

#1

## Key Issues in Measuring Lost Profits

James Plummer and Gerald McGowin\*

### I. Introduction

The case law issues of lost profits are dealt with in a number of excellent reference sources, such as Robert Dunn's *Recovery of Damages for Lost Profits* (Lawpress, 4th edition, 1992). Proving the *existence* of lost profits is subject to the standard of "reasonable certainty." Once that is demonstrated, proving the *level* of lost profits is subject to the more liberal standards of "best available evidence" and a "reasonable estimate". These standards allow plaintiff and defense attorneys wide latitude in the use of facts, expert witnesses, and methodologies, and can result in a competition to impress the jury. This competition can force attorneys to acquire greater familiarity with the concepts and terminology in the fields of economics, accounting, finance, and statistics.

### II. Different Types of Lost Profit Cases

For purposes of delineating the key issues involved in measuring lost profits, it is useful to distinguish between types of lost profits cases via a matrix:

Type of Impact on Plaintiff	Size of Impact on Plaintiff	
	(A) Significant but not fatal	(B) Fatal Impact
1. Loss of Revenue	Type 1A	Type 1B
2. Short-term increase in operating costs, or loss of working capital, or loss of inventory	Type 2A	Type 2B
3. Long-term equipment underperformance or loss of fixed capital	Type 3A	Type 3B

Figure 1

As will become evident in later discussion, the analytical tools used to measure lost profits are quite different for these different types of cases.

\*The authors are principals of QED Research, Inc., a consulting firm with offices in Palo Alto and Los Angeles, CA.

### III. What Would the Level of Revenue Have Been?

If the impact of the wrongful act is a loss of revenue to a firm (case type 1A), the simplest approach is to project past revenues forward in time by assuming that the past rate of growth would have remained constant. This only works for firms that have had steady rates of growth, are in industries with steady rates of growth, and do *not* exhibit seasonality or business cycle patterns. Otherwise, it is necessary to examine how the whole industry (or, more accurately, the "relevant market") has behaved both before and after the date of the wrongful act. It may be necessary to examine how market shares have changed and how those market shares were impacted by the actions of the defendant.

As an example, the revenue of a California-based Hawaiian tour packaging firm may be a function of the number of monthly visitors from California to Hawaii, a market subject to both annual seasonality and strong business cycles. The market share of this kind of firm may be a function of its level of advertising in previous periods, as well as other competitive variables. The econometric technique of multiple regression analysis can be very useful in these kind of situations.

When the wrongful act involves the diversion of plaintiff revenue to the defendant, one approach is to use the revenue gained by the defendant as the best available measure of the level of revenue lost by the plaintiff. This can lead to the "hybrid approach" of estimating lost profits by multiplying the revenue gained by the defendant by the profit margin of the plaintiff.

### IV. Measuring the Change in Net Profits

In cases where the wrongful act has caused a non-fatal loss of revenue to the plaintiff (case type 1A), a frequent pattern is for the plaintiff's expert to argue that lost profits are measured by multiplying the amount of lost revenue times the historical *Gross Profit Margin* of the damaged firm, and for the defendant's expert to argue just as vehemently that lost profits are measured by multiplying the lost revenue times the historical *Net Profit Margin*. This can devolve into a fruitless search for authoritative accounting definitions of these terms. Actually, neither the Gross Profit Margin nor the Net Profit Margin is likely to be appropriate for measuring lost profits.

The objective is to measure the change in *net* profits that resulted from the wrongful acts. However, the Net Profit Margin is simply the amount of net profit at the end of an accounting period divided by revenue for the same period. It is an *average* ratio or margin. What is needed to measure a *change* in net profits is an "Incremental Profit Margin." The Incremental Profit Margin measures the *change* in net profits as a result of a *change* in revenue. This Incremental Profit Margin will fall in between the Gross Profit Margin and the Net Profit Margin. Realizing why the Net Profit Margin is not the right parameter for measuring the change in net profits is the most important single concept in lost profits analysis.

The important distinction in the law (see *Oakland California Towel Co. v. Sivils*, 52 Cal. App. 2d 517, 520, 1942) and in economic logic is between which categories of cost are fixed (do not vary with the level of revenue) and which categories of cost are variable (do vary with the level of revenue). Another way of expressing the same ideas is that variable costs are those costs that can be cut back or "avoided" after the revenue loss occurs. Fixed

costs are not relevant, since they would have been the same with or without the tort.

