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A Breakthrough in Transfer Pricing: The Renegotiate-Any-Time System

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It provides the right incentives that encourage divisions doing business with each other to set a transfer price that benefits the company as a whole.

Despite the long history of transfer pricing in many organizations, the attainment of an optimal transfer price often remains elusive. Toward this end, I have modified a concept from finance and developed it into a system applicable to the field of management accounting to make it easier for two divisions to agree on an optimal transfer price. I call it the Renegotiate-Any-Time (RAT) system. Under the RAT system, the buying division is allowed to purchase an option from the selling division, which gives the buying division the right to buy the intermediate goods at a reduced unit price. Both the option price and the reduced unit transfer price are negotiable between the two divisions. The option system provides an incentive mechanism that motivates both divisions to set a transfer price that maximizes profit for the firm as a whole.

Vertically integrated firms often prefer decentralized decision making over centralized. In order to coordinate actions among divisions and to evaluate the performance of individual divisions in a decentralized environment, management needs a system to price intermediate goods being transferred internally. Ideally, transfer prices should promote a high level of autonomy in decision making and goal congruence among the divisions. In economics terms, goal congruence means working together to maximize profit for the firm as a whole.

There are two basic types of transfer price situations:

1. The transfer of intermediate goods with an existing market price (for example, chips for computers or crystals for electronic audio and video components).

2. The transfer of intermediate goods with no external market (for example, special engines for cars or customized components).

The second situation is a far greater challenge because there is no existing market price that can be used as a guide. This is where my proposed transfer pricing system comes into play.

A Survey of Current Practices

There are four general types of transfer pricing methods:

Market-based. The least controversial way to set transfer prices, it entails using the existing market price for a product. The major drawback is that it is only possible if a market for the intermediate goods exists. Around 26% of U.S. domestic firms use a market-based system to set transfer prices.

Cost-based. This involves setting the transfer price at cost—either full or variable cost—to the selling division. Sometimes a markup is added. The drawback to this method is the selling division's lack of incentive to control cost. This system is used by 53% of U.S. domestic companies (including both full and variable costing).

Negotiated. Two divisions negotiate a transfer price between themselves. The negotiated price may not be equivalent to marginal cost, however, because a selling division would be unwilling to accept a price on which it would incur a loss. (Marginal cost can be defined as the incremental cost per unit). Furthermore, negotiation where one party requests favorable treatment at the expense of the other without compensation may turn acrimonious and lead to resentment and dysfunctional behavior. Seventeen percent of U.S. domestic companies use negotiated transfer prices.

Dictated. Top management dictates the transfer price. In order for management to set a price that maximizes profit for the firm, it needs a tremendous amount of information. That's one of the reasons for decentralization. Furthermore, performance evaluation is meaningless if top management sets a transfer price because divisional profits would be determined externally. That is why only a combined 4% of U.S. domestic firms use either a dictated transfer price or some other system not discussed.[1]

Practical Problems of Marginal-Cost Pricing

The transfer price is optimal if its level provides incentive for each division to operate in ways that lead to profit maximization for the entire company. In general, the market price serves as a benchmark, but for cases where a market for the intermediate goods does not exist, the optimal transfer price would be the marginal cost for the selling division at the profit maximizing level of output for the firm.[2] While marginal-cost pricing is well established in economics, applying it to accounting practice brings up several problems:

1. Because production often takes place before the actual level of demand for the final product is known, the optimal level of output cannot be determined with certainty. Consequently, marginal cost at the optimal output level is also unknown. Even if the optimal output level is known, the marginal cost at that output level is still unobservable, and its estimated value may not be accurate.

2. Whenever marginal cost is below average cost, it results in a loss for the selling division.

3. Marginal-cost pricing may allow the selling division to export some inefficiency because the selling division will receive marginal cost regardless of how inefficiently it operates or how high actual marginal cost is relative to the lowest feasible marginal cost. For example, a manager's incentive to improve efficiency, which leads to lower marginal cost, would be reduced if lowering his/her marginal costs would also lower the transfer price that his/her division receives.

