A MULTIPLE-INPUT TRANSFER FUNCTION MODEL OF OKUN’S MISERY INDEX: AN EMPIRICAL TEST OF THE MAHARISHI EFFECT

KENNETH L. CAVANAUGH,¹ KURLEIGH D. KING,² and CEVAT ERTUNA³

¹ Department of Management and Public Affairs, Maharishi International University, Fairfield, Iowa, U.S.A.
² Governor, Central Bank of Barbados, Bridgetown, Barbados
³ College of Business and Economics, Memphis State University, Memphis, Tennessee, U.S.A.


Periods with large numbers in the group practice of the Transcendental Meditation and TM-Sidhi program led to a marked reduction in an index of inflation and unemployment in the U.S., controlling for the effect of business cycle fluctuations as well as short- and long-term effects of other major economic variables.—EDITORS

This paper analyzes the time series behavior of Okun’s economic “misery index” of inflation and unemployment, defined as the sum of the inflation rate and unemployment rate. We identify and estimate a multiple-input transfer function model of the monthly misery index for the U.S. during the period 1979 to 1988 using Liu’s (1985) linear transfer function (LTF) method supplemented by the use of the Akaike information criterion (AIC) to provide an objective criterion of model selection. Maximum likelihood estimates of the model are used to further test a hypothesis suggested by a new field-theoretic paradigm of consciousness and socioeconomic behavior proposed by Maharishi Mahesh Yogi. The results of this study suggest that over this period the substantial improvement in this index of economic performance and the economic quality of life was significantly influenced by the collective practice of a subjective technology of consciousness, the Transcendental Meditation (TM) and TM-Sidhi program. The decline in the misery index attributable to the influence of the TM and TM-Sidhi group is estimated to be approximately 54 percent of the total decline of the index from its peak in 1980 to the end of the sample period in 1988. These results are highly statistically significant. Controlling for the effects of monetary growth, the rate of change of crude materials prices, and the rate of change of industrial production, the null hypothesis of no effect of the TM and TM-Sidhi group on the misery index must be decisively rejected for these data ($p = 3.2 \times 10^{-9}$). Therefore, these findings lend strong support to the hypothesized reduction in the misery index through the Maharishi Effect.

1. INTRODUCTION

This paper presents the most recent empirical findings of an ongoing research program studying the behavior of a key measure of the economic dimension of the quality of life in the U.S. over the past decade. Specifically, we report a further empirical test of the hypothesis that the quality of economic life in the U.S., as measured by Okun’s “misery index” of inflation and unemployment, was positively influenced over the period 1979 to 1988 by the collective practice of a subjective technology of consciousness, the Transcendental Meditation and TM-Sidhi program. To test this hypothesis suggested by a new field-theoretic paradigm of consciousness and socioeconomic behavior, we estimate a multiple-input transfer function (TF) model of the misery index using Liu’s (1985) linear transfer function (LTF) approach to model identification.

The field-theoretic paradigm examined in this paper is based on a novel analysis of the fundamental nature of
human consciousness and its relation to the behavior of the individual and society put forth by Maharishi Mahesh Yogi, the noted scholar, teacher, and authority on the ancient Vedic science of consciousness (1977, 1978, 1985, 1986). By integrating fundamental insights of the ancient Vedic tradition of knowledge with those of the modern natural and social sciences, Maharishi's Vedic Science has inspired a rapidly growing body of published theoretical and empirical research in the natural, health, and social sciences. A survey of the literature on Maharishi's theory of collective consciousness and social dynamics is provided by Hagelin (1987); Dillbeck et al. (1987); Orme-Johnson and Dillbeck (1987); Orme-Johnson et al. (1988); and Dillbeck et al. (1988). The purpose of this paper is to further examine one specific implication of this new paradigm for the field of economics.

Maharishi's Transcendental Meditation (TM) program is a simple mental technique for enlivening the full potential of the individual and improving the quality of life of the individual and society. On the basis of numerous published studies, the TM technique and its more advanced aspect, the TM-Sidhi program, have been found to be effective in improving the quality of individual life through enhanced creativity, intelligence, happiness, energy, mental and physical health, and resistance to stress (Orme-Johnson and Farrow, 1977). In addition to these benefits in individual life, Maharishi Mahesh Yogi, the founder of the TM and TM-Sidhi program, predicted as early as 1960 that even a small fraction of the population—on the order of one percent—practicing the TM technique would be sufficient to induce a measurable, holistic improvement in the quality of life in society. The predicted result of this effect, later named the "Maharishi Effect," was more positive trends in life quality as measured, for example, by decreased crime, accidents, and social conflict; improved physical and mental health; and more positive economic trends (Maharishi Mahesh Yogi, 1977, pp. 8–10).

These beneficial social effects are produced not by direct behavioral interaction between the TM practitioners and other individuals in society, but rather via a "field effect" mediated by a nonlocalized, unified field of "pure consciousness" experienced during the TM technique, a field which Maharishi (1986) identifies as the underlying source of all activity in nature, subjective and objective. According to Maharishi, the collective practice of this technology of consciousness generates improvements in the quality of life by neutralizing accumulated stress and tension in the collective consciousness of society (Maharishi Mahesh Yogi, 1986). This purification of collective consciousness results from the enlivenment of the unified basis of individual and collective consciousness, the field of pure consciousness, which Maharishi identifies with the unified field of natural law described in recent unified field theory in physics (Maharishi Mahesh Yogi, 1986; Hagelin, 1987). The enlivenment of pure consciousness by a small percentage of the individuals in society brings the thought and behavior of everyone in society into greater attunement with natural law, leading to a holistic improvement in the quality of life (Maharishi Mahesh Yogi, 1986).

Maharishi later proposed that the same positive effects on society would be generated by approximately the square root of one percent of the population practicing the TM-Sidhi program together in a single group (Maharishi European Research University, 1979, p. 160). Maharishi's Vedic Science predicts that upon reaching the critical threshold level for the size of the TM-Sidhi group, a phase transition to a more ordered and coherent state of national and individual consciousness will be induced, resulting in a marked improvement in the overall quality of life.

More than 30 studies since 1974 have empirically investigated the hypothesis that the quality of life in society may be improved through the group practice of the TM and TM-Sidhi program. A survey of these studies is given in Dillbeck et al. (1987); Hagelin (1987); Orme-Johnson and Dillbeck (1987); and Orme-Johnson et al. (1988). In addition to the effect on the U.S. and Canadian misery index discussed below, these studies report evidence of field effects on such diverse measures of the quality of life as crime and suicide rates, automobile accidents, notifiable diseases, civil disorder, international conflict, and composite indices of life quality. One attraction of the field theory of consciousness as formulated by Maharishi is that it alone seems capable of offering a unified and parsimonious explanation of these diverse research findings.

