TIME SERIES ANALYSIS OF U.S. AND CANADIAN INFLATION AND UNEMPLOYMENT: A TEST OF A FIELD-THEORETIC HYPOTHESIS

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Time series analysis of an index of inflation and unemployment showed that following periods of high participation in the group practice of the Transcendental Meditation and TM-Sidhi program by a single large group in North America, economic conditions improved in both the U.S. and Canada.—EDITORS

This paper presents an empirical test of a new field-theoretic paradigm of consciousness and human behavior formulated by Maharishi Mahesh Yogi. A key testable implication of this paradigm is that the collective practice of a subjective technology of consciousness, the Transcendental Meditation (TM) and TM-Sidhi program, by a group comprising the square root of one percent of the national population will result in a significant improvement in the quality of life in society (the Maharishi Effect). To test this hypothesis, this paper analyzes the time series behavior of a measure of the economic dimension of the quality of life, Okun's economic "misery index" of inflation and unemployment, for the U.S. and Canada. Okun's index is defined as the sum of the inflation rate and unemployment rate. Empirical tests of the hypothesis are based on maximum likelihood estimates of an impact-assessment model of the monthly misery index for the U.S. and Canada during the period 1979 to 1988. 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, was used to identify the time series model. The time series 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 TM-Sidhi group. For a TM-Sidhi group of 1700 or more, the estimated decline in the U.S. index was 5.62 points, or 39.9 percent of the total decline of the index from its peak over the sample period. For Canada, the comparable estimate was a reduction of 4.55 points, or 29.3 percent, of the total decline of the index from its peak. For both countries slightly smaller estimated reductions in the misery index were attributed to the influence of a TM-Sidhi group ranging in size from 1500 to 1699. These results are highly statistically significant. The null hypothesis of no effect of the TM and TM-Sidhi group on the misery index for both the U.S. (p = .0097) and Canada (p = 4.3 x 10^-5) must be strongly rejected for these data, thus lending support to the hypothesis of reduction in the misery index through the Maharishi Effect.

1. INTRODUCTION

This paper describes an empirical study of the effect of the group practice of Maharishi's Transcendental Meditation (TM) and TM-Sidhi program on the economic quality of life in the U.S. and Canada. Using recently developed tools of statistical time series analysis, this study tests the hypothesis that the quality of economic life in the whole society may be improved through the collective practice of the TM and TM-Sidhi program by a single group comprising approximately the square root of one percent of the national population. This hypothesis is based on a field-theoretic paradigm of human consciousness 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 Vedic tradition of knowledge with those of modern science, Maharishi’s Vedic Science has inspired a rapidly growing body of published theoretical and empirical research in the social sciences, physical and health sciences, and many other disciplines. A survey of the literature on Maharishi’s theory of consciousness and its implications for society 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.

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 the unemployment rate. Proposed originally by economist Arthur Okun, the misery index provides a useful summary of macroeconomic performance and of the economic dimension of the 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). As shown in Figure 1, the U.S. misery index began rising in the mid-1960s, peaked in 1980 at a level exceeded only during the Great Depression of the 1930s, and then fell by 1988 to its lowest level since 1972.

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, 1987, p. 537). 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 Americans felt during much of this period that inflation, 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, 1987, 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).

On the basis of numerous published studies, Maharishi’s Transcendental Meditation program and its more advanced aspect, the TM-Sidhi program, have been shown to be
effective in improving the quality of individual life by enhancing 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 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 mental and physical 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 (Maharishi Mahesh Yogi, 1986). Maharishi (1986) identifies the field of pure consciousness 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 the entire 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 and 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 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 (Maharishi Mahesh Yogi, 1977).

The hypothesis that the quality of life in society may be positively affected by the Maharishi Effect has been empirically investigated in more than 30 studies since 1974. A survey of these studies is given in Hagelin (1987); Dillbeck et al. (1987); Orme-Johnson and Dillbeck (1987); Orme-Johnson et al. (1988); and Dillbeck et al. (1988). In addition to the effect on the misery index for the U.S. and Canada, these studies report evidence of field effects of consciousness 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.

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) reported correlations between the misery index and both the incidence of strikes and a measure of “corporatist” institutional structure. Neither Tarantelli nor McCallum examined the behavior of the misery index over time for any of the countries in their samples. Thus the study described in this paper apparently represents the first in-depth investigation of the time series behavior of Okun’s misery index. This paper addresses the question of whether the increase in the size of the largest TM-Sidhi 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 since the early 1980s.

This study focuses on the influence of the group 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. April 1979 was chosen as the starting date for the sample period because it marks the founding of the largest permanent TM and TM-Sidhi group in North America at Maharishi International University (MIU) in Fairfield, Iowa, U.S.A. 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 together to create coherence in collective consciousness has been termed the “Super Radiance group.”

Liu’s (1985) linear transfer function (LTF) approach to time series analysis was used to fit an impact-assessment model of the misery index. The LTF method was augmented by use of the Akaike information criterion (AIC) to provide an objective standard for model selection. The time series 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. These negative effects on the misery index were felt 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 were highly statistically significant for both the U.S. \((p = .0097)\) and Canada \((p = 4.3 \times 10^{-6})\). These reductions were also substantial. For a Super Radiance group averaging 1500 to 1699 in size, the estimated long-run impact of the Super Radiance group on the U.S. misery index, as measured by the long-run multiplier, was a reduction of 4.23 points. As a proportion of the total decline of 14.1 points in the U.S. misery index from its peak in 1980 to the end of the sample period in 1988, this reduction in the U.S. index represents a decline of 30.0 percent. For a group of 1700 or more, the estimated decline for the U.S. was 5.62 points, or 39.9 percent, of the total decline from the peak of the index over the sample period.

