal to the selling units' net contribution from external sales in the same planning and reporting period" (p. 53). However, Emmanuel's rule will lead a company to profit maximization only when the external market for the intermediate product is perfectly competitive. Otherwise, Emmanuel's units' net contribution from external sales will not completely capture the economic reality of the competitive market. Although Emmanuel's rule is operational, it represents a tradeoff of economic reality for operational reality, but establishes a reasonable balance between the two.

The main focus of this paper is showing how an opportunity cost general rule can be operationalized and applied to different economic markets. The rule is based upon the work of Hirshleifer, Cook, Horngren/Foster, and Emmanuel, and is designed to avoid the more narrow applicability of Manes' and Emmanuel's opportunity cost general rules.

The Proposed Opportunity Cost General Rule

The opportunity cost general rule used in this paper for transfer pricing is:

The transfer price (TP) should equal the standard variable costs (SVC) plus the contribution margin per unit given up on the outside sale by the company when a segment sells internally. The contribution margin given up is referred to as the lost contribution margin (LCM). Symbolically, the general rule is $TP = SVC + LCM$. (Benke and Edwards, 1980)

The lost contribution margin is an opportunity cost, and is the difference between the prevailing (external) market price of the transferred product and its standard variable cost when it is sold externally. This difference contributes to fixed costs, variances from standard, and profit. If the product does not have an external market price and a defensible substitute cannot be found, the lost contribution margin is zero.

Standard cost is used for cost control purposes. Standard costs are preferable to actual costs because actual costs tend to fluctuate and be-

cause transfer prices cannot be calculated until actual costs are determined. Furthermore, using actual costs as transfer prices will pass the inefficiencies of the supplying segment to the receiving segment.

Variable cost is a substitute for marginal cost. The substantive difference between variable cost and marginal cost is the range of activity involved. The economist is concerned with a broad range of activity while the accountant is concerned with a more narrow range of activity. Within the accountant's narrower range, variable cost will closely approximate marginal cost. Thus, the opportunity cost general rule (OCGR) used herein is consistent with the general rules of Cook, Horngren/Foster, and Emmanuel. It will be shown that this rule is also consistent with Hirshleifer's widely accepted, but non-operational, marginal cost general rule.

Application of the OCGR to Pure Cost Centers

A pure cost center is a responsibility center in which no product has a lost contribution margin. This means that no product can be sold externally and the productive facilities cannot be used to produce externally sold products.

The application of the OCGR in pure cost centers is straight forward. The OCGR, $TP = SVC + LCM$, gives a transfer price equal to the SVC, since the LCM must equal zero.

A central feature of the use of the OCGR in pure cost centers is that the fixed costs of the transferring division are not allocated to the transferred products, and no effort is made to convert the pure cost center into a profit center. Thomas (1974) has warned us that all allocation processes are arbitrary because allocations lack theoretical justification. Either allocating fixed costs among products or allocating profit among divisions (e.g. via cost plus a markup) will obscure profit maximization and bias performance evaluations.

Diagram 1 shows Hirshleifer's analysis for a manufacturing division that must sell internally to a distribution division because there is no external market for the transferred product. Following Hirshleifer's marginal cost general rule (MCGR), the transfer price, p^* , is set along the

marginal cost of the manufacturing division (mmc) where mmc intersects the vertical line dropped from the intersection of MC and MR at volume Q_m , Q_d . The intersection of MC and MR determines the optimal volume for the organization, and the mmc at that volume determines the optimal transfer price.

Following the earlier assertion that the SVC approximates MC in any relevant range, it can be said that the SVC will approximate p^* at volume Q_m , Q_d . This relationship assumes that while the SVC is constant within the accountants' narrow relevant range, it is a series of discrete increasing intervals over the economist's broad range. The SVC increases as the MC increases, but in intervals rather than continuously. Hence, in a pure cost center a transfer price equal to the SVC is consistent with Hirshleifer's marginal cost general rule.

Application of the OCGR in Pure Profit Centers

A pure profit center is a responsibility center in which all products have a lost contribution margin. The lost contribution margin may result from selling products internally rather than externally or from using production facilities that can be used to produce products for external sale to produce products for internal sale.

Hirshleifer was the first to recognize that the determination of the transfer price does not depend upon the type of company involved, but rather on the type of economic market faced by the transferring segment of the company. For example, if a small transferring segment in an oligopolistic market can sell all the product it can produce without affecting the market price, the segment faces a perfectly competitive market even though other companies in the market may not. For this reason different companies in the same market may find they should use different transfer prices.

