1 Cost Behavior

"Profitability is just around the corner." This is a common expression in the business world; you may have heard or said this yourself. But, the reality is that many businesses don't make it! Business is tough, profits are illusive, and competition has a habit of moving into areas where profits are available. And, sometimes, business owners become frustrated because revenue growth only seems to bring on waves of additional expenses, even to the point of going backwards.

How does one realistically assess the viability of a business? This is perhaps the most critical business assessment a manager must make. Most of us are taught from an early age to do our best and not give up, even in the face of adversity. And, there are countless stories of businesses that struggled to survive their infancy, but went on to become highly successful firms. But, it is equally important to note that some business models will not work. You likely have heard the tongue-in-cheek story about the car dealer who said he loses money on every sale but makes it up on volume. Of course, the math just won't work. A good manager must learn to use information to make informed decisions about which business prospects to pursue. Managerial accounting methods provide techniques for evaluating the viability and ability to grow or "scale" a business. These techniques are called cost-volume-profit analysis (CVP).

1.1 The Nature of Costs

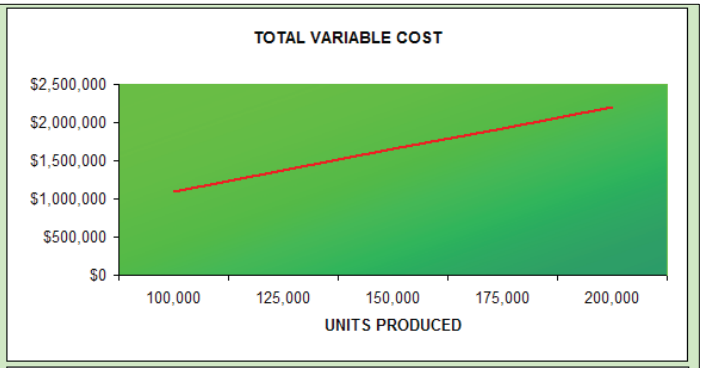
Before one can begin to understand how a business is going to perform over time and with shifts in volume, it is imperative to first consider the cost structure of the business. This requires drilling down into the specific types of costs that are to be incurred and trying to understand their unique attributes.

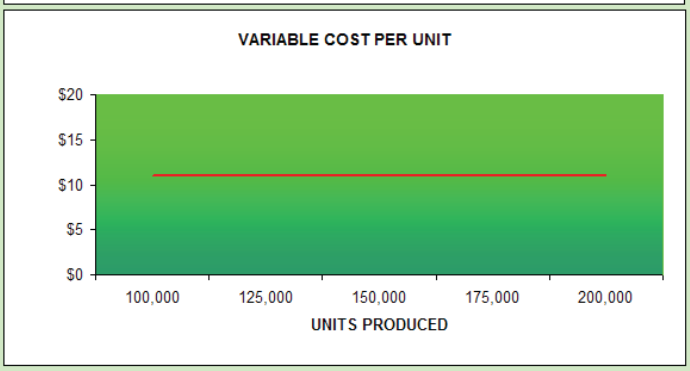
1.2 Variable Costs

Variable costs will vary in direct proportion to changes in the level of an activity. For example, direct material, direct labor, sales commissions, fuel cost for a trucking company, and so on, may be expected to increase with each additional unit of output.

Assume that GoSound produces portable digital music players. Each unit produced requires a printed circuit board (PCB) that costs $11. Below is a spreadsheet that reveals rising PCB costs with increases in unit production. For example, $1,650,000 is spent when 150,000 units are produced (150,000 × $11 = $1,650,000). The data are plotted on the graphs. The top graph reveals that total variable cost increases in a linear fashion as total production rises. The slope of the line is constant. Of course, when plotted on a "per unit" basis (the bottom graph), the variable cost is constant at $11 per unit. Increases in volume do not change the per unit cost. In summary, every additional unit produced brings another incremental unit of variable cost.

Units	PCB	PCB per unit (PCB/UNITS)
100,000	$1,100,000	$11
125,000	$1,375,000	$11
150,000	$1,650,000	$11
175,000	$1,925,000	$11
200,000	$2,200,000	$11