The results for Canada are also supportive of the hypothesis of reduction in the misery index through the Maharishi Effect. For a group of 1500 to 1699, the reduction in the misery index attributable to the Super Radiance group was estimated at 4.14 points, or 26.7 percent, of the total decline of 15.5 points in the Canadian misery index from its peak in 1981 to the end of the sample period in 1988. For a Super Radiance group of 1700 or more, the estimated reduction was 4.55 points, or 29.3 percent, of the total decline. Thus for both countries, the estimated effect on the misery index was larger for the bigger Super Radiance group.

These empirical results are consistent with those of an impact-assessment analysis of the misery index for the U.S. and Canada over a somewhat shorter sample period, November 1980 to January 1987 (Cavanaugh, 1987). Using the same LTF statistical methodology, somewhat larger reductions in the misery index for both the U.S. and Canada were found for this shorter sample period. The estimated effect of the Super Radiance group on the misery index was highly significant for both the U.S. \((p = 5.5 \times 10^{-6})\) and Canada \((p = 5.7 \times 10^{-6})\). By examining the influence of three different Super Radiance threshold levels defined by quartiles of the group size, the latter analysis also found evidence of a marked jump in the effect of the Super Radiance group on the misery index for both countries beginning at an average group size of approximately 1500. This latter finding is strikingly consistent with the hypothesis of a sudden increase in the coherence of collective consciousness when the Super Radiance group reaches the square root of one percent of the national population.

The results of this study, therefore, lend strong support to the hypothesis that during the decade 1979 to 1988 the collective 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. The null hypothesis of no effect of the Super Radiance group on the misery index must be strongly rejected for both countries.

The remainder of this paper is organized as follows. The next section discusses Maharishi's theory of collective consciousness and society in greater detail. Section 3 describes the statistical methodology, and Section 4 summarizes the empirical results. Section 5 presents concluding remarks.

2. MAHARIISHI'S THEORY OF COLLECTIVE CONSCIOUSNESS

Although new to contemporary thought in the social sciences, the paradigm discussed in this paper has its roots in the oldest continuous tradition of human knowledge, the ancient Vedic tradition of India (Basham, 1959, p. 4). As noted by Dillbeck et al. (1987), this paradigm is also profoundly new in the respect that (1) it draws upon some of the most recent developments in the physical sciences, and (2) it postulates a much deeper connection between human behavior and the most fundamental fields of nature as described in unified field theories of quantum physics than has previously been suggested or empirically investigated. Much of the discussion in this section draws heavily on that in Dillbeck et al. (1987), and Hagelin (1987), which provide a more detailed exposition of many points that may be only briefly outlined here.

MAHARIISHI'S VEDIC SCIENCE OF CONSCIOUSNESS—The dominant theoretical perspectives in contemporary social science—whether in psychology, sociology, economics, etc.—are in the broadest sense fundamentally behavioral in nature. From the perspective of the new field-theoretic framework elaborated in this section, these theories are seen as intrinsically incomplete in that they fail to incorporate a satisfactory theory of human consciousness. In focusing solely on observed behavior, such behavioral theories ignore the basis of all thought and behavior—consciousness or awareness. This gap in social science theory reflects the fact that the origin and nature of consciousness remains one of the great unsolved questions of modern science generally. The study of consciousness using the scientific methods of the modern objective approach to knowledge remains in its infancy. In fact, consciousness has been widely regarded as unsuitable for scientific investigation because of the generally vague and indefinite meaning of the term "consciousness," and because, by its very nature, consciousness is not directly observable by the senses (Hagelin, 1987, p. 56).

The most ambitious approach to formulating a satisfactory scientific analysis of consciousness and human behavior stems from the work of Maharishi Mahesh Yogi, who over the past thirty years has progressively revived and reinterpreted the ancient science of consciousness expounded for millennia by the sages and seers of the Vedic tradition of India. Maharishi has provided a highly precise and coherent description of the nature and development of consciousness, its connection to the physical universe, and its relation to the behavior of the individual and society. Maharishi has also provided "a reliable, systematic method by which consciousness can be isolated and directly experienced in its most fundamental state" (Hagelin, 1987, pp. 56-57). Maharishi has systematically expressed the theoretical basis of Vedic knowledge in terms that are accessible and empirically testable, and explored the relationship between the findings of the ancient subjective approach to knowledge and those of the most recent discoveries of the modern objective approach to gaining knowledge. In doing so, Maharishi has created a synthesis of modern science and ancient Vedic science which has attracted the attention of leading scholars from both traditions.

At the basis of the Vedic theory ("Ved" means knowledge in Sanskrit) is the proposition that human behavior has its basis in consciousness, which in its most fundamental state, "pure consciousness," is an unbounded, nonlocalized, unified field which serves to connect all individuals in society and to connect man with the universe. According to the Vedic tradition, consciousness is not an emergent property of matter that comes into existence through the functioning of the human nervous system, but is fundamental in nature. Pure consciousness is seen as the essential nature of life, an unbounded, unified field which gives rise to and pervades the physical universe (Bhagavad-Gita, 1977; Maharishi Mahesh Yogi, 1969; Sankaracharya, 1977; Principal Upanishads, 1974). The Vedic tradition also hold that it is possible for the individual to experience the field of pure consciousness by allowing human awareness to experience its "self-referral" state in which consciousness is awake only to itself rather than identified with objects of perception, thought, or feeling. A simple, systematic procedure for experiencing this unified field of consciousness, the Transcendental Meditation technique, has been taught to over three million people around the world during the past thirty years (Dillbeck et al., 1987).

CONSCIOUSNESS AND UNIFIED FIELD THEORY IN PHYSICS—The Vedic description of the unified field of consciousness, as elaborated by Maharishi, bears a striking resemblance in most of its fundamental features to the description of the unified field in contemporary
concluded that century physics (e.g. d'Espagnat, 1979; Eddington, 1929; Jeans, 1930; Schrödinger, 1967). More recently, a leading unified field theorist in physics (Hagelin, 1987) has identified with the unified field of pure consciousness, inherent in which is the totality of all the laws of nature which govern the evolution of the universe. Likewise, physics describes the unified field as a field in which all natural laws, all principles of orderly change, are inherent.