4. Marginal-cost pricing can induce the selling division to overstate marginal cost in order to increase the transfer price, such as reclassifying fixed costs or semifixed costs as variable costs.

While marginal-cost pricing is a condition for efficiency, realizing such a condition is a separate issue. Though the theoretical condition for efficiency—setting transfer price to marginal cost at the optimal level of output—is well known, little has been said about how this condition can actually be attained in the real world.

After Jack Hirshflier's classic postulate on marginal-cost pricing was published[3], many other authors discussed the problems of transfer pricing and possible ways to deal with them, but they all fell short of presenting a workable solution that ensures the attainment of optimal price. The theory of optimal transfer price was developed by economists, whose main emphasis is on efficiency and overall profit maximization. Transfer pricing, however, is applied by accountants, who focus on performance evaluation and convenience in application. Economists often think in terms of marginal cost, while accountants think in terms of variable cost. But marginal cost is quite different from variable cost; the two are equal only under the special case of linear cost function.

The Renegotiate-Any-Time Option System

In a decentralized decision-making environment, there is no incentive for the selling division to set transfer price at marginal cost, especially if doing so would cause the division to incur a loss. Although the need for some form of subsidy provided to the selling division for sustaining marginal-cost pricing is well known in the field of economics, no workable models of subsidization have yet been applied in the business world. Unless the selling division is subsidized, failure in achieving efficiency (overall profit maximization) is all but certain.

The Renegotiate-Any-Time option system is a practical means of achieving efficient transfer pricing through a scheme of flexible compensation. Under the RAT system, divisions are given total autonomy and flexibility in setting the final transfer price through the creation of an option, which grants the buying division the right to buy the intermediate good at a discount from the initial transfer price for a specified period. The proposed transfer price is analogous to the strike price or exercise price in a stock option. The right to buy the intermediate goods at a discount entails a cost, which is the price of the option. The transfer price and the price of the option are negotiated as a package by the two divisions. The cost of the option, paid by one division to another, is tantamount to the lump-sum subsidy or compensation to the selling division for agreeing on a lower transfer price. The terms of the agreement, which specifies the combination of the transfer price and the associated option cost, may be changed bilaterally at any time after the agreement has been made, an important characteristic that is emphasized by the system's name.

Achieving Optimal Transfer Price with RAT

Let's see how the system works. Assume that the initial transfer price (t1), which can be determined by management or by mutual agreement between the two divisions, is above the marginal cost at the optimal level of output (t*). Under the RAT system, the buying division may propose to pay the selling division for the right to purchase the intermediate goods at a lower transfer price (t2). To get the selling division to agree to a lower transfer price, the buying division must pay an amount that sufficiently compensates the selling division for the loss created by its accepting the lower amount. The maximum compensation the buying division is willing to pay would be the increase in profit (profit at t2 minus profit at t1), which is derived from the savings from the reduction in transfer price plus any gain to be generated by the increase in output. In parallel, the minimum compensation the selling division is willing to accept should equal the loss associated with the lowering of the transfer price. If the maximum the buying division is willing to pay exceeds the minimum the selling division is willing to accept, then both divisions will be better off with such an agreement.

If t2 is closer to t* than t1, then lowering the transfer price to t2 would generate an efficiency gain or net increase in overall profit for the firm, which implies that the incremental gain attained by the buying division would be greater than the incremental loss incurred by the selling division. This means that the maximum amount the buying division is willing to pay for lowering the transfer price to t2 must exceed the minimum amount the selling division is willing to accept. In this way, both parties benefit by lowering the transfer price to t2.

Even if t2 still does not equal t*, both parties potentially can gain, which is an incentive for them to continue negotiating to lower the transfer price further. Agreement on further revision will cease once the transfer price reaches the optimal level because movement beyond this point will no longer generate a gain for the buying division (maximum compensation the buying division is willing to pay) that would be sufficient to induce the selling division to further lower the price. Thus, under the RAT system, the transfer price will ultimately settle at t*, and profit for the firm will be maximized.

A Numerical Illustration

Let's look at a numerical example that shows how the RAT system can be applied. Assume an auto manufacturer produces only one model, and there are two divisions within the company: engine and assembly. In this case, the intermediate product is an engine designed specifically for the model in question. External market is nonexistent for the engine, so there is no market price to use as a benchmark for the transfer price.

