SOCIAL BEHAVIOR AND PERSONALITY, 1988, *16*(1), 85-89

DOI 10.2224/sbp.1988.16.1.85

USING EFFECT CODING FOR COMPARING MODELS IN SOCIAL RESEARCH

MENI KOSLOWSKY
Bar-Ilan University

Often researchers are required to examine a specific model under 2 different situations. In several studies cited here, authors compared results descriptively without the use of inferential statistics. By using a series of regression tests suggested by Kerlinger and Pedhazur in another context, the 2 situations can be compared statistically. An example from a recent study is used to illustrate the technique and several advantages are suggested.

Keywords: effect coding, comparing models, social research.

Many research projects are concerned with determining the comparability of a model across situations or over time. Typically, the investigators collect at least two sets of data on the independent variables and then compare visually or descriptively variance explained [R^2 in each situation or time period (Larsen, Diener, & Emmons, 1986; Rosenberger & Strube, 1986; Werbel & Gould, 1984; Westbrook & Nordholm, 1986)]. For example, Larsen et al. examined high and low intensity affective response groups on several different measures. For purposes of the paper this technique will be called multiple situation comparison by regression (MSCR). Implicit in MSCR is the notion that the difference between the R^2 in each situation needs to be evaluated with inferential statistics.

It is necessary to emphasize that MSCR as used here involves data collection from separate samples. This type of study must be contrasted with the situation where two or more sets of data are available on the same group and the purpose of the research is to determine the predictive ability of each set. (An illustration of this type of study is provided by Turnage & Muchinsky, 1984.) This latter situation is handled adequately by commonly used solutions such as stepwise, forward, and backward regression. Researchers confronting the two or more situation problem have not considered a simple solution suggested by Kerlinger and Pedhazur (1973) in another context. In their discussion of regression techniques with categorical and continuous variables, Kerlinger and Pedhazur derive an F test that permits testing the generalizability of a prediction equation to different circumstances. Similar expositions have appeared in several recent works (Hanushek & Jackson, 1977; Kelinbaum & Kupper, 1978; Pedhazur, 1982). Table 1 illustrates in vector form a typical MSCR problem derived from the Kerlinger and Pedhazur paradigm. Vector 1 contains the values of the dependent variable, vector 2 represents the presence of X1 with 1's or the presence

Correspondence and reprint requests should be addressed to: Meni Koslowsky, Department of Psychology, Bar-Ilan University, 52100 Ramat Gan, Israel.

TABLE 1: VECTOR REPRESENTATION OF MULTIPLE SITUATION COMPARISON BY REGRESSION

Groups	*V1*	*V2*	*V3*	*V4*	*V5*
X1	Y1	1	a1	0	a1
	Y2	1	a2	0	a2
	Y3	1	a3	0	a3
	Y4	1	a4	0	a4
	Y5	1	a5	0	a5
X2	Y6	-1	0	a6	a6
	Y7	-1	0	a7	a7
	Y8	-1	0	a8	a8
	Y9	-1	0	a9	a9
	Y10	-1	0	a10	a10

of X2 with -1's, vectors 3 and 4 contain the values of the independent variable under conditions X1 and X2, respectively, and vector 5 contains the value of the independent variable across both conditions.

In this setup, X1 and X2 represent the two conditions for which regression comparisons are desired. The codes of 1 and -1 are used for representing the groups. The use of these values, often referred to as effect coding, has several advantages over other systems, such as dummy coding, which uses 1's and 0's, because the former system is directly comparable to the results from an analysis of variance, whereas the latter is not (see Kerlinger & Pedhazur, 1973, for a more detailed discussion of this point). The effect coding system easily handles more than two groups of conditions; members of each additional group would be assigned 0 in vector 2 of Table 1 and for each group a new vector would be needed to represent the values of the independent variable.

Three statistical tests are available for comparing regression variance explained by the independent variables under each condition. The first test compares regression slopes across groups. Using the scheme from Table 1, the test is:

[1] In all cases, the degrees of freedom necessary for the tests of significance is *df* 1 = (k1 - k2) and *df* 2 = (*N* - k1 -1), where k1 = number of predictor vectors for the larger R^2 and k2 = number of predictor vectors in the smaller R^2. For a full discussion of the derivations of all formulae, refer to Kerlinger and Pedhazur (1973), chapters 9 and 10.

$$F = \frac{(R^2_{1.234} - R^2_{1.25}) / (k - k)_{1\ 2}}{(1 - R^2_{1.234}) / (N - k - 1)_{1}} \qquad (1)$$

Actually, this test determines the significance of the increment in variance explained by using separate b's, or regression coefficients, rather than a common b. The second formula tests for the statistical significance of the common regression coefficient:

$$F = \frac{(R^2_{1.25} - R^2_{1.2}) / (k - k)_{1\ 2}}{(1 - R^2_{1.25}) / (N - k - 1)_{1}} \qquad (2)$$

From another perspective, this equation examines the significance of the variance explained by the independent variable beyond that explained by condition or group membership.

Finally, if slopes do not differ significantly, the difference between intercepts for each group can be tested using the following formula:

$$F = \frac{(R^2_{1.25} - R^2_{1.5}) / (k - k)_{1\ 2}}{(1 - R^2_{1.25}) / (N - k - 1)_{1}} \qquad (3)$$

In practice, this formula provides a test of the treatment effects of vector 2, the so-called condition or group variable.

If the slopes as determined by the first formula are significantly different, then each condition requires its own formula. At this stage of the analysis, other issues such as the type of interaction, region or significance, and the Johnson-Neyman technique need to be considered. For a detailed discussion of some of these issues see Johnson and Jackson (1959) and Potthoff (1964).

Finally, several general considerations make this procedure particularly attractive. First, the independent variables in the predictor set can be continuous, dichotomous, or categorical. Interactions among groups and/or independent variables are readily handled by creating new vectors. In addition, the procedure discussed here is not dependent on equal samples in each group. Analysis of MSCR with unequal *N*'s requires no modification.

AN EXAMPLE

Recently, Kluger and Koslowsky (1985) began a series of studies on musical behavior. Specifically, they were interested in predicting participation in activities

(such as concert attendance, record purchase, and listening) from a knowledge of an individual's commitment level as measured by Rusbult and Farrell (1983) and intentions as defined by Ajzen and Fishbein (1980). Measures of behavior were taken over two time periods, a week and a month.[2] For various reasons, two comparable but separate groups of participants were required. Each group was asked to respond to a long list of questions, which, among other items, included a checklist of 15 musical behaviors. The first group was asked to check off those behaviors they intend to perform over the next week and the second group received the same question but with a time period of one month.

For each time period, a set of predictors based on the commitment model was compared to a set of predictors based on the intention model. The usual regression procedures were used to test the increment in variance of each model after the other set of predictors had been entered.

In addition, it was hypothesized that the equation for each set would not change over time. In other words, the slope associated with each time period would stay the same. However, the intercepts or treatment effects of time would differ. MSCR was used to test these hypotheses.

The results are reported in Table 2. For the intention model, a common regression slope can be used for the week and month period. The intercepts, however, differ between time periods. For the commitment model, the slopes for each time period are different, removing the need for comparison of intercepts. Separate equations for week and month are needed in the latter case. Further discussion of these issues is available in Kluger and Koslowsky (1985).

IMPLICATIONS

The purpose in the present study was to illustrate a technique that has been discussed in several treatises on linear models, but has often been neglected in applied research. The type of problem described here is common to many areas of psychology. For example, in educational psychology the need to compare predictors across grades or institutions with various philosophies is often of interest. Similarly, in cross-cultural studies, different subpopulations may be examined to see if inferences concerning the characteristics of different groups are similar or not (see e.g., Hui & Triandis, 1986). These examples can be extended to include any situation where data have been collected for separate groups. MSCR provides an efficient system for such comparisons.

