Cost Behavior: Analysis and Use

least three cost behavior patterns—variable, fixed, and mixed—are found in most organizations.Of course, many other types of cost behavior patterns exist, but these three patterns are fairly common and the mixed cost model can be used to provide approximations to more complex cost behavior patterns within a relevant range. It is important for managers to understand the behavior of each type of cost.

1. Variable Costs. The total amount of a variable cost varies in direct proportion to changes in the activity level. When expressed on a per unit basis, variable costs are constant.

. This is particularly true of direct labor and other employee wages and salaries that may be effectively fixed due to labor laws in a country, custom, labor contracts, or the organization's personnel policies.

a. Activity base (cost driver). For a cost to be variable, it must be variable with respect to some activity base. An activity base is a measure of whatever causes the incurrence of a variable cost. Some of the most common activity bases are machine-hours, units produced, and units sold. A measure of activity should be used to allocate a cost for decision-making purposes only if it actually causes the cost.

b. True variable and step-variable costs. Some variable costs, such as direct materials, vary in direct proportion to the level of activity. These costs are called true variable costs. A cost that is obtainable only in large chunks and that increases or decreases in response to fairly wide changes in the activity level is known as a step-variable cost. For example, direct labor may be a step-variable cost when workers are only hired on a full-time basis.

c. In reality, many costs are curvilinear. Most frequently, costs increase less than proportionately with activity. Nevertheless, within any given narrow band of activity even a curvilinear cost function is approximately linear. This narrow band of activity within which a particular straight line is a reasonable approximation to the true underlying cost function is called its relevant range.

• Thus, within the relevant range, variable cost per unit can be assumed to be constant.

• The notion of the relevant range often causes confusion. Some individuals refer to the relevant range as the range of activity within which the company expects to operate or has operated in the recent past. That is not what we mean by the relevant range.

The relevant range, as we use the term, is the range of activity within which a particular straight line provides a reasonable approximation to the real underlying cost function.

Fixed Costs:

 A fixed cost remains constant in total dollar amount within the relevant range, Since fixed costs remain constant in total, the amount of cost computed on a per unit basis becomes smaller as the number of units produced increases.

The relevant range for a fixed cost is that range of activity over which total fixed cost does not

3. Mixed Costs. A mixed cost contains both variable and fixed cost elements. Many costs are mixed and can be expressed in terms of the cost formula

$$Y = a + bX$$

where Y is the total estimated cost, a is the estimated total fixed cost, b is the estimated variable cost per unit of activity, and X is the amount of activity. Even when the underlying cost is not linear, this formula can provide a reasonable approximation to the underlying cost function within the relevant range.

B. Analysis of Mixed Costs. For planning and control purposes, mixed costs should be broken down into variable and fixed components.

A number of methods can be used to analyze mixed costs. three techniques for analyzing past records of cost and activity:

the scattergraph method.

the high-low method.

least-squares regression.

1. The Scattergraph Method.

a. The data should be plotted no matter what method is ultimately used to estimate fixed and variable costs. A graph is constructed with cost on the vertical axis and activity on the horizontal axis. Costs at various levels of activity are then plotted on the graph.This plot will often provide important insights concerning the underlying relationship and can help in identifying nonlinearities and outliers (unusual points) that should be ignored.

b. While this is not ordinarily done in practice, a line can be fitted to the plotted points by eye with a straightedge. The line should be placed so that approximately equal numbers of points fall above and below it. While not strictly necessary, in the text and in problems we always draw the line through one of the points to simplify calculations.

This line can then be used to derive what we call "quick-and-dirty" estimates of the fixed and variable costs. The fixed cost can be estimated by the vertical intercept. The variable cost per unit can be estimated by computing the slope of the line.

2. The High-Low Method. The high-low method of analyzing mixed costs focuses exclusively on the high and low levels of activity.The difference in cost observed at these two extremes is divided by the change in activity to
estimate the variable cost per unit of activity
.A major defect of the high-low method is that it utilizes only two points and ignores all of the other data. Generally, two points are not enough to produce accurate results. Moreover,
the periods in which the high and low activity levels occur are often not typical of most periods.

3. The Least-Squares Regression Method. Using mathematical formulas, the least-squares regression method fits a regression line that minimizes the sum of the squared errors.

One of the most informative is the R2, which is a measure of the goodness of fit of the regression line. It tells us the percentage of the variation in the dependent variable (cost) that is explained by variation in the independent variable (activity). We do not show in the text how the R2 is computed, but you may want to discuss its interpretation with students.