After the engine is manufactured in the engine division, it is transferred to the assembly division for installation. Once the car is completed, it is sold by the assembly division for $20,000 per vehicle.

The engine division charges the assembly division for the engine so that profit for the engine division can be computed. Currently, both divisions have agreed to set a transfer price for the engine at average cost plus 10% margin. From past experience, the average cost incurred by the engine division ranges between $8,500 and $9,500 per engine. The engine division uses $9,000 (the average) as the base for determining the transfer price. With a 10% margin, the transfer price is set at $9,900.

Assume the costs for the two divisions can be expressed as the following polynomial functions:

TCE= *ae* + *be* * Q + *ce** Q2

TCM= *am* + *bm* * Q + *cm** Q2

TCE=total production cost for the engine division. TCM=total production cost for the assembly division. Q= the number of engines or the number of cars to be produced. *Ae*=fixed cost of the engine ($800,000), and *am*=the fixed cost of the assembly division ($250,000). *Be* (10,000), *ce* (2000), *bm* (-1), and *cm* (3) are coefficients or parameters of the cost functions.

Marginal cost may be defined as the incremental cost per unit. Where there are economies of scale, marginal cost declines with increasing volume. The marginal-cost functions can be derived by taking the derivatives of the cost functions with respect to Q:

MCE= *be* + 2 *ce* Q

MCM= *bm* + 2 *cm* Q

MCE=the marginal cost of engine division, and MCM=the marginal cost of assembly divisions (excluding price paid for engine).

Based on economic principles, a division's profit is maximized at the output level where its marginal revenue (MR) equals the marginal cost (MC) for the division. (As long as MR is greater than MC, which means that revenue exceeds cost at the margin, the division can increase its profit by raising its level of output. To maximize its own profit, the division would continue raising output until MR=MC.) The profit-maximizing output level for the assembly division, however, may not be optimal for the firm. To illustrate, the profits for the divisions and the firms are calculated for a range of output levels using the four equations. The results are summarized in Table 1.

With a transfer price set at $9,900, the assembly

Table 1: Profit Under the Average-Cost Approach

(1) OUTPUT	(2) TCE	(3) ACE	(4) t	(5) TCM	(6) MCM	(7) MCM'	(8) MR	(9) PROFITE	(10) PROFITM	(11) PROFITT
1,300	12,110,000	9,315	9,900	7,920,000	9,800	19,700	20,000	760,000	5,210,000	5,970,000
1,310	12,183,900	9,301	9,900	8,018,300	9,860	19,760	20,000	785,100	5,212,700	5,997,800
1,320	12,257,600	9,286	9,900	8,117,200	9,920	19,820	20,000	810,400	5,214,800	6,025,200
1,330	12,331,100	9,272	9,900	8,216,700	9,980	19,880	20,000	835,900	5,216,300	6,052,200
1,340	12,404,400	9,257	9,900	8,316,800	10,040	19,940	20,000	861,600	5,217,200	6,078,800
1,350	**12,477,500**	**9,243**	**9,900**	**8,417,500**	**10,100**	**20,000**	**20,000**	**887,500**	**5,217,500**	**6,105,000**
1,360	12,550,400	9,228	9,900	8,518,800	10,160	20,060	20,000	913,600	5,217,200	6,130,800
1,370	12,623,100	9,214	9,900	8,620,700	10,220	20,120	20,000	939,900	5,216,300	6,156,200
1,380	12,695,600	9,200	9,900	8,723,200	10,280	20,180	20,000	966,400	5,214,800	6,181,200
1,390	12,767,900	9,186	9,900	8,826,300	10,340	20,240	20,000	993,100	5,212,700	6,205,800
1,400	12,840,000	9,171	9,900	8,930,000	10,400	20,300	20,000	1,020,000	5,210,000	6,230,000

where ACE = average cost per engine

t = transfer price

MCM' = MCM + t, where MCM' represents marginal cost for the assembly division, inclusive of the transfer price paid for the engine.