The Incremental Profit Margin is one minus the percentage ratio of variable costs to gross revenue. For the moment, we shall assume that a given category of costs is either all fixed or all variable.

Unfortunately, most financial accounting statements are not organized so as to easily distinguish between categories of fixed cost and categories of variable cost. The following hierarchy of categories is often used in Income Statements (also known as Profit and Loss Statements):

Gross Revenue	100
Cost of Goods Sold	<u>(50)</u>
Gross Profit	50
Overhead	<u>(25)</u>
Net Profit	<u><u>25</u></u>

At first glance, one might think that Cost of Goods Sold is just another name for variable cost, and Overhead is just another name for fixed cost. It isn't so. Although some firms just include variable costs (for example, the direct labor and materials embodied in the product) in Cost of Goods Sold, other firms may also include the depreciation on the production line machinery or the rent on the building that houses production. Advertising and salesmen salaries may appear either in Cost of Goods Sold or in Overhead. Many items that are often included in overhead may, in fact, vary with the level of revenue. Items such as interest expense, depreciation, and R&D may be included in overhead, or may be put into a separate aggregation of costs below the net profit line. A wide variety of terminology and practice is compatible with "generally accepted accounting principles" (GAAP). The reason is that each firm has different management objectives in deciding the format of its Income Statement. For closely held corporations, there is no standardization of terminology. The public disclosure requirements on publicly traded corporations do impose some degree of uniformity.

#### V. Statistical Techniques for Distinguishing Between Fixed and Variable Costs

Given the difficulty in using the aggregate categories from the Income Statement, there is no choice but to look at the individual cost categories that make up these aggregates, and decide which of them vary with the level of revenue. Some of these might be labeled all fixed or all variable, at least for a period of time. If one wishes to classify a given cost category as either all fixed or all variable, one technique is to measure the correlation coefficient between revenue and each category of cost. Then one can rank the categories of cost from more variable to less variable depending on the size of the correlation coefficient. A cost category that was perfectly variable would have a correlation coefficient of 1.0, whereas a cost category that was perfectly fixed would have a correlation coefficient of zero. If there are a lot of cost categories in between, one possibility is to label them "70% variable" or "50% variable" or "30% variable," depending on the size of the correlation with revenue. It is best to try to use annual observations, then quarterly observations, then monthly observations to see how the results vary.

A more precise technique for measuring the degree of variability of cost to revenue is linear regression analysis, as illustrated by Figure 2. The asterisks are individual monthly observations of cost and revenue, and the solid line is a "fitted" linear regression line. It is the line that minimizes the square of the deviations of the observations from the regression line. The vertical axis intercept (\$20,000 in Figure 2) is the level of fixed cost. The slope of the linear regression line is the Incremental Cost Ratio (one minus the Incremental Profit Margin). This kind of analysis can be done for all categories of cost together, for all "overhead cost," or for each category of cost separately. Likewise, it can be done on annual, quarterly, or monthly data. Although it is more precise than most other methods employed by accountants to separate out variable and fixed costs, it can be attacked from a statistical standards point of view. For example, the linear regression line in Figure 2 has a correlation of .63 and an "explained variance" level of 39% (the correlation coefficient squared). Thus although it looks convincing, and may be "best evidence," it is still vulnerable to attack relative to high statistical standards. The defense can say that factors other than revenue explain 61% of the variation in cost, and cause the whole scheme of analysis to look suspect. Living by the sword of statistical analysis to appear more scientific and elegant can also expose the expert witness to the fate of dying by the sword of statistical purity.

