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MARKETING ECONOMICS

The purpose of this note is to prepare you for a series of exercises in marketing economics calculations. It will give you the basic information on the purpose and structure of various calculations, but the note, by itself, will not help you develop a facility for doing these calculations. The series of exercises in marketing economics will help you to become more proficient in performing what will eventually become simple calculations. These calculations are not replacements for spreadsheets or more detailed economic calculations such as net present value or return on investment. Rather, they are "back of the envelope" estimates that can easily be communicated to others to buttress your arguments about what a company should or should not do in a decision situation.

The note and the exercises will prepare you for the task of learning how to "see" which calculations are relevant to a particular case. That is a task that requires practice. The concepts of fixed and variable costs, for example, are simple in theory compared with practice. Deciding what should be *treated* (assumed) as variable or fixed says a lot about how you *intend* to manage the business. This note will not make a cost accountant out of you. The goal is to start you on a process of becoming fluent in the practice of marketing economic calculations.

These types of marketing calculations are used both for what we normally think of as marketing-related decisions and for decisions more generally associated with the finance and operations functions. Marketing-related decisions often made in conjunction with these calculations include (1) How many units of a product do I have to sell before I begin making a profit? (2) How much more do I need to sell to make a particular change in my marketing plan profitable?

There are many other situations in which these calculations are common. Venture capitalists must determine whether a new business is likely to be profitable. Part of that evaluation necessarily involves calculating costs and the sales volume necessary to cover those costs, a break-even analysis. A company may want to decide whether a new technology designed to streamline the production process and reduce costs is worth the price of acquisition. Again, an integral part of such analysis is a break-even.

In the next sections we define different types of costs and provide examples of break-even analysis and contribution margin calculations. We also briefly discuss the impact that selling through channel partners has on such analysis.

Costs

Costs are often divided into *fixed* and *variable*. Whereas total fixed costs remain constant despite changes in sales or production volume, the sum total of variable costs changes per unit manufactured or sold.

Total Costs = Total Variable Costs + Fixed Costs

Variable costs

Variable costs (VC) are costs that vary with volume. VC can be expressed on a per unit basis, as VC per unit; for example, as $3.50 labor and material

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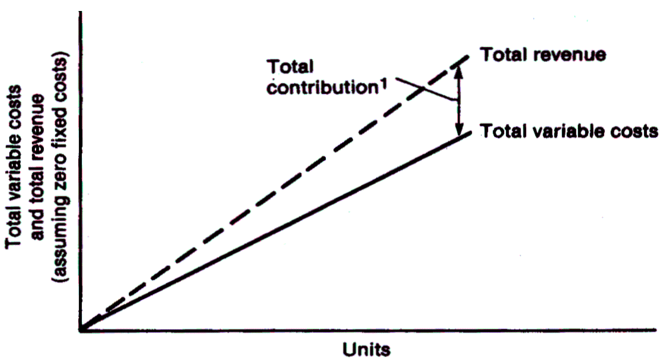
cost per unit. As more units are manufactured and sold, total VC equals VC per unit times units sold. (Note that selling price, SP, is revenue per unit and is analogous to variable cost per unit. Therefore, as additional units are sold, the relevant effect in terms of a net income of funds into a business is shown by: SP per unit less VC per unit. This residual amount is called contribution to fixed costs and profit, and this concept will be further explained in the following section.)

As more units are manufactured and sold, total VC (and revenue) behave as shown in **Figure 1**.

Fixed costs

Fixed costs (FC) do not vary with volume. As more units are manufactured and sold, FC (such as rent and depreciation) remain the same, as shown in **Figure 2**.

Figure 1. Total Contribution.



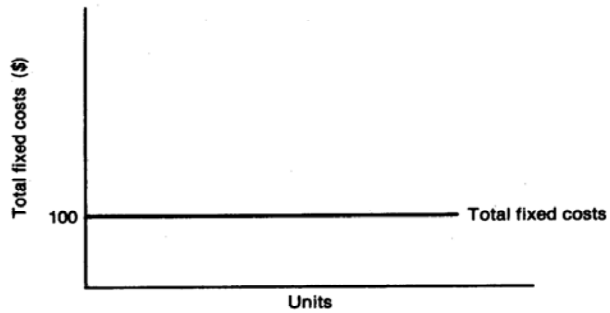
Note: The vertical distance between the revenue and variable cost lines represents *total contribution* at a *particular sales volume*. Contribution *per unit* (SP – VC per unit) can also be found by dividing total contribution at a particular sales volume by the number of units sold.

