# Using Statistics to Assess Lost Profits During an Economic Downturn

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The economic downturn has obviously had negative effects on many commercial enterprises, causing them to suffer financial losses. When a firm is a plaintiff in a business lawsuit, how can one evaluate how much of its losses were caused by the defendant versus deteriorating economic or industry conditions? This article discusses the use of statistical analysis to make this sort of assessment.

## ATTRIBUTION OF LOSSES

If a firm had a profit of $100 one year ago and this year it was only $20, obviously its profits fell $80. Suppose the timing of this decline coincides with events at the center of a civil lawsuit such as a claim for breach of contract or business interruption. Simplistically, someone might argue that if the defendant is indeed liable, the amount of compensable damages in the suit is $80. But the plaintiff's profits might have declined for reasons unrelated to the defendant such as poor economic or industry conditions. How can analysts evaluate whether a firm's loss of profits was caused by the defendant or something else? Depending on particular facts in a case, cross-sectional statistical analysis might be a way to isolate effects.

## REGRESSION ANALYSIS

Regression is a statistical tool that tests for relationships between variables. Ordinary least squares (OLS) regression is arguably the workhorse in statistical analysis on economic topics. With this tool it is sometimes possible to examine factors that have explained a firm's historical sales. For instance, a firm with business activities related to real estate development might have its revenues dependent on local real estate activity and other economic factors. In exploring these sorts of relationships using statistical analysis, one could collect historical data on those factors and empirically examine whether they indeed

## Statistics (continued)

have a relationship with the firm's sales. If it can be established with a regression analysis that these sorts of relationships existed prior to an economic downturn, for instance, an analyst might use those historical relationships to estimate the effect of changing external conditions on the firm's sales.

Using this sort of approach to analyze a firm's sales—when economic or industry conditions have changed—might help isolate the effect of a defendant's actions on the plaintiff's sales. First, a statistical model would estimate a firm's sales after an economic downturn began through the present using (1) economic or industry measurements since the downturn and (2) historical relationships between those factors and the firm's sales established by regression analysis. A decrease in a firm s sales using this sort of model could be attributed to deteriorating economic or industry conditions. From the earlier example, if a statistical model shows a change in economic conditions caused the firm's profits to fall from $100 last year to $25, one might say that the defendant at most caused damages of $5 ($25 minus $20). Simply put, the firm's profits actually fell $80 from a year ago but $75 was caused by deteriorating economic conditions.

### A GENERAL APPROACH
A detailed discussion of a statistical analysis of this sort is beyond the scope of this article. Nevertheless, a general approach for such an analysis might be as follows.

Identify a priori or from experience what economic or industry factors might have an effect on the amount of a firm's historical sales. Collect data on those economic or industry factors. The time horizon for the data would be before and after conditions began changing. Next, using statistical analysis, observe the relationships between the firm's sales and each potential factor prior to the time economic or industry conditions changed. As mentioned earlier, we are assuming the downturn coincides with the disputed events in the lawsuit. Time lags in this sort of analysis may be appropriate. Essentially, time lags are used in observing the relationship between a firm's sales at time t and an economic or industry factor at another time such as t-1. Further, correlation statistics are one measure to preliminarily examine whether factors have an effect on revenues.

Using OLS regression, perform exploratory statistical analysis by regressing one or more economic or industry factors on the firm's sales prior to the time conditions deteriorated. Next, observe the output created by the computer for signs of statistically significant relationships. If a model is found that shows signs of statistical significance, investigate whether the general assumptions of linear regression have largely been met.[1] Those assumptions are beyond the scope of this article but are discussed in statistics texts. Some main assumptions in OLS regression are: the relationship between the predictor variable(s) and the outcome variable is linear; and the regression 'residuals'[2] have a constant variance, are randomly distributed, and are uncorrelated with each other. These sorts of regression assumptions can be evaluated with graphical or statistical tests.

If a model is found that is statistically significant and the assump-

tions of linear regression are largely met, if relevant, observe the parameters from the OLS regression output.[3] A model would describe the relationships between the factor(s) in the model and a firm's sales before the decline in economic or industry conditions. Using the model's parameters and recent economic or industry data, estimate the firm's sales after conditions began deteriorating. Put another way, use the statistical model by applying post-event economic or industry data to pre-event relationships between the factor(s) and the firm's sales. But consider whether those relationships are still relevant during the post-event horizon.

Next, compare sales predicted by the model to the firm's actual post-event sales. The difference can be attributed to factors other than the economic or industry variables used in the model. Depending on the particular facts, the entire difference might be attributed to the defendant's actions. In that case, the difference represents the firm's lost sales over the time horizon. Next, apply cost factors—determined from a separate analysis—to the lost sales to estimate the firm's lost profits. In other words, subtract the estimated costs that are related to the lost sales from the amount of lost sales to measure the firm's lost profits.

As mentioned earlier, this approach is a general one. The facts and circumstances of a particular case may alter the general approach or lead to a different analytical approach altogether.

### CONCLUSION
In summary, in a commercial law-

## Statistics (continued)

suit, isolating a firm's economic losses caused by a defendant is a basis for claiming compensatory damages. Separating a firm's actual losses between those caused by a defendant and those caused by other factors, such as poor economic or industry conditions, can be assessed with statistical analysis. ◊

Endnotes:

1 Whether OLS regression assumptions matter in a particular case depends on how the statistical results are being used or the hypothesis. Essentially, this issue goes to how the regression results are being interpreted.

2 Imagine a X-Y scatterplot with a trend line drawn by the computer. Residuals are the distance between each observation and the corresponding point on the regression line.

3 OLS parameters consist of a 'constant' and coefficient for each predictor variable.

# Claims of Economic Damages:  Lost Profits and Intellectual Property

## Michael J. Mard, CPA/ABV, ASA

The following is an excerpt from a recent article by Michael Mard published in <u>The Licensing Journal</u>.

## Measurement

Many factors go into an expert's consideration for the reasonable measurement of damages. Such factors are defined by the facts and circumstance of the alleged event as defined by the complaint. Some of the considerations by the expert might include:

- Determination of change in revenues perhaps based on historical trends

- Incremental costs avoided by the loss in revenues

- Reasonable profits expected but not realized

- Economic outlook affecting calculation

- Industry outlook affecting calculation

- Actual performance realized during the period damaged thus providing a mitigation to the profits claimed lost

- The length of time horizon of the period damaged

- Adjustments for risk and cost of capital (discount rates)

- Fixed and variable costs of production

- The impact of competition

- Capacity constraints on the business

- Available technology and its effect on damage

- Regulatory and environmental issues

This is a partial list intended to be demonstrative. Specific considerations of course vary based on the facts and circumstances of a particular claim.

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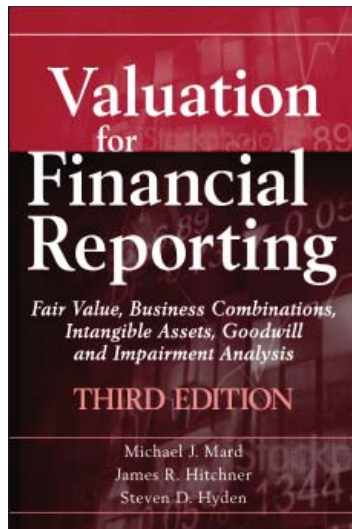**The Financial Valuation Group
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