TARGET PROFIT PRICING WITH THE WEB-BASED BREAKEVEN ANALYSIS PACKAGE

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ABSTRACT

The web-based Breakeven Analysis Package enables competing participant teams to consider cost and demand factors when setting price. Participants set target profit and desired margin or price for each strategic business unit (SBU). The fixed and variable costs are computed based on inputs extracted from the simulation results. Based on these inputs, the unit and dollar sales needed to achieve the target profit at the set price are computed for each SBU. Participants can adjust the desired profit and margin or price until the unit and dollar sales needed to achieve the target profit at the set price are realistic. Cell comments clarify input variables used and calculations made.

INTRODUCTION

The Breakeven Analysis Package enables competing participant teams in the marketing simulation COMPETE (Faria 2006) to simultaneously consider both cost and demand factors when setting price for each of their nine strategic business units (SBUs). SBUs are specific product offerings in specific regions that have specific target markets with specific needs and purchase motivations, a specific set of strategies, facing a specific set of competitors with specific competing strategies. This Microsoft Excel-based package is based on the Breakeven spreadsheet in the Lotus 1-2-3-based COMPETE Analysis Programs decision support package provided with the COMPETE (4th ed.) student manual (Nulsen, Roussos, & Faria, 1993; Nulsen, Faria, & Roussos, 1994).

The Breakeven Analysis Package (see Figure 1) extracts relevant data via external links on (a) Total Operating Expenses and (b) Salesforce Commission Expense by region, (c) Unit Production Costs by product, (d) Price by SBU, and (e) Percent Salesforce Commission for the company from the Excel version of the COMPETE simulation results. In addition, this package calculates and graphs the unit and dollar sales required to breakeven (see Figure 2). Further, this package calculates the unit and dollars sales needed to achieve the target profit at a margin or price set by the user. The use of external links ensures relevant data are extracted from relevant sources (statements) in the simulation results and precludes data entry error. Cell formulae ensure that data on desired profit and price are consistently used on a pre-tax basis. Cell comments (see Figure 3) clarify variables used and calculations made.

The primary purpose of this paper is to present this new user-centered learning tool that helps to prepare students for marketing decision-making responsibilities in their future careers. The objective is to provide participant teams the opportunity to use breakeven analysis as one input in setting price for each of their SBUs.

PRICING

The price of a product influences the quantity purchased. Consumers look for a price that reflects the potential perceived benefits derived from the product relative to competitive offerings. At the same time, the price influences whether product sales are profitable for the organization. Price increases usually lead to some decrease in unit sales. Further, price increases can either increase or decrease sales volume depending on the price elasticity of demand. Consequently, the pricing decision is complex and important (Bagozzi, Rosa, Celly, & Coronel, 1998; Churchill, Jr., & Peter, 1995; Kotler, 2003; Lamb, Hair, & McDaniel, 2004; McCarthy, & Perreault, Jr., 1987; Perreault, Jr., & McCarthy, 1996).

At the same time, the price of a product is influenced by other elements of the marketing mix. The product element of the marketing mix influences price through product quality, cost of production, stage of the product life cycle and the benefits delivered to consumers. The place (distribution) element of the marketing mix influences price through the strategy used (intensive, selective, or exclusive), channel length (long, medium, or short), and channel intermediaries and transportation methods used. The promotion (communication) element of the marketing mix affects price through the strategy used (push, pull, or combo push and pull), budget, media, message, and its impact on customer perception of the offering and brand image. Pricing consistent with other elements of the marketing mix helps to position the brand relative to competitive offerings in the consumer's mind (Bagozzi, Rosa, Celly, & Coronel, 1998; Churchill, Jr., & Peter, 1995; Kotler, 2003; Lamb, Hair, & McDaniel 2004; McCarthy, & Perreault, Jr., 1987; Perreault, Jr., & McCarthy, 1996).