Total costs

Total costs equal FC + total VC (VC per unit times units sold). In **Figure 3**, if the number of units manufactured and sold were 40, then total costs would be FC = \$100 + total VC = \$140 (40 times \$3.50), for a total of \$240.

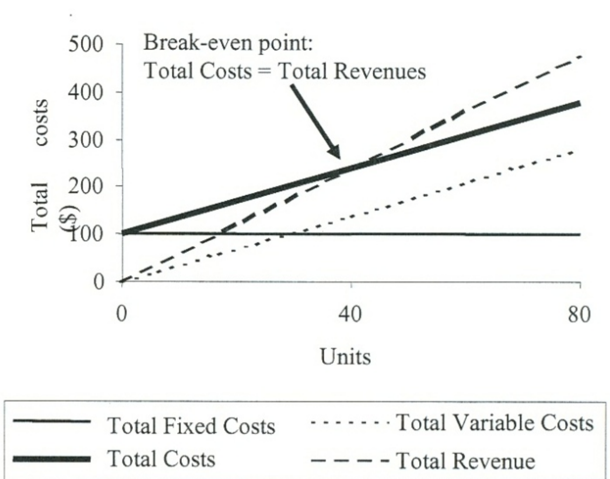
The fixed costs and variable costs categories are usually oversimplifications of most business situations. For example, some costs may be *semi-variable*, such as certain employee costs. That is, employees may be like a fixed cost in that you do not

Figure 2. Fixed Costs.



want to fire them if you do not have 40 hours a week of work for them at all times. However, things may become so slack that employees have to be furloughed, or alternatively, sales may be so good that they will use overtime. Other costs may seem relatively fixed for existing volume but may go up in large chunks when volume takes a sharp turn. The ambiguity of certain cost situations can be confusing.

Figure 3. Total Costs.



Notice that our simple graphical interpretation of costs has assumed that the unit cost of production is constant. In other words, for the sake of clear explanation, we have assumed that the first unit a company produces costs them exactly the same as the thousandth unit. There are many instances in which variable costs will decrease, or even increase, as the number of units produced rises. Common reasons for a decrease in variable costs include (1) obtaining better prices on raw materials as the quantity purchased increases (quantity discounts) and (2) becoming more efficient at the production process as experience increases. Also, increases can occur because of very practical consideration such as (1) the need to pay employees overtime wages to support an increase in production output and (2) the need to hold additional levels of inventory to serve the ramped-up production process. These are just a few of many possible reasons. Clearly, if variable costs are anticipated to change with different levels of production, this needs to factor into your analysis.

Break-even and Target Volume Analysis

Break-even analysis is a useful analytical technique to use: (1) when a new product is planned or (2) when a change in the marketing program is considered. Break-even analysis is most useful when it is converted to a percentage of market share, because then the manager will have one more gauge of whether the assumptions required to make a project profitable are reasonable.

New product

When a new product is planned, the marketer needs to calculate how many *units* (usually on a per year basis) will need to be sold to *break even on all costs*. That is, how many units will have to be sold to reach a point where the total revenue just equals the total costs of the product?

By way of introduction, *break-even analysis* is a general term that refers to an easy way to study, under a number of situations, the interrelationship that exists between: (1) selling price, variable costs, and fixed costs; and (2) volume of sales. The general formula for break-even (BE) is as follows:

$$Break\text{-}even\ volume\ (in\ units) = \frac{Fixed\ costs}{Unit\ contribution}$$

Unit contribution = Selling price per unit less variable costs per unit

Explanations of break-even analysis begin with a consideration of the concept of "contribution," because break-even analysis is taught to train marketing students to think in terms of contribution—*not in terms of sales*. Contribution per unit, which is the selling price per unit less variable costs per unit, measures a *net* income of funds into a business as additional units are sold. That is, as sales of a product are made, revenue flows into the business at a rate that equals *selling price* (SP) times the unit volume sold. At the same time, other funds—*variable costs* (VC)—are flowing out of the business with each unit sold. Variable costs (VC) include such variable marketing costs as salespeople's commissions and shipping, and such variable manufacturing costs as raw materials, direct labor, and the variable portion of factory overhead. Selling price (SP) and variable costs (VC) thus are closely related. Marketers want to sell an additional unit for a certain price, but they also want to know how much it costs to sell that additional unit. "Unit contribution to fixed costs and profit" (or simply "unit contribution") is calculated as selling price per unit (SP) less variable costs per unit (V). Unit contribution, then, is money that each unit sold "contributes" to paying fixed costs and providing profit.

