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THE USE OF PROGRAM CVP IN TEACHING COST-VOLUME-PROFIT ANALYSIS"

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INTRODUCTION

Cost-volume-profit (breakeven) analysis, the study of the relationships of the factors affecting profits, is usually first introduced to college students in their second accounting course, managerial accounting. Breakeven analysis at that level is a fairly simple concept used to determine the number of units of a product which must be sold in order to cover its variable costs and share of fixed costs. The breakeven point is that point at which there is no profit or loss, or where total revenues equal total expenses. Profits, either before or after taxes, may also be incorporated into the model to determine the number of units which must be sold to yield a certain profit.

FORMULAS

The basic formula for determining the breakeven point (BEP) in units for a single-product firm is as follows:

$$BEP = \text{Total fixed costs}/\text{Unit contribution margin}$$

where the unit contribution margin (CM) is equal to the unit selling price (SP) minus the unit variable cost (VC). If a desired profit level is to be included, the numerator of the above formula consists of the desired before-tax profits in addition to total fixed costs, where before-tax profits are equal to after-tax profits divided by (1 minus the tax rate).

A variation of the basic formula will yield a break-even point in dollars (sales revenues) by dividing by the contribution margin percentage (CM/SP) instead of the unit contribution margin.

To compute the breakeven point for a multiple-product firm, it is necessary to calculate a group contribution margin in place of the unit contribution margin in the above formula by assuming a particular mix of products to be sold. The group contribution margin is the sum of the individual contribution margins of each product multiplied by its sales mix proportion. The resulting breakeven point consists of groups of the products, each group consisting of the proportionate ratio of each product. The groups can then be broken down into breakeven units of the individual products.

ASSUMPTIONS

Breakeven analysis at the introductory level does include some simplifying assumptions. First, the behavior of revenues and expenses is expected to be linear over the entire relevant range (no change in selling prices, variable costs, or fixed costs regardless of level of activity). Also, It is assumed that the expenses can be accurately separated into their fixed and variable components. Finally, sales mix is assumed to be constant and inventories fixed (or sales equal to production). Although these assumptions may appear to severely limit the value of breakeven analysis, they in fact will not alter the basic principles learned at the introductory level.

PROGRAM CVP

As the actual computation of the breakeven point is merely a matter of inserting the various figures into the appropriate formula and actually is just the beginning of the analysis, an alternative approach to teaching the effects of changes in the various parameters of the breakeven formula on the breakeven point was developed. An understanding of what happens to the break- even point if fixed costs, variable costs, or selling prices should increase or decrease is in fact the most valuable part of the analysis for managerial accountants.

Program CVP was designed to minimize the time spent on the rote calculations of the breakeven point and allow the students ample opportunity to analyze the changes in the breakeven point by changing the various parameters. Does the breakeven point increase or decrease if fixed costs (variable costs, selling prices) increase or decrease? Is the change in breakeven point proportional to the change in the parameter and why? The primary purpose of the program is to allow the students to develop a feel for the sensitivity of the breakeven point in regard to changes in fixed costs, variable costs, selling prices, or product mix, rather than the determination of the breakeven point itself.

No previous background in computer programming is necessary to run this program. It can be run either interactively, which would be the ideal choice if facilities are available, or in batch form, which requires keypunching approximately 20 cards per run.

The inputs to Program CVP include total fixed costs, before- or after-tax profits and tax rate (previously coded in so the computer can distinguish between them), the number of products sold (maximum of 8), selling prices of each product, the unit contribution margin, unit variable cost, contribution margin percentage or variable cost percentage for each product (also coded in prior to input), the proportion of unit sales of each product to total sales for a multiple-product firm and an option to rerun the program.

The output lists all of the inputs and in addition shows the breakeven point for each product in both units and dollars.

RESULTS

After running several variations of sample problems, the students were required to write a short paper analyzing the results of their runs. Although working with the computer was a new and time-consuming project for many of them, it did provide valuable experience for them and writing up a paper reinforced the learning that was taking place. Overall, they demonstrated a better understanding of the analysis than has been the case in the past using a straight lecture/problems format for teaching cost-volume-profit analysis.