PRICING CONSIDERATIONS

A variety of factors need to be considered when setting price for an offering (Bagozzi, Rosa, Celly, & Coronel, 1998; Churchill, & Peter, 1995; Dalrymple, & Parsons, 1995; Kotler, 2003; Kotler, & Keller, 2007; Lamb, Hair, & McDaniel, 2004; Lynn, 1967; McCarthy, & Perreault, Jr., 1984; McCarthy, & Perreault, Jr., 1987; Nagle, & Holden, 2002; O'Dell, 1984; Palda, 1971; Perreault, Jr., & McCarthy, 1996; Peter, & Donnelly, Jr., 1994). The price floor is the cost per unit to produce, transport and warehouse a product. Pricing below the price floor will lead to inability to recover costs, realize profit, and lead to losses. The price ceiling is the willingness and ability of consumers to pay the set price. Pricing above the ceiling will lead to brand substitution by consumers.

Several other factors need to be considered when setting price. The nature of the target customer segment as well as the needs, purchase motivations, and benefits sought by consumers are important factors to consider when setting price. The perception of price v quality v value by consumers is more important than the actual price v quality v value of the offering. Hence, integrated marketing communications are used to reinforce the image of price v quality v value perceived by customers.

The nature of the product is another important consideration. Pricing varies for luxury v necessity products, consumer v industrial products, and convenience v shopping v specialty goods. Consumers use price as the determining factor when selecting among homogeneous shopping goods. On the other hand, they use non-price determining factors when selecting among heterogeneous shopping goods. The stage of the product life cycle (introduction, growth, maturity, decline) also has an influence on price.

The pricing decision is not made in isolation. Competitor prices need to be considered when setting price. Competitor-based pricing techniques include "Follow-the-leader pricing," "Adaptive pricing," "Opportunistic pricing," and "Predatory pricing" (Churchill, Jr., & Peter, 1995). The price v quality v value proposition of competing brands will determine their position in the premium, high value, penetration or rip-off quadrants on a product positioning map (Kotler, 1988).

Another factor to consider when setting price is the nature of competition in the marketplace. Firms in various competitive market structures (pure competition, monopolistic competition, oligopoly (pure v differentiated) and pure competition) exhibit different pricing behavior. The majority of firms exist in either monopolistic competitive or oligopoly markets. Specifically, firms exhibit price leadership behavior and tend to use non-price variables in oligopoly markets. On the other hand, firms use price as a competitive variable in monopolistic competitive markets.

Yet another factor is the nature of price elasticity of demand for the offering. Based on the Total Revenue Test of Elasticity, the movement in price and Total Revenue are in opposite directions when the demand is price elastic. Accordingly, when demand is price elastic, a 10% decrease in price will result in a larger than proportionate (for instance, 20%) increase in the quantity sold, resulting in an increase in sales revenue. Similarly, a 10% increase in price will result in a larger than proportionate (for instance 20%) decrease in the quantity sold, resulting in a decrease in sales revenue. Hence, in order to maximize sales revenue, marketers should decrease price when demand is price elastic.

On the other hand, when the demand is price inelastic, the movement in price and Total Revenue are in the same direction. Accordingly, when demand is price inelastic, a 10% decrease in price will result in a less than proportionate (for instance, 5%) increase in quantity sold, resulting in a decrease in sales revenue. Similarly, a 10% increase in price will result in a less than proportionate (for instance, 5%) decrease in quantity sold, resulting in an increase in sales revenue. Hence, in order to maximize sales revenue, marketers should increase price when demand is price inelastic.

The determinants of price elasticity of demand include the availability of close substitutes, the urgency of demand, and the proportion of the price of the offering to the income of the consumer (McCarthy, & Perreault, Jr., 1984). Availability of close substitutes leads to elastic demand. Urgency of demand leads to inelastic demand. Finally, as the offering price to consumer income increases, demand becomes more elastic.