Fixed costs may fall into several categories and usually include marketing costs such as advertising, sales office rent, and so on, and such manufacturing costs as property taxes, insurance, and factory depreciation. (For the latter cost, remember that it is yearly depreciation and not total investment that becomes a cost to be subtracted from sales to compute profits for any given year.) When a new product (or other business venture) is planned, there will always be some new fixed costs that will occur regardless of sales volume. *Profits* are the dollars left over after fixed costs and variable costs have been covered.

Break-even volume: If the analyst's objective is to make a break-even calculation that will show how many units will have to be sold to cover all costs, then the formula would be (**Equation 1**):

$$BE\ (units) = \frac{Fixed\ \ Costs}{Selling\ \ price - Var.\ costs\ \ per\ unit} \tag{1}$$

$$\mathrm{BE} = \frac{\mathrm{FC}}{\mathrm{SP} - \mathrm{VC}}$$

For example, if the following information applied: SP = \$100, VC per unit = \$60, and FC = \$10,000, then unit contribution would be \$100 − \$60, or \$40 per unit. Break-even volume then would be \$10,000 ÷ \$40, or *250 units*. (Note: In some cases, such division will yield a fraction. All such fractions in break-even calculations should be rounded up since the final results are expressed in units, and one cannot sell less than a whole unit.)

Target volume: More than likely, a marketer wants to do better than simply break even on his costs because at this volume his profits are zero. If the objective is to do a calculation that will show how many units have to be sold to reach break-even on costs and to produce a profit as well, the break-even formula can be expanded into a "target volume" (TV) formula:

$$TV\ (units) = \frac{Fixed\ costs + Profit}{Selling\ price - Var.\ costs\ per\ unit} \quad (2)$$

$$\text{Target volume} = \frac{\text{FC + P}}{\text{SP} - \text{VC}}$$

For example, if the information in the previous example was used in connection with a profit objective of $6,000, then the calculation would be as follows: ($10,000 + $6,000) ÷ ($40) = *400 units*.

Change in the marketing program

Break-even analysis (or its extension, target volume analysis) can be used for a number of purposes, one of which (used in connection with a new product) we have already demonstrated. Similar analysis can be used to evaluate the economic effect of a change in the marketing program. When a marketing program is changed, it will usually involve a change in one of three things (or combination thereof): (1) a change in selling price (e.g., a "price special"), (2) a change in variable costs (e.g., a more expensive package for the product), or (3) a change in fixed costs (e.g., increased advertising expenditures).

We have been using an example about a product whose SP = $100, VC = $60, FC = $10,000, and the desired profit is $6,000. Assume that this product comes under a new product manager who wants to cut the price to $90. He also wants to advertise the special price on television, which will cost an extra $5,000. A new package promoting the special price will cost $5 more than the regular package. Yet the manager still wishes, under the new marketing program, to retain the same dollar amount of *profit* that is currently being made—usually, he would not want to make any change that would reduce his profit, or there would be no point in changing.

In that situation there would be a whole new set of numbers to substitute into the target volume formula:

$$TV\ (units) = \frac{New\ FC + Profit}{New\ SP - New\ VC}$$

$$TV\ (units) = \frac{(\$10{,}000 + \$5{,}000) + (\$6{,}000)}{(\$100 - \$10) - (\$60 + \$5)}$$

Target volume (units) = 840 units, an increase of 440 units.