PROFITE = profit for engine division PROFITM = profit for assembly division PROFITT = total profit for firm (both divisions combined) department (whose objective is to maximize profit for its own division) will order 1,350 engines because that is the level of output where MR equals its own MC (MCM', which is the marginal cost for the assembly division including the transfer price paid for the engines), as shown in columns 7 and 8 of Table 1.

At 1,350 units, the profit for assembly division peaks at $5,217,500. In pursuit of its own interest, the assembly division will produce 1,350 units and buy 1,350 engines if the transfer price is $9,900. The total profit earned by the firm as a whole at this level of output is $6,105,000, which is lower than could be earned at higher levels of output (see column 1). This means that the average-cost approach leads the divisions to make suboptimal decisions.

Now look at the marginal-cost approach, where the transfer price is set equal to MCE. As before, profits with marginal-cost pricing are calculated for a range of output levels, and they are summarized in Table 2. Based on economic principles, the level of output that will maximize profit for the firm as a whole occurs at the output level where marginal revenue for the firm equals marginal cost for the firm.

The results in column 11 of Table 2 indicate that profit for the firm as a whole is indeed maximized at the point where MR=MCT, which occurs at the output level of 2,000 cars. The efficient transfer price in this case, therefore, is one that would induce the divisions to produce 2,000 cars, even though individual divisions would choose this level of output only if the transfer price is set equal to the marginal cost of an engine (MCE). This is because the assembly division regards the transfer price it pays as an addition to its own marginal cost (MCM):

MCM' = MCM + t, where MCM' represents marginal cost for the assembly division, inclusive of the price it pays for the engine (t).

If the transfer price is set at the marginal cost of the engine division, then that formula can be rewritten as: MCM' = MCM + MCE. Note that the right-hand side is the sum of the marginal costs for both divisions, which is the total marginal cost for the firm (MCT). From this, it can be seen that when the assembly division equates its own MR with its own MC (MCM') to maximize its own profit, it is also equating MR to MC for the firm as a whole (MRT), thus maximizing profit not only for itself but for the firm as a whole. This is why setting the transfer price at the marginal-cost level ($6,000) leads to efficiency.

But without a compensation scheme, the engine divi-

Table 2: Profit Under Marginal-Cost Pricing

(1) Output	(2) TCE	(3) MCE	(4) t* = MCE	(5) TCM	(6) MCM	(7) MCT	(8) MR	(9) PROFITE	(10) PROFITM	(11) PROFITT
1,950	16,497,500	6,100	6,100	15,557,500	13,700	19,800	20,000	-4,602,500	11,547,500	6,945,000
1,960	16,558,400	6,080	6,080	15,694,800	13,760	19,840	20,000	-4,641,600	11,588,400	6,946,800
1,970	16,619,100	6,060	6,060	15,832,700	13,820	19,880	20,000	-4,680,900	11,629,100	6,948,200
1,980	16,679,600	6,040	6,040	15,971,200	13,880	19,920	20,000	-4,720,400	11,669,600	6,949,200
1,990	16,739,900	6,020	6,020	16,110,300	13,940	19,960	20,000	-4,760,100	11,709,900	6,949,800
2,000	**16,800,000**	**6,000**	**6,000**	**16,250,000**	**14,000**	**20,000**	**20,000**	**-4,800,000**	**11,750,000**	**6,950,000**
2,010	16,859,900	5,980	5,980	16,390,300	14,060	20,040	20,000	-4,840,100	11,789,900	6,949,800
2,020	16,919,600	5,960	5,960	16,531,200	14,120	20,080	20,000	-4,880,400	11,829,600	6,949,200
2,030	16,979,100	5,940	5,940	16,672,700	14,180	20,120	20,000	-4,920,900	11,869,100	6,948,200
2,040	17,038,400	5,920	5,920	16,814,800	14,240	20,160	20,000	-4,961,600	11,908,400	6,946,800
2,050	17,097,500	5,900	5,900	16,957,500	14,300	20,200	20,000	-5,002,500	11,947,500	6,945,000

MR = MCT, where MCT is the total marginal cost for the firm, which is the sum of the marginal cost for both divisions:
MCT = MCM + MCE.

sion is unlikely to accept $6,000 as the transfer price because the engine division would suffer a loss at this price. Table 3 shows that the assembly division stands to gain more from the transfer price reduction than what is needed to compensate the engine division for its loss.