In order to prosper, firms need to move beyond cost-based pricing, markup pricing, and rate-of-return pricing, which add a desired rate of return on the investment needed to produce the product. Marginal analysis can be used to identify the point at which profits will be maximized – the point at which marginal costs equal marginal revenues. Indeed, marginal analysis based on more realistic downward sloping demand curves and non-linear cost functions, reveals two breakeven points enclosing a region of profitability. This region of profitability is preceded by a region of loss where total revenue is less than but approaching total cost. The same region of profitability is succeeded by a region of loss where total cost has caught up with and exceeds total revenue. Yet, it is difficult to construct accurate demand curves and accurately identify the total costs associated with each product. Given the limitations of marginal analysis, marketers seek other ways to identify a profitable price. One such technique is breakeven analysis.

BREAKEVEN ANALYSIS

Breakeven analysis has been referred to extensively in the simulation literature, and used in simulations in a variety of courses in different functional areas. These include

courses in Accounting (Bonczkowski, Gentry, & Caldwell, 1979), Agribusiness (O'Rourke, 2000), Business Policy Capstone (Tangedahl, 1998; Sampson, & Sotiriou, 1977), Economics (Koontz, Peel, Trapp, & Ward, 1994), Entrepreneurship (Lai, & Siau, 2003), Finance (Markovich, 1995), General Business (Dyson, Jr., 1977; Sprague, & Cotlar, 1974), International Business (Halpin, 2006), Management (Frazer, 1985), Marketing (Dube, 1977; Faria, & Whiteley, 1990; Greenlaw, 1989; Palia, 1989, 1991, 1997; Rubin, 1987, 1988; Smith, 1986; Whiteley, 1993, 2006; and Whiteley, & Faria, 1989), and Strategic Management (Woodruff, 1991). Appropriate use of breakeven analysis requires knowledge of the objectives, underlying theory and assumptions, and limitations of this technique.

Breakeven analysis is a technique used to identify the sales volume at a price needed to cover costs ("break even"). The breakeven point is the level of sales at which total revenues equal total costs. In order to find the breakeven point, the marketer estimates (a) the revenues that would be earned at various quantities at a given price, and (b) the total costs of producing and marketing those quantities. Both the total revenue and total cost are linear functions based on the simplifying assumptions that (a) each unit is sold at the same price, and (b) the cost to produce each additional unit is the same. The point at which the total revenue and total cost lines intersect is the breakeven point. Based on this analysis, the marketer would offer the product at the specific price only if the firm expects to sell more than the breakeven quantity.

$$\text{Breakeven Point} \quad = \quad \frac{\text{Total Fixed Costs}}{\text{Price} - \text{Unit Variable Cost}}$$

Once the marketer has estimated the breakeven point – the sales volume needed to cover costs at a specific price, it is necessary to consider whether the firm is likely to sell that quantity at the given price. Hence, the marketer combines breakeven analysis with knowledge of consumer demand. In addition, given the desirability of generating a profit as opposed to merely breaking even, the marketer can incorporate a specific profit objective into breakeven analysis. Thus the marketer can determine the unit sales needed to achieve the desired profit level.

$$\text{Unit Sales Needed to Achieve Desired Profit} \quad = \quad \frac{\text{Fixed Costs} + \text{Desired Profit}}{\text{Price} - \text{Unit Variable Cost}}$$

Consequently, Breakeven Analysis simultaneously considers both cost and demand factors and provides valuable input when setting price.

THE MARKETING SIMULATION COMPETE

COMPETE (Faria, 2006) is a marketing simulation designed to provide students with marketing strategy development and decision-making experience. Competing student teams are placed in a complex, dynamic, and uncertain environment. The participants experience the excitement and uncertainty of competitive events and are motivated to be active seekers of knowledge. They learn the need for and usefulness of mastering an underlying set of decision-making principles.

Competing student teams plan, implement, and control a marketing program for three high-tech products in three regions within the United States. These three products are a Total Spectrum Television (TST), a Computerized DVD/Video Editor (CVE) and a Safe Shot Laser (SSL). The features and benefits of each product and the characteristics of consumers in each region are described in the student manual. Based on a marketing opportunity analysis, a mission statement is generated, specific and measurable company goals are set, and marketing strategies are formulated to achieve these goals. Constant monitoring and analysis of their own and competitive performance helps the teams better understand their markets and improve their decisions.