The preceding example included the current figures as well as the new figures for the changed selling price, variable costs, and fixed costs that would occur as a result of a change in the marketing program. In some marketing cases, however, that information may not be available, and all that may be available about the current situation is the *total* contribution from an existing marketing program. (Of course, total contribution equals unit contribution times the number of units sold.) Therefore, a specific breakdown of what part of this current total contribution is covering fixed costs and what part of it is left for profits will not be available. A moment's thought, however, will reveal that "total contribution" and the "fixed costs plus profits" are the same thing. After all, profits equal total contribution less fixed costs (Profits = Total contribution – FC); therefore, total contribution equals fixed costs plus profits (Total contribution = FC + Profits).

To illustrate that point, in the previous example suppose that under the current marketing program total contribution equaled $16,000. (That total contribution would have been the same as the combined figure of old fixed costs of $10,000 and a profit of $6,000.) Under the new marketing program, in that example, fixed costs would be increased by another $5,000, and, with the same changes in selling price and variable costs as in the example, the target volume would likewise be 840 units, computed by the following formula:

$$TV\ (units) = \frac{Current\ total\ contribution + Change\ in\ FC}{Unit\ contribution}$$

$$TV\ (units) = \frac{\$21{,}000}{\$25} = 840\ units$$

There are two other important considerations concerning break-even analysis.

First, all break-even and target volumes should be converted to market share. If the market for the product in the examples were 2,000 units, target volume needed to cover fixed costs and desired profit before the proposed change in the marketing program would have been 0.20 (400 ÷ 2,000), or 20%. After the change, the necessary market share would have risen to 0.42 (840 ÷ 2,000). The brand manager must ask the crucial question: How reasonable does the new market share look in light of the expected effects of the new marketing program? That is a criterion by which *all* marketing strategies should be evaluated, whether they involve a new product or a change in the marketing program.

There are other questions that marketers might ask at this point. Can our plant produce this amount in the time required? Would our suppliers be able to give use the additional raw materials required?

Second, although break-even and target volume are initially expressed in units, they can also be shown in dollars (sales revenue). Remember, though, that all preceding *formulas* use volume figures expressed in units.

$$BE\ (dollars) = \frac{Fixed\ Costs}{\frac{SP - VC}{SP}} = \frac{Fixed\ Costs}{\frac{Unit\ contribution}{SP}}$$

Or, Break-even volume (dollars) = Break-even volume (unit) × Selling price

If the break-even volume is 250 units, then in dollar terms the break-even volume needed is $25,000 in sales (250 units × $100 selling price).

$$TV\ (\$) = \frac{Fixed\ Costs + Profit}{\frac{SP - VC}{SP}} = \frac{FC + Profit}{\frac{Unit\ contribution}{SP}}$$

Or,

Target volume ($) = Target volume (unit) × SP

This discussion has ignored any reference to financing charges that will occur if a new product or new marketing program requires additional investment of funds, such as for a new building or equipment or for increased accounts receivable and/or inventory. If financing charges related to additional investment (e.g., "cost of capital") are available *and applicable*, they should be included as a part of fixed costs in certain marketing calculations. Similarly, if a new marketing program or new product involves additional investment, you should *never include the total initial investment* as a part of the fixed costs when computing break-even volumes if such investments have an economic life of over one year, as most investments will. Include only yearly *depreciation* in fixed costs.

Price–Volume Tradeoffs

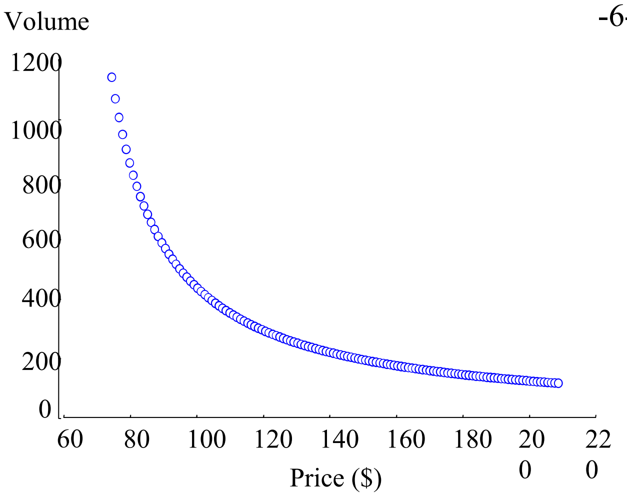
You have by now no doubt noticed that target volume (TV) and selling price (SP) are intimately related. In particular, as SP rises, so does unit contribution. That means that the TV needed to cover a given fixed cost and profit will fall (see **Equation 2**), which makes a great deal of intuitive sense. A manager who sets a higher price will generally need to sell fewer units in order to achieve a given profit goal. In fact, although this note has been focused on determining break-even and target volume, both in terms of units and dollars, you can easily also think of calculating a break-even price from a given fixed and variable cost, sales volume, and target profit. If you perform some very straightforward algebra on **Equation 2** you can write break-even price (BEP) in terms of the other variables as