Furthermore, Hirshleifer showed that the prevailing market price for the transferred product is the appropriate transfer price only when the market faced by the transferring segment is perfectly competitive. In other markets the appropriate transfer price must be lower than the prevailing market price in order to promote profit maximization. Since perfectly competitive markets

are relatively unusual, the appropriate transfer price will rarely be the prevailing market price.

The application of the OCGR in pure profit centers follows the approach of Hirshleifer. The application does not depend upon the company involved; rather, it depends upon the type of market faced by the transferring segment.

Market #1 - Perfectly Competitive Markets

A perfectly competitive market is one that meets four conditions: (1) there are many buyers and sellers of whatever is being bought and sold in the market; (2) there is not collusion among buyers and sellers; (3) there is no price fixing (Leftwich, 1970, p. 56) and (4) there is perfect information. Because there are many buyers and sellers it is assumed that any one buyer or seller is insignificant.

The application of the OCGR in a perfectly competitive market is not complicated. Since the external market price is constant for all quantities the producer wishes to sell and there is no significant cost of selling, the OCGR, $TP = SVC + LCM$, always leads to the prevailing market price.

Hirshleifer showed that when the market for the transferred product is perfectly competitive, the appropriate transfer price is the prevailing market price of the transferred product. At equilibrium this price leads to profit maximization. The analysis is shown on Diagram 2.

The transfer price, p^* , is determined by the intersection of the marginal cost of the manufacturing division, mmc , and the marginal revenue for the transferred product, p . Where $mmc = p$, the manufacturing division will produce Q_m units; the selling division will purchase Q_d units, leaving $Q_m - Q_d$ units to be sold in the perfectly competitive market at the prevailing market price, p , which equals p^* .

Market 2 - Monopolistically Competitive Markets

A monopolistically competitive market differs from a perfectly competitive market in a minor way: it is a many-seller case with product differentiation. Product differentiation and some attachment of consumers to specific seller's products makes the demand curve and, hence, the

Diagram 2
Applying the Marginal Cost General Rule
In Perfectly Competitive Markets

Where: mmc = manufacturing marginal cost
dmc = distribution marginal cost
p* = transfer price
p = prevailing market price (also the marginal revenue)
MR = marginal revenue of final sale
MC = marginal cost
Qd = quantity purchased by the distribution division
Qm = quantity manufactured

Diagram 1
Applying the Marginal Cost General Rule
In Pure Cost Centers

Where mmc = manufacturing marginal cost
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firm's marginal revenue curve slope downward to some small extent; the demand curve is highly elastic. In the short run the firm maximizes profits at the output where its marginal cost equals its marginal revenue.

In a monopolistically competitive market there are many means of differentiating products. Special payments terms or credit terms might be offered. Offering a slightly different design or slightly different capability may differentiate a product. Advertising and packaging are other means of differentiating a product.

The costs of several factors that can differentiate a product in a monopolistically competitive market might be avoided by a division when it sells internally. For example, special payment terms, warranty expense, advertising, and sales commissions might be avoided for internal sales. If the selling division attempts to sell internally at the external market price, which includes the cost of avoidable differentiating factors, the receiving division might not purchase the product even though to do so will benefit the company.

Assume that Division A wishes to sell units costing \$16 each to Division B at the prevailing market price of \$30. Suppose, however, a price of \$30 gives Division B a negative contribution margin of \$100 on the product it produces that uses the product from Division A. Division B will not purchase the product, forcing Division A to now sell in the external market at \$30. Division A receives a contribution margin of \$14 per unit.

Should \$30 be the transfer price? When internal sales are made in a monopolistically competitive market, the SVC for external sales needs to be adjusted downward by the amount of cost savings from internal sales. Let us assume this amount is \$4. The SVC now is $\$16 - \$4 = \$12$. The lost contribution margin (LCM) is still \$14 per unit ($\30 sales price - $\$16$ SVC), the difference between the prevailing market price and the SVC for external sales. Using the OCGR, $TP = SVC + LCM$, the transfer prices should be $(\$16 - \$4) + \$14 = \26 , not the prevailing market price of \$30.

Hersheleifer did not apply his marginal cost general rule to monopolistically competitive markets. Therefore, the analysis is derived in

Diagram 3(1).

As Diagram 3 shows, the selling division has two marginal cost curves; one for internal sales (mmc') and a second, higher one, for external sales (mmc). To maximize the company's profits, the transfer price should be lower than the external sales price.

In the absence of any constraints, the manufacturing division in Diagram 3 will set its price at p and produce Q_m units. Given price p the distribution division will purchase Q_d units, leaving $Q_m - Q_d$ units to be sold externally by the manufacturing division.