Each decision period (quarter), the competing teams make a total of 74 marketing decisions with regard to marketing their three brands in the three regional markets. These decisions include nine pricing decisions, nine shipment decisions, three sales force size decisions, nine sales force time allocation decisions, one sales force salary decision, one sales force commission decision, twenty-seven advertising media decisions, nine advertising content decisions, three quality-improvement R&D decisions, and three cost-reduction R&D decisions. Successful planning, implementation, and control of their respective marketing programs require that each company constantly monitor trends in its own and competitive decision variables and resulting performance.

COMPETE ONLINE DECISION ENTRY SYSTEM (CODES)

The COMPETE Online Decision Entry System (CODES) is a web-based simulation interface that enables competing participant teams with Internet access, to register their teams, enter and submit their decisions, and subsequently to retrieve and print out their results from a remote site (Palia, Mak, & Roussos, 2000).

The teams log in to the CODES website (Palia, & Mak, 2001, Palia et al, 2000). Their login is validated against a database of participating teams for each industry, and they have access to their decisions and printouts (results) for all prior decision periods.

Once the team ID and password are validated against a database of participating teams, the user (participant) is presented with a personalized Welcome screen with several options. In addition to the "Main Menu" option, the user is presented with one or more of three dynamic links "Grades," "Handouts," and "Performance" only if and when

the corresponding files are uploaded to their industry folder on the web server by the administrator (Palia, 2006).

At the "Main Menu" webpage they select "Enter Decisions" to enter their team decisions prior to the decision deadline. At the decision deadline, the administrator downloads the team decision files, runs the simulation, and uploads the text and Excel versions of the simulation results to the Web Server. Later, the teams log in to CODES, proceed to the Main Menu, and select "View Results" to view their team performance results in either text or Excel format.

THE BREAKEVEN ANALYSIS PACKAGE

The web-based Breakeven Analysis Package Version 1.0 is accessible online to competing participant teams in the marketing simulation COMPETE. The Breakeven Analysis Package Version 1.0 is a set of twelve zipped folders Breakeven 1.zip, Breakeven 2.zip, …, Breakeven 12.zip, one for each of the twelve decision periods (three years of competition). Each zipped folder consists of three Excel workbooks Breakeven – TST.xls, Breakeven – CVE.xls, Breakeven – SSL.xls (each with external links to the x.xls COMPETE output file) and x.xls Excel version of sample COMPETE output for a specified period "x".

First, the participant teams download and unzip the Breakeven x.zip folder for a specified period "x". Next, they login to CODES and download, rename and save the Excel version of results for the same period "x" in the unzipped "C:\Breakeven x" directory. Then, they update the selected Breakeven – TST.xls, Breakeven – CVE.xls, and/or Breakeven – SSL.xls workbooks with team data. For instance, to update the Breakeven – TST.xls workbook with their team data, they first open the unzipped Breakeven x folder, then open the Breakeven – TST.xls workbook, and finally click "Update file" in the pop-up menu that appears.

Each of the three updated Breakeven Analysis Workbooks consists of a Breakeven Analysis worksheet and associated Breakeven graphs. External links in the Breakeven Analysis worksheets minimize user data entry requirements. Breakeven Analysis graphs are provided to enhance visualization and understanding of the relationships among the variables and to facilitate data analysis.

The Breakeven Analysis Workbook is used as one input in the pricing decision for each strategic business unit (SBU). Given a desired level of profit, total fixed cost, and unit variable cost for each SBU, the Breakeven Analysis Workbook determines the unit and/or dollar sales needed to achieve the target level of profit. With this workbook, the user can (a) set a desired profit objective for each SBU, (b) extract cost data from the Excel printouts accessible via CODES, (c) calculate the total fixed cost and unit variable cost for each SBU, (d) set a desired margin for each SBU, (e) calculate the breakeven point in units and dollars, and (f) calculate the unit and/or dollar sales needed to achieve the desired profit at a set price.