$$BEP = VC + \frac{FC + Profits}{Target\ Volume} \quad (3)$$

So, returning to a previous example, if VC is $60 per unit, FC = $10,000, and the profit objective is $6,000, then we can use either **Equation 2** or **Equation 3** to analyze all the price-volume combinations that will satisfy our profit criteria. Using **Equation 3** we can directly see that one combination that satisfies our profit requirements is a selling price of $100 and a volume of 400 units. A combination of 500 units sold and a price of $92 would also work. Indeed, **Figure 4** depicts all volume-price combinations between a selling price of $75 and $200 that generate $6,000 of profit. The graph demonstrates the tradeoff managers face between break-even price and volume. It is an isoprofit curve, a curve along which all combinations yield the same projected profit.

The natural question then becomes what makes one price-volume combination along that curve better than another. That question involves specialized knowledge of product pricing techniques

Figure 4: Price-volume tradeoff.



and is beyond the scope of this note. For some quick intuition, however, notice that the isoprofit curve contains no information about how much people would actually be willing to pay for the product. Selling 115 units at $200 might, in theory, produce the target profit amount but in fact no one may be willing to pay $200. Thus, to answer this important question, break-even analysis must be paired with information on the quantity demanded of the product at various prices to complete the picture.

For example, let's suppose the owner of a snow cone stand hopes to sell 1,000 snow cones next month. She has a variable cost of $0.25 per snow cone, and a total contribution goal of $500. How much should she charge per snow cone? Applying **Equation 3**:

SP = $0.25 + ($500 ÷ 1,000 snow cones)
SP = $0.75

Thus, she should sell her snow cones for a price of $0.75 each to meet her objectives. Now let's suppose she decides to spend $250 on advertising over the course of the month, and expects to double her total contribution while cutting her sales price to $0.50. What percentage increase in sales volume must she achieve to meet her goals?

$0.50 = $0.25 + ($1000 + $250) ÷ Volume
Volume = 5000 snow cones

That amounts to a 400% increase in sales! Perhaps her new sales goal is unrealistic.

To express the target profit as a percentage of sales instead of as a dollar amount, reduce the contribution margin by the desired percentage profit margin and apply the formula for target volume:

TV ($) x % Cont. – FC = TV ($) x % Profit

TV ($) x % Cont. – TV($) x % Profit = FC

$$TV\ (\$) = \frac{Fixed\ costs}{\%\ Contribution - \%\ Profit}$$

For example, if the owner of a snow cone stand has fixed costs of $1,000 per month, a contribution percentage margin of 75%, and a goal of a profit margin on sales of 25%, what must be her target volume in dollars for the month?

TV ($) = $1000 ÷ (75% − 25%) = $2,000

Calculating Margin

Margin (or "markup" or "mark-on") refers to the arithmetic difference between the cost of a product and its selling price.[1] (Therefore, *cost plus margin always equals selling price*.) In the case of a merchant or retailer, the "cost" is the price paid for the product, while for a manufacturer, the term refers to the producer's variable manufacturing costs.[2]

Margin can be expressed in *dollars and cents* or as a *percentage*. When the margin is expressed as a percentage, that means the margin on *selling price* (i.e., selling price is taken as the base or 100%) as follows:

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[1] "Markup" is a term that some marketers (especially retailers) use in place of "margin." Often, but not always, percentage markup will be on "cost" and not as a percentage of selling price. Dollar markup is exactly the same as dollar margin. "Markdown" refers to a reduction in regular selling price.

[2] The margin on each product sold is applied to cover "other expenses" and profit. For the merchant or retailer, margin is used to cover fixed overhead, such as rent; variable overhead, such as billing expenses; and profits. For the manufacturer, margin covers fixed manufacturing overhead as well as fixed and variable marketing costs and profit.