Suppose, however, that transferring pricing rules require the manufacturing division to lower its price to the distribution division by the amount of cost savings from internal sales. At price p^* , which is p minus the cost savings, the distribution will purchase $Q'd$ units rather than Q_d units, leaving $Q_m - Q'd$ units to be sold externally. Since the manufacturing division lowers its price to the distribution division by the amount of cost savings from selling internally, $p - p^* = mmc - mmc'$ and the manufacturing division has exactly the same profit it would receive if all Q_m units were sold externally(2).

The distribution division buys $Q'd - Q_d$ more units than before the manufacturing division lowered its transfer price. Since each unit sold by the distribution division includes the profit the manufacturing division will receive if it sold the units externally [$p = mmc$] as well as the profit earned by the distribution division from selling externally [$p' - (p^* + MC)$], the more units sold by the distribution division the greater will be the company profits. Thus, a transfer price equal to p^* maximizes company profits.

Hirshleifer's marginal cost general rule gives a transfer price equal to the prevailing market price minus the cost savings from selling internally. This is the same price determined with the OCGR.

Market #3 - Oligopolistic Competitive Markets

An oligopolistic competitive market differs from a monopolistically competitive market rather significantly: it has only a few sellers. As a consequence, the sellers are interdependent, and

it is difficult for each firm to precisely locate its demand curve. However, the demand curve is known to slope downward at a greater rate than in monopolistically competitive markets(3).

The interdependency of sellers in an oligopolistic competitive market has prevented economists from developing the same precise relationships as in other markets. On this problem F. M. Scherer notes (1980, p. 152):

Recognizing the wide range of theoretical predictions and actual behavior, some economists have asserted that the oligopoly problem is indeterminate. This is correct, in the narrow sense that one cannot forge unique and compelling mechanistic links from cost and demand conditions to price equilibria. But it would be misleading to conclude that we cannot develop theories predicting oligopolistic conduct and performance with tolerable precision...We must not expect too much, however. The most that can be hoped for is a kind of soft determination: predictions correct on the average, but subject to occasional substantial errors.

For these reasons the application of the OCGR results in a "kind of soft determination." Within the constraints noted by Scherer, the OCGR can be shown to be consistent with the marginal cost general rule. Nevertheless, the exact determination of LCM is difficult and will often require estimation.

As an example of applying the OCGR, assume that a company manufactures 20,000 pounds of a product. Ten thousand pounds of the product is sold externally at \$11 per pound, yielding a \$6 contribution margin per unit. The remaining 10,000 pounds is sold internally to Division B and is converted for resale at \$14 per pound, yielding a company contribution margin per unit of \$5. Further, assume that in order for the company to sell all 20,000 pounds externally, it estimates that it will have to lower the external sales price to \$9.

In this situation the OCGR, $TP = SVC + LCM$, gives a transfer price of \$7 per pound, or $TP = \$5 SVC + [\$4 - \$2]$. Explanation: By not selling externally the 10,000 pounds it sells to Division B the company gives up a \$4 contribution margin per pound [\$9 expected sales price - \$5 standard variable cost]. However, if the sell-

ing division sold this 10,000 pounds externally it would have to lower the sales price of 10,000 pounds previously sold at \$11 per pound to \$9 per pound. Therefore, the company saves a contribution margin of \$2 per pound by not selling the second 10,000 pounds externally, because it avoids lowering the price of the first 10,000 (now sold externally) by \$2 per pound, or from an \$11 sales price to a \$9 sales price. At the same time the company loses a contribution margin of \$4 per pound by not selling the second 10,000 pounds externally. Thus, the company loses a contribution margin of \$4 per pound, but saves a contribution margin of \$2 per pound, for a net LCM of \$2.

Hirshleifer's marginal cost general rule is shown in Diagram 4. As before, the transfer price, $p(t)$, is determined by the intersection of the marginal cost of the receiving division, $MC(r)$ and the net marginal revenue curve, MR . A line drawn from the intersection of the marginal cost curve and marginal revenue curve to the vertical axis establishes the transfer price. This line intersects the marginal revenue curve, $MS(s)$, for external sales of the manufacturing division's product. This intersection determines that the supplying division will sell quantity Q_x of its product externally at price $P(t)$. Thus, the external market price for the transferred product will be greater than the transfer price.

Of course, the determination of the transfer price in an oligopolistic competitive markets depends upon the ability of the seller to determine its demand curve. As Scherer noted this is difficult to do with precision.

A standard solution to the oligopoly problem is to assume that each principal seller should expect to supply a more or less fixed share of the overall market. If so, each seller can estimate its own individual demand curve from knowledge of the industry demand curve. The demand curve of each of the principal sellers will have the same price elasticity as the industry demand curve, and the quantity each sells will be a constant fraction of the total quantity demanded for all sellers.