Maharishi's Vedic Science goes beyond contemporary unified field theories in physics in suggesting that the unified field, described by physics as underlying the objective physical universe, is to be identified with the deepest level of human consciousness, pure consciousness (Maharishi Mahesh Yogi, 1985). Since, according to unified field theory, all properties of nature have their source in the unified field, it follows that consciousness, as one such property, must be inherent in some way in the unified field (Dillbeck et al., 1987).

The suggestion that consciousness must be deeply related to the most fundamental descriptions of nature given by modern science has been made repeatedly in twentieth-century physics (e.g. d'Espagnat, 1979; Eddington, 1929; Jeans, 1930; Schrödinger, 1967). More recently, a leading unified field theorist in physics (Hagelin, 1987) has concluded that the unified field is consistent with all known physical principles, but requires an expanded physical framework for the understanding of consciousness which leads to a more integrated picture of the physical world and the full range of human experience. Indeed, such a framework appears to be required to account for experimentally observed field effects of consciousness and other phenomenological aspects of higher states of consciousness, which are otherwise anomalous within the paradigms that are currently in vogue. (p. 56)

Thus Maharishi's suggestion that consciousness is intimately related to the fundamental fields of nature described in modern physics is not without precedent, but the current theoretical framework of physics must be expanded to provide a full understanding of the relationship between consciousness and matter.

CONSCIOUSNESS AND HUMAN BEHAVIOR—The fundamental relationship between consciousness and behavior implied by this new paradigm is that the quality of individual behavior is dependent on the quality of individual consciousness. When human awareness consciously identifies with the unified field of pure consciousness, then all thought, feeling, and behavior begin to more fully reflect the comprehensive intelligence of nature which is lively in the unified field of natural law (Maharishi Mahesh Yogi, 1985, pp. 56–58). According to Maharishi, if the experience of pure consciousness is permanently established in individual awareness, then, spontaneously, all thought, feeling, and behavior will have a constructive influence in terms of all the specific laws of nature governing human life (Maharishi Mahesh Yogi, 1978, pp. 146–156). If, however, due to stress and lack of refinement in the human physiology, the experience of pure consciousness is blocked, human awareness will be restricted to the ordinary, localized states of consciousness—waking, dreaming, and sleeping—and pure consciousness will not be the permanent or even occasional experience of the individual. For the purpose of systematically facilitating the experience of pure consciousness and inducing the refinement in the functioning of mind and body needed to permanently sustain this experience, Maharishi has introduced a technology of consciousness, a specific set of procedures from the Vedic tradition known collectively as the Transcendental Meditation and TM-Sidhi program.

From the perspective of Maharishi's Vedic Science, the cultivation of the experience of pure consciousness is of fundamental importance. This is because all problems and suffering in individual life ultimately stem from the "violation" of natural law which, in turn, results from lack of conscious contact with the unified source of natural law, pure consciousness (Maharishi Mahesh Yogi, 1978, pp. 98–101). Violation of natural law refers to behavior which creates a destructive rather than constructive influence in the life of the individual and those around him (Dillbeck et al., 1987). Such violation of the natural laws governing human development results in the accumulation of stress and tension in individual consciousness. This growth of stress in individual consciousness is seen as the fundamental cause of all forms of misery, suffering, and problems in the life of both the individual and society.

According to Maharishi's Vedic Science, the quality of life in any nation is ultimately determined by the quality of what Maharishi calls the "collective consciousness" of the nation. Each level of society—family, community, city, state, nation, or the entire world—is described as having its own characteristic collective consciousness which is the wholeness of consciousness of the entire group (Maharishi Mahesh Yogi, 1977, pp. 123–124). The most fundamental level of collective consciousness is the same as that of individual consciousness, the unified field of pure consciousness (Maharishi Mahesh Yogi, 1985, pp. 56–76). Just as the quality of the...
behavior of the individual is an expression of the quality of individual consciousness, the quality of behavior in society is seen as an integrated expression of the quality of the consciousness of the individuals of the nation.

Because individual and collective consciousness reciprocally influence each other, Maharishi’s Vedic Science suggests that an increase in stress and tension in individual consciousness will be mirrored in the quality of collective consciousness and vice versa. Just as problems and suffering in individual life are attributed to the violation of natural law by the individual, all social and economic problems in society are seen as arising from the accumulation of stress in national consciousness due to the continual violation of natural law by the individuals of the nation (Maharishi Mahesh Yogi, 1978, pp. 98–108). Thus, according to Maharishi, the build-up of stress and tension in national consciousness will result in the growth of social conflict, economic problems, ill health, crime, and other manifestations of socioeconomic disorder and malfunction.

**TESTABLE IMPLICATIONS OF A FIELD THEORY OF CONSCIOUSNESS**—The hypothesized field nature of pure consciousness as the basis of both individual and collective consciousness, and the relation between consciousness and behavior, together imply a remarkable set of testable predictions for social science. If consciousness is indeed a field, and if pure consciousness can be systematically influenced, then a characteristic property of fields in physics, “action at a distance,” should be observed in social systems. In physics, phenomena involving action at a distance, such as the gravitational effect of the earth on the moon, are typically explained by theories positing the existence of an underlying field which mediates the interaction (Sudarnshan and Mukunda, 1974).

The existence of such field effects in social systems was postulated as early as 1960 when Maharishi predicted that even a small fraction of the population, on the order of one percent, practicing the Transcendental Meditation technique, would be sufficient to induce a measurable, holistic improvement in the quality of life in society. This effect, the Maharishi Effect, was predicted to produce more positive trends in life quality as measured, for example, by decreased crime, accidents, and social conflict, and improved physical and mental health and economic prosperity (Maharishi Mahesh Yogi, 1977, pp. 8–10). According to Maharishi’s Vedic Science, these positive effects on society are produced not by means of direct interaction between the TM practitioners and other individuals in society. Rather, these beneficial effects are generated by means of a field effect mediated by a nonlocalized unified field of pure consciousness that connects the individuals in society both with one another and with the most fundamental fields of nature identified by contemporary unified field theory in physics. The collective practice of this technology of consciousness generates these improvements in the quality of life by neutralizing accumulated stress and tension in the collective consciousness of society through enlivening the unified field of natural law, pure consciousness.