	$	%
Selling Price	$1.00	100%
Cost	0.75	75
Margin	$0.25	25

Thus, the formula for the percent margin on selling price is as follows:

$$Percent\ margin\ on\ SP = \frac{\$\ Margin}{\$\ SP}\ x\ 100 \quad (4)$$

Note: Selling price (SP) in a margin formula refers to the selling price *at each level of distribution*. A wholesaler, for example, figures margin on *his* selling price, not on the ultimate retail selling price.

The following three situations illustrate common calculations involving margin. For simplicity, we will calculate margin on the selling price as a decimal rather than a percentage.

A frequent use of percent margin is to calculate selling price (SP), when the desired margin and the cost of the product are known. If a clothing retailer buys a scarf for $3.57 and wants to sell it at a 0.40 margin (i.e., a 40% margin on her selling price), then she will want to have a retail price on the item of $3.57/0.60. In other words, 60% of the selling price is equal to $3.57, the cost, and thus:

0.60SP = $3.57

Solving for SP, the retail list price is $5.95.

The formula for finding list price, given cost and desired margin, is as follows:

$$Selling\ \ price = \frac{Cost}{1 - (Desired\ \ margin)} \quad (5)$$

Another frequent margin calculation is to determine selling prices at each level of business; for example, at the manufacturing level, the wholesale level, and the retail level (which is the price the ultimate consumer pays).

Usually the target margins at each level of business will be known. Assume that the following margins apply: manufacturer, 0.10; wholesaler, 0.18; and retailer, 0.35. Assume that the manufacturing costs for a certain product are $64.50. Based on **Equation 5**, *the selling price at each level of business can be calculated by considering the cost and desired margin at each level:*

Manufacturer's selling price =
Cost ÷ (1-Desired margin) = $64.50÷0.90 = $71.67

The manufacturer's selling price is the wholesaler's cost. Thus,

Wholesaler's selling price = $71.67 ÷ 0.82 = $87.40

Similarly, the wholesaler's selling price is the retailer's cost. Thus,

Retailer's selling price = $87.40 ÷ 0.65 = $134.46

In the previous example, it was assumed that the selling price to the consumer ($134.46) could be derived, given the variable manufacturing costs and the desired margin down the channel of distribution. However, frequently the "cost" of *desired* margins cannot easily be passed on to the consumer (or to the wholesaler or retailer). That is, pricing constraints may exist at one or more levels in the channel of distribution.

For example, a manufacturer may feel he cannot sell a new product at retail for any more than $1.50 a unit. He knows that it costs $0.73 in *variable manufacturing* costs to produce the product, and he knows that his wholesalers will want a margin of 0.18 and his retailer 0.35. The question, then, is at what price can the manufacturer sell the product to his wholesalers? By applying the techniques from the previous example, the answer can be derived from starting with the known information at the retail level and working backward through the channel of distribution to get the manufacturer's selling price:

$$Selling\ \ price\ (retail)\ \$1.50 = \frac{Cost\ to\ retailer}{1 - (0.35)}$$

Cost to retailer = $0.97

The retailer, thus, would pay the wholesaler $0.97. This is both the cost to the retailer as well as the wholesaler's selling price. The wholesaler in turn wants to have a margin of 0.18. By going back another level through the channel of distribution, the cost to the wholesaler is calculated as follows:

$$Selling\ price\ (wholesaler)\ \$0.97 = \frac{Cost\ to\ wholesaler}{1-(0.18)}$$

Cost to wholesaler = $0.80

Since the wholesaler's cost equals the manufacturer's selling price, the manufacturer would receive $0.80 for the product. His margin would therefore be:

$$Margin\ on\ SP = \frac{\$0.80 - \$0.73}{\$0.80} = 0.088,\ or\ 8.8\%$$

Margin on Cost (An Exception to Margin on Selling Price)

Some in business calculate margin on costs, rather than on selling price.[3] These situations are *exceptions* to the general rule; therefore, one should assume that the basis for the calculation is the selling price unless a case explicitly states that margin percentages are computed on cost. Margin on cost can be expressed in either dollars and cents or as a percentage:

Selling price (SP) = $1.00
Cost = $0.75
Margin = $0.25 ($1.00 - $0.75)
Percent margin = $0.25 / $0.75 = 33 1/3 %