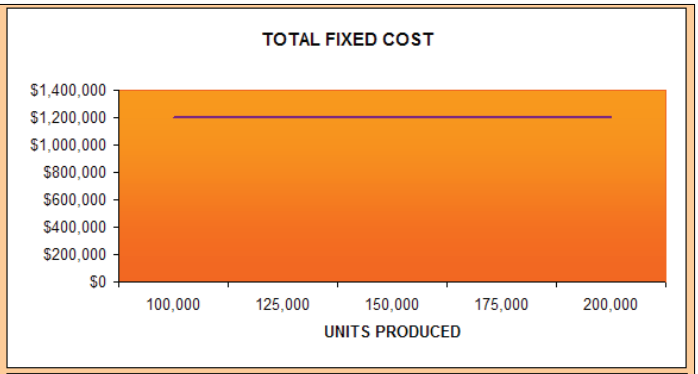


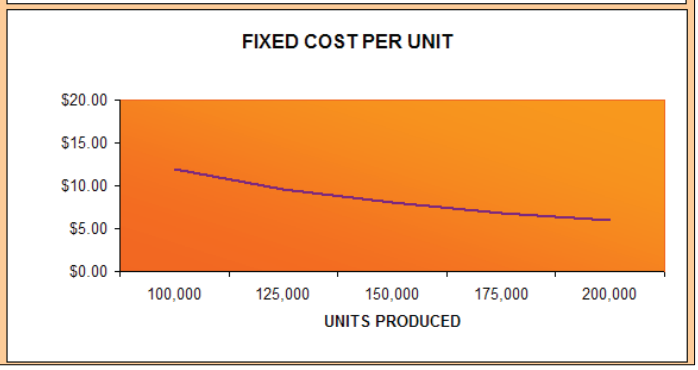
The activity base is the item or event that causes the incurrence of a variable cost. It is easy to think of the activity base in terms of units produced, but it can be more than that. Activity can relate to labor hours worked, units sold, customers processed, or other such "cost drivers." For instance, a dentist uses a new pair of disposable gloves for each patient seen, no matter how many teeth are being filled. Therefore, disposable gloves are variable and key on patient count. But, the material used for fillings is a variable that is tied to the number of decayed teeth that are repaired. Some patients have none, some have one, and others have many. So, each variable cost must be considered independently and with careful attention to what activity drives the cost.

1.3 Fixed Costs

The opposite of variable costs are fixed costs. Fixed costs do not fluctuate with changes in the level of activity. Assume that GoSound leases the manufacturing facility where the portable digital music players are assembled. Assume that rent is $1,200,000 no matter the level of production. The rent is said to be a "fixed" cost, because total rent will not change as output rises and falls. The following spreadsheet reveals the factory rent incurred at different levels of production and the resulting "per unit" rent amount. Observe that the fixed cost per unit will decline with increases in production. This attribute of fixed costs is important to consider in assessing the scalability of a business proposition. There are numerous types of fixed costs. Examples include administrative salaries, rents, property taxes, security, networking infrastructure support, and so forth.

Units	Factory Rent	Rent per unit (RENT/UNITS)
100,000	$1,200,000	$12.00
125,000	$1,200,000	$9.60
150,000	$1,200,000	$8.00
175,000	$1,200,000	$6.86
200,000	$1,200,000	$6.00





1.4 Business Implications of the Fixed Cost Structure

The nature of a specific business will have a lot to do with defining its inherent fixed cost structure. Airlines have historically been burdened with high fixed costs related to gates, maintenance, contractual labor agreements, computer reservation systems, aircraft, and the like. As you are aware, airlines have struggled during lean years because they are unable to cover fixed costs. During boom years, these same companies have been extremely profitable, because costs do not rise (much) with increases in volume. Basically, there is not much cost difference in flying a plane empty or full! Software companies have a big investment in product development, but very little cost in reproducing multiple electronic copies of the finished product. Their variable costs are low.

Other businesses have attempted to avoid fixed costs so that they can maintain a more stable stream of income relative to sales. For example, a computer company might outsource its tech support. Rather than having a fixed staff that is either idle or overloaded at any point in time, they pay an independent support company a per-call fee. The effect is to transform the organization's fixed costs to variable, and better insulate the bottom line from fluctuations brought about by the related ability to cover or not cover the fixed costs of operations.

Every business is unique, and a savvy business person will be careful to understand their cost structure. For a long time, the trend for many businesses was toward increased fixed costs. Some of this was the result of increased investment in robotics and technology. However, those components have become more affordable. And, we are now seeing more outsourcing, elimination of health insurance, conversion of pension plans, and so forth. These activities suggest attempts to structure businesses with a definitive margin (revenues minus variable costs) that scales up and down with changes in the level of business activity. No matter the specific example, a manager must understand their cost structure.

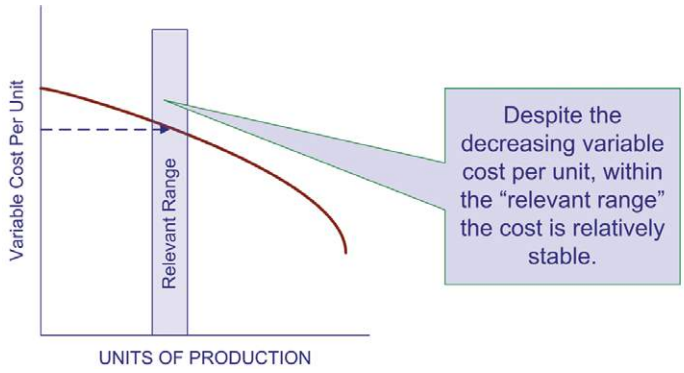
1.5 Economies of Sale

Economists speak of the concept of economies of scale. This means that certain efficiencies are achieved as production levels rise. This can take many forms. For starters, fixed costs can be spread over larger production runs, and this causes a decrease in the per unit fixed cost. In addition, enhanced buying power results (e.g., quantity discounts) as volume goes up, and this can reduce the per unit variable cost. These are valid considerations. The accountant is not blind to these issues and must take them into consideration in any business evaluation. However, care must also be exercised to limit one's analysis to a "relevant range" of activity.