After introducing the TM-Sidhi program, a more advanced aspect of Maharishi’s Vedic Science and Technology, Maharishi later predicted that the same positive effects on society would be generated by approximately the square root of one percent of the population practicing this more powerful procedure together in a single group (Maharishi European Research University, 1979, p. 160). This latter prediction is consistent with a field-theoretic model in which constructive interference due to the coherent superposition of wave amplitudes generates a field effect with intensity proportional to the square of the number of participants (Hagelin, 1987, p. 65).

This study uses time series impact-assessment analysis to test the hypothesis that the misery index for the U.S. and Canada was beneficially influenced by a single, large group in the U.S. practicing the TM and TM-Sidhi program. Beginning in April 1979, a group at Maharishi International University (MIU) in Fairfield, Iowa, began practicing 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. A time series plot of the monthly average size of the TM-Sidhi group for the afternoon session is shown in Figure 4 for the period April 1979 to April 1988. On three occasions when the size of the MIU group was briefly exceeded by that of temporary TM-Sidhi groups (World Peace Assemblies) in Washington, D.C., and Amherst, Massachusetts, the size of the larger group was used in the calculation of the monthly average size of the Super Radiance group.

Maharishi’s Vedic Science implies that a marked improvement in life quality will occur when the TM-Sidhi group reaches a critical size approximately equal to the square root of one percent of the population. 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). The corresponding critical threshold for the effect of the U.S. group on both Canada and the U.S. is the square root of one percent of the total population of North America. This threshold for North America as a whole ranged from 1577 in 1979 to 1650 in 1988. Since the calculation of the theoretical threshold for the size of the
TM-Sidhi group ignores the possible influence of several other TM-Sidhi groups of smaller size in North America as well as the effect generated by the more than one million individual practitioners of the TM technique or the TM-Sidhi program in the U.S. and Canada, the hypothesized improvement in the quality of life may have possibly begun to be felt at a threshold value somewhat lower than the square root of one percent.

In the plot of the monthly average size of the TM-Sidhi group shown in Figure 4 a horizontal line is drawn at the 1500 level, approximately the square root of one percent of the U.S. population. The two large spikes in the plot of the TM-Sidhi group correspond to two large World Peace Assemblies at MIU, December 1983 to January 1984, and again in July 1984, when the monthly average size of the group exceeded 3300.

Shown in Figure 3 is a plot of the monthly U.S. misery index for the same time period. A corresponding plot for Canada is given in Figure 5. As shown in Figure 3, the U.S. misery index peaked in January and March of 1980 at 24.5 percent, spiked again at 23.6 percent as late as June 1982, thereafter falling irregularly to a level of 10.3 percent in April 1988. Together with the plot of annual data for the misery index in Figure 1, Figure 3 shows a reversal of the rising trend of the 1960s and 1970s, with the reversal beginning in January 1980, four to five months after the TM-Sidhi group first exceeded the 1500 threshold in July and August 1979. During the latter two months, the size of the largest TM-Sidhi group in the U.S. reached a peak of 2778 at a World Peace Assembly in Amherst, Massachusetts. The initial reversal of the upward trend in the misery index also followed six consecutive months in which the average size of the Super Radiance group consistently exceeded 1000 for the first time.

Figure 3 also suggests a possible downward shift in the mean level of the U.S. series beginning sometime in 1982, a year in which the average monthly size of the Super Radiance group for the first time exceeded the 1500 critical threshold for five months. Also apparent in Figure 3 is the continued decline of the U.S. misery index after 1982 and its ultimate stabilization substantially below its 1979–1980 level as the TM-Sidhi group rose to a level consistently exceeding the critical 1500 threshold. For the period April 1979 to April 1988 the simple contemporaneous correlation between the U.S. misery index and the size of the Super Radiance group is −.501.

The Canadian misery index shown in Figure 5 displays a continuation of the historical rising trend of the index well into 1981, followed by a levelling out in 1981–1982, and subsequent decline. The decline seems to be associated with the rise of the Super Radiance group to a level frequently exceeding the square-root-of-one-percent threshold. To facilitate comparison between the plot of the Canadian misery index and the plot of the U.S. Super Radiance group, the latter is repeated as Figure 6. In terms of the annual data shown in Figure 2, the misery index for Canada peaked in 1982, two years after the U.S. In terms of the monthly data, the peak for Canada occurred in June of 1981 at 27.1 points, thereafter falling to a level of 11.6 points by the end of the sample period in April 1988. The plot of the Canadian series also exhibits a possible downward shift in the mean level of the series during 1983 when the average size of the Super Radiance group began to frequently exceed the critical threshold for all of North America. The correlation between the Canadian misery index and the size of the TM-Sidhi group is −.319, somewhat smaller than for the U.S.

The weaker relationship between the average size of the Super Radiance group and the misery index for Canada is consistent with Maharishi’s analysis of collective consciousness. Since the theoretical Super Radiance threshold for influencing both Canada and the U.S. is larger than the critical threshold for the U.S. alone, this higher threshold for influencing all of North America was reached fewer times over the period 1979 to 1988 than the lower threshold for the U.S. Similar reasoning may also help to explain why the rising trend of the Canadian index was reversed at a later date than for the U.S. index, and why the proportionate decline of the Canadian index was also less than that of her neighbor to the south.

3. STATISTICAL METHODS

An impact-assessment approach (Box and Tiao, 1975; Tiao, Box, and Hamming, 1975) was used to investigate the possibly nonlinear relationship between group size and the misery index and to estimate the effect on the misery index of a TM-Sidhi group equalling or exceeding the predicted critical threshold of the square root of one percent of the U.S. population. Impact-assessment analysis explicitly controls for the “typical” time series behavior of the misery index, as described by the “noise component” of the model, and seeks to answer the question of whether this behavior was significantly altered during or following periods in which the critical Super Radiance threshold was exceeded. Impact-assessment models have been previously applied to the analysis of U.S. inflation by Box and Tiao (1975).