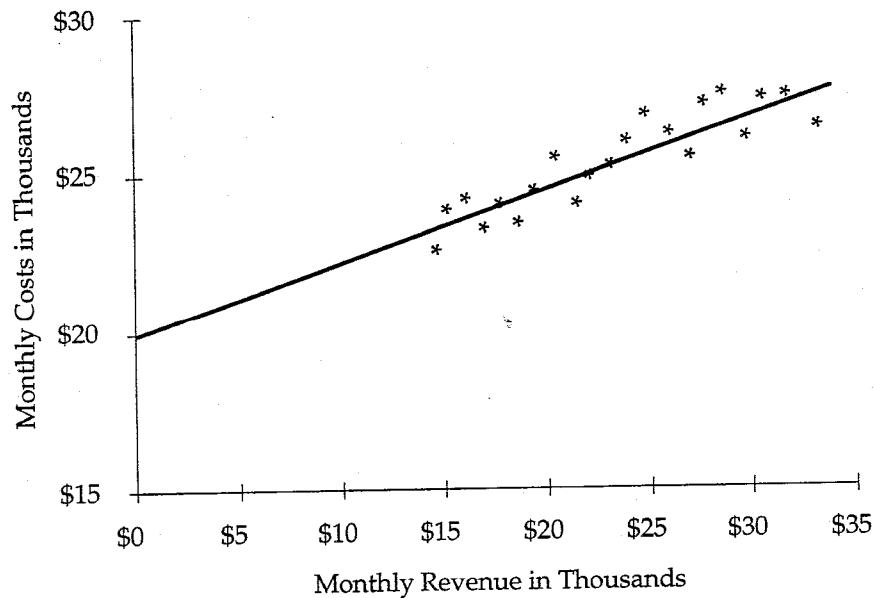


Figure 2. Fitting a Regression Line to Cost Data

#### VI. Adjustment of the Incremental Profit Margin Over Time.

Another reason why it is silly to argue about whether the Gross Profit Margin or the Net Profit Margin is the best proxy for the Incremental Profit Margin is that the Incremental Profit Margin varies as the firm makes more

and more adjustments to the loss of revenue. So the Incremental Profit Margin may start out closer to the Gross Profit Margin, right after the tort occurs, and then end up closer to the Net Profit Margin after many adjustments have occurred. "Shrinkage" of the Incremental Profit Margin over time is shown in the following example:

Period	Lost Profit Margin
1 (wrongful act)	60%
2	40%
3	25%
4	15%
5	10%
6	8%

The lost profits expert may judgmentally switch more categories of cost from fixed to variable with each successive period to show this kind of pattern, or he may even assume that there is both a fixed and variable element to each category of cost (as in Figure 2), and then assume that the variable element becomes larger with each passing period. Exercise of the expert's judgment is unavoidable in this area, and necessary to achieve credible lost profit estimates.

This shrinkage of the Incremental Profit Margin over time is obviously related to the obligation of the plaintiff to mitigate damages. A plaintiff that does not make the adjustments that will bring down the Incremental Profit Margin in this kind of progression may not be entitled to recover more lost profit than what would have occurred if he had made the cost adjustments necessary to bring it down (if the defense hires a savvy expert).

### VII. Treatment of Owner Compensation as Profit

If a closely-held firm is a regular "C corporation" (as contrasted with an "S corporation"), then the owners may well take each year's profits in the form of more salary and bonuses rather than profit that would be subjected to federal and state profits taxes. When a family goes to sell a business, an appraiser or business broker will "recast" the income statement to allow for the higher level of earnings that would have existed in the absence of this kind of tax avoidance. Whereas the salaries of the owners should be considered a fixed cost, because they would have been employed with or without the tort, how does one treat the bonus compensations to family employees? If the amount of owner labor time involved in the business would have been different, with and without the lost revenue at issue, then some marginal adjustment of labor cost is required. However, except for these adjustments of labor costs, the bulk of owner compensation is regarded the same as profit (see *Dempsey v. Sternik*, 498 N.E. 2d, 310, 315, Illinois App. 3 Dist., 1986).

Where a family-owned business has gone under as a result of a wrongful act (case types 1B, 2B, or 3B), and the owners have gone on to alternative employment, the earnings or profits from that alternative employment during the damage period are offsets to the owners' lost profits.

### VIII. Multiple Causes of Business Failure

The law clearly differentiates between the demise of an unestablished business and an established business. If a business is young, small, and undercapitalized, then it is considered to be vulnerable to so many different causes of failure that it may be very difficult to prove that the wrongful act was the fatal blow. In these kinds of cases, experts for the defense will frequently point to the high failure rates of small businesses in their first five years of operation.<sup>1</sup> Plaintiff experts will point out that the risk of failure goes down dramatically if a firm survives three years and has more than five employees.