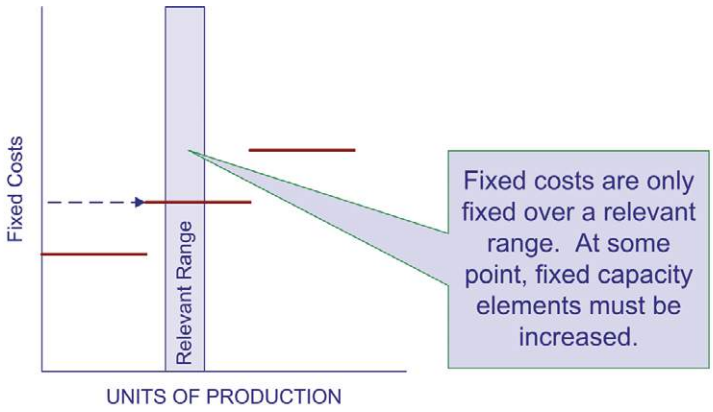
Below is an excerpt from an online catalog (Digi-Key Corporation). This is a pricing table for surface mount Zener Diodes. Notice that they are $0.44 each, or $3.00 for ten units, or $20.80 for 100 units, or $92.00 per thousand. The bottom line here is that they range from $0.44 down to $0.092 each, depending on the quantity purchased. This is quite a remarkable spread.

		Price Break	Unit Price	Price
Digi-Key Part Number	BZX84C36-FDICT-ND	1	0.44000	0.44
Manufacturer Part Number	BZX84C36-7-F	10	0.30000	3.00
		100	0.20800	20.80
Description	Diode Zener 300MW 36V SOT 23	250	0.15000	37.50
		500	0.11200	56.00
Quantity Available	2896	1000	0.09200	92.00

Despite the wild spread in pricing, if your business needed about 150 of these diodes in your production process, you would study the above table and determine that the best quantity for you to order would be priced at $20.80 per hundred. As a result, your per unit variable cost would be $0.208. The "relevant range" is the anticipated activity level at which you will perform. Any pricing data outside of this range is irrelevant and need not be considered. This enhanced concept of variable cost is portrayed in the following graphic:



The relevant range comes into play when considering fixed costs as well. Many fixed costs are only fixed for a certain level of production. For example, a machine or manufacturing plant can reach capacity. To increase production beyond a certain level, additional machinery (or a new plant, additional supervisors, etc.) must be deployed. This will cause a major step upward in the fixed cost. Fixed costs that behave in this fashion are also called step costs. These costs are illustrated by the following diagram. The key conceptual point is to note that fixed costs are only fixed over some particular range of activity, and moving outside that range can significantly alter the cost structure.



1.6 Dialing in Your Business Model

After grasping the concepts of variable and fixed costs, it is important to understand their full implications in managing a business. Let's first give added thought to fixed cost concepts. In an ideal setting, you would try to produce at the right-most edge of a fixed-cost step. This squeezes maximum productive output from a given level of expenditure. For a machine, it is as simple as running at full capacity. However, for a business with many fixed costs, it is more challenging to orchestrate operations so that each component is fully utilized.

Some fixed costs are committed fixed costs arising from an organization's commitment to engage in operations. These elements include such items as depreciation, rent, insurance, property taxes, and the like. These costs are not easily adjusted with changes in business activity. On the other hand, discretionary fixed costs originate from top management's yearly spending decisions; proper planning can result in avoidance of these costs if cutbacks become necessary or desirable. Examples of discretionary fixed costs include advertising, employee training, and so forth. Committed fixed costs relate to the desired long-run positioning of the firm; whereas, discretionary fixed costs have a short-term orientation. Committed fixed costs are important because they cannot be avoided in lean times; discretionary fixed costs can be altered with proper planning. Of course, a company should be careful to avoid incurring excessive committed fixed costs.

Variable costs are also subject to adjustment. In the Digi-Key Corporation example, it was illustrated how such costs can vary based on quantities ordered. Perhaps it occurred to you that one might order and store large quantities of the diodes for use in future periods (after all, 1200 units at $.208 each > 3000 units at $0.08 each). In a subsequent chapter, you will learn how to calculate economic order quantities that take into account carrying and ordering costs in balancing these important considerations. Even direct labor cost can be subject to adjustment for overtime premiums, based on whether or not overtime is worked. It may or may not make sense to meet customer demand by ramping up production when overtime premiums kick in. Later in this book, you will learn how to perform incremental analysis for such decision tasks.

The interplay between all of the different costs emphasizes the importance of good planning. The trick is to synchronize operations so that the benefits of each fixed cost are maximized, and variable cost patterns are established in the most economic position. All of this must be weighed against revenue opportunities; you must be able to sell what you produce. Some advanced managerial accounting courses present sophisticated linear programming models that take into account constraints and opportunities and project the ideal firm positioning. Those models are beyond the scope of an introductory class, but a number of simpler tools are available, and will be covered next.