Impact-assessment analysis is a special case of transfer function analysis in which the input series, or independent variables, are binary indicator variables. A transfer function (TF) model is a dynamic regression model...
with (1) linear or rational distributed lag relationships between one or more input variables and the dependent, or output, variable, and (2) a disturbance, or noise, term which may take the form of an autoregressive moving average (ARMA) process. In constructing an impact assessment model for the misery index, one binary variable was employed to indicate months in which the average size of the group ranged between 1500 and 1699. A second binary variable was used to indicate months in which the average size of the group was 1700 or more.

The impact assessment model employed in this study may be written as

\[ \text{MIS}_t = c + \beta_1(B)I_{1t} + \beta_2(B)I_{2t} + N_t. \]  

In equation (1), MIS, is the misery index at time t; I_{1t} and I_{2t} are binary indicator variables defined as taking
the value zero except \( I_{15} = 1 \) when the average size of the MIU group was between 1500 and 1699, and \( I_{17} = 1 \) when the size of the group was 1700 or above. Given this definition of the binary input variables, \( c \) is a constant term which represents the mean of the misery index series during those months in which the size of the group was below 1500.

In equation (1) the \( \beta_j(B) \) terms are transfer functions which describe the dynamic relationship between the binary input variables and the output variable, the misery index. Each transfer function consists of linear or rational polynomials in the backshift operator \( B \), where \( B^i Y_t = Y_{t-i} \). Omitting the "j" subscripts for simplicity, each of these transfer functions may be expressed in general by the rational polynomial \( \omega(B)/\delta(B) \) where

\[
\omega(B) = (\omega_0 + \omega_1 B + \ldots + \omega_{s-1} B^{s-1})B^b
\]
are polynomials in the backshift operator, and all roots of the polynomial \( \delta(B) \) must lie outside the unit circle for dynamic stability.

Finally, in equation (1), \( N_t \) is the noise component of the model which may take the form of a stationary autoregressive moving average (ARMA) process given by (in the nonseasonal case)

\[
N_t = [\theta(B)/\phi(B)] \alpha_t
\]  

(2)

where

\[
\phi(B) = 1 - \phi_1B - \cdots - \phi_pB^p
\]

and

\[
\theta(B) = 1 - \theta_1B - \cdots - \theta_qB^q
\]

are polynomials in the backshift operator \( B \), and \( \{\alpha_t\} \) is a normally distributed white noise process of independently and identically distributed random variables with mean zero and variance \( \sigma^2 \). It is further assumed that \( \alpha_t \) is independent of the input variables \( \{x_t\} \).

In calculating the misery index series for the U.S., the rate of inflation was computed 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

\[
100\left[ (1 + d)^{12} - 1 \right]
\]

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 Canadian CPI data were obtained from Business Conditions Digest, BCD series 733, April 1988 (p. 101) and January 1989 (p. 96). For Canada, the rate of inflation was approximated by the first difference of the natural logarithm of the monthly consumer price index, not seasonally adjusted, multiplied by a factor of \( 1200 \) to annualize the rate and express it in percentage units. It is well known that, for sufficiently small percentage changes in the untransformed series, the first difference of the natural logarithm closely approximates the continuously compounded rate of change of the original series. Canadian unemployment was measured by the civilian unemployment rate (seasonally adjusted) as reported in Main Economic Indicators, Historical Statistics 1960–1979 (OECD, 1980, p. 29) and various issues of Main Economic Indicators (OECD, 1979 to 1989).

The impact-assessment model given in equation (1) may be considered to be a dynamic regression, or distributed lag, model with binary independent variables and a stochastic disturbance which may take the form of an ARMA process. Liu’s 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 as well as to binary input variables in impact-assessment analysis.

The LTF procedure for identifying a transfer function model involves three principal steps (Liu, 1985). These same three steps were employed in applying the LTF method to the identification of the impact-assessment model:

1. estimating the impulse response weights, \( V_j(B) \), for each input variable;
2. determining the form of the rational polynomial \( \omega(B)/\delta(B) \) which best approximates \( V_j(B) \) for each input series; and
3. determining the form of the noise model \( N_t \).

In the estimation of the impulse response weights, if all roots of the \( \delta(B) \) polynomial lie outside the unit circle, each rational transfer function \( \omega_j(B)/\delta_j(B) \) in equation (1) may be approximated by a linear function \( V_j(B) \) with a finite number of terms (Box and Jenkins, 1976). Following Liu (1985), initial estimates of the impulse response weights were based on maximum likelihood estimates of the following equation

\[
\text{MIS}_t = c + V_{1}(B)\lambda_1 + V_{2}(B)\lambda_2 + N_t
\]  

(3)

where the impulse response weights are given by the estimated coefficients of the polynomial

\[
V_j(B) = v_{0j} + v_{1j}B + v_{2j}B^2 + \cdots ,
\]  

(4)

with each polynomial \( V_j(B) \) truncated at 10 lags, and \( N_t \) initially assumed to be a first-order autoregressive process. The tentative assumption of an AR(1) noise process allows a check for the necessity of differencing. Differencing of all variables in the model would be indicated if the estimated autoregressive parameter were approximately equal to 1.0 (Liu, 1985).
Estimates of the model were obtained by maximum likelihood employing an approximation to the likelihood function due to Hillmer and Tiao (1979), as implemented in the SCA System for Forecasting and Time Series Analysis, version 3.2 (Liu et al., 1986). In the case of both the U.S. and Canada, estimates of equation (3) with an AR(1) noise specification yielded autoregressive parameter estimates far from 1.0, clearly indicating that differencing was not required.