The formula for percent margin on cost is:

$$Percent\ margin\ on\ cost = \frac{\$\ Margin}{\$\ Cost}\ x\ 100 \quad (6)$$

For simplicity, we will calculate margin on cost as a decimal rather than a percentage. Again, margin on cost is an *exception* to the general rule of margin on selling price. To convert margin on selling price to margin on cost, the following formula applies:

$$Margin\ on\ cost = \frac{Margin\ on\ price}{1 - Margin\ on\ price} \quad (7)$$

Suppose the margin on SP is 0.221. What is the margin on cost?

$$\text{Margin on cost} = \frac{0.221}{1-0.221} = 0.284$$

As for the opposite situation—and converting margin on cost to margin on selling price—the following formula applies:

$$Margin\ on\ selling\ price = \frac{Margin\ on\ cost}{1 + Margin\ on\ cost} \quad (8)$$

Note that the denominator represents selling price, which is cost plus margin. Suppose the margin on cost is 0.284. What is the margin on SP??

$$\text{Margin on selling price} = \frac{0.284}{1+0.284} = 0.221$$

Cannibalization

The following discussion of cannibalization will incorporate many of the concepts discussed earlier in this note. It will also prepare you to perform basic calculations so that you may better estimate the economic effects that cannibalization will have on a business or business segment. These examples are straightforward and assume that the impact of cannibalization in the marketplace can be effectively isolated and precisely measured. This will provide you with a basic framework that can then be used as a foundation from which to tackle the more intricate and dynamic problems commonly found in business practice. Various market research methodologies exist in order to more accurately estimate draw from existing and potential competitors. You will likely be introduced to some of these techniques in your marketing course. In the following sections we will address two specific types of market cannibalization: intra-company and new entrant.

Intracompany cannibalization

Often, companies will introduce new products that are very similar to existing products. The phrase "new & improved" is used to market products that may have one or two minor differences with their predecessor. One reason to do this may be

[3] Examples include certain U.S. drug firms and some Canadian businesses.

to keep pace with a competitor who has recently introduced a product that may be perceived as more innovative or better than the existing array of products. Another reason may be to expand a product's appeal to a broader customer base, those who are waiting for the "right upgrades" before they decide to jump in and buy. Whatever the reason, it is important for the initiating company to understand that a portion of the contribution generated by the new product *will almost certainly* detract from the contribution of the company's existing products. It can be said that the new product is "cannibalizing" sales of the existing product.

For example, Tight Security makes fencing products for domestic use. They sell 1,000 units of their current product "KeepOut" each year (let's assume 1 unit = 100 feet of fencing). Tight Security's research department has developed a longer-lasting fence called "KeepOutPlus" that withstands weather damage better than the existing model. If KeepOut sells for $300 per unit with a variable cost of $100, and KeepOutPlus sells for $350 per unit with a variable cost of $200, then:

Unit Contribution (KeepOut): $200
Unit Contribution (KeepOutPlus): $150

This difference is due to the higher cost of making the newer model, as well as the difficulty of raising prices due to the presence of competition. The critical business question for Tight Security to answer is how much of the new fencing's sales are a result of cannibalization from the old fencing's sales? Or, does adding a new product line increase contribution to the company after the effects of cannibalization are calculated? Given the following:

Previous KeepOut unit sales per year: 1,000
Current KeepOutPlus unit sales per year: 500
Old fencing cannibalization rate: 80%
Current KeepOut unit sales per year: 1,000 − (500 × 80%) = 600

The cannibalization rate is the percentage of new product sales that will come from the old product. Note that cannibalization rates should be calculated using equivalent units unless otherwise specified. The cannibalization rate should not be confused with the percentage sales decrease that the old product incurs after the new product introduction. In the above example:

Previous KeepOut unit sales per year: 1,000
Current KeepOut unit sales per year: 1,000 − (500 − 80%) = 600
Percentage sales decrease of KeepOut: 1− (600 ÷ 1,000) = 40%

At first glance it would appear the introduction of KeepOutPlus was a success, since now Tight Security sells 1,100 fence units per year (500 KeepOutPlus and 600 KeepOut). But let us compare the total fencing contribution Tight Security now earns:

Before the new fencing product,
Contribution = (1,000 KeepOut units × $200 unit contribution) = $200,000 total contribution

After the new fencing product,
Contribution = (600 KeepOut units × $200 unit contribution) = $120,000, plus (500 KeepOutPlus units x $150 unit contribution) = $75,000 = $195,000 total contribution ($120,000 + $75,000)

So in this case, Tight Security would be better off *not* introducing the new product.