THE BREAKEVEN ANALYSIS PROCESS

First, the user sets the desired profit to be achieved by each SBU. The user enters the Earnings per Share (EPS) goal for the entire company over a period of four quarters (one year of operation). Based on this EPS goal, the Breakeven Analysis worksheet (see Figure 2) calculates the before-tax desired profit for each SBU for each quarter (decision period). If necessary, the user can modify this calculated before-tax SBU desired profit in order to account for varying emphasis for each product, region, and/or period.

Next, the Breakeven Analysis worksheet estimates the Total Fixed Expense for each product in each region. The salesforce commission expense (the only variable operating expense) for each region is subtracted from the total operating expense for the corresponding region. The resulting fixed operating expense for the region is divided by three to arrive at the estimated Total Fixed Expense for each product in each region. The salesforce commission expense and total operating expense data are extracted from the corresponding regional income contribution statements in the Excel version of the results printout. Cell comments (see Figure 3) clarify variables used and calculations made.

Then, the Breakeven Analysis worksheet estimates the Unit Variable Cost for each product in each region. The regional Salesforce Commission Expense was earlier deducted from the total fixed expense when estimating the Total Fixed Cost. This variable expense is now considered part of Variable Cost on a per unit basis. Accordingly, the Unit Salesforce Commission Expense is first calculated by multiplying the Price of each product by the Percent Salesforce Commission. This Unit Salesforce Commission Expense is then added to the Unit Production Cost in order to arrive at the Unit Variable Cost for each product in each region. The data on Price, Percent Salesforce Commission and Unit Production Cost are extracted from the Price, Salesforce Commission and Cost of Production reports in the Excel version of the results printout. Cell comments (see Figure 3) clarify variables used and calculations made.

Later, the user sets the desired Gross Margin for each SBU. The Breakeven Analysis worksheet first calculates the Price based on the Unit Variable Cost and the Gross Margin. This price is used to calculate the unit and dollar sales needed to breakeven, and the unit and dollar sales needed to achieve the desired target profit for each SBU. Breakeven graphs (see Figure 2) are provided for each SBU.

Once the unit and dollar sales needed to achieve the desired target profit for each SBU are calculated, the user needs to consider whether the firm is likely to sell that quantity at the calculated or set price. If not, the user can modify the desired profit, gross margin, or price, until the unit and dollar sales needed to achieve a target profit level at a set price are attainable.

LIMITATIONS

The web-based Breakeven Analysis Package suffers from the same limitations as theoretical breakeven analysis. The simplistic assumptions of constant marginal revenue (based on a linear perfectly elastic demand function which exists only in perfect competition) and constant unit variable costs (based on a linear variable cost function) yield linear total revenue and linear total cost functions. These linear total revenue and total cost functions suggest that once the breakeven point (where total revenue catches up with and is equal to total cost) is reached, further increase in output and sales will result in ever-expanding profits.

Thus, traditional breakeven analysis assumes that the demand curve is perfectly horizontal at the selling price, suggests that profits will grow rapidly as sales volume increases beyond the breakeven point, and makes it appear that any quantity can be sold at the assumed price. In addition, traditional breakeven analysis assumes that average variable cost is the same regardless of the quantity sold.

By contrast, realistic breakeven analysis recognizes that varying marginal revenue (based on a more realistic non-linear downward sloping demand curve which exists in monopolistically competitive or oligopolistic markets) and varying unit variable cost (based on a more realistic non-linear variable cost function) yield non-linear total revenue and total cost functions. These non-linear total revenue and total cost functions suggest that there will be two breakeven points. The first breakeven point is arrived at when total revenue catches up with and is equal to total cost. The second breakeven point is arrived at when total cost catches up with and surpasses total revenue. These two breakeven points include a zone of profitability bounded on both sides by loss zones.