As an example, assume that a company transfers 10,000 pounds of product internally and that the external market it faces is oligopolistic. In this situation the market price for the 10,000

pounds cannot be determined without actually selling all 10,000 pounds externally. The new market price for any pounds sold externally will necessarily be lower than the old market price and will depend, in part, upon the response of other companies in the same market. However, the market price could be estimated from the industry demand curve(4).

Market #4 - Monopolistic Competitive Markets

Bierman and Dyckman (1976), showed when either the selling or receiving division is a monopoly, the monopolistic division will exploit the other division, thereby increasing its own profits, but lowering the profits of the company. This situation was examined by Hirshleifer and is shown in Diagram 4. An external sales price higher than the transfer price allows the selling division to continue exploiting its monopolistic power over external customers, but not over the receiving function.

Application of the OCGR in a monopolistic competitive market achieves results similar to Hirshleifer's. In essence, the application of the OCGR is the same as for oligopolistic competitive markets except that in a monopolistic market the LCM can be more accurately determined since the demand curve of a monopolist is more precise. Furthermore, the monopolist always operates in the area of its demand curve where elasticity is greater than one; therefore, whether it will sell the internally sold units externally does not depend on the elasticity of its demand curve. However, the monopolist will only move down its demand curve to the point where its marginal cost equals its marginal revenue.

Application of OCGR in Profit/Cost Centers

A profit/cost center is a combination of a profit center and a cost center. Some products produced in a profit/cost center can be sold both externally and internally. In these circumstances the appropriate transfer price is determined with the OCGR as outlined for pure profit centers.

Other products in a profit/cost center do not have external markets. Since a transfer price equal to the SVC can lead to severe motivational problems in a profit/cost center, it is not sufficient to apply the principles outlined for pure cost centers in a profit/cost center(5).

How then can the OCGR be used to determine the appropriate transfer price in a profit/cost center for products that do not have an external market?

Productive Capacity Can Be Used to Produce Externally Sold Products

When the productive capacity used to produce internally sold products can be used to produce externally sold products, the opportunity, LCM, is the contribution margin given up on the alternative products. If the manufacturing division gives up producing product A for external sale in order to produce product B for internal sale, the division should receive the same contribution margin on both products. The transfer price is the sum of the SVC for product B and the LCM for product A. As long as it is possible to use the productive capacity to produce a product with an external market price, the LCM will not be zero.

Productive Capacity Cannot Be Used to Produce Externally Sold Products

The second case in a profit/cost center is determining the transfer price for products when the productive facilities cannot be used for anything else. Since there are no opportunity costs involved, the OCGR gives a transfer price equal to the SVC. While this transfer price is appropriate in a pure cost center, if used in a profit/cost center motivational problems will result.

There are a couple of possible solutions to the motivational problems, no one of which is universal. For example, since the productive facilities involved do not have an alternative use, it may be possible to separate them from the profit/cost center. The responsibility for the productive facilities might be transferred to a pure cost center. This will convert the profit/cost center into a pure profit center and eliminate the problem.

Another possibility is to shift as a lump sum the avoidable fixed costs for the product from the transferring division to the receiving division. Thus, the entire profit responsibility for the product is shifted to the receiving division.

In summary, transfers at the SVC in a profit/cost center can be determined with the OCGR.

Overcoming motivational problems might require special procedures.

Summary and Conclusions

The purpose of this paper is to show that transfer prices determined with the opportunity cost general rule, $TP = SVC + LCM$, can be used by businesses to promote profit maximization. This was shown by comparing the transfer prices determined with the OCGR to the transfer prices determined by Hirshleifer's marginal cost general rule.

Considerable progress has been made in transfer pricing since Hirshleifer first demonstrated the correctness of his marginal cost general rule. The discussion in this paper is hopefully one more link in the chain of events leading to operational transfer prices.

Footnotes

1. The author gratefully acknowledges the assistance of Professor Paul Rubin, Department of Economics, University of Georgia, in developing Diagram 3.
2. For simplicity the cost savings is assumed to be constant over volume.
3. Throughout the discussion on oligopolistic competitive markets it is assumed that neither the selling division nor buying division can act as a monopolist.
4. More detailed examples of how an opportunity cost general rule might be applied under such circumstances is illustrated in Benke and Caster (1981) and Benke and Bishop (1986).
5. Some businesses have responded to this problem by using the "cost plus" transfer pricing technique or a similar process. These techniques have been shown by Benke and Edwards (1981) to be misleading.

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