The figures from Table 3 represent profits (before compensation) for both divisions under the two transfer price levels, which are derived from Tables 1 and 2. GAIN represents the increase in division profit due to the lowering of the transfer price from $9,900 to $6,000. As indicated in Table 3, the assembly division stands to gain $6,532,500 if the transfer price is lowered to $6,000. As long as the assembly division pays less than $6,532,500 in exchange for this transfer price reduction, it is worthwhile for the assembly division to do so.

The gain for the assembly division represents the maximum it is willing to pay to lower the transfer price (t) to $6,000. In parallel, the engine division's loss (negative gain) represents the minimum compensation it will accept before agreeing to the corresponding reduction in transfer price. Because the amount the assembly division is willing to pay ($6,532,000) exceeds the amount required by the engine division ($5,687,500), the divisions will agree to lower the transfer price. The negotiated amount of the compensation will fall between the two figures.

Let's assume both agree on a compensation level (option cost) of $6 million. The engine division is now better off than if the transfer price remained at $9,900 with no compensation, and the same holds true for the assembly division. The firm's combined profit is the same ($6,950,000), regardless of the amount of the compensation, because it determines only the divisions' relative shares of the total profit of the firm. As seen in the last column of Table 3, the RAT system encourages the divisions to achieve the most efficient level of output, and the firm increases its profit to $6,950,000 (an increase of about 14% from the $6,105,000 earned under the average-cost system).

Table 3: Profit Comparison for Two Transfer Price Levels

	OUTPUT	PROFITE	PROFITM	PROFITT
t=$6,000	2,000	$(4,800,000)	$11,750,000	$ 6,950,000
t=$9,900	1,350	$ 887,500	$ 5,217,500	$ 6,105,000
GAIN		$(5,687,500)	$ 6,532,500	$ 845,000

Another Wrinkle

Suppose the transfer price had been set initially at $11,000 instead of $9,900. Would the RAT system still bring the transfer price down to the optimal level of $6,000? Yes. Although it would require a larger compensation to persuade the engine division to cut the transfer price from $11,000 (instead of from $9,900) to $6,000, the assembly division is still willing to pay the required amount because its gains from such a cut in transfer price are also greater. Because the combined profit for the two divisions peaks at t=$6,000, movement from any transfer price level toward $6,000 will result in a net increase in combined profit, which means that the gain of one division will exceed the loss of the other. Regardless of the initial level of transfer price, the RAT system leads to efficient transfer pricing without mandates or formulas.

The example used is one where the assembly division pays the engine division for the option. But should the initial price be lower than the marginal cost, the selling division (engine) would have the incentive to pay the buying division (assembly) for raising (instead of lowering) the transfer price. The option payment can be two-way. In either case, the RAT system leads to the settlement of the transfer price at the optimal level.

In short, the RAT system provides the missing link between the theory and practice of setting efficient transfer prices in cases where market prices are not available. It succeeds where others fail because it puts the most essential element—the compensation amount (price of the option)—on the bargaining table.

Achieving Dynamic Efficiency

In an ever-changing business environment, achieving efficient transfer prices is even a greater challenge because the optimal level of output may change due to market climate or firm condition. The division with greater knowledge about the market and its own cost behaviors has an advantage in negotiating because it knows more about the costs and benefits of lowering the transfer price for itself and for the other party. The RAT system provides incentive for both parties to acquire more information on the market (revenue) and operation (costs). Such activities enhance both parties' abilities to predict the optimal level of output and the marginal cost at that level of output, which enables them to set a transfer price level closer to the true marginal cost, resulting in greater efficiency for the company. Under the traditional cost-based system, however, there is little incentive for the selling division to study its own cost function.

As in any business circumstances, negotiation of a contract takes place before all the variables in the contract period can be known with certainty, and these variables may change during the life of a contract. For example, while the replacement of an obsolete machine with a modern one would change the cost function, a more aggressive marketing strategy by a competitor would reduce the firm's demand, which affects its revenue function. To maintain dynamic efficiency in light of an ever-changing business environment, it is important to allow continuous renegotiations as new events unfold. Under a system with a locked-in transfer price, divisions would not be able to capitalize on new opportunities or retreat from unforeseen problems.

Under the RAT system, however, a transfer price is payable upon delivery, whereas the cost of the option is payable upon expiration date (last day of the contract period). From an administrative perspective, it may be simpler to defer the payment to the end because the option price—along with the transfer price—may be renegotiated during the option period. The unlimited flexibility granted to divisions for the good of all is the most desirable feature of the RAT system.

The car manufacturing example can be extended to illustrate the renegotiation process. Suppose the assembly division has agreed to pay the engine division $6 million for a RAT option that gives it the right to buy engines for $6,000 per unit for the next calendar year. Operations proceeded as planned during the beginning of the year, but by the end of March the market for its vehicle softens, and the sales price drops from $20,000 to $19,000 per unit. At this new market price, the optimal rate of production falls to 1,750 vehicles per year (based on the profit maximization principle MR=MCT). The optimal transfer price at this level is $6,500, which means the previously agreed price of $6,000 is no longer efficient. The divisions must be allowed to renegotiate so that the level of output may be changed to the new efficient level. The RAT system enables the divisions to renegotiate using the previous agreement as the status quo, which remains in effect until both divisions agree on a new price.

When the vehicle price drops to $19,000, the assembly division will produce fewer cars and thus buy fewer engines. Consequently, the engine division, which operates more efficiently at high volume, will be operating at a lower capacity level where marginal cost is substantially higher. At any time during the contract period, the engine division is free to offer to pay the assembly division for raising the transfer price. Assume that on April 1 the divisions mutually agreed on $1 million as the amount to be paid by the engine division for raising the transfer price from $6,000 to $6,500 for the remainder of the year. If no more renegotiations take place for the rest of the year, then the assembly division will pay the engine division for the cumulative value of the option (now $5 million) at the conclusion of the contract period on December 31. Engines purchased prior to the revision date (April 1) will not be credited retrospectively, so the new transfer price applies only to subsequent transactions.

The optimal level of operation changes with market conditions and technology. If the original transfer price is no longer efficient, then new incentives for either party to revise the option agreement will emerge, even if a division reaps only a fraction of the additional profit from the revision. All revisions require approval by both parties, so only proposals that benefit both divisions will be approved. If the revision benefits both divisions, the firm as a whole must gain. Thus, only revisions that increase profits for *both* divisions, and consequently the firm as a whole, will be implemented under the RAT system.

The RAT option must have a definite expiration date, however, to ensure that both sides are negotiating in the same time frame and to eliminate uncertainty on the time length of the agreement. As the option expiration date approaches, top management should deliberate on a new set of initial transfer prices and option costs that will serve as a base for negotiation for the next accounting period. One way is to use the latest combination of transfer price and option cost as a guide.

Advantages of RAT System

The Renegotiate-Any-Time system:

- allows either division to make changes that maximize profit for the company as a whole on a continuous basis, thus creating dynamic efficiency and boosting profits;
- provides an incentive for divisions to minimize cost because the transfer price and option values are not linked to cost of production;
- does not require the volume of information on revenue and cost that linear programming needs (if such volume of information is available, centralized planning should be implemented);
- enables the firm to attain the highest efficiency possible given the level of information possessed by the divisions without compromising on autonomy and goal congruence; and
- provides incentives for each division to acquire more knowledge regarding the market environment and operating conditions, which leads to even greater efficiency than what is usually associated with choosing an optimal level of production.

Add all of this up, and you get a system that encourages both divisions to make the decision that is best for the entire company, which leads to greater efficiency and higher profits. ■

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1 Percentages were obtained from R. Tang's *Transfer Pricing Systems Management: Practical Issues and Cases*, Institute of Management Accountants, Montvale, N.J., 2001.
2 Jack Hirshflier, "On the Economics of Transfer Pricing," *The Journal of Business*, July 1956, pp. 172-184.
3 *Ibid.*