Despite these limitations, breakeven analysis can show which prices will not be profitable. In addition, breakeven analysis can be adapted to evaluate the quantity that needs to be sold to earn a target profit, by adding the target profit to fixed costs. Marketing managers need to be aware that breakeven analysis may result in a "breakeven" quantity that it would be impossible to sell at the assumed price. Finally, breakeven analysis can be useful for comparing pricing alternatives.

CONCLUSION

The web-based Breakeven Analysis Package is a user-centered learning tool that helps to prepare students for pricing and marketing decision-making responsibilities in their future careers. The package enables users to simultaneously consider cost and demand factors when setting price. Participants use the Breakeven Analysis Package to determine the unit and dollar sales needed to achieve a desired profit when facing specific levels of fixed and variable costs. This web-based Breakeven Analysis Package facilitates the integration of computers, the Internet and the World Wide Web into the marketing curriculum.

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Breakeven Analysis Worksheet
Figure 1

PERIOD #	1	************	************	************	************	06-Oct-07	**********
——————>	BREAKEVEN ANALYSIS -TST (ANAL.#19)		YearEPS GOAL=	$3.00			

	REGION 1		REGION 2		REGION 3	
Unit Sales Price ($).....'A'	$4,899.00	$4,899.00	$4,400.00	$4,400.00	$4,500.00	$4,500.00
Unit Prod. Cost ($)......'B'	$ 3,461.20	$3,461.20	$ 3,458.50	$3,458.50	$ 3,458.65	$3,458.65
Gross Margin (Decimal)...'C'		29.35%		21.40%		23.14%

(Linear Breakeven Graphs use data from next 3 lines....)

	REGION 1	REGION 2	REGION 3
Total Fixed Expense (Est.)......	$ 690,333	$ 632,667	$ 506,333
Break-even Dollar Sales	$2,352,165	$2,956,700	$2,188,025
Break-even Point (Units).....	480	672	486

	REGION 1	REGION 2	REGION 3
Profit Desired ($)...........	$245,098	$245,098	$245,098
Sales Required ($)...........	$3,187,285	$4,102,140	$3,247,171
Sales Required (Units).......	651	932	722

INTRODUCTION:

The above screen shows the layout and contents of a Breakeven worksheet. This worksheet provides a convenient tool for calculating and graphing breakeven (units or $) in each region. The data in the example screen below is for Total Spectrum Television system (TST).

The Breakeven worksheet is particularly useful for performing simple calculations and "What If" analysis. For example, if the user inputs Unit Sales Price (line 1) and Unit Production Cost (line 2), the Gross Margin % will be calculated and displayed on line 3.

OR, if line 2 is entered in dollars and the DESIRED Gross Margin decimal is entered on line 3, the price REQUIRED will be calculated and shown on line #1.

LEGEND:

Enter data

Data extracted from printout

Calculation based on EPS goal

Breakeven Analysis Worksheet Graph
Figure 2

TRADITIONAL BREAK-EVEN
TST REGION 1
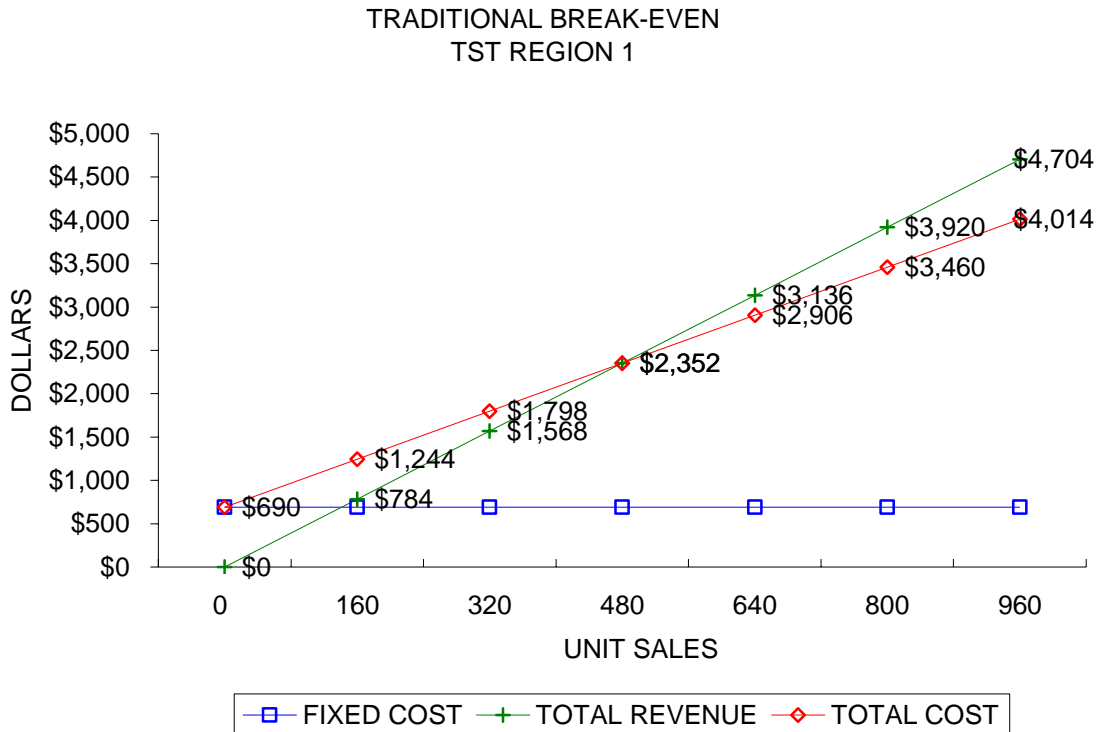
Breakeven Analysis Worksheet With Cell Comments
Figure 3

```
    PERIOD #      1   ********** **************** [Aspy Palia:        ]**************************        08-Oct-07   **************
--------->        BREAKEVEN ANALYSIS-TST   (ANA[Enter decision period.]Year EPS GOAL=     $3.00   [Aspy Palia:          ]
********* ****** *********** ***********************        **************************   ***[Enter EPS Goal for Year] ************

                              REGION 1     [Aspy Palia:        ]   REGION 2                                REGION 3
Unit Sales Price ($)....."A"   $4,899.00   [Clear price and enter]   $4,400.00   [Aspy Palia:                            ]   $4,500.00
Unit Prod. Cost ($)......"B"  $  3,461.20  [desired gross margin]  $  3,458.50   [=(Unit Prodn. Cost) + (Unit Salesforce Commn. Exp.)]  $3,458.65
Gross Margin (Decimal)..."C"                in row 3                             [=(Unit Prodn. Cost) + (Price * %Salesforce Commn.)]    23.14%

        (Linear Breakeven Graphs use data from [Aspy Palia:             ]
Total Fixed Expense (Est.)....  $   690,333  [Enter desired gross margin.]  632,667   [Aspy Palia:                  ]
Break-even Dollar Sales .....    $2,352,165                            $2,956,700    [= [Tot. Op. Exp - SF Commission Exp] / 3,]
Break-even Point (Units).....        480                                  672        [from RIC 2]                     486

        ==============================================================  [Aspy Palia:                      ] ===================
Profit Desired ($)...........   $245,098                   $245,098     [= (EPS x 2,000,000) / [(1-0.32) x 4 x ]098
Sales Required ($)...........   $3,187,285                 $4,102,140                              $3,247,171
Sales Required (Units).......       651                       932                                     722
********* ****** *********** ***************************        *****************************   ***********************************
```

INTRODUCTION:

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OR, if line 2 is entered in dollars and the DESIRED Gross Margin decimal is entered on line 3, the price REQUIRED will be calculated and shown on line #1.

LEGEND:

(yellow)	Enter data
(cyan)	Data extracted from printout
(orange)	Calculation based on EPS goal