The next step in the LTF method was tentative identification of the form of the noise model N, based on the estimated autocorrelation, partial autocorrelation, and extended autocorrelation functions of the estimated noise process of the initially estimated model. For both series, a variety of plausible alternative noise model structures were estimated, and, typically, several stationary and invertible models were found which yielded white noise residuals. The choice between alternative noise models was based on the minimization of the AIC criterion as described below.

After tentative identification of the noise model, equation (3) was then reestimated for each country using the identified noise model 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 transfer function for each input variable. If the estimated impulse response function displays a decay pattern, the corner method may be used to help identify the form of the rational transfer function (Liu and Hannsens, 1982). However, for both the U.S. and Canada, all estimated impulse response functions displayed an apparent cutoff pattern, thus suggesting that all transfer functions are linear, consisting only of numerator polynomials \( \omega(B) \) and with all denominator polynomials \( \delta(B) = 1.0 \) (Liu, 1985).

Using the tentatively identified transfer functions and the previously identified noise model, equation (1) was then estimated and diagnostic checks were used to suggest possible alterations in the model. Nonsignificant coefficients in the transfer functions were gradually deleted from the model, with higher order coefficients being deleted first (Vandaele, 1983, p. 314).

At each step in the identification process, minimization of the AIC was employed as the fundamental criterion in model selection (Akaike, 1973, 1974; Ozaki, 1977). Akaike’s information criterion is defined as

$$\text{AIC} = -2 \log(\text{maximum likelihood}) + 2k$$  \hspace{1cm} (5)

where \( k \) is the number of model parameters estimated.

The AIC is an entropy-based, or information-based, measure of model adequacy, the use of which has generally been justified on rather ad hoc grounds. However, Lardimore (1983) has shown that in evaluating model order, model structure, and parameter estimation, the use of the AIC may be justified as a measure of model-approximation error for both large and small samples on the basis of the statistical principles of sufficiency and asymptotic likelihood.

Because the AIC is proportional to the sample size used in estimation, all alternative models were estimated using the same number of effective observations to allow more 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. Pre-sample observations were used, as needed, to supply starting values required for estimation. To obtain more efficient estimates of moving average noise parameters, all models incorporating moving average terms were estimated using the SCA “exact” likelihood option (Liu et al., 1986). The AIC was calculated using the approach of Ozaki (1977).

4. EMPIRICAL RESULTS

The estimates of the impact-assessment model for the U.S. misery index which minimized the AIC criterion are presented in Table 1 and those for Canada in Table 2. For the U.S., the estimated equation has the following form:

$$\text{MIS}_t = c_t + \omega_1 I_{t-1} + \omega_2 I_{t-2} + \omega_3 I_{t-4} + \omega_4 I_{t-5} + (1 - \phi B) A_t$$  \hspace{1cm} (6)

Equation (6) includes estimated transfer function parameters at lags 4, 7, and 8 for binary variable \( I_1 \) representing a Super Radiance group of 1500 to 1699 in size. Significant TF estimates were also found at lags 2, 4, and 5 for variable \( I_2 \) representing a TM-Sidhi group of 1700 or more. The noise process is AR(1).

For Canada, the estimated TF equation is given by

$$\text{MIS}_t = c_t + \omega_1 I_{t-1} + \omega_2 I_{t-2} + \omega_3 I_{t-4} + \omega_4 I_{t-5} + (1 - \phi B) A_t$$  \hspace{1cm} (7)

The impact-assessment model for Canada includes TF coefficients at lags 6 and 8 for variable \( I_1 \) and at lags 5 and 8 for binary variable \( I_2 \). The noise model is AR(12), reflecting apparent annual seasonality in the Canadian misery index series.

For both the U.S. and Canada the impact-assessment
Table 1. Impact-Assessment 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</td>
<td>$c_1$</td>
<td>Const.</td>
<td>0</td>
<td>15.914</td>
<td>0.981</td>
<td>17.86*</td>
</tr>
<tr>
<td>2</td>
<td>$\omega_1$</td>
<td>I_1</td>
<td>4</td>
<td>-1.482</td>
<td>0.742</td>
<td>-1.96*</td>
</tr>
<tr>
<td>3</td>
<td>$\omega_2$</td>
<td>I_1</td>
<td>7</td>
<td>-1.133</td>
<td>0.647</td>
<td>-1.75</td>
</tr>
<tr>
<td>4</td>
<td>$\omega_3$</td>
<td>I_1</td>
<td>8</td>
<td>-1.613</td>
<td>0.657</td>
<td>-2.45*</td>
</tr>
<tr>
<td>5</td>
<td>$\omega_4$</td>
<td>I_2</td>
<td>2</td>
<td>-1.952</td>
<td>0.787</td>
<td>-2.48*</td>
</tr>
<tr>
<td>6</td>
<td>$\omega_5$</td>
<td>I_2</td>
<td>4</td>
<td>-2.078</td>
<td>0.928</td>
<td>-2.24*</td>
</tr>
<tr>
<td>7</td>
<td>$\omega_6$</td>
<td>I_2</td>
<td>5</td>
<td>-1.589</td>
<td>0.797</td>
<td>-1.99*</td>
</tr>
<tr>
<td>8</td>
<td>$\phi_1$</td>
<td>MIS AR</td>
<td>1</td>
<td>0.627</td>
<td>0.077</td>
<td>8.15*</td>
</tr>
</tbody>
</table>

Residual Sum of Squares ........................................... 798.88
R-Square .................................................................. .64
Effective Number of Observations .............................. 109
Residual Standard Error ........................................ 2.71
Ljung-Box Q Statistic (11 d.f.)^d .................... 12.4
Likelihood Ratio Statistic (6 d.f.)^d ................... 16.88^b
A.I.C. ..................................................................... 544.44

^p ≤ .05; ^b p ≤ .01; ^c p ≤ .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.