This paper presents an empirical test of the hypothesis that the quality of economic life in society as a whole has been positively influenced by the collective practice of the TM and TM-Sidhi program. The measure of the economic quality of life examined in this study is the economic "misery index," or "discomfort index," defined as the sum of the inflation rate and unemployment rate. Proposed originally by economist Arthur Okun, the misery index provides a useful summary measure of macroeconomic performance and the economic quality of life. Okun's index may be seen as a measure of the intensity of "stagflation"—simultaneous high inflation and unemployment—which was indisputably the primary economic problem of the 1970s and early 1980s in the U.S. and abroad (Bruno and Sachs, 1985). After ratcheting up markedly beginning in the mid-1960s, the U.S. misery
The misery index measures the degree to which society is plagued by the "twin evils" of inflation and unemployment. Since the level of unemployment is negatively related to the rate of growth in real GNP through Okun's law, movements in the misery index also reflect the performance of the macroeconomy in promoting real economic growth (Dornbusch and Fischer, 1988, p. 573). As noted by Maisel (1982, pp. 15–16), the sharp upward trend in this index for the U.S. beginning in the mid-1960s was reflected in a growing dissatisfaction with U.S. economic performance and a deterioration in the sense of well-being of the American people. According to national public opinion polls conducted in the 1970s and early 1980s, a large majority of the U.S. people felt during much of this period that inflation or unemployment or both were the most serious problems facing the nation, ranking ahead of such issues as nuclear war, crime, and pollution (Dornbusch and Fischer, 1988, p. 537). That the misery index may be associated with broader measures of the quality of life is suggested by research showing a strong correlation between unemployment and several measures of social stress including increased mental and physical illness, suicide, homicide, cardiovascular mortality, and prison admissions (Brenner, 1979).

In testing for hypothesized field effects of consciousness on the economic quality of life, we analyzed the behavior of the misery index and its determinants using recently developed tools of time series analysis to empirically identify and estimate a multiple-input transfer function model of the misery index for the period 1979 to 1988 (Liu, 1985). This approach to building an unrestricted reduced-form, dynamic regression model is highly general in that it permits the identification and estimation of equations with rational or linear distributed lag relationships and autoregressive moving average (ARMA) disturbances. The linear transfer function method for the identification of multiple-input TF equations (Liu, 1985) was used to identify the model. The LTF method was supplemented by use of the Akaike information criterion (AIC) to provide an objective criterion for model selection (Akaike, 1973, 1974; Larimore, 1983). The estimated model was then used to assess the impact of the group practice of the TM and TM-Sidhi program on the substantial decline of the misery index during this period, controlling for key macroeconomic variables which capture the influence of important shocks to aggregate supply and demand.

The intensity of supply-side shocks was measured by the rate of growth of the crude materials component of the producer price index, in which energy and food prices
receive a heavy weighting. Aggregate demand influences were captured by the rate of monetary growth as measured by the rate of growth of the adjusted monetary base. These variables were selected because supply-side and monetary shocks have been widely hypothesized to be perhaps the leading causal factors in the worldwide stagflationary experience of the 1970s and 1980s (Helliwell, 1988; Bruno and Sachs, 1985). Also, in a multiple time series analysis of inflation, Horrigan (1986) found the growth rate of the monetary base to be the best predictor of future inflation. He also found the rate of change of crude materials prices to be the best predictor of consumer price inflation among several alternative commodity price measures. Since inflation is more volatile than the unemployment rate in monthly data, short-run movements in the misery index tend to be dominated by changes in the rate of inflation; thus, the growth rate of the monetary base and the rate of change of crude materials prices may be expected to be important determinants of short-run fluctuations in the misery index.

Our empirical analysis of the misery index extends that of Cavanaugh and King (1988a, 1988b) who found highly significant effects of the TM and TM-Sidhi program on the U.S. misery index over the same sample period. Cavanaugh and King used a multiple time series model with impact-assessment components to test for nonlinear threshold effects produced by the Maharishi Effect. Their simultaneous transfer function (STF) model also statistically controlled for the effects of the rate of change of both crude materials prices and the monetary base on the misery index.

In this paper we estimate a single-equation, multiple-input TF model of the misery index. We extend the analysis of Cavanaugh and King in two important directions. First, we directly control for business cycle fluctuations, as measured by the rate of change of the industrial production index. The rate of growth of the industrial production index is included as an independent (or input) variable in the transfer function equation in addition to the two independent variables used by Cavanaugh and King, the rate of growth of the monetary base and the rate of change of crude materials prices. Second, we examine the possibility of higher-order lagged effects of the rate of growth of the monetary base on the misery index beyond the maximum lag of 10 months considered by Cavanaugh and King. It is important to consider the possibility of such higher-order lagged effects of monetary growth on the misery index because short-run movements of the misery index often tend to be dominated by month-to-month fluctuations in the rate of inflation, and because fluctuations in monetary growth are widely believed to have important effects on the rate of inflation as much as two years later (Parkin, 1984, p. 187). Thus the empirical analysis reported below allows for possible lagged effects of monetary growth up to a maximum lag of 28 months.

In calculating the misery index series, the rate of inflation was calculated from the month-to-month change in the consumer price index for all urban consumers (CPI), seasonally adjusted, BCD series 320c, as reported in Business Conditions Digest, March 1988 (p. 98) and July 1988 (p. 84). The compound annualized inflation rate, in percentage units, was calculated as \(100[(1+d)^{12} - 1]\) where \(d\) is the change in the CPI. Unemployment was measured by the civilian unemployment rate, seasonally adjusted, BCD series 43, from Business Conditions Digest, July 1988 (p. 62) and February 1988 (p. 99).

The measure of crude materials prices used in this study was the crude materials component of the producer price index, seasonally adjusted, BCD series 331, as reported in Business Conditions Digest, July 1988 (p. 85) and March 1988 (p. 101). Crude nonfood materials receive a weight of 47 percent in the index (including 36 percent for fossil fuels), and crude foodstuffs and feedstuffs 53 percent (Horrigan, 1986).

Monetary growth was measured by the adjusted monetary base, seasonally adjusted, from the Federal Reserve Bank of St. Louis. Data for the index of industrial production was obtained from Business Conditions Digest, December 1987 (p. 99) and January 1989 (p. 94), BCD series 47. Compound annual growth rates in percentage units for crude materials prices, the monetary base, and industrial production were approximated by the first difference of the natural logarithm for each variable multiplied by a factor of 1200.