For larger firms that are clearly established businesses, it is possible to measure the impact of a particular loss of revenue on the financial ratios of the firm. Then, it is possible to draw inferences from the change in those key financial ratios to the risk of failure of the firm. There is considerable literature on predicting the failure rate of larger firms based on the changes in key financial ratios.<sup>2</sup>

For a business or product line that has "gone belly up," the dilemma for the lost profits expert is to quantify and separate out the influence of the wrongful act from other causal forces that may have also contributed to failure. One technique is mapping points of break-even price and sales volume:

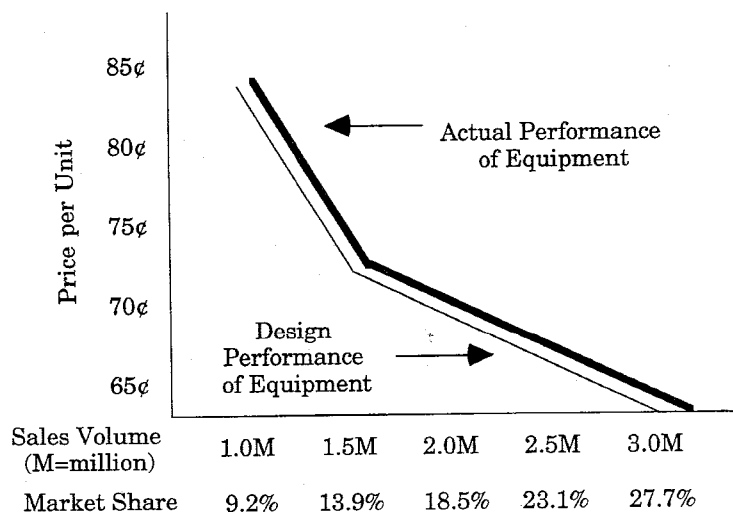


Figure 3 — Breakeven Combination of Price and Quantity

The horizontal axis not only shows quantities of sales, but also how those levels of sales translate into percentage market shares in the given industry. In this case, there are two curves of break-even prices and sales, one corresponding to fully-performing equipment and the other to under-performing equipment. For the failed product line that was the subject of this case, competition has driven prices down to the point that the firm had no hope of achieving sales (market share) sufficient to break even, regardless of

<sup>1</sup>See Platt, 1985.

<sup>2</sup>See Altman, 1968.

whether the equipment they had purchased performed fully to specification or not. The under-performance of the equipment was an insignificant contributor to failure relative to other economic forces.

### IX. Loss of Working Capital

If the wrongful act involves the loss of working capital to the plaintiff (case type 2A or 2B), financial analysis can be used to estimate the amount of lost profit. The following identity can be particularly useful:

$$\text{Profit} = \frac{\text{Profit}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{Working Capital}} \times \text{Working Capital}$$

The ratio of profit to revenue is the Lost Profit Margin discussed above. The ratio of revenue to working capital is a standard financial ratio.<sup>3</sup> If the wrongful act results in loss of working capital to the plaintiff, then its impact on profit can be estimated by multiplying the loss of working capital by the above two standard ratios.

If the wrongful act involves damage to the inventory of the plaintiff (e.g. water damage, or fire damage, or theft), then the expert can similarly use the revenue-to-inventory ratio (what businessmen call "inventory turns") to arrive at a lost profits estimate:

$$\text{Profit} = \frac{\text{Profit}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{Inventory}} \times \text{Inventory}$$

### X. Special Issues Involved in Under-Performing Equipment

There are many different kinds of cases and issues involving under-performing equipment.<sup>4</sup> Would the equipment ever have been ordered in the absence of misrepresentations? Would different equipment have been ordered? From the same seller, or a different seller? Was the equipment ordered, but not delivered? Was the equipment delivered but not accepted? Was the acceptance later revoked? Was the equipment permanently accepted, but with the buyer suffering adverse cost consequences?

Short-term analysis is differentiated from long-term analysis by whether the level of productive capacity has changed. In long-term situations (case types 3A or 3B), the with and without damage scenarios may have different levels of depreciation cost and interest cost. Also, when the level of production capacity of the firm is variable, the prices and competitive environment of the whole industry may be impacted.

### XI. Discounting to Present Value

An error that is sometimes made in plaintiff lost profits estimates is to use a riskless interest rate (discount rate) for converting future lost profits to present value. Whereas the use of riskless interest rates has become em-

<sup>3</sup>Robert Morris Associates publishes *Annual Statement Studies*, which contains financial ratios by Standard Industrial Codes (SICs) and by size of firm.