Once Tight Security has a track record of rolling out similar products that may compete with existing ones, they may be able to estimate a cannibalization rate or percentage sales decrease before introducing the new product. That estimate could then be used in setting an initial product price and/or knowing the necessary volume that would be needed to increase total contribution. That information would give management a better idea of whether a new product should be introduced at all.

In the original example, suppose Tight Security knew beforehand that their cannibalization rate of KeepOut from KeepOutPlus would be 90%. Virtually everyone would purchase the new fencing. If management estimates that their sales of new fencing would still be 500 units, they could determine the contribution margin they would need to receive on each unit, and therefore set their pricing and/or variable cost goals appropriately:

Current KeepOut sales = 1,000 – [90% × 500] = 550
Current KeepOut contribution
= 550 × $200 per unit = $110,000
Necessary KeepOutPlus total contribution =
$200,000 (KeepOut only) − $110,000 = $90,000

Necessary KeepOutPlus unit contribution = \$90,000 ÷ 500 = \$180

New entrant cannibalization

When a company decides to develop a product that competes in an existing product group, it is reasonable to expect that the bulk of sales that the new product generates will be taken from existing products. For example, when Honda introduced its cars in the United States, most of its business was generated by selling to people who had previously bought cars made by General Motors, Ford or Chrysler. Only a small percentage of Honda's sales were a result of overall car market growth. This represents the type of cannibalization caused when a new entrant takes share from existing participants. The concept of "fair share draw" attempts to quantify how much share a new participant takes from existing participants. "Fair share draw" specifies that existing participants will lose share to the new entrant in direct proportion to their existing share. For example, the present local market shares for groceries break down as follows:

Sam's: 50%
Mary's: 30%
Tina's: 20%
Total: 100%

Let's assume a new entrant, "Bart," enters the local market and gains a 10% share. The existing entrants will lose share in the following way:

Sam's: 50% × 10% =	5%
Mary's: 30% × 10% =	3%
Tina's: 20% × 10% =	2%
Total Lost	**10%**

Notice the total market share lost equals Bart's new market share. Thus, the new market shares will be:

Sam's: 50% − 5% =	45%
Mary's: 30% − 3% =	27%
Tina's: 20% − 2% =	18%
Bart's:	10%
Total	**100%**

Note that each of the original competitors still has the same proportion of market share relative to each other that it had before the new entrant appeared. Before Bart entered the market, Mary had 60% (30% ÷ 50%) of Sam's share. After Bart entered, Mary still had 60% (27% ÷ 45%) of Sam's share. So this problem could also be solved with the following algebraic equation:

$$10\% + x + 0.6x + 0.4x = 1 \text{ (or } 100\%)$$

where x represents Sam's share, $0.6x$ represents Mary's share relative to Sam's, and $0.4x$ represents Tina's share relative to Sam's.

Bart's share + Sam's share + Mary's share + Tina's share = Total market share (100%)

That simplifies to $2x = 0.9$, so that $x = 0.45$, which is Sam's new market share.

In that example, suppose we know that Bart's store is focused on being the low-price leader in the community. Suppose Sam and Mary also cater to that market, while Tina is a niche grocery store focused on premium food and preparation for a decidedly upscale clientele. That would make the chance of fair share draw most unlikely. The market share realignment may look more like:

Market share "at risk" from Bart's entry: 80% (Sam 50% + Mary 30%)

Fair share draw would then exist between the relevant competitors:

Sam controls 62.5% (50% ÷ 80%) and would lose 62.5% x 10% or 6.25%

Mary controls 37.5% (30% ÷ 80%) and would lose 37.5% × 10% or 3.75%.

Therefore the new share breakdown would be as follows:

Sam's: 50% − 6.25% =	43.75%
Mary's: 30% − 3.75% =	26.25%
Tina's: 20% − 0 % =	20.00%
Bart's:	10.00%
Total	**100%**