---

[2] In studies by Steel and Ovalle (1984) on intentions and Porter, Crampton, and Smith (1976) on commitment, time seems to play an important role in moderating the prediction of behavior.

TABLE 2: THE EFFECTS OF TIME ON INTENTION AND COMMITMENT MODELS FOR PREDICTING MUSICAL BEHAVIOR

Models	*Time 1*	*Time 2*	*Comparison of Slope*	*Comparison of Intercepts*
Intention	.59	.74	$p > .05$	$< .01$
Commitment	.60	.54	$p < .01$	*nr*

Note: The numbers in the table refer to variance explained.
nr = not relevant

REFERENCES

Ajzen, L., & Fishbein, M. (1980). Understanding attitudes and predicting social behavior. Englewood Cliffs, NJ: Prentice-Hall.

Hanushek, E. A., & Jackson, J. E. (1970). Statistical methods for social scientists. New York: Academic Press.

Hui, C. H., & Triandis, H. C. (1986). Individualism-collectivism: A study of cross-cultural researchers. Journal of Cross-Cultural Psychology, 17, 225-248.

Johnson, P. O., & Jackson, R. W. B. (1959). Modern statistical methods: Descriptive and inferential. Skokie, IL: Rand McNally.

Kerlinger, F., & Pedhazur, E. J. (1973). Multiple regression in behavioral research. New York: Holt, Rinehart, & Winston.

Kleinbaum, D. G., & Kupper, L. L. (1978). Applied regression analysis and other multivariable methods. North Scituate, MA: Duxbury.

Kluger, A. N., & Koslowsky, M. (1985). A predictive study of commitment to music. Paper presented at the 93rd Annual Convention of the American Psychological Association, Los Angeles, CA.

Larsen, R. J., Diener, E., & Emmons, R. A. (1986). Affect intensity and reactions to daily life events. Journal of Personality and Social Psychology, 51, 803-814.

Pedhazur, E. J. (1982). Multiple regression analysis in behavioral research: Explanation and prediction (2nd ed.). New York: Holt, Rinehart, & Winston.

Porter, L. W., Crampton, W. J., & Smith, F. J. (1976). Organizational commitment and managerial turnover: A longitudinal study. Organizational Behavior and Human Performance, 15, 87-98.

Potthoff, R. F. (1964). On the Johnson-Neyman technique and some extensions thereof. Psychometrika, 29, 241-256.

Rosenberger, L. M., & Strube, J. J. (1986). The influence of Type A and Type B behavior patterns on the perceived quality of dating relationships. Journal of Applied Social Psychology, 16, 277-286.

Rusbult, C. E., & Farrell, D. (1983). A longitudinal study of the investment model: The impact on job satisfaction, job commitment, and turnover of variation in rewards, costs, alternatives, and investments. Journal of Applied Psychology, 68, 429-438.

Steel, R. P., & Ovalle, N. K. (1984). A review and meta-analysis of research on the relationship between behavioral intentions and employee turnover. Journal of Applied Psychology, 69, 673-686.

Turnage, J. J., & Muchinsky, P. M. (1984). A comparison of the predictive validity of assessment center evaluations versus traditional measures in forecasting supervisory job performance: Interpretive implications of criterion distortion for the assessment paradigm. Journal of Applied Psychology, 69, 595-602.

Werbel, J. D., & Gould, S. (1984). A comparison of the relationship of commitment to turnover of recent hires and tenured employees. Journal of Applied Psychology, 69, 687-690.

Westbrook, Mary T., & Nordholm, L. A. (1986). Reactions to patients' self- or chance-blaming attributions for illnesses having varying life-style involvement. Journal of Applied Social Psychology, 16, 428-446.