<sup>4</sup>See Priest, 1979.

bodied in the law for reducing future wage losses to present value, it is wrong to analogize that practice to lost profits analysis. The earning of business profits involves substantial risks and a lot of illiquidity for equity investors. These risks and illiquidities are particularly high for smaller closely-held businesses, and extremely high for younger firms.

When business valuations are done for established small-to-medium-sized firms that are closely held, the price/earnings ratios are frequently in the range of 3 to 7. That implies discount rates (the reciprocal of the price/earnings ratio) in the range of *at least* 14% to 25% to fully incorporate the risk and illiquidity present.<sup>5</sup> Those are the kinds of discount rates that ought to be used in lost profits analysis. If that is done, then measuring the present value of *future* lost profits is very similar to measuring the "diminution in the value of the firm" (as of the valuation date, not the date of the tort) as a result of the wrongful act.<sup>6</sup> That kind of consistency is important, because the only way of valuing damages for a firm that ceased to exist because of the acts of the defendant may be to value the firm prior to the date of the wrongful act.

### **XII. Can the Present Value of Future Lost Profits Ever Exceed the Value of the Firm?**

Using the above logic, it would be unusual for the present value of future lost profits to exceed substantially the value of the firm (on the valuation date, not the date of the tort). This is a logically consistent position, and a good cross-check against inflated damage analyses. One exception is when a small business is owned and operated by persons whose alternative income will be much less if the firm is fatally damaged by a wrongful act. In these kinds of cases, the lost profits analysis gets converted into a lost earnings analysis. The defense can challenge whether the owner operators may have some alternatives that they choose not to recognize, such as using the proceeds of a judgment to purchase another small business.

### **XIII. Length of the Damage Period**

The choice of a length of a damage period depends on the length of time necessary for the damaged firm to complete the adjustment to the loss of revenue. Also, the lost profits expert must consider a length of time sufficient that other causal influences on the firm's profit overwhelm the influence of the wrongful act.

If the Incremental Profit Margin shrinks with each successive period in the manner shown above, and if discount rates that fully incorporate the existing risk and illiquidity are used, then usually the present value of each future year's lost profit will fall off pretty quickly. As the present value in each period decreases toward zero, it will be fairly obvious where to cut off

<sup>5</sup>See Pratt (1989), Chapter 8, "Data on Required rates of Return." Actually, the appropriate discount rate is the capitalization rate *plus* an estimate of *safe* annual growth in future earnings.

<sup>6</sup>Lost profits are measured in before-tax dollars, whereas many business valuation formulas use after-tax profits. In theory, the present value of future lost profits would be higher than the diminution of firm value by the amount of the effective corporate income tax rate. In actuality, effective corporate income tax rates for most small and medium-size businesses are so small that the issue becomes minimal or mute.

the damage period. If the analysis is done correctly, one should not see a "cliff" in the present value of lost profits at the end of the damage period, unless there is some intervening event that truncates the damage period (e.g., the end of a contract period).

#### XIV. Multi-Disciplinary Approach

From the above discussion, it is obvious that lost profits analysis often requires a multi-disciplinary approach. Many accountants are very nervous about engaging in forecasting analysis, or lack the tools to do it convincingly. Economists have the forecasting tools and expository techniques, but not the knowledge to deal with the tax issues or detailed cost accounting issues. Neither may have the expertise to deal with many statistical or financial issues. This doesn't make life easier for the trial attorney in selecting and preparing an expert or experts to measure lost profits. Depending on the complexity of the litigation, the attorney will have to judge carefully whether one expert can embody all the necessary skills, or whether multiple experts may be necessary.

#### References

- Altman, E., "Financial Ratios, Discriminant Analysis, and the Prediction of Corporate Bankruptcy," *Journal of Finance*, September 1968.  
Platt, Harlan D., *Why Companies Fail*, D.C. Heath & Co., 1985.  
Pratt, Shannon, *Valuing a Business*, Dow-Jones Irwin, 1989.  
Priest, George L., "Breach and Remedy for the Tender of Nonconforming Goods Under the Uniform Commercial Code: An Economic Approach," in Anthony T. Kronman and Richard A. Posner, *The Economics of Contract Law*, Little, Brown & Co., 1979.