Maharishi's field theory of consciousness implies a marked improvement in the quality of life when the size of the group practicing the TM and TM-Sidhi program reaches the critical threshold of approximately the square root of one percent of the population. Beginning in April 1979, a group was founded at Maharishi International University in Fairfield, Iowa, to practice the TM and TM-Sidhi program together twice a day (morning and afternoon) for the purpose of improving the quality of life in North America and the world. By analogy with the phenomenon of super radiance in physics, through which a phase transition process leads to the emission of coherent light by a laser, the group practicing the TM and TM-Sidhi program at MIU to create coherence in collective consciousness has been termed the "Super Radiance group."

A time series plot of the monthly average size of the Super Radiance group for the afternoon session is shown.
in Figure 3 for the period April 1979. For the U.S. the implied critical threshold for the size of the Super Radiance group during this period ranged from approximately 1500 in 1979 to 1569 in 1988, based on mid-year population estimates (United Nations, 1989). In Figure 3 a horizontal line is drawn at the 1500 threshold level. The two large spikes in the plot of average group size in Figure 3 correspond to two large gatherings of TM-Sidhi group participants (World Peace Assemblies) at MIU in December 1983 to January 1984 and again in July 1984 when the average size of the group exceeded 3300.

The plot of the monthly misery index in Figure 2 shows that the peak of the misery index in January 1980 occurred four months after the Super Radiance group first exceeded the 1500 threshold in July and August of 1979. This initial reversal of the upward trend in the index also followed six consecutive months in which the average size of the Super Radiance group consistently
exceeded 1000 for the first time. Figure 2 also suggests a possible downward shift in the mean level of the misery index beginning sometime in 1982, a year in which the 1500 threshold was exceeded for five months. Also apparent in Figure 2 is the continued decline of the index after 1982 and its ultimate stabilization substantially below its peak level of 1980 as the Super Radiance group rose to a level consistently exceeding the approximate critical threshold of 1500.

For the period April 1979 to April 1988 the contemporaneous correlation between the misery index and the size of the Super Radiance group is -.501. The negative relationship between the misery index and the size of the group is clearly apparent in the scatterplot shown in Figure 4.

The results of the transfer function analysis reported below indicate a statistically significant negative effect of the TM-Sidhi group on the U.S. misery index with a lag of 1 to 8 months. This finding statistically controls for the influence of the rate of change of crude materials prices, industrial production, and the monetary base on the misery index. The long-run multipliers (or steady-state gain) for the Super Radiance group were negative, as hypothesized, and sizeable. For a Super Radiance group averaging 1500 to 1699, where 1500 is approximately the square root of one percent of the U.S. population, the multiplier was −7.61 points. Relative to the peak value of the misery index over the sample period, this estimated long-run multiplier represents a decline of 31.1 percent in the misery index. This decline of 7.61 points also represents 54.0 percent of the total decline of 14.1 points in the misery index from its peak in 1980 to the end of the sample period in April 1988. For a Super Radiance group averaging 1700 or more, the multiplier was −7.65 points, equivalent to a 31.2 percent decline in the misery index from its peak, and 54.2 percent of the total decline of the index from January 1980 to April 1988.

The estimated effect of the Super Radiance group on the misery index was highly statistically significant. The joint null hypothesis of no effect of the TM-Sidhi group on the U.S. misery index must be strongly rejected for these data \( p = 3.2 \times 10^{-9} \).

These empirical results lend further support to the findings of previous studies of the misery index by Cavanaugh, King, and Titus (in press); Cavanaugh, King, and Titus (1989); Cavanaugh and King (1988a, 1988b); and Cavanaugh (1987). Using the LTF methodology augmented by the AIC criterion, each of these studies found substantial and statistically significant effects of the Super Radiance group on the misery index for the U.S., Canada, or both. Since the LTF method has been found through simulation studies to be very effective in detecting a lack of relationship between time series variables (Liu, 1985; Liu and Hudak, 1985), the finding of a significant effect of the Super Radiance group on the misery index in these studies provides strong empirical support for the major hypothesis of this study.

The remainder of this paper is organized as follows. The next section briefly summarizes previous empirical
research on the misery index. The third section describes the statistical methodology. Section four presents the empirical results, and the final section offers concluding remarks.

2. PREVIOUS STUDIES OF THE MISERY INDEX

Previous empirical study of the misery index is limited. Tarantelli (1986) employed the misery index as a measure of stagflation in a regression analysis of cross-national economic performance. In another study of cross-national performance, McCallum (1986) reports correlations between the misery index and both the incidence of strikes and a measure of Okun's measure of stagflation in a regression analysis of cross-national performance. Neither Tarantelli nor McCallum examined the behavior of the misery index over time for any of the countries in their samples. Thus, this study and the four prior studies described below apparently represent the first in-depth examination of the time series behavior of Okun's misery index. These studies address the question of whether the increase in the size of the largest Super Radiance group in North America over the past decade has significantly contributed to enhanced economic performance in the U.S. and Canada as measured by the substantial decline in Okun's misery index of inflation and unemployment.

Study number one (Cavanaugh, King, and Titus, in press) focused on the influence of the collective practice of the TM and TM-Sidhi program on the misery index for the U.S. and Canada over the period April 1979 through April 1988. Using Liu's (1985) LTF approach to time series analysis, an impact-assessment analysis of monthly data for both the U.S. and Canada found evidence of sizeable and highly statistically significant reductions in Okun's misery index attributable to the influence of the Super Radiance group. On average, these declines in the misery index occurred two to eight months after the average monthly size of the Super Radiance group equalled or exceeded 1500 participants, approximately the square root of one percent of the U.S. population as of 1979.

The reductions in the misery index found in study one were highly significant for both the U.S. (p = 0.0097) and Canada (p = 4.3 x 10^{-5}). Relative to the peak level of the U.S. misery index in January 1980 (24.5 points), the total estimated long-run impact of the Super Radiance group as measured by the long-run multiplier represents a decline of 17.3 percent (4.23 points) in the index for a group averaging 1500 to 1699, and 22.9 percent (5.62 points) for a group of 1700 or more. For a group of 1500 to 1699, the reduction in the misery index for Canada was estimated at 4.14 points, or 15.3 percent, relative to the peak level of the misery index in June 1981 (27.1 points), and 4.55 points, or 16.8 percent, for a Super Radiance group of 1700 or more.

The results of study one are consistent with those of an earlier impact-assessment analysis of the misery index for the U.S. and Canada over a somewhat shorter sample period, 1980 to 1987 (Cavanaugh, 1987). This earlier study, denoted as study two, used the same statistical methodology as that employed in study one, and found even larger reductions in the misery index for both the U.S. and Canada attributable to exceeding the approximate theoretical threshold of 1500 Super Radiance participants. The estimated effect of the Super Radiance group on the misery index was highly significant for both the U.S. (p = 5.5 x 10^{-6}) and Canada (p = 5.7 x 10^{-10}). By examining the influence of three different possible threshold measures based on quartiles of the TM-Sidhi group size, study two also found evidence of a substantial increase in the estimated effect of the Super Radiance group on the misery index for both countries beginning at an average group size of approximately 1500, approximately the square root of one percent of the U.S. population. This latter finding is strikingly consistent with the prediction of the Maharishi Effect.

Study three (Cavanaugh and King, 1988a, 1988b) used multivariate time series methodology to investigate the effect of the Super Radiance group on the misery index while explicitly controlling for the impact of other key explanatory variables suggested by economic theory. Using the same sample period as study one, study three considered whether the Super Radiance group continued to have a significant estimated effect on the U.S. misery index even after controlling for the impact of key measures of aggregate supply and demand. A measure of monetary growth, the growth rate of the monetary base, was used to capture aggregate demand influences, and the rate of change of an index of food, energy, and other crude materials prices was used to measure the effect of supply-side shocks.

In study three, simultaneous transfer function methodology (Liu and Hudak, 1985) was used to estimate a dynamic, three-equation model which describes the dynamic interactions among the misery index, the rate of change of the producer price index for crude materials, and the rate of growth of the monetary base. Also included in the STF model were binary variables representing the same critical thresholds for the size of the Super Radiance group used in study one. After allowing for the impact of these other key economic variables, Cavanaugh and King found highly significant contemporaneous and lagged effects of the Super Radiance group on the U.S. misery index (p = 8.7 x 10^{-7}). For a Super Radiance group averaging 1500 to 1699 in size, the estimated long-run multiplier indicated a reduction of 4.07
points in the misery index, or a decline of 16.6 percent from the peak level of the index during the period 1979 to 1988. For a group of 1700 or more, the estimated reduction was 8.84 points, or 36.1 percent, relative to the peak value of the index.

A striking finding of study three was that, for the same sample period, the estimated effect of the Super Radiance group was even larger in absolute value than the corresponding estimate for the pure impact-assessment approach of study one. This finding suggests that any omitted variable bias resulting from the omission of the monetary growth and crude materials price variables in study one led to underestimation, rather than overestimation, of the effect of the Super Radiance group on the U.S. misery index. The estimated multipliers for the current study also exceed those of study one for both group-size categories, thus suggesting that the omission of the rate of growth of industrial production also did not upwardly bias the multiplier estimates of study one.

Study three also found that the Super Radiance group had a significant negative effect on the rate of change of crude materials prices ($p = 2.6 \times 10^{-5}$), suggesting that the collective practice of the TM and TM-Sidhi program contributed to a substantial easing of negative supply-side shocks. Such negative supply shocks are widely believed to increase both inflation and unemployment in the short run, thus elevating the misery index. In the long run, a Super Radiance group of 1500 to 1699 was estimated to reduce the percent rate of growth of crude materials prices by 8.79 percentage points, with an estimated reduction of 13.68 points for a group of 1700 or more. Finally, study three found that the joint null hypothesis of no effect of the Super Radiance group on the misery index, the rate of change of crude materials prices, and the growth of the monetary base must be strongly rejected for these data ($p = 1.6 \times 10^{-5}$).

Study four (Cavanaugh, King, and Titus, 1989) directly estimated the effect on the U.S. misery index of fluctuations in the average monthly size of the Super Radiance group over the same sample period as studies one and three. The approach of study four contrasts with that of the first three studies which investigated the effect on the misery index of a Super Radiance group exceeding the hypothesized critical threshold of approximately the square root of one percent of the population. The same LTF method used in the previous three studies was used to empirically identify and estimate a multiple-input TF model of the misery index for the period 1979 to 1988. The estimated model was used to assess the impact of the group practice of the TM and TM-Sidhi program on the U.S. misery index after controlling for the same macroeconomic variables used in study three.

After allowing for the influence of both the rate of change of crude materials prices and the monetary base on the misery index, study four found a statistically significant negative effect of the Super Radiance group on the U.S. misery index ($p < .025$). A sustained increase of 100 participants in the Super Radiance group was estimated to lead to a reduction of .31 points in the U.S. misery index with a lag of 4 to 5 months. The magnitude of the estimated effect on the misery index is broadly consistent with those of the other studies. For example, a reduction of 5.27 points in the misery index is implied for a steady-state rise in the group from zero to an average monthly size of 1700.

Study four also found evidence of a unidirectional influence of the Super Radiance group on the misery index, with no significant effect of the misery index on the size of the TM-Sidhi group. Estimation of a TF equation with the Super Radiance group as the output (dependent) variable and the misery index, monetary base growth, and the rate of change of crude materials prices as input (independent) variables indicated no significant effect of these variables on the size of the TM-Sidhi group. This result supports the assumption of the exogeneity of the Super Radiance group and indicates a unidirectional relationship running from the TM-Sidhi group to the misery index. Because the Super Radiance group clearly leads the misery index, rather than the other way around, the hypothesis of reverse causation must be ruled out.

Taken together, the results of these four studies lend strong support to the hypothesis that the group practice of the TM and TM-Sidhi program significantly contributed to a substantial improvement in the economic quality of life for both the U.S. and Canada as measured by a marked decline in Okun's misery index of inflation and unemployment during the period 1979 to 1988. The null hypothesis of no effect of the Super Radiance group on the misery index was strongly rejected in the case of all four studies.

3. STATISTICAL METHODS

This study investigates the dynamic relationship between the size of the Super Radiance group and the misery index, controlling for the rate of change of crude materials prices, the monetary base, and industrial production. For this purpose we empirically identified and estimated an unrestricted reduced-form, multiple-input TF model of the misery index using Liu's LTF approach (Liu, 1985). A transfer function model is a dynamic regression model with (1) linear or rational distributed lag relationships between independent variables and the dependent variable, and (2) a disturbance, or noise,
term which may take the form of an ARMA process. The LTF approach offers a systematic procedure for empirically determining the appropriate form of the distributed lag relationships and the noise process. A major advantage of the LTF procedure is that, unlike the standard "prewhitening" approach to the identification of TF models developed by Box and Jenkins (1976), the LTF method is readily generalized to the case of multiple input series and to the identification of transfer functions for binary impact-assessment variables.

At each step in the model identification process, the LTF approach to model identification was supplemented by use of Akaike’s information criterion as the fundamental criterion in model selection. The AIC is defined as

\[
AIC = -2 \log (\text{maximum likelihood}) + 2k \quad (1)
\]

where \( k \) is the number of model parameters estimated (Akaike, 1973, 1974). The AIC is an entropy-based or information-based measure of model adequacy which has generally been justified on rather ad hoc grounds. However, Larimore (1983) and Larimore and Mehra (1985) point out that, for both large and small samples, use of the AIC as a measure of model-approximation error can be justified on the basis of sufficiency and an asymptotic likelihood principle for the evaluation of model order, model structure, and parameter estimates.

Further justification of the use of the AIC criterion is provided by Shibata (1983, p. 238), who shows that, although the AIC procedure does not provide a consistent estimate of model order, “it satisfactorily balances both underfitting and overfitting risks, and is asymptotically efficient for selecting one model from a family of models, each specified by many parameters.” Shibata (p. 237) also demonstrates that “the inconsistency of the AIC procedure is the inevitable concomitant of balancing underfitting and overfitting risks.” Order-consistent procedures of model selection, such as those based on the Schwarz information criterion (SIC) and others, are not asymptotically efficient, do not satisfactorily balance overfitting and underfitting risks, and sometimes involve large risks of underfitting which may significantly increase bias in parameter estimates (Shibata, p. 238).

The choice between alternative noise models and lag structures was based on the minimization of the AIC criterion. The approach used in Ozaki (1977) was employed to compute the AIC. Because the AIC is proportional to sample size, all alternative models were estimated using the same number of effective observations to allow precise comparison of the AIC across model structures. All models were estimated over the sample period April 1979 through April 1988, a sample of 109 monthly observations. Maximum likelihood estimates were obtained using the SCA Statistical System software version 3.2 (Liu et al., 1986). Estimation by maximum likelihood yields consistent estimates of the reduced-form parameters (Liu, 1985).

The general form of the transfer function model examined in this study is given by the following equation:

\[
MIS_t = c + \beta_1(B)I_1 + \beta_2(B)I_2 + \beta_3(B)MB_t + \beta_4(B)IP_t + \beta_5(B)PCM_t + N_t. \quad (2)
\]

In equation (2), MIS\(_t\) is the misery index at time \( t \), \( c \) is a constant term, \( I_1 \) and \( I_2 \) are binary indicator variables described below, \( MB \) is the rate of growth of the monetary base, \( IP \) is the rate of growth of the industrial production index, and \( PCM \) is the rate of change of the crude materials component of the producer price index. The latter three economic variables are taken to be endogenously related. Finally, \( N_t \) is a stochastic disturbance which may take the form of a stationary and invertible ARMA process. The \( \beta(B) \) terms in equation (2) are transfer functions consisting of linear or rational polynomials in the backshift, or lag, operator. Omitting the "1," subscripts for simplicity, each of these transfer functions may be expressed in general as \( \phi(B)/\delta(B) \) where

\[
\phi(B) = (\phi_0 + \phi_1B + \ldots + \phi_rB^r)B^p \quad \text{and} \quad \delta(B) = 1 - \delta_1B - \ldots - \delta_cB^c
\]

are polynomials in the backshift operator, and all roots of the polynomial \( \delta(B) \) lie outside the unit circle. To avoid simultaneous equation bias, no contemporaneous endogenous relationships are included in the reduced form, and thus the parameter \( \phi_0 \) is constrained to zero in the TF polynomial for each endogenous input.

The binary indicator variables in equation (2) are defined as taking the value zero except \( I_1 = 1.0 \) when the average size of the Super Radiance group was greater than or equal to 1500 but less than 1700, and \( I_2 = 1.0 \) when the size of the Super Radiance group equalled or exceeded 1700. With the inclusion of these binary impact-assessment variables, equation (2) represents a multiple-input TF equation with impact-assessment components. As in the case of all other input variables, the LTF procedure, augmented by the use of the AIC, was used to empirically determine the form of the transfer function for each impact-assessment component. Another example of TF modeling with impact-assessment components is provided by Krishnamurthi, Narayan, and Raj (1989).

MODEL IDENTIFICATION—Liu’s LTF method (1985), as supplemented by the use of the AIC criterion, was employed for the purpose of tentative identification of
the dynamic reduced-form equation. The first step in the LTF procedure was estimation of the impulse response weights for the transfer functions $\beta_i(B)$ in equation (2). Following Liu (1985), initial estimates of the impulse response weights were based on maximum likelihood estimates of equation (2) letting $\beta_i(B) = v_i(B)$, where the $v_i(B)$ are linear transfer functions given by (suppressing the ‘$T$’ subscripts)

$$v(B) = v_0 + v_1B + v_2B^2 + \ldots ,$$  \hfill (3)

with a sufficient number of terms to avoid truncation bias. For all endogenous input variables, the lag-zero transfer function parameter $v_0$ was set equal to zero to avoid possible simultaneity bias.

At the estimation stage, the polynomial $v_i(B)$ was truncated at 8 lags for variables I$_{1t}$ and I$_{2t}$ because previous analysis of these data had found no significant effects of these variables on the misery index beyond this lag. A maximum of 18 lags was used for IP, and PCM. In view of previous research suggesting significant lagged effects of monetary growth on inflation as much as two years later, a maximum lag of 28 months was used in the linear TF polynomial for the monetary base variable MB.$_t$.

Following Liu (1985), at the outset of the identification stage, the noise model was tentatively assumed to be a first-order autoregressive process. The tentative assumption of an AR(1) noise process, which may be modified later if necessary, generally improves the efficiency of the initial estimates and allows a check for the necessity of differencing. Differencing of all variables in the model would be indicated if the estimated autoregressive parameter were close to 1.0 (Liu, 1985). This check indicated no need for differencing.

The next step in the LTF procedure was tentative identification of the noise model based on the autocorrelation, partial autocorrelation, and extended autocorrelation functions of the estimated noise series for the initial estimate of the LTF equation. A variety of plausible alternative noise model specifications were estimated, and the one giving the lowest AIC was selected. After tentative identification of the noise model, the LTF equation was then reestimated in order to obtain more efficient estimates of the impulse response weights.

Once satisfactory estimates of the impulse response weights were obtained, the pattern of the impulse response weights was examined to identify the form of the rational transfer function for each input series. The corner method was used to help identify the form of the rational transfer function (Liu and Hanssens, 1982). The apparent cutoff pattern found for inputs IP, MB, and PCM, suggested that the transfer functions for these input series were linear and consisted only of numerator polynomials $\omega_i(B)$ (Liu, 1985). Several rational and linear TF specifications for the two impact-assessment variables were tried, but for both variables a linear specification yielded a lower AIC.

Using the tentatively identified transfer functions and noise model, the reduced-form TF equation was then estimated and diagnostic checks were used to suggest possible alterations in the model. Nonsignificant TF coefficients were gradually deleted from the model at this stage, with higher order coefficients being deleted first (Vandaele, 1983). At each step in this iterative identification process the AIC was employed as the fundamental criterion in model selection.

At every stage of the identification process, all TF estimates were obtained by maximum likelihood, employing an approximation to the likelihood function due to Hillmer and Tiao (1979) as implemented in the SCA time series analysis software (Liu et al., 1986). For models involving moving average noise terms, the SCA "exact" likelihood option was employed to obtain more efficient estimates of moving average noise parameters (Liu et al., 1986).

4. EMPIRICAL RESULTS

The iterative LTF model identification and estimation procedure led to the TF model shown in equation (4) below. In equation (4), the $\omega_i$ are TF coefficients; $\phi_i$, $\phi_{i2}$, and $\phi_i$ are autoregressive noise parameters; $a_i$ is an independently and identically distributed Gaussian white noise error term; and all other terms are defined as in equation (2).

The maximum likelihood estimates for equation (4) are presented in Table 1A and continued in Table 1B. The estimated model is dynamically stable, and the

\[
\text{MIS}_t = c + (\omega_1B + \omega_2B^4 + \omega_3B^7 + \omega_4B^{11})I_{1t} + (\omega_5B^3 + \omega_6B^4 + \omega_7B^7 + \omega_8B^{10})I_{2t} + (\omega_9B^4 + \omega_{10}B^5 + \omega_{11}B^8 + \omega_{12}B^{16})MB_t + (\omega_{13}B^2 + \omega_{14}B^3 + \omega_{15}B^8 + \omega_{16}B^{11} + \omega_{17}B^{15} + \omega_{18}B^{17})IP_t + (\omega_{19}B + \omega_{20}B^{11} + \omega_{21}B^{12})PCM_t + (1 - \phi_1B - \phi_2B^2 - \phi_3B^3)^{-1}a_t
\]  \hfill (4)
Table 1A. Transfer Function Model Estimates:
U.S. Misery Index

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Variable</th>
<th>Parameter Type</th>
<th>Lag</th>
<th>Parameter Estimate</th>
<th>Std. Error</th>
<th>T Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 c</td>
<td></td>
<td>Const.</td>
<td>0</td>
<td>8.811</td>
<td>1.129</td>
<td>7.81c</td>
</tr>
<tr>
<td>2 ω₁</td>
<td>I₁</td>
<td>Num.</td>
<td>1</td>
<td>-1.186</td>
<td>0.358</td>
<td>-3.31c</td>
</tr>
<tr>
<td>3 ω₂</td>
<td>I₁</td>
<td>Num.</td>
<td>4</td>
<td>-1.470</td>
<td>0.468</td>
<td>-3.14b</td>
</tr>
<tr>
<td>4 ω₃</td>
<td>I₁</td>
<td>Num.</td>
<td>5</td>
<td>-1.973</td>
<td>0.475</td>
<td>-4.16c</td>
</tr>
<tr>
<td>5 ω₄</td>
<td>I₁</td>
<td>Num.</td>
<td>7</td>
<td>-1.757</td>
<td>0.515</td>
<td>-3.41c</td>
</tr>
<tr>
<td>6 ω₅</td>
<td>I₁</td>
<td>Num.</td>
<td>8</td>
<td>-1.220</td>
<td>0.405</td>
<td>-3.01b</td>
</tr>
<tr>
<td>7 ω₆</td>
<td>I₂</td>
<td>Num.</td>
<td>3</td>
<td>-0.960</td>
<td>0.485</td>
<td>-1.98c</td>
</tr>
<tr>
<td>8 ω₇</td>
<td>I₂</td>
<td>Num.</td>
<td>4</td>
<td>-1.740</td>
<td>0.607</td>
<td>-2.87b</td>
</tr>
<tr>
<td>9 ω₈</td>
<td>I₂</td>
<td>Num.</td>
<td>5</td>
<td>-3.261</td>
<td>0.594</td>
<td>-5.49c</td>
</tr>
<tr>
<td>10 ω₉</td>
<td>I₂</td>
<td>Num.</td>
<td>7</td>
<td>-1.687</td>
<td>0.670</td>
<td>-2.52b</td>
</tr>
<tr>
<td>11 ω₁₀</td>
<td>MB</td>
<td>Num.</td>
<td>4</td>
<td>0.229</td>
<td>0.050</td>
<td>4.58c</td>
</tr>
<tr>
<td>12 ω₁₁</td>
<td>MB</td>
<td>Num.</td>
<td>5</td>
<td>0.313</td>
<td>0.052</td>
<td>6.04c</td>
</tr>
<tr>
<td>13 ω₁₂</td>
<td>MB</td>
<td>Num.</td>
<td>7</td>
<td>0.138</td>
<td>0.046</td>
<td>3.01b</td>
</tr>
<tr>
<td>14 ω₁₃</td>
<td>MB</td>
<td>Num.</td>
<td>17</td>
<td>-0.134</td>
<td>0.044</td>
<td>-3.03b</td>
</tr>
<tr>
<td>15 ω₁₄</td>
<td>MB</td>
<td>Num.</td>
<td>21</td>
<td>0.120</td>
<td>0.046</td>
<td>2.61b</td>
</tr>
<tr>
<td>16 ω₁₅</td>
<td>MB</td>
<td>Num.</td>
<td>23</td>
<td>0.330</td>
<td>0.045</td>
<td>7.38c</td>
</tr>
<tr>
<td>17 ω₁₆</td>
<td>MB</td>
<td>Num.</td>
<td>27</td>
<td>-0.182</td>
<td>0.050</td>
<td>-3.65c</td>
</tr>
<tr>
<td>18 ω₁₇</td>
<td>MB</td>
<td>Num.</td>
<td>28</td>
<td>0.221</td>
<td>0.051</td>
<td>4.34c</td>
</tr>
</tbody>
</table>

*p ≤ .05;  \( b \)p ≤ .01;  \( c \)p ≤ .001 (two-tailed tests).
Table 1B. Transfer Function Model Estimates (cont.):

U.S. Misery Index

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Variable</th>
<th>Parameter Type</th>
<th>Lag</th>
<th>Parameter Estimate</th>
<th>Std. Error</th>
<th>T Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 $\omega_{18}$</td>
<td>IP</td>
<td>Num.</td>
<td>2</td>
<td>-0.034</td>
<td>0.018</td>
<td>-1.96(^a)</td>
</tr>
<tr>
<td>20 $\omega_{19}$</td>
<td>IP</td>
<td>Num.</td>
<td>3</td>
<td>0.054</td>
<td>0.018</td>
<td>3.01(^b)</td>
</tr>
<tr>
<td>21 $\omega_{20}$</td>
<td>IP</td>
<td>Num.</td>
<td>8</td>
<td>0.045</td>
<td>0.017</td>
<td>2.69(^b)</td>
</tr>
<tr>
<td>22 $\omega_{21}$</td>
<td>IP</td>
<td>Num.</td>
<td>11</td>
<td>-0.094</td>
<td>0.018</td>
<td>-5.14(^c)</td>
</tr>
<tr>
<td>23 $\omega_{22}$</td>
<td>IP</td>
<td>Num.</td>
<td>15</td>
<td>0.103</td>
<td>0.017</td>
<td>6.12(^c)</td>
</tr>
<tr>
<td>24 $\omega_{23}$</td>
<td>IP</td>
<td>Num.</td>
<td>17</td>
<td>0.044</td>
<td>0.017</td>
<td>2.58(^b)</td>
</tr>
<tr>
<td>25 $\omega_{24}$</td>
<td>PCM</td>
<td>Num.</td>
<td>1</td>
<td>0.052</td>
<td>0.009</td>
<td>5.71(^c)</td>
</tr>
<tr>
<td>26 $\omega_{25}$</td>
<td>PCM</td>
<td>Num.</td>
<td>11</td>
<td>0.047</td>
<td>0.011</td>
<td>4.37(^c)</td>
</tr>
<tr>
<td>27 $\omega_{26}$</td>
<td>PCM</td>
<td>Num.</td>
<td>12</td>
<td>0.053</td>
<td>0.011</td>
<td>4.74(^c)</td>
</tr>
<tr>
<td>28 $\phi_1$</td>
<td>MIS</td>
<td>AR</td>
<td>1</td>
<td>0.747</td>
<td>0.089</td>
<td>8.41(^c)</td>
</tr>
<tr>
<td>29 $\phi_2$</td>
<td>MIS</td>
<td>AR</td>
<td>2</td>
<td>-0.441</td>
<td>0.087</td>
<td>-5.07(^c)</td>
</tr>
<tr>
<td>30 $\phi_3$</td>
<td>MIS</td>
<td>AR</td>
<td>5</td>
<td>-0.160</td>
<td>0.069</td>
<td>-2.32(^c)</td>
</tr>
</tbody>
</table>

Residual Sum of Squares ................................................. 276.58
R-Square .......................................................... .86
Effective Number of Observations .................................. 109
Residual Standard Error ............................................. 1.59
Ljung-Box Q Statistic (9 d.f.)\(^d\) ....................... 10.7
Likelihood Ratio Statistic (9 d.f.)\(^d\) ............ 58.03\(^c\)
A.I.C. ................................................................. 472.83

\(^a\) p \leq .05; \(^b\) p \leq .01; \(^c\) p \leq .001 (two-tailed tests except for the Ljung-Box Q and likelihood ratio statistics). \(^d\) Test statistic is a chi-squared variable with indicated d.f.
The long-run multiplier for both Super Radiance variables is given in Table 2. Since the estimated transfer functions are linear, the long-run multiplier for each variable is given by the sum of its reduced-form coefficients (Box and Jenkins, 1976). Table 2 indicates that, controlling for the influence of the other explanatory variables in equation (4), a sustained rise in the average size of the Super Radiance group to a level between 1500 and 1699 is estimated to lead to an ultimate reduction of 7.61 points in the steady-state level of the misery index. A sustained increase in the size of the Super Radiance group to a level of 1700 or more is estimated to bring a long-run reduction of 7.65 points in the misery index. As noted in the introductory section, these multipliers are very large relative both to the peak level of the misery index and to the total decline of the index from its peak to the end of the sample period.

That all long-run multipliers are negative is consistent with the hypothesis that the economic quality of life will be improved through the collective practice of the TM and TM-Sidhi program by a single group equalling or exceeding the square root of one percent of the national population. All previous studies of the effect of the Super Radiance group on the U.S. and Canadian misery index have likewise found all long-run multipliers to be negative and substantial in size. It is noteworthy that the multipliers for both Super Radiance group-size categories are larger in absolute value than the corresponding estimates based on the pure impact-assessment model for the U.S. misery index over the same period reported in study one (Cavanaugh, King, and Titus, in press). Thus controlling for the effect of three key macroeconomic influences on the misery index in the current study served to increase, rather than decrease, the estimated long-run Super Radiance multipliers, as well as increase the statistical significance of the empirical results.

These multiplier estimates also appear to be robust to the choice of model-selection criterion. The use of the Schwarz information criterion (SIC) (Schwarz, 1978) in place of the AIC in the LTF procedure provided very similar results. Details of this estimated model are not shown here, but are available from the authors on request. For the SIC model, the long-run multipliers were −7.71 for the smaller Super Radiance group and −7.14 for the larger group. As expected, the SIC procedure yielded a somewhat more parsimonious model: 26 parameters as opposed to 30. The form of the minimum-SIC model was the same except that the following parameters were dropped from the model reported in Tables 1A and 1B: lag 3 for variable IP; lags 2 and 17 for variable I$_2$; and lag 5 in the AR noise model. The magnitude, sign, and statistical significance of all remaining parameter estimates were close to those of the minimum-AIC model. Finally, for the minimum-SIC model the null hypothesis of no effect of the Super Radiance group on the misery index must also be decisively rejected using a likelihood ratio test ($p = 8.9 \times 10^{-9}$).

For the minimum-AIC model, the long-run multiplier reported in Table 2 for a group of 1500 to 1699 is substantially larger in absolute value than the corresponding estimate in Cavanaugh and King (1988a, 1988b), while the multiplier for a group of 1700 or more is somewhat smaller. The Cavanaugh and King estimates were based on a three-equation STF model which provided reduced-form

<table>
<thead>
<tr>
<th>Variable</th>
<th>Average Group Size</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>I$_1$</td>
<td>1500–1699</td>
<td>−7.606</td>
</tr>
<tr>
<td>I$_2$</td>
<td>1700–</td>
<td>−7.648</td>
</tr>
</tbody>
</table>
estimates of the dynamic interaction between the misery index, the rate of increase of crude materials prices, and the growth of the monetary base. Thus it is not surprising that the multipliers of the current study would differ somewhat in magnitude from those in Cavanaugh and King because the latter incorporated indirect effects of the Super Radiance variables on the misery index via their effect on the other endogenous variables. These indirect effects are not modeled in the single-equation approach of the current study. Also the Cavanaugh and King study did not control for the rate of growth of industrial production and for higher-order lagged effects of monetary growth.

With regard to the reduced-form estimates for monetary base growth in Table 1A, significant positive effects on the misery index at lags were found at lags 4, 5, 7, 21, 23, and 28, and negative effects at lags 17 and 27. The influence of monetary base growth on the misery index was generally greater than that of the rate of growth of industrial production or of crude materials prices. The generally, but not exclusively, positive signs of the reduced-form parameters for the monetary base variable is not surprising since the standard analysis of the short run effect of a stimulus to aggregate demand yields no unambiguous prediction about the effect of monetary growth on the misery index. The ambiguity arises because, in the short run, inflation and unemployment are predicted to move in opposite directions in response to aggregate demand shocks, as reflected in the short-run Phillips curve relationship (Dornbusch and Fischer, 1988). However, if money is neutral in the long run (Hall and Taylor, 1988, p. 378), a steady-state increase in the rate of monetary growth should have a positive long-run effect on the misery index because the steady-state inflation rate would rise while the unemployment rate would be unaffected. The generally positive reduced-form parameter estimates reported in Table 1A are thus consistent with the superneutrality hypothesis.

As shown in Table 1B, positive reduced-form estimates for the rate of growth of industrial production were found at lags of 3, 8, 15, and 17, while negative estimates were found at lags of 2 and 11 months. Again, the effect on the misery index of an increase in the rate of growth of industrial production is ambiguous a priori, since such an increase would generally be expected to decrease unemployment while increasing inflationary pressures in the short run.

The reduced-form estimates reported in Table 1B also indicate significant positive effects of the rate of change of crude materials prices on the misery index at lags of 1, 11, and 12 months. The positive sign of the TF parameter estimates for the crude materials price variable is consistent with the standard textbook analysis which predicts that inflation and unemployment will move in the same direction in the short run in response to aggregate supply shocks (Dornbusch and Fischer, 1988).

All diagnostic checks for the model are satisfactory. As shown in Table 1B, the null hypothesis of white noise residuals cannot be rejected using the Ljung-Box joint test for autocorrelation at lags 1 to 12 (Ljung and Box, 1978); this result also holds for higher order lags (not shown). No instability of variance or extreme outliers are apparent in the time series plot of residuals.

5. CONCLUSION

In summary, to test the hypothesis that the collective practice of the TM and TM-Sidhi program led to a measurable and statistically significant improvement in the quality of economic life in the U.S. over the period 1979 to 1988, we empirically identified and estimated a reduced-form, multiple-input transfer function model of Okun’s misery index of inflation and unemployment. Highly statistically significant negative effects of the TM-Sidhi group on the misery index were found after controlling for the effect of monetary growth, the rate of change of crude materials prices, and the rate of change of industrial production. Thus the null hypothesis of no effect of the Super Radiance group on the time series behavior of the U.S. misery index must be strongly rejected for these data. The empirical tests reported in this paper lend further support to the findings of Cavanaugh, King, and Titus (in press); Cavanaugh, King, and Titus (1989); Cavanaugh and King (1988a, 1988b); and Cavanaugh (1987) who likewise found substantial and highly significant effects of the Super Radiance group on the misery index for the U.S., Canada, or both.

As with all previous studies, the estimated long-run multipliers are negative, as predicted by the Maharishi Effect. Also consistent with prior studies, the estimated multipliers were found to be very large in magnitude. Taken together, the results of these five studies offer strong support for the hypothesis that the collective practice of the TM and TM-Sidhi program by a single group comprising approximately the square root of one percent of the U.S. population contributed to a substantial improvement in the economic quality of life as measured by the sharp decline in Okun’s misery index for both the U.S. and Canada during the period 1979 to 1988. These five studies also suggest that the significant negative effect of the Super Radiance group on the U.S. misery index appears to be quite robust to the specification of the transfer function equation for the misery index.
These studies demonstrate that the hypothesis of no effect of the Super Radiance group on the U.S. and Canadian misery index can be decisively rejected at conventional significance levels. Therefore, these empirical results are clearly consistent with a causal hypothesis of the effect of the Super Radiance group on the misery index. The case for a causal interpretation of these findings is strengthened by the fact that the negative sign of the estimated effect of the Super Radiance group on the misery index is consistent with the prediction based on Maharishi’s analysis of collective consciousness. The case for a causal relationship is further strengthened by the finding of all five studies that the Super Radiance group temporally leads the misery index, as well as by the finding of Cavanaugh, King, and Titus (1989) that there is no significant feedback from the misery index to the size of the Super Radiance group, thus ruling out the hypothesis of reverse causation. That more than 30 other studies of the Maharishi Effect using other measures of the quality of life have similarly been able to reject the null hypothesis of no effect of the Super Radiance group also lends further support to a causal interpretation of these findings.

Research on the misery index may be fruitfully extended in several directions. First, it would be illuminating to apply the approach of the current study to further analyze the behavior of the misery index for Canada. Second, it would be useful to control for the effect of additional economic variables such as fiscal policy. Since appropriate measures of fiscal policy, such as the cyclically adjusted budget deficit, are available only on a quarterly basis, to adequately control for the effect of fiscal policy will require the use of quarterly rather than monthly data. The use of quarterly data over the sample period 1979 to 1988, however, would obviously involve a substantial reduction in sample size and degrees of freedom. Third, analysis of the effects of the Super Radiance group on inflation and unemployment separately would also be fruitful. Again, this approach might require the use of quarterly data since many of the best existing models for inflation and unemployment involve variables for which monthly data are not available. Finally, it may be useful to apply appropriate tools of nonlinear time series analysis to research on the Maharishi Effect.

While further research will undoubtedly deepen our understanding of the economic implications of the Maharishi Effect, the growing body of published research on the Maharishi Effect and the substantial magnitude and statistical significance of the existing estimates of the impact of the Super Radiance group on the misery index suggest that any government seeking to lower inflation and unemployment would be imprudent to ignore this new technology for improving macroeconomic performance and the broader quality of life. In our view, the existing evidence is sufficient to provide a strong case for making support of the collective practice of this technology of consciousness an integral part of national economic policy for any nation.

ACKNOWLEDGEMENTS

We would like to thank John Dey and Ken Sewall for their interest and support; Scott Herriott and Bob Wynne for their instrumental role in providing research assistance; Wallace Larimore for valuable statistical consultation; Michael Dillbeck, Birney Titus, and Geoffrey Wells for many helpful comments; Barney Sherman for editorial assistance; and Nirmal Pugh for skillful help with graphics.

REFERENCES


MAHARISHI EUROPEAN RESEARCH UNIVERSITY (1979), New Horizons in Criminology, Rheinweiler, W. Germany: MERU Press.


