Mooresville Honda Company: a Case in Forensic Accounting

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Abstract

This case requires that students use their understanding of cost estimation, cost-volume-profit analysis, and the time value of money to determine damages in a lawsuit. New automobiles representing potential sales were diverted from Mooresville Honda, a dealer who did not participate in a bribery scheme that occurred within American Honda Motor Co. The assignment is to estimate the profit lost by Mooresville Honda because of the bribery scheme. The case is based on an actual lawsuit and incorporates real-world relationships in the financial information. After completing and discussing the case, you should be able to:

1. develop an approach to estimate business losses in a lawsuit using accounting data
2. make judgments about what data to use and how to deal with some of the vagaries found in real-world situations
3. assess the strengths and weaknesses of the loss estimation approach
4. prepare a formal business memorandum

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1. Introduction

"HONDA FOUND GUILTY IN CONSPIRACY CASE" was a headline splashed across the pages of the financial press in 1995. Following a long investigation into the sales practices of American Honda Motor Co., Inc., a federal grand jury indicted a number of high-ranking executives on charges of racketeering, conspiracy, fraud, and obstruction of justice. When the legal proceedings ended, over twenty Honda executives, as well as numerous Honda dealers, were found guilty of criminal charges.

The specific criminal conduct in this case was the paying and accepting of bribes and kickbacks during the period 1979 to 1992. Throughout the 1980's, Honda cars were in short supply, and consumers were willing to pay well above sticker price to buy them. Dealers who had enough Hondas to sell, particularly the most popular models, were guaranteed to become rich. In order to assure that they could indeed receive adequate allotments of the best cars from the factory, many Honda dealers were more than willing to shower Honda executives with gifts. About one-third of the nation's 1,000 Honda dealers, so-called "dirty dealers," participated in the bribery scheme to one extent or another, offering such gifts as cash payments (of as much as $800,000), Rolex watches, home improvements, shopping sprees in Hong Kong, golf memberships, college tuition, and luxurious vacations. As the bribery became more widespread, the Honda executives became increasingly greedy. As boasted by Jack Billmyer, once the Executive Vice President of American Honda, "At American Honda, they don't pay you a million dollars, but you can live like a millionaire" (Lynch 1997, 2).

The corruption within the highest ranks of American Honda eventually grew beyond accepting bribes for car allotments and came to include bribery for awarding new dealerships. However, the scams began to unravel as those who did not participate in the bribery began to complain. A district service manager obtained copies of checks given to high-ranking executives as bribes to obtain a dealership and threatened to go public. An existing dealer complained that a new dealership was awarded to another party based upon the payment of a bribe. The ex-husband of a Honda traffic assistant (who scheduled new car shipments) detailed to American Honda the payoffs that his ex-wife had received for increasing allocations to a particular dealership. Although insiders felt that the President of American Honda had been aware of, but simply ignored, the corruption for years, an internal investigation was begun in early 1992.

The internal investigation quickly resulted in the firing of a dozen managers. However, Honda was not able to keep their problems an inside matter. In a 1993 court case between American Honda and one of its dealers, in which the dealer alleged wrongful termination of a franchise agreement, accusations of corporate corruption were made. The judge reported this information to the FBI and the U.S. Attorney, and a federal investigation began. When the dust cleared, 18 top executives were convicted of federal charges and sentenced to jail. Another ten sales officials were found guilty of lesser charges. The Assistant U.S. Attorney involved in the litigation deemed the scandal the largest commercial bribery case in U.S. history, saying that more than $15 million in cash and goods had been involved.

One effect of the bribery was to increase the distribution of new Honda cars to the “dirty dealers.” For them, the expected gain in profit obviously exceeded the expected

cost of bribes. The other effect was that “clean dealers” lost profits that could have been earned from sales of high-demand automobiles that were diverted as the result of the bribery.

Mooresville Honda Company, one of the “clean dealers,” sued American Honda Motor Co., Inc. and other defendants to recover lost profits as damages. Mooresville contended that the bribery, which occurred within American Honda, resulted in fewer total cars and, in particular, fewer cars with the popular colors and styles being made available to Mooresville Honda because it did not participate in the illegal conduct.

Based on other testimony, the court has already determined the number of cars diverted from Mooresville Honda during the years 1980 to 1992.

(Insert Table 1 here)

2. Assignment

You have been asked to assist the court in estimating the total profits lost by Mooresville Honda as of the end of 1992. The legal counsel for American Honda Motor Company and the other defendants has suggested that the number of diverted cars each year be multiplied by the annual operating profits per new car to estimate the annual damages. The total damages to Mooresville would be then the sum of the thirteen yearly amounts.

Mooresville Honda Company has raised three objections to this approach. First, Mooresville argues that the gross margin better measures the additional profits that would have been made on each diverted car than does the operating profit. Second, profits on new car sales understate the total loss because profits from financing, insurance, and other tie-ins with the sale are not considered. Lost profits from used car sales related to

the new car purchases and from follow-up business in service, parts, and accessories are also ignored. Finally, a simple summing of the annual lost profits in historical dollars ignores the fact that lost profits from early years could have been reinvested.

The judge has asked you to develop a methodology for estimating the total amount of lost profits as of the end of 1992. You are to apply that methodology to the information provided by Mooresville Honda Company to reach a specific dollar estimate. The judge also wants to know about any limitations or biases in your approach.

3. General background

Mooresville Honda is located in the Southeast United States. Mooresville began business in 1970, has operated profitably most years, and has built a reputation for excellent customer service and quality repair work. Although the company has been competitive in price, it has not tried to be the "low-price" dealer.

During the 1980s, Honda was the most demanded car in the U.S. Several economic conditions contributed to its popularity, beginning with the Arab oil embargo in 1973. The typical American car at that time got only 13 miles per gallon, and consumers scrambled to find fuel-efficient automobiles. During the 1980s, the U.S. set a quota on the number of cars that Japan could export to the U.S. The restricted supply of Honda cars, combined with the pent-up demand, drove prices and profits skyward. Honda dealers routinely charged thousands of dollars over sticker price, yet customers clamored for more cars. One Honda dealership sported a sign on its empty showroom stating, "We Are Not Out of Business. . . Just Out of Cars" (Lynch 1997, 4).

4. Financial data

Like most automobile dealers, Mooresville Honda is organized into three or four profit centers—New Car Sales, Used Car Sales, Service, and Parts and Accessories. In the case of Mooresville Honda, the last two areas are combined. Exhibits 1, 2, and 3 provide financial information for the period 1980 through 1992 for each of the three profit centers.[1] This information comes from Mooresville's internal accounting records and from a summary of detailed reports provided to American Honda.

4.1. New car sales (Exhibit 1)

Sales and Cost of Sales in Exhibit 1 represent the retail prices and purchase costs, respectively, of the total units sold each year. Sales Related Income includes revenues earned from the financing and insuring of new car sales, usually in the form of commissions received from the financing and insuring agencies, plus the amounts received from the sale of service contracts. Sales Related Income, according to management, is directly related to dollar sales of new cars.

(Insert Exhibit 1 here)

Operating expenses are grouped into four categories in Exhibit 1. Selling Expense includes salaries, commissions, and bonuses earned by salespersons. It also includes floor plan interest (financing charges related to units in inventory), delivery expenses, demonstration expenses, and advertising. With the exception of the advertising and some salary expense of the sales staff, management believes these expenses vary with sales.

Other Personnel Expense includes salaries of supervisors and clerical employees, payroll taxes and employee benefits, and compensation to owners. The latter item, in

[1] These three exhibits are available in spreadsheet format using EXCEL and can be downloaded from the following web site: http://www.bus.ucf.edu/gharrison/data/misc/honda

particular, is highly discretionary each year. It sometimes is a function of overall profits (often with a lag), but often it appears to be independent of operating activities.

Normal office costs such as supplies, telephone, postage, and data processing form part of the category called Semi-Fixed Expense. This category also includes company vehicle expense, bad debts, legal and accounting services, laundry and uniforms, and travel and entertainment. As a mixed category, management is not sure how these costs as a group fluctuate with volume of activity.

The major item in the Fixed Cost category is rent. Other costs related to property such as repairs to real estate and equipment, insurance, property taxes, and utilities also are reported here. As with most costs, these amounts have risen over the years as prices in general have increased. In a couple of years, such as 1985 and 1987, additional floor space was built and rented for both new cars and service. As a result, the amount of cost allocated to new car sales jumped significantly.

4.2. Used car sales (Exhibit 2)

Management at Mooresville Honda believes strongly that used car sales are driven to a large extent by new car sales. As the sales manager states, “Many of our new car customers want to trade in their old vehicles. We rarely acquire used cars except as trade-ins. If we had been allocated more new cars to sell, we undoubtedly would have had more used cars to sell.”

The dollar results in Exhibit 2, particularly for Sales and Gross Margin on a per unit basis, differ from year to year because of variations in the number of used cars wholesaled or retailed. When a used car is received as a trade-in, it can be sold almost immediately on the wholesale market, or it can be reconditioned and sold by used car

sales personnel at retail prices. Mooresville Honda wholesales a larger percentage of its used cars than do many automobile dealers. In keeping with its image as an up-scale dealer, Mooresville retains only newer models in excellent condition to sell at retail. However, the proportion of used cars retained for resale fluctuates from one year to the next.

(Insert Exhibit 2 here)

The Sales figure shown in Exhibit 2 reflects the proceeds received by Mooresville Honda—either the retail price or the wholesale price—from disposition of the used car. The Cost of Sales figure consists of the wholesale price of the used car at the time it was received as a trade-in. If a used car is sold at wholesale, its gross margin is close to zero. For those used cars that are retained and sold at retail, Mooresville Honda earns additional revenues associated with financing, insurance, and sale of service contracts. These amounts are recorded in the category called Sales Related Income, which is similar to the item described under New Car Sales.

Definitions for expense categories listed in Exhibit 2—Selling Expense, Other Personnel Expense, Semi-Fixed Expense, and Fixed Expense—parallel those in Exhibit 1 for New Car Sales. However, the amount of owners' compensation included in Other Personnel Expense represents an arbitrary allocation to used cars. Similarly, some of the items included in Fixed Expense represent a proration of cost among the profit centers. Notice that the spike in Fixed Expense in Exhibit 2 occurred in 1986 and 1988 for used cars, while it appeared in 1985 and 1987 in Exhibit 1 for new cars. The increased cost assigned to used cars was caused by a change in the allocation of rent for the floor space added in the latter two years.

4.3. Service and parts department (Exhibit 3)

The cost driver for the service and parts department is probably the number of service orders written. The large majority of the orders involve the servicing or repairing of vehicles, and these orders require the incurrence of both labor costs and parts costs. However, a few orders are just for the sale of parts or accessories. Again, management believes that the number of cars sold influences the number of service orders written during a year.

Financial information and the number of orders written in the Service and Parts Department are shown in Exhibit 3. The Sales figure represents the total retail price for parts and labor on the orders. The Cost of Parts Sold and the Cost of Labor represent the direct costs of the items and work reflected on the service orders. These two costs should relate quite strongly to the number of orders written.

(Insert Exhibit 3 here)

The three other expense categories are defined in the same way as for the new and used car sales departments. However, the amounts are probably affected even more by arbitrary and changing allocations. Notice, however, that the Fixed Cost category increases in 1985 and 1987, when management added floor space.

5. Specific Case Requirements

You have been asked to prepare a dollar estimate of damages due to lost profits caused by the diversion of Honda automobiles away from Mooresville Honda. The total

dollar claim should be valued as of December 31, 1992.[2] State law provides for interest at a statutory annual rate of 8 percent. Your analysis should be done in the following steps.

1. Prepare a written brief or memorandum to the Court outlining and explaining the general approach that you believe should be used to estimate the dollar amount of damages. Your memorandum should be between two and six pages long and should cover the following areas:
    - The general framework for your analysis.
    - How you would go about measuring the lost profits for new car sales, including a description of any statistical tools you plan to use.
    - How you would incorporate into your analysis the impact of new car sales on the used car department and on the service and parts departments.
    - How you would sum the total annual lost profits into a single figure as of December 31, 1992.
2. Apply your methodology to the data from Mooresville Honda to arrive at the total amount of damages as of December 31, 1992.
3. Write a short memorandum setting forth the limitations of your analysis. Include factors that could cause your estimate to be over- or understated.
4. If state law did not specify a rate of eight percent for the time value of money, how would you have determined an appropriate rate?

6. Teaching notes

This instructional case was developed from a professional assignment undertaken by two of its authors, who served as damages experts in a case brought by four Honda

[2]December 31, 1992 was selected because it is the end of the time period for which the damages occurred. To determine the payment necessary to compensate Mooresville Honda, the Court would adjust this

dealers against American Honda. Mooresville Honda's financial results reflect real-world relationships, but do not conform to those of any specific dealer. Adjustments in the data were made to remove some anomalies (e.g., some dealers sold new cars other than Honda or had no used car operations), gaps (e.g., not all dealers operated continuously throughout the 13 years), and some of the serial correlation.

6.1 Learning objectives

This case has two broad learning objectives—application and integration. The case emphasizes three subjects typically covered in many managerial and cost accounting courses—cost estimation, cost-volume-profit analysis, and the time value of money. In Mooresville Honda, students have an opportunity to apply their understanding of the three subject areas in a unique non-production setting. Therefore, one set of learning objectives involves increasing student understanding of each of these basic topics.

A second objective is integration. In most courses these three topics are covered close together temporally in a section of the course on the use of accounting data in decision making. However, usually in textbook coverage, the topics are presented in separate chapters, and the problem material emphasizes just one decision-making tool. The Mooresville Honda case integrates all three topics in a single situation. It provides a vehicle to study their interrelationship. Cost-volume-profit analysis provides the framework. Cost estimation techniques, particularly regression, are used to obtain many of the cash flow estimates, and interest must be considered to adjust for the time value of money.

The case involves high levels of conceptual and analytical thinking, which help develop student's critical thinking skills. The case also explicitly addresses three of the

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damages amount to reflect interest until the date of its ruling.

core competencies—decision modeling, problem solving, and communication—advocated by the American Institute of Certified Public Accountants for those entering the accounting profession (AICPA, 2002).

6.2 Suggested teaching strategy

This case can be used in any course that incorporates the three topic areas. Because of typical coverage in managerial and cost accounting courses, the case is particularly useful there. Because of its richness, the case can be used with many different audiences—undergraduate, MBA's, graduate accounting students, and executives.

While the case may be assigned as an individual project, we prefer to use groups of 3-5 students. Given the unstructured decision setting, the large number of calculations involved, and the difficult judgments to be made, a group is more likely to generate viable solutions with less instructor guidance. Furthermore, the opportunity for the group to interact on several assignments enhances the case's educational merit by bringing out the richness of the case and the nuances of some of the data.

Three different strategies can be employed in using the case, depending on the experience of the students and on the time available. One approach is to simply provide the students with the case information and ask them to estimate the damages. A major difficulty with this open-ended approach is that many students have difficulty determining how to approach the problem, i.e., deriving the estimated damages.

The second strategy, our preferred approach, is reflected in the requirements presented at the end of the case. This approach provides some structure for the detailed work, yet allows students to consider a variety of approaches. The written assignment (Requirement 1) is submitted for formal evaluation by the instructor. This is done about a

week after the case has been assigned. Part or all of a class period, (45-75 minutes) is then spent discussing the merits of different approaches. In this way, students may gain a sense of the importance of thinking about how to structure an answer—a valuable skill in real-world problems. Through this discussion, the instructor can bring out the major points covered in the solution to Requirement 1. Based on the in-class discussion, students can solve the rest of the case outside of class, perhaps using a very different approach and set of cost/revenue functions than they originally intended. Most students should emerge from the class discussion with a clear focus on a definite overall framework. Their detailed computations then are probably less burdensome.

A third approach can be employed in situations where regression has not been covered formally or where the time available does not permit the running of detailed regressions. In this situation, the instructor can provide various regression results to the students as part of the case. In some courses, students are exposed to cost estimation in the form of a linear equation, Cost = a + bx, and perhaps to the general concept of regression. However, the actual computer and/or statistical skills to run the regressions are not present. These students can still benefit from the case. The Appendix displays some 35 linear equations that *could* be used in solving the case. Whether all or just a subset of the equations is provided depends on how many judgments and decisions the instructor wishes the students to make.

6.3 Classroom validation

The Mooresville Honda Company case was class-tested by three different instructors, other than the authors, at three different universities. One of these experiential situations was a required MBA managerial accounting course, and one was a required

undergraduate cost accounting course. In the third situation, the instructor used the case as an extra assignment for MBA students to receive graduate credit for an undergraduate elective course in Advanced Cost Accounting.

In the first situation, the instructor taught two sections of MBA students in a medium size public university. There were 38 students in each class. He followed the case requirements as presented (the second teaching strategy). The teams consisted of 4-6 persons, and the case was 20 percent of the grade. About a week after forming teams and assigning the case, the instructor collected the first written assignment outlining the general approach and techniques to the case. Then a 75-minute class period was spent discussing the recommendations of the various teams. The instructor played a passive role, letting the individual students argue and debate. The instructor stepped in only to keep the discussion on track or to correct major fallacies in thinking (e.g., some groups wanted to focus on preparing new income statements instead of measuring future differential cash flows). The instructor specifically refrained from suggesting detailed implementation approaches. The students completed the rest of the assignment over the next two weeks. The final case was not discussed in class.

The undergraduate cost accounting class consisted of 65 students. It was taught in a medium size public university. The group size was 3-5 students, and the case was 10 percent of the course grade. After receiving the case materials, students were given a week to write a two-page memo on how they would assess damages. No help was provided by the instructor. These memos were graded and returned along with the 35 cost equations from the Appendix. Students then had another two weeks to complete the

assignment. They could ask the instructor questions outside of class, but no discussion of the case took place during class time.

The third setting was at a small private university. Two MBA students had to complete the case as a supplemental assignment to receive graduate credit for an Advanced Cost Accounting course taught at the undergraduate level. The case counted 10 percent of their grade. The instructor gave the case to the two students to think about for a week. He then met with them for about an hour to discuss how to approach the problem and to review the basics of regression. Two weeks later, another meeting was held outside of class to review progress and to respond to questions and problems. The students gave a verbal summary of the case to the undergraduate students in the class and then submitted a written report.

All three instructors were asked to distribute a questionnaire to their students as well as complete a slightly different form themselves. All instructors found the case materials and teaching note to be clear and free from any problems or deficiencies. They believed that the case accomplished its educational objectives. More importantly, all three indicated that they would use the case again and would recommend it to other instructors. Their mean responses are included in Table 2. Table 3 summarizes the student responses. Again, the responses were favorable.

(Insert Tables 2 and 3 here)

6.4. Word of caution regarding regression

Our experience suggests that many students try to regress each variable on every other variable in search of a high R^2. Prior to the case, or in the class discussion of

Requirement 1, we reiterate some of the potential pitfalls of cost estimation and regression. Specifically, we emphasize the following.

1. Linear regression is a mathematical way of describing a *linear* relationship. It should be used when there is a strong *ex ante* expectation of a linear relationship or when a graph of the data suggests one. A large R^2 does not necessarily mean linearity.
2. Use your common sense about the data. Beware of statistical relationships that lack an underlying causal reason. Spurious relationships may be introduced into cost functions when costs are allocated among departments. Also, when both the independent and dependent variables are measured in dollars, price changes over time can cause fixed costs to appear to be variable.
3. If students are well versed in regression, remind them that serial correlation is often present in time series data.
4. Several of the intercepts in the regression equations are negative. This phenomenon sometimes happens in time series data, particularly when inflationary price changes may be present. Remember the concept of the relevant range. Linear regression attempts to determine a straight line that describes the range of data actually used. This data set often does not include any experience at zero or low levels of activity.

6.5. Solution to requirement 1

Requirement 1 asked students to write a memo outlining their general approach to estimating damages. The main idea to be recognized in this memo is that the change in new-car volume is the driving factor in the analysis. Lost profits (cash flows) represent

the difference between the increase in revenues and the increase in expenses (costs) that would have occurred if Mooresville Honda had received its proper allotment of cars. Only those revenues and expenses that would have increased each year if the volume of new car sales had increased are relevant.

6.5.1. New cars

The gross margin on new car sales reflects revenues and expenses directly associated with sales volume. Annual operating margins, on the other hand, are influenced by fixed expenses that do not change with annual sales volume. Expressing operating margins on a per-unit basis would treat these fixed costs as if they were variable and thus would understate the incremental margin and, therefore, the profits from an expansion of new car sales. Accordingly, the first calculation will be to multiply the number of cars diverted each year by the actual average gross margin per car each year.

The analysis cannot stop, however, with gross margin. If Mooresville Honda had sold more cars, some costs other than the wholesale cost of the cars would have been higher. Likewise, sales-related income would have increased. To determine how sales-related income and each expense category are related to new car sales, a linear function of the form, $Y = a + bX$, can be estimated using statistical regression. The independent variable (X) is new-car sales. If the "b" coefficient is statistically different from zero ($p < .025$ one tail), it can be multiplied by the diverted new car sales to estimate how that expense category or sales-related income would have increased if more new cars had been sold. This procedure should be followed only for revenues and costs where a linear

relationship with volume is anticipated based on the nature of the item and/or a graph of the data.

New car sales can be expressed in units or in sales dollars. If dollars of cost are regressed against dollars of sales, possible biases may exist in the regression results because of price changes over the thirteen years. Also, serial correlations are likely to be greater when dollars are used. Consequently, unit sales of new cars will be used as the independent variable in most cases. The only exception will be for sales-related income (financing, insurance, and service contracts), where there is an *a priori* expectation that the income is a function of sales dollars, or for expenses that clearly relate to dollars rather than to units.

6.5.2. Used cars

Lost sales of new Honda cars do result in the sales of used cars, parts and accessories, and service being reduced. However, as was the case with new cars, if sales in these other areas had been greater, some costs in these other areas likewise would have been greater.

A simple approach for used cars would be to regress used car revenues and costs against new car sales in units or dollars. Any significant “b” coefficients presumably would reflect how that cost or income fluctuated with new car sales.

On the other hand, used car sales are the direct cause of used car costs and revenues, not new car sales. Consequently, we propose a two-step approach that reflects the logic driving the cost-volume relationships for used cars. First, used car sales in units should be regressed against new car sales in units. The “b” coefficient, which reflects the average change in used car unit sales per sale of one new car, will be multiplied by the

number of new cars diverted each year. The result is an estimate of the number of used cars that would have been sold each year if the new cars had not been diverted. This estimate, multiplied by the average gross margin on used cars each year, provides the starting point for estimating lost profits on used cars.

The second step would be to regress the historical amounts for sales-related income and for the various used-car cost categories expected to have a linear relationship with sales volume against used car sales. Any significant coefficients on the "X" variable would estimate how these categories would likely increase if used car sales increased. Multiplication by the estimated used car sales increase from the first stage would then give the dollar change.

6.5.3. Parts and service

A two-step process similar to used car sales is recommended for parts and service. The number of service orders written is regressed against total new and used car sales. The resulting "b" coefficient, if significant, would show the relationship between increases in new and used car sales and increases in service orders written. Multiplication of this coefficient by the total volume of increased cars (new cars diverted plus the used car sales lost) would give an estimate of the increased number of service orders if the bribery had not occurred. This estimate can be multiplied by the average sales value per service order each year to obtain a measure of lost revenue.

The second step is to establish the relationship between each of the costs associated with parts and service orders. In the case of cost of parts sold and the cost of service and parts labor, we would expect them to be directly variable costs. Therefore, we will simply use the average cost of parts per order and the average labor cost each year to

determine the change in these costs. For the other costs, where some of the cost is likely to be nonvariable, regression may help to isolate the variable portion. Any significant regression coefficients can then be multiplied by estimated increased service orders to estimate the increased costs associated with the additional business.

6.5.4. Time value of money

Combining the results from the application of the methods described in the three preceding sections should give an estimate of the total lost profits (lost cash flow) each year caused by the diversion of new Honda automobiles away from Mooresville Honda. A simple summation of these results in historical dollars, however, would understate the claim for damages as of December 31, 1992. If Mooresville had not been denied cars, it would have increased its profits *in the past*. Because Mooresville has lost the use of its money over a period of years, it has been denied the opportunity to earn interest, invest, or otherwise put that money to use.

The final step, then, in estimating damages is to compute interest on the lost profits. The award of interest is necessary to restore Mooresville to the position it would have been in had the diversion of cars not occurred. State law provides for the award of interest at a statutory rate of 8 percent. The application of this rate to the yearly lost profits will yield the present value of the lost profits as of December 31, 1992. The calculation to determine this present value consists of multiplying each annual amount of lost profits in historical dollars by $(1.08)^N$, where N is the difference between each specific year and 1992.

6.6. Solution to requirement 2

Requirement 2 is the main assignment. In it students are asked to apply their general approach to the data of Mooresville Honda to come up with a specific estimate of damages. Exhibit 4 contains a solution to this requirement, following the methodology described above in Requirement 1. Exhibit 5 explains the calculations contained in Exhibit 4. The solution employs selected regressions from the Appendix. These are identified by numbers in the calculations.

(Insert Exhibits 4 and 5 here)

We downplay the concept of a "right answer" in favor of a logical approach. Too much judgment and too many equally acceptable approaches exist to be able to label one solution "correct." For example, do you use new car sales in units or new car sales in dollars as the independent variable? The actual court filings used sales dollars for simplicity and because some costs like floor plan interest and commissions are a function of sales dollars. Which cost categories should be represented by actual unit costs (e.g., cost of new cars sold and cost of parts sold) and which should be represented by the regression coefficients? For pure variable costs, actual average annual figures would be appropriate. Yet what are the pure variable costs? With time series data influenced by price changes, regression analysis can produce a significant coefficient for a pure fixed cost yet might not produce a coefficient of one for a pure variable cost. Finally, should a single-step approach be employed for used car sales and for parts and service, wherein new car sales is the independent variable, or is the two-step approach outlined in Requirement 1 more appropriate? The actual court filings used the single-step approach.

The specific dollar estimate for the present value of lost profits as of December 31, 1992 is almost $5 million. This amount is derived by adding the amount for each year on line 34 in Exhibit 4.

6.7. Solution to requirement 3

Potential limitations of the above solution can be organized around the following questions:

1. Would Mooresville Honda Company have been able to sell the additional cars that would have been allocated to them and at what price?
2. Did Mooresville Honda have the capacity to handle an increased volume of sales without additional spending on fixed costs?
3. Does using regression introduce any biases into the estimate?

For many years, the number of new cars diverted from Mooresville Honda was between 30 and 40 percent of historical new car sales. The U.S. economy was coming out of a period of stagnation in the 1980s. The Southeast, where Mooresville Honda is located, tends to lag the rest of the United States in economic recoveries. These factors could have had a detrimental effect on incremental car sales in the first few years. To be able to sell the additional quantity of automobiles, Mooresville Honda may have had to reduce the sales price significantly or provide other costly incentives. If so, the historical gross margins may overstate the amount of additional profit that could have been earned.

On the other hand, although a decrease in the overall demand for cars occurred, there was a shift in demand from larger U.S. cars toward smaller imports. During the period covered in the case, popular models of Honda automobiles were actually in short supply. Mooresville Honda is located in a metropolitan area that probably could have

supported the sale of 150 to 200 additional automobiles each year. More importantly, the bribery affected the mix of cars delivered to Honda dealers because the diverted cars commonly were popular in terms of color or model (e.g., four-door Accords with automatic transmission). These more popular Hondas turned over rapidly, sold at premium prices, and provided very high margins. Therefore, the use of historical gross margins, reflecting a less desirable mix of cars, understates the amount of profit lost by Mooresville Honda.

The analysis of damages presented earlier used the significant coefficients on the "X" variable from the regression equations. These coefficients estimate the change in cost with a per unit change in volume. But estimates of variable cost apply only within a relevant range. Accordingly, the analysis assumes that sufficient capacity would have existed throughout the 13 years to handle a 30 to 40 percent increase in volume each year. If a volume change that large would have caused fixed costs to increase, then the estimate of damages is overstated. We have no information on this possibility. We do note that Mooresville Honda increased its capacity twice. The question is whether those increases were just sufficient to provide for the actual volume increases Mooresville experienced or whether they were made to provide for even larger sales volume.

Finally, the analysis of damages relies heavily on statistical regression, which presents the following potential problems.

1. We have only 13 data points in the regressions. As a result, some economically significant cost-volume relationships may not show up as statistically significant because of a lack of sufficient observations. If so, the estimate of cost change would be understated and the estimate of damages would be overstated.

2. Many of Mooresville Honda's cost classifications are broad, and individual costs that vary in different ways and with different bases (units or sales dollars) are combined in single categories. This combination could reduce the overall statistical relationship, although no easy way exists to determine whether or not this happened. To the extent that some estimated cost coefficients turned out to be less significant than the underlying true relationship would imply, the estimate of damages would be overstated.

3. The data in our regressions are from a time series (repeated observations on the same unit through time). One major assumption of standard regression analysis is that the error corresponding to any specific observation is not correlated with errors for any other observations. This assumption is often untenable in time series data where a single year is likely to be influenced by the preceding year or years. The effect of this serial correlation can be magnified when both the "X" and "Y" variables are measured in terms of dollars. Although parameter estimates are unbiased in the presence of serial correlation, significance tests are more likely to indicate that a coefficient is statistically significant when it is not. In our regressions, we used a low cut-off to determine statistical significance (.025 one-tail), so it is less likely that we have assumed a relationship when none is present. However, to the extent that some non-significant cost-volume relationships are treated as significant, the estimate of damages is understated.

6.8. Solution to requirement 4

Some instructors may prefer to delete Requirement 4 because it involves concepts from economics and finance. In our experience, interest issues often arise in legal

proceedings similar to those covered in this case. Accordingly, we have raised the issue of what an appropriate interest rate should be for those wishing to explore it.

The most important concept for students to understand is the power of compound interest and the recognition that if interest is not received, Mooresville Honda will not be adequately compensated for its loss. By simply asking students whether they would be willing to lend someone money, say $100, now in exchange for a return of the same $100 in 13 years, the importance of seeking interest can be made intuitively clear. The difficulty, of course, is in determining how best to calculate this interest. In the absence of a statutory rate dictating the determination of interest, three alternative approaches have been mentioned in the literature.

Students are often told to use estimated average cost of capital (debt and equity) as the discount rate in investment decisions. The rationale is that the interest rate should represent opportunity cost to Mooresville Honda—the marginal return or earning rate the company would have received on any incremental funds available to invest. In equilibrium, the marginal rate of return would equal the company's marginal cost of capital.

Such an approach may not be feasible over a 13-year time period in which cost of capital is likely to change each year. Moreover, the calculation of cost of equity capital for a non-publicly owned company like Mooresville Honda is impossible. No current market prices of shares exist, so the analyst has no way of judging current stockholder expectations. In this imperfect setting, the analyst might look for a surrogate in the average long-run accounting rate of return earned on total assets, either by Mooresville or by a typical automobile dealer based on trade association figures.

A second approach comes from the literature on damage assessment (Coller & Harrison 2001; Patel et al. 1982). This approach would advocate the use of the *defendant's* debt rate, i.e., American Honda's. The rationale here emphasizes that an opportunity cost is the rate that would be earned in an alternative investment *of comparable risk*. When one party incurs costs (or loses profits) due to the actions of another party, the relevant alternative investment of comparable risk is a loan to the responsible party. In other words, because Mooresville Honda has been deprived of profits due to the actions of American Honda, it should be compensated by a return of the profits and interest that would have accumulated under the terms of a loan to American Honda.

This approach is quite simple to apply when, as in this case, the defendant is a publicly traded company and information on the borrowing rate is readily available. The approach also draws support under the legal theory of restitution. One goal of the court in seeking an equitable outcome often is to force the defendant to give up any gains accumulated from the actions in question. Awarding interest determined at the defendant's borrowing rate would be consistent with forcing the defendant to give up the present value of the gains, as the defendant would measure that value.

A third approach that has appeared in the literature is the simple use of a risk-free rate (Fisher & Romaine 1990). For example, the rate available on U.S. Treasury bills available in each year that damages are incurred can be used to compound those damages to the current year. While this method is conceptually simple and utilizes rates that are readily available, it compensates the plaintiff only for minimal interest. Whether we view interest as reflecting lost general business opportunities for the plaintiff, or as

compensating the plaintiff for a “loan” to the defendant, the result is likely to be a figure greater than the risk-free rate. Nonetheless, the risk-free rate is often used as a conservative lower bound for a satisfactory award of damages.

7. Epilogue

In Requirement 2, our estimate of the present value of damages as of December 31, 1992 was about $5 million. In our classroom validation studies, well-grounded student groups came up with estimates of $ 2.9 million to $ 8.9 million. Students typically find the amount much larger than they would have anticipated. A similar methodology, when applied to the four Honda dealers involved in the original legal action, yielded conservative estimates of $ 3.9 million to $ 7.9 million. Unfortunately from an educational standpoint, the case was finally settled by mediation in 1999, shortly after the damage estimates were prepared. The results were sealed, so we cannot report what actually happened.

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Table 1

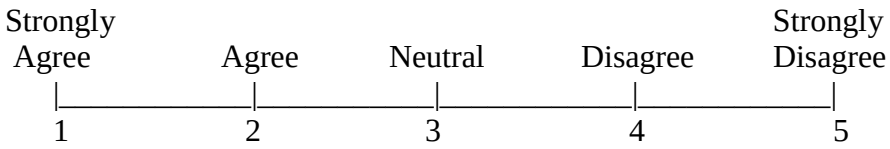
Number of cars diverted from Mooresville Honda

Year	# of Cars	Year	# of Cars
1980	151	1987	210
1981	163	1988	211
1982	139	1989	210
1983	174	1990	208
1984	196	1991	203
1985	201	1992	193
1986	204		

Table 2

Faculty Evaluation of the Mooresville Honda Case

1. The case has several objectives. Indicate on the scale below each question the extent of your agreement with statements describing these objectives.



	Mean Response
a. The case provided a good review of cost-volume concepts.	1.7
b. The case provided a good review of regression analysis and cost estimation.	1.7
c. The case provided a good review of the impact of the time value of money.	2.0
d. The case provided a good opportunity for applying managerial accounting concepts and procedures.	2.0
e. The case required students to integrate their knowledge of specific concepts and procedures in managerial accounting.	2.3
f. The case required students to make judgments using their critical thinking skills.	1.7
g. Students appeared to find the case interesting.	1.3
h. Most student groups were able to perform well on the case.	2.3

2. On the scales below, please evaluate the case materials.

a. Overall, how would you rate the case? (1 = Excellent; 5 = Bad)	1.7
b. Overall, how would you rate the teaching note? (1 = Excellent; 5 = Bad)	1.3
c. How would you compare the case to others you generally use? (1 = Much Better; 5 = Much Poorer)	2.3
d. I would use the case again. (1 = Strongly Agree; 5 = Strongly Disagree)	1.7
e. I would recommend its use to other instructors. (1 = Strongly Agree; 5 = Strongly Disagree)	1.3

Table 3

Student Evaluation of the Mooresville Honda Case

	Undergraduate	MBA
Average total hours spent on case	8.3	9.7 hours
Achievement of educational objectives (1 = Strongly Agree; 2 = Agree; 3 = Neutral; 4 = Disagree; 5 = Strongly Disagree)		
Completing the case helped me to understand cost-volume principles and relationships.	2.2	2.3
Completing the case helped me to understand regression analysis and cost estimation techniques.	2.2	1.8
Completing the case helped me to understand the impact of the time value of money.	2.1	2.3
Completing the case required me to integrate my knowledge of specific concepts and procedures in managerial accounting.	2.1	2.3
The learning I derived from the case was worth the time spent.	2.3	2.5
The case should be assigned in future semesters of the course	2.5	2.6
Evaluation of the case		
Clarity of written material including directions (1 = Clear; 5 = Unclear)	2.2	1.8
How interesting was the case? (1 = Interesting; 5 = Boring)	2.0	2.4
How realistic was the case? (1 = Realistic; 5 = Unrealistic)	1.5	1.9
Overall, how useful was the case in your study of managerial accounting? (1 = Highly Useful; 5 = Highly Useless)	2.3	2.5

Exhibit 1
Mooresville Honda Company
New car sales

	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980
Unit sales	455	526	553	634	586	582	667	653	638	566	455	479	476
Sales	$6,807,726	$7,366,389	$7,409,165	$8,324,233	$7,757,904	$7,217,695	$7,805,515	$6,677,496	$6,063,218	$5,190,077	$3,956,236	$3,577,374	$3,027,663
Cost of sales	6,280,798	6,891,727	6,783,961	7,537,261	6,973,041	6,378,081	6,745,453	5,720,178	5,165,693	4,473,976	3,470,326	3,153,620	2,625,751
Gross margin	526,928	474,662	625,204	786,972	784,863	839,614	1,060,062	957,318	897,525	716,101	485,910	423,754	401,912
Sales related income	73,474	78,428	78,309	86,497	80,606	74,188	80,051	68,495	62,141	53,093	41,978	36,901	31,433
Operating margin	600,402	553,090	703,513	873,469	865,469	913,802	1,140,113	1,025,813	959,666	769,194	527,888	460,655	433,345
Selling expense	179,836	202,508	210,962	223,848	158,418	156,187	166,348	144,472	119,451	90,212	64,725	72,956	70,814
Other personnel expense	240,043	239,305	232,042	214,416	219,037	227,535	225,576	233,385	233,567	235,721	190,369	174,956	178,004
Semi-fixed expense	82,235	90,618	92,476	109,416	103,668	103,039	124,250	110,837	105,833	104,882	98,379	101,433	75,793
Fixed expense	88,730	89,637	88,426	81,372	82,303	84,752	74,141	78,193	63,729	64,036	60,824	60,384	60,855
Operating profit	9,558	(68,978)	79,607	244,417	302,043	342,289	549,798	458,926	437,086	274,343	113,591	50,926	47,879

Exhibit 2
Mooresville Honda Company
Used car sales

	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980
Unit sales	213	248	237	276	237	294	263	256	234	223	164	179	160
Sales	$865,206	$776,240	$770,961	$796,812	$615,489	$723,534	$540,991	$617,984	$607,464	$560,176	$394,420	$328,644	$293,280
Cost of sales	817,707	721,680	717,873	743,013	565,803	660,912	496,807	543,488	552,942	516,691	367,852	283,715	264,000
Gross margin	47,499	54,560	53,088	53,799	49,686	62,622	44,184	74,496	54,522	43,485	26,568	44,929	29,280
Sales related income	3,968	3,570	3,432	3,646	2,959	3,499	2,764	3,062	2,917	2,708	1,981	1,799	1,673
Operating margin	51,467	58,130	56,520	57,445	52,645	66,121	46,948	77,558	57,439	46,193	28,549	46,728	30,953
Selling expense	24,375	25,135	24,436	26,548	22,692	26,530	23,065	23,396	22,105	20,997	16,306	16,316	14,938
Other personnel expense	18,828	18,455	18,612	17,224	17,656	16,213	16,390	17,022	18,784	14,416	14,598	13,432	13,825
Semi-fixed expense	8,397	9,163	8,954	10,007	8,593	10,660	9,364	9,129	8,470	7,924	6,353	6,471	5,962
Fixed expense	8,889	8,995	9,563	8,734	8,804	7,812	8,110	7,181	7,286	7,307	7,852	6,425	6,640
Operating profit	(9,022)	(3,618)	(5,045)	(5,068)	(5,100)	4,906	(9,981)	20,830	794	(4,451)	(16,560)	4,084	(10,412)

Exhibit 3
Mooresville Honda Company
Service and parts department

	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980
# of Service Orders written	9,459	9,614	9,574	9,976	9,464	9,231	9,565	9,268	8,966	8,300	7,587	7,333	7,107
Sales	$2,062,062	$2,105,466	$2,106,280	$2,104,936	$1,949,584	$1,846,200	$1,903,435	$1,825,796	$1,766,302	$1,552,100	$1,375,312	$1,224,611	$1,130,013
Cost of parts sold	1,017,523	1,051,786	1,057,400	1,047,720	1,008,544	986,176	1,046,935	1,026,800	1,014,532	905,100	813,178	767,303	725,416
Cost of service and parts labor	478,360	465,332	482,960	469,112	431,240	404,623	406,080	378,040	360,014	324,100	289,625	261,326	235,033
Operating margin	566,179	588,348	565,920	588,104	509,800	455,401	450,420	420,956	391,756	322,900	272,509	195,982	169,564
Other personnel expense	324,859	296,753	310,301	282,700	254,153	296,594	173,541	175,524	175,559	175,816	117,564	109,886	111,921
Semi-fixed expense	87,709	75,661	76,477	75,255	72,107	74,873	61,682	66,497	68,855	60,568	63,479	53,160	57,956
Fixed expense	198,649	190,054	191,808	193,296	111,895	119,300	103,004	103,557	83,778	89,264	89,998	58,219	55,606
Operating profit	(45,038)	25,880	(12,666)	36,853	71,645	(35,366)	112,193	75,378	63,564	(2,748)	1,468	(25,283)	(55,919)

Exhibit 4
Estimate of damages
(Dollars in thousands, except per unit amounts)

	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980
(1) NEW CARS													
(2)													
(3) # of diverted cars	193	203	208	210	211	210	204	201	196	174	139	163	151
(4) Average historical per unit gross margin	$1,158	$ 902	$1,131	$1,241	$1,339	$1,443	$1,589	$1,466	$1,407	$1,265	$1,068	$ 885	$ 844
(5) Lost gross margin	$ 223.5	$ 183.1	$ 235.2	$ 260.6	$ 282.5	$ 303.0	$ 324.2	$ 294.7	$ 275.8	$ 220.1	$ 148.5	$ 144.3	$ 127.4
(6) Lost sales-related income	28.9	28.4	27.9	27.6	27.9	26.0	23.9	20.6	18.6	16.0	12.1	12.2	9.6
(7) Increased selling expense	(83.7)	(82.4)	(80.8)	(80.0)	(81.0)	(75.5)	(69.2)	(59.6)	(54.0)	(46.3)	(35.0)	(35.3)	(27.9)
(8) Increased semi-fixed expense	(25.7)	(27.0)	(27.7)	(27.9)	(28.1)	(27.9)	(27.1)	(26.7)	(26.1)	(23.1)	(18.5)	(21.7)	(20.1)
(9) Subtotal—new cars	$ 143.0	$ 102.1	$ 154.6	$ 180.3	$ 201.3	$ 225.6	$ 251.8	$ 229.0	$ 214.3	$ 166.7	$ 107.1	$ 99.5	$ 89.0
(10)													
(11) USED CARS													
(12)													
(13) # of used car sales lost	81	85	87	88	89	88	86	84	82	73	58	68	63
(14) Average historical per unit gross margin	$ 223	$ 220	$ 224	$ 195	$ 210	$ 213	$ 168	$ 291	$ 233	$ 195	$ 162	$ 251	$ 183
(15) Lost gross margin	$ 18.1	$ 18.7	$ 19.5	$ 17.2	$ 18.7	$ 18.7	$ 14.4	$ 24.4	$ 19.1	$ 14.2	$ 9.4	$ 17.1	$ 11.5
(16) Lost sales-related income	1.3	1.1	1.1	1.0	.9	.9	.7	.8	.9	.7	.6	.5	.5
(17) Increased selling expense	(7.0)	(7.3)	(7.5)	(7.6)	(7.7)	(7.6)	(7.4)	(7.2)	(7.1)	(6.3)	(5.0)	(5.9)	(5.4)
(18) Increased semi-fixed expense	(2.7)	(2.9)	(2.9)	(3.0)	(3.0)	(3.0)	(2.9)	(2.8)	(2.8)	(2.5)	(2.0)	(2.3)	(2.1)
(19) Subtotal—used cars	$ 9.7	$ 9.6	$ 10.2	$ 7.6	$ 8.9	$ 9.0	$ 4.8	$ 15.2	$ 10.1	$ 6.1	$ 3.0	$ 9.4	$ 4.5
(20)													

Exhibit 4
Estimate of damages (continued)
(Dollars in thousands, except per unit amounts)

	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980
(21) SERVICE													
(22)													
(23) # of service orders lost	1,743	1,832	1,876	1,895	1,908	1,895	1,844	1,813	1,768	1,571	1,253	1,469	1,361
(24) Revenue per order	$ 218	$ 219	$ 220	$ 211	$ 206	$ 200	$ 199	$ 197	$ 197	$ 187	$ 181	$ 167	$ 159
(25) Lost service revenue	$ 380.0	$ 401.2	$ 412.7	$ 399.8	$ 393.0	$ 379.0	$ 367.0	$ 357.2	$ 348.3	$ 293.8	$ 227.1	$ 245.3	$ 216.4
(26) Increased cost of parts	(187.5)	(200.4)	(207.2)	(199.0)	(203.3)	(202.4)	(201.8)	(200.9)	(200.0)	(171.3)	(134.3)	(153.7)	(138.9)
(27) Increased cost of labor	(88.1)	(88.7)	(94.6)	(89.1)	(86.9)	(83.1)	(78.3)	(74.0)	(71.0)	(61.3)	(47.8)	(52.4)	(45.0)
(28) Increased semi-fixed expense	(12.7)	(13.4)	(13.7)	(13.8)	(13.9)	(13.8)	(13.5)	(13.2)	(12.9)	(11.5)	(9.1)	(10.7)	(9.9)
(29) Subtotal—service	$ 91.7	$ 98.7	$ 97.2	$ 97.9	$ 88.9	$ 79.7	$ 73.4	$ 69.1	$ 64.4	$ 49.7	$ 35.9	$ 28.5	$ 22.6
(30)													
(31) TOTAL LOST PROFITS	$ 244.4	$ 210.4	$ 262.0	$ 285.8	$ 299.1	$ 314.3	$ 330.0	$ 313.3	$ 288.8	$ 222.5	$ 146.0	$ 137.4	$ 116.1
(32) Interest factor	1.0000	1.0800	1.1664	1.2597	1.3605	1.4693	1.5869	1.7138	1.8509	1.9990	2.1589	2.3316	2.5182
(33)													
(34) PRESENT VALUE OF DAMAGES	$ 244.4	$ 227.2	$ 305.6	$ 360.0	$ 406.9	$ 461.8	$ 523.7	$ 536.9	$ 534.5	$ 444.8	$ 315.2	$ 320.4	$ 292.4
TOTAL	$4,973.8												

Exhibit 5
Explanation of calculations in exhibit 4

line 3—Determined by Court and given in the case.

line 4—Gross margin from Exhibit 1 in the case divided by unit sales. For example, for 1992, $526,928 / 455 = $1,158.

line 5—Line 3 times line 4. For 1992, 193 x $1,158 = $223.5 thousand.

line 6—Sales-related income is logically and strongly statistically related to dollar sales (See regression 9). The regression coefficient of .01 is multiplied by the total sales price of the diverted cars. For 1992, $6,807,726 / 455 cars (from Exhibit 1 in the case) = $14,962 average selling price. 193 diverted cars x $14,962 x .01 = $28.9 thousand.

line 7—By description, selling expense would appear to include a significant element of variable cost. Based on the regression analysis, the cost does not appear to vary with unit volume, but it does vary with sales dollars. A scatter diagram bears out this linear relationship. Commissions and floor plan interest could be the significant items. Therefore, the regression coefficient of .029 from Regression 10 is multiplied by the total sales price of the diverted cars. For 1992, $6,807,726 / 455 cars (from Exhibit 1in the case) = $14,962. 193 x $14,962 x .029 = $83.7 thousand.

Although the same statistical argument could be made for Other Personnel Costs, we excluded them from our analysis. By description, most of the items appear to be committed fixed costs (salaries) or discretionary fixed costs (compensation to owners). A scatter diagram does not reveal a clear linear pattern. We suspect that the relationship with sales dollars is simply the result of price changes over the years.

line 8—Semi-fixed expenses bear a statistically significant linear relationship with unit sales. The coefficient of $133 from Regression 4 is multiplied by the number of diverted cars. For 1992, 193 x $133 = $25.7 thousand.

Fixed expenses are basically a fixed cost that rises in two major steps over the years. Although it has a statistically significant relationship with sales dollars, it is not a linear function of sales dollars. This expense is excluded from the incremental analysis.

line 9—Subtotal representing total net cash flow associated with lost sales of new cars. It is the sum of lines 5, 6, 7, and 8.

line 13—A linear relationship appears to exist between used car sales in units and new car sales in units. Regression 6 suggests that for every new car sold, .42 of a used car would be sold. Consequently, we estimate the number of used car sales lost by multiplying .42 times the number of diverted new cars. For 1992, .42 x 193 = 81.

line 14—Gross margin from Exhibit 2 in the case divided by unit sales. For 1992, $47,499 / 213 = $223.

line 15—Line 13 times line 14. For 1992, 81 x $223.

line 16—As with the case of new car sales, sales-related income for used cars is strongly related to used car sales (see Regression 19). The regression coefficient of .004 is multiplied by the total sales price of the lost used car sales. For 1992, $865,206 / 213 (from Exhibit 2 in the case) = $4,062 average selling price. 81 lost unit sales x $4,002 x.004 = $1.3 thousand.

line 17—Selling expense for used cars by nature probably includes a variable element. It is statistically related to both used car unit sales (Regression 15) and used car dollar sales (Regression 20). We are more comfortable using unit measures of volume where available. So we multiply the number of lost used car sales on line 13 by 86.2, the regression coefficient from Regression 15. For 1992, 81 x $86.2 = $7.0 thousand.

Although the same argument as above would seem to apply to Other Personnel Expense-Used, we have excluded it from the calculation of increased costs for the same reason we did for new cars. By definition, the cost category includes mostly fixed costs. The statistical relationship that appears, we suspect, is caused by the arbitrary allocation of owner's compensation to the used car division. There is likely no causal relationship with increased used car sales volume.

line 18—See the rationale for line 8. Following a similar argument, we take the coefficient of 33.8 from Regression 17 and multiply it by the number of lost used car sales on line 13. For 1992, 81 x $33.8 = $2.7 thousand.

For the same reason that we excluded the fixed expenses of new cars from the analysis, we are excluding the fixed expenses of used car sales. No relationship exists with unit volume, and the relationship with dollar volume is not linear, based on a scatter diagram. We suspect the statistical relationship reflects primarily the impact of price changes over time and not any causal effect of volume.

line 19—Subtotal representing the total net cash flow lost in the Used Car area because of the diversion of new cars allocated to Mooresville. It is the sum of lines 15, 16, 17, and 18.

line 23—The number of service orders written is expected to be related to the number of new cars sold, and this expectation is manifest in Regression 7. However, we would also expect that the sales of used cars would result in more service orders. Regression 24, which uses the total number of new and used car sales as the independent variable, does result in a higher R^2 (and lower standard error). Consequently, we have used this equation for our prediction of service orders lost. The "b" coefficient of 6.36 is multiplied by the additional number of new and used cars that would have been sold each year. For 1992, 6.36 x (193 from line 1 + 81 from line 13) = 1,743 additional service orders related to the lost sales volume.

line 24—Sales each year from service orders (Exhibit 3 in the case) divided by the number of service orders each year. For 1992, $2,062,062 / 9,459 = $218 average revenue per service order.

line 25—Line 23 multiplied by the average revenue per service order each year (line 24). For 1992, 1,743 service orders x $218 = $380.0 thousand.

line 26—We have assumed that cost of parts is a directly variable cost. Therefore, we have calculated the average actual parts cost per service order (dividing the cost of parts each year from Exhibit 3 in the case by the number of service orders each year) and then multiplying by the number of lost service orders. For example, in 1992, $1,017,523 / 9,459 = $107.57 parts costs per service order. 1,743 additional service orders (line 23) x $107.57 = $187.5 thousand.

line 27—We have also assumed that cost of service labor is a directly variable cost. The average cost of labor per service order is calculated by dividing the cost of service labor each year from Exhibit 3 in the case by the number of service orders each year. The result is multiplied by the number of lost service orders. In 1992, $478,360 / 9,459 = $50.57 labor cost per service order. 1,743 additional service orders (line 23) x $50.57 = $88.1 thousand.

For basically the same reasons discussed above under new car sales and used car sales, we have excluded Other Personnel-Service costs from the analysis. Although a strong statistical relationship exists between this cost and number of service orders written (Regression 28) and service order sales dollars (Regression 33), a graph of the data does not reveal any clear linear relationship. We are concerned with the potential bias introduced into this cost category by arbitrary allocations.

line 28—Semi-fixed expense for service does seem to be a mixed cost. The estimate of the variable element from Regression 29 is statistically significant. We multiply the “b” coefficient of 7.30 by the estimated number of service orders each year (from line 23). For 1992, the calculation was $7.30 x 1,743 orders = $12.7 thousand.

line 29—Subtotal representing the total net cash flow lost in the Service area because of the lower quantity of new and used cars to service. It is the sum of lines 25, 26, 27, and 28.

line 31—Total lost profits (cash flow) for all areas of the business. It is the sum of lines 9, 19, and 29.

line 32—$(1.08)^N$ where N = (1992 – individual year). For 1990 N = 2 and $(1.08)^N = 1.1664$.

line 34—line 31 x line 32.

Appendix: Set of possible cost and revenue functions as determined by OLS regression (n=13; df=11)

Equation	Dependent Variable (y)	Independent Variable (X)	Linear Function	R^2	Standard Error of y Estimate	t-Value of XCoefficient
(1)	Sales related income—new	New car units	y = -14,475 + 142X	0.348	15,506	2.42*
(2)	Selling expense—new	New car units	y = -23,276 + 298X	0.169	52,591	1.49
(3)	Other Personnel—new	New car units	y = 137,338 + 146X	0.235	20,938	1.84
(4)	Semi-fixed new	New car units	y = 25,842 + 133X	0.641	7,930	4.43*
(5)	Fixed—new	New car units	y = 59,420 + 28.2X	0.034	12,019	0.62
(6)	Used car units	New car units	y = -5.27 + 0.420X	0.597	27	4.03*
(7)	Service orders written	New car units	y = 4,581 + 7.69X	0.368	802	2.53*
(8)	Sales $--service & parts	New car units	y = 611,215 + 2064X	0.213	320,000	1.73
(9)	Sales related income—new	New car $ sales	y = -218 + 0.010X	0.996	1,249	50.88*
(10)	Selling expense—new	New car $ sales	y = -36,988 + 0.029X	0.840	23,053	7.61*
(11)	Other Personnel—new	New car $ sales	y = 157,989 + 0.010X	0.556	15,953	3.71*
(12)	Semi-fixed—new	New car $ sales	y = 81,146 + 0.003X	0.179	11,985	1.55
(13)	Fixed—new	New car $ sales	y = 40,691 + 0.006X	0.686	6,855	4.90*
(14)	Sales related income—used	Used car units	y = -138 + 13.3X	0.569	502	3.81*
(15)	Selling expense—used	Used car units	y = 2,278 + 86.2X	0.843	1,613	7.67*
(16)	Other Personnel—used	Used car units	y = 10,594 + 26.0X	0.307	1,696	2.21*
(17)	Semi-fixed—used	Used car units	y = 664 + 33.8X	0.974	241	20.14*
(18)	Fixed—used	Used car units	y = 5,624 + 10.2X	0.188	920	1.59
(19)	Sales related income—used	Used car $ sales	y = 499 + 0.004X	0.990	77	32.73*
(20)	Selling expense—used	Used car $ sales	y = 10,004 + .020X	0.868	1,476	8.51*
(21)	Other Personnel—used	Used car $ sales	y = 11,104 + 0.009X	0.712	1,094	5.21*
(22)	Semi-fixed—used	Used car $ sales	y = 4,633 + 0.006X	0.644	885	4.46*

Appendix: Set of possible cost and revenue functions as determined by OLS regression (n=13; df=11)

Equation	Dependent Variable (y)	Independent Variable (X)	Linear Function	R^2	Standard Error of y Estimate	t-Value of XCoefficient
(23)	Fixed—used	Used car $ sales	y = 5,401 + 0.004X	0.624	626	4.28*
(24)	Service orders written	Total units—new & used	y = 3,865 + 6.36X	0.538	686	3.58*
(25)	Sales $--service & parts	Total units—new & used	y = 309,163 + 1,846X	0.365	280,000	2.51*
(26)	Cost of parts sold	Service orders written	y = -94,330 + 119X	0.962	23,662	16.77*
(27)	Cost of service labor	Service orders written	y = -356,312 + 83.3X	0.903	27,554	10.12*
(28)	Other Personnel—service	Service orders written	y = -389,100 + 68.1X	0.665	48,808	4.67*
(29)	Semi-fixed—service	Service orders written	y = 3,924 + 7.30X	0.560	6,537	3.74*
(30)	Fixed—service	Service orders written	y = -248,603 + 41.8X	0.586	35,408	3.95*
(31)	Cost of parts sold	Sales $--service & parts	y = 374,896 + 0.331X	0.931	31,974	12.21*
(32)	Cost of service labor	Sales $--service & parts	y = -50,085 + 0.246xX	0.976	13,729	21.11*
(33)	Other Personnel—service	Sales $--service & parts	y = -152,300 + 0.208X	0.774	40,033	6.14*
(34)	Semi-fixed—service	Sales $--service & parts	y = 28,322 + 0.023X	0.685	5,526	4.89*
(35)	Fixed—service	Sales $--service & parts	y = -111,396 + 0.132X	0.732	28,506	5.48*

* Significant at the .025 level (one tail) for n = 13, df = 11