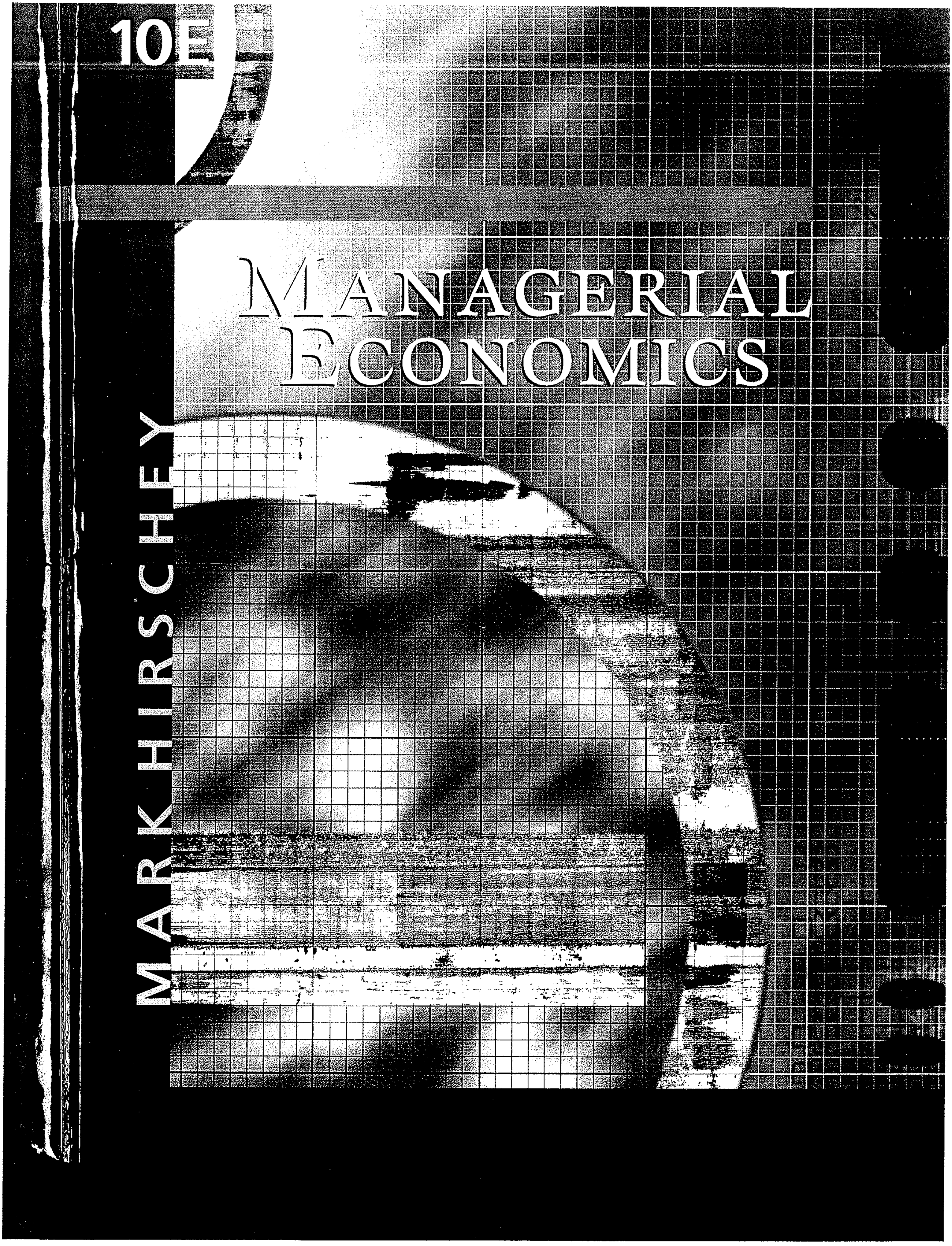
EXHIBIT 6


10E
MANAGERIAL ECONOMICS
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TENTH EDITION

Managerial Economics

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cumstances, the chance of a calculated t value that is less than –1.645 is only 5 percent; the chance of a calculated t value greater than +1.645 is 5 percent. If $t = 1.645$, it is possible to reject the $b_X = 0$ hypothesis with 90 percent confidence; it is possible to reject the $b_X < 0$ hypothesis with 95 percent confidence. In a two-tail t test, rejection of the null hypothesis occurs with a finding that the t statistic is not in the *region around zero*. In one-tail t tests, rejection of the null hypothesis occurs when the t statistic is in one specific tail of the distribution.

In the EDP example, the estimated coefficient for the personal selling expenditures X variable is 0.09289 with a standard deviation of 0.01097. The calculated t statistic = 8.47 > 2.764, the critical t value for a one-tail t test with $n - k = 10$ degrees of freedom at the $\alpha = 0.01$ significance level. With 99 percent confidence, the negative effect hypothesis can be rejected. The probability of encountering such a large positive t statistic is less than 1 percents [hence the probability (p) value of 0.000 in Figure 5.5] when there is in fact a negative relation between the total units Y variable and the personal selling expenditures X variable.

PRACTICAL SOLUTIONS TO REGRESSION PROBLEMS

Pitfalls can be encountered in regression analysis. Not the least of these is the problem that correlation by itself does not imply causality. Does advertising cause (produce) sales? Do sales cause (fund) advertising? Or does causality run in *both* directions? In light of this and other difficulties encountered in using historical data to project future relations, some caveats are in order concerning the use of regression techniques.

Choosing the Best Model

The specific form of a regression equation is typically based on a demand or cost model derived from economic theory. Nevertheless, some experimentation might sometimes prove appropriate. As a first step, it is possible to experiment with various measures of the dependent and independent variables. Often it is worthwhile to try separate output measures based upon different product classifications. The costs of producing output can and do vary depending on the types of product characteristics required by customers. Similarly, demand conditions often depend on unique product characteristics that are obscured when sales are aggregated into a product class that is too broad.

The specific functional form of the regression model is also often worthy of some experimentation. After the data on relevant dependent and independent variables have been collected, managers may have little prior reason to suspect whether the linear or log-linear (multiplicative) form of the regression equation model is most appropriate. Trying both and then relying on the form that consistently provides the best fit seems reasonable. Similarly, careful experimentation with the range of independent X variables incorporated in the regression model might be proper. Some managers use a regression method called **stepwise multiple regression**, which relies on the underlying correlation between X and Y variables to indicate the independent X variables to be included in the model. In this method, X variables are actually selected by the computer software according to their ability to reduce the overall level of unexplained variation. Using this technique, the regression analysis method has the potential to become wholly inductive in character, where the nature of the data, rather than the prior expectations of the manager, determines the specific form of the regression function.

stepwise multiple regression Experimental method of independent variable selection based upon XY correlation

The benefit of experimentation lies in its potential for improving regression model fit. The danger of experimentation is that the resulting regression model might bear little resemblance to a robust and durable economic relation. As was described in the degrees of freedom discussion, R^2 can typically be increased by the addition of further independent variables, even if no true relation exists between the dependent Y variable and the additional X variables. An approach in which absolutely every variable is tried can lead to models that effectively pick up