Parameter estimates for variables $I_1$ and $I_2$, shown in Tables 1 and 2 are negative at all lags. The negative sign of these estimates is consistent with the field theory of consciousness. In the case of the model for the U.S., the TF estimates at lags 4 and 8 for variable $I_1$ shown in Table 1 are individually significant at the .05 level using a two-tailed test, while the estimate at lag 7 is significant only under a one-tailed test. Because dropping the lag 7 parameter from the model led to an increase in the AIC, it was retained in the final model. Significant negative effects were also found at lags 2, 4, and 5 months for a Super Radiance group of 1700 or more in size (variable $I_2$), with all estimates being individually significant at the .05 level using a two-tailed test.

To illustrate the interpretation of the estimated coefficients in Tables 1 and 2, the transfer function estimates for binary variable $I_1$ in Table 1, for example, indicate that when the average size of the Super Radiance group rose to between 1500 and 1699, there was, on average, a decline of 1.48 points in the U.S. misery index four months later, followed by subsequent declines averaging 1.13 after 7 months, and 1.61 points after 8 months. Lagged effects of this order, or higher, are commonly found in empirical studies of dynamic relationships between economic variables believed to be causally related. These estimated reductions in the U.S. misery index are measured relative to the mean value of the
Table 2. Impact-Assessment Model Estimates:

<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 c₂</td>
<td>Const.</td>
<td></td>
<td>0</td>
<td>18.135</td>
<td>0.620</td>
<td>29.27</td>
</tr>
<tr>
<td>2 ŷ₇</td>
<td>I₁</td>
<td>Num.</td>
<td>6</td>
<td>-2.032</td>
<td>0.742</td>
<td>-2.74</td>
</tr>
<tr>
<td>3 ŷ₈</td>
<td>I₁</td>
<td>Num.</td>
<td>8</td>
<td>-2.107</td>
<td>0.808</td>
<td>-2.61</td>
</tr>
<tr>
<td>4 ŷ₉</td>
<td>I₂</td>
<td>Num.</td>
<td>5</td>
<td>-2.196</td>
<td>0.830</td>
<td>-2.65</td>
</tr>
<tr>
<td>5 ŷ₁₀</td>
<td>I₂</td>
<td>Num.</td>
<td>8</td>
<td>-2.349</td>
<td>0.018</td>
<td>-2.59</td>
</tr>
<tr>
<td>6 φ₂</td>
<td>MIS</td>
<td>AR</td>
<td>12</td>
<td>0.321</td>
<td>0.083</td>
<td>3.89</td>
</tr>
</tbody>
</table>

Residual Sum of Squares: 1073.29
R-Square: .43
Effective Number of Observations: 109
Residual Standard Error: 3.14
Ljung-Box Q Statistic (11 d.f.): 7.1
Likelihood Ratio Statistic (4 d.f.): 25.35
A.I.C.: 572.63

* p ≤ .05;  b p ≤ .01;  c p ≤ .001 (two-tailed tests except for the Ljung-Box Q and likelihood ratio statistics).

Likewise, for Canada, the impact-assessment parameter estimates show declines in the misery index measured relative to the mean level of the Canadian index (18.13) during those months in which the average size of the TM-Sidhi group was below 1500. As shown in Table 2, significant negative effects on the Canadian misery index were found at lags of 6 and 8 months for a TM-Sidhi group averaging 1500 to 1699 in size (variable I₁). Significant negative effects were also found at lags 5 and 8 months for a Super Radiance group 1700 or larger (variable I₂).

A test of the null hypothesis that the Super Radiance group had no effect on the misery index during this period may be based on a test of the joint significance of all impact-assessment parameter estimates for each country using a likelihood ratio test. The test statistic is given by

$$\lambda = N \log_e \left( \frac{SSE_c}{SSE} \right)$$

where $N$ is the effective number of observations, $SSE_c$ is the residual sum of squares for the constrained model (in this case the univariate time series model for the index), and $SSE$ is the residual sum of squares for the full impact-assessment model. For large samples, the likelihood ratio statistic $\lambda$ will be distributed approximately as a chi-squared variable with degrees of freedom equal to the number of constrained parameters (Nelson, 1976). As shown in Tables 1 and 2, the likelihood ratio test for the joint significance of all parameter estimates for variables $I₁$ and $I₂$ is highly significant for the U.S. ($p = .0097$) and for Canada ($p = 4.3 \times 10^{-5}$). Thus the null hypothesis that the Super Radiance group had no effect on the misery index (15.91 points) during months in which the average group size was below the approximate critical threshold of 1500.
index must be strongly rejected for both the U.S. and Canada.

Experiments with alternative model structures involving denominator parameters in the transfer functions, different lag structures, or other noise models resulted in higher AICs and, in some cases, less satisfactory residual diagnostics. Several models with only somewhat higher AICs were found, but the overall results presented in Tables 1–3 appear to be quite robust to other plausible specifications of the noise model.

In the case of each model, diagnostic tests on the model residuals were satisfactory. Inspection of the estimated residual autocorrelation, partial autocorrelation, and extended autocorrelation functions indicate that the residuals for each model are consistent with the hypothesis of a white noise process. For both residual series, the null hypothesis of white noise cannot be rejected on the basis of the Ljung-Box Q test for the joint significance of a set of residual autocorrelations (Ljung and Box, 1978). As shown in Tables 1 and 2, the Ljung-Box Q statistic for lags 1 to 12 is insignificant for both models, as are the Q statistics for lags 24 and 36 (not shown). Inspection of the histogram and time series plot of the residuals revealed no extreme outliers, evidence of nonstationarity, gross nonnormality, or other indications of model inadequacy.

Of particular importance in assessing the hypothesized impact of the MIU group on the misery index is the long-run multiplier, or steady state gain, for each binary impact-assessment variable. The long-run multiplier for input variable I, for example, describes the ultimate estimated impact on the misery index of a one-unit increase in that input, where the increase is maintained indefinitely (Box and Jenkins, 1976; Dhrymes, 1974). Thus the long-run multiplier for I gives the estimated long-run change in the misery index resulting from a sustained increase in the size of the Super Radiance group to a level between 1500 and 1699. The long-run multiplier for variable I has an analogous interpretation for a TM-Sidhi group of size 1700 and above. In the case of linear transfer functions such as those reported in Tables 1 and 2, the long-run multiplier for each input variable is given by the sum of the estimated transfer function parameters for that input (Box and Jenkins, 1976, p. 346). The long-run multipliers for both countries are shown in Table 3.

As shown in Table 3, the estimated long-run decline in the U.S. misery index was 4.23 points for a Super Radiance group of 1500 to 1699, and 5.62 points for a group of 1700 or more. These results are consistent with the key empirical implication of Maharishi’s field theory of collective consciousness, which is that the long-run multiplier should be negative for Super Radiance groups equaling or exceeding the approximate square-root-of-one-percent threshold. The estimated declines in the misery index shown in Table 3 are substantial. As a proportion of the total decline of 14.1 points in the U.S. misery index from its peak in 1980 to the end of the sample period in 1988, the reduction of 4.23 points for the group of 1500–1699 represents 30.0 percent of the total decline in the index. For the larger group, the comparable proportionate decline is 39.9 percent. Relative to the peak level of the U.S. misery index in January 1980 (24.5 points), the long-run multiplier represents a decline of 17.3 percent in the index for a group averaging 1500 to 1699, and 22.9 percent for a group of 1700 or more.

All long-run multipliers were negative in the case of Canada as well. As shown in Table 3, the estimated long-run multiplier for a group of 1500 to 1699 was −4.14 points, and −4.55 points for a TM-Sidhi group averaging 1700 or more. These estimated reductions represent 26.7 percent and 29.3 percent, respectively, of the total decline of 15.5 points in the Canadian misery index from its peak of 27.1 in June 1981 to the end of the sample period in 1988. Relative to the peak level of the misery index, the reduction in the Canadian misery index attributable to the Maharishi Effect was 15.3 percent for a group of 1500 to 1699, and 16.8 percent for a Super Radiance group of 1700 or more.

For both the U.S. and Canada, the negative long-run multipliers for Super Radiance groups of 1500 or more in size are consistent with the hypothesis that the economic quality of life of the U.S. and Canada was significantly improved through the collective practice of the TM and TM-Sidhi program by a group equaling or exceeding the square root of one percent of the U.S. population. For both countries, the estimated long-run multipliers were larger in absolute value for the larger group of 1700 or more.

| Table 3. Estimated Long-Run Multipliers: U.S. and Canadian Misery Index |
|---------------------------------|-----------------|-----------------|
| Average Group Size | U.S. | Canada |
| 1500-1699 | −4.228 | −4.138 |
| 1700- | −5.619 | −4.545 |

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It is also noteworthy that the estimated multipliers for the U.S. are larger in absolute value than the corresponding multipliers for Canada, especially in percentage terms. Proportionately larger long-run reductions in the misery index for the U.S. may reflect the fact that the theoretical square-root-of-one-percent threshold for the U.S. was exceeded more frequently during the sample period, and at an earlier date, than the larger theoretical threshold for all of North America.

The results reported above are consistent with those of an analysis of the misery index for the U.S. and Canada using a somewhat shorter data sample. This initial analysis, first reported in Cavanaugh (1987), employed monthly data over the sample period April 1979 to January 1987, but the use of in-sample observations for starting values in model estimation further reduced the effective sample to November 1980 to January 1987 (N = 75). The same LTF methodology, as augmented by the use of the AIC criterion, was used to identify and estimate the impact-assessment model.

To look for possible nonlinear threshold effects on the U.S. and Canadian misery index, a model similar to equation (1) was used, but with three binary impact-assessment variables rather than two. Three binary variables were used to represent months in which the average size of the Super Radiance group fell within specific ranges defined by quartiles of the group size for the full sample period April 1979 to January 1987. This approach allowed estimation of the differential effect on the misery index of three categories of TM-Sidhi group size: those groups with average size falling between the 25th and 49th percentile (1108 to 1495), the 50th and the 74th percentile (1496 to 1702), and the 75th percentile (1703) or above, respectively. The estimated effect of each of the three group-size categories on the misery index was measured relative to the mean level of the index when the Super Radiance group size was below the 25th percentile.

Since, coincidentally, the 50th percentile (1496) was approximately equal to the square root of one percent of the U.S. population in 1979, the field theory of collective consciousness implies that one should observe a negative long-run multiplier for groups equalling or exceeding the 50th percentile of Super Radiance group size. Also, if a sudden "phase transition" to greater coherence in collective consciousness occurs beginning at a critical threshold of approximately 1500, one should also observe a jump in the absolute value of the long-run multiplier beginning with groups in the range 1496 to 1702.

As shown in Table 4, for both the U.S. and Canada the estimated long-run multipliers for this subsample were strikingly consistent with these implications of the field theory of collective consciousness. Table 4 shows that, for both countries, the long-run multipliers are negative for groups approximately 1500 or more in size. Also the absolute value of the multipliers for both countries increase sharply at a threshold of approximately 1500. This abrupt increase in the estimated effect of the Super Radiance group beginning at the predicted critical threshold provides a striking confirmation of the Maharishi Effect.

For the U.S. misery index, the estimated long-run multiplier for a Super Radiance group of 1496 to 1702 was -5.25 points, and -7.44 points for a group exceeding 1702. In the case of Canada, the long-run multipliers were -5.23 points for Super Radiance groups of 1496 to 1702, and -6.08 points for an average group size of 1703 or greater.

As in the case of the results for the full sample, the long-run multipliers for both countries were larger in absolute value for the largest group size category, approximately 1700 or more. Likewise, in both studies the effect on the misery index for the U.S. was greater in percentage terms than the corresponding effect for Canada.

For both the U.S. and Canada, the long-run multipliers shown in Table 4 are larger than the corresponding multipliers reported in Table 3. This difference may be attributable in part to the use of a longer sample period in the analysis reported in Table 3, as well as to the use of more recently revised data and of seasonally adjusted changes in the CPI to calculate the U.S. inflation rate.

Probably a more important reason for the finding of larger multipliers in the subsample analysis is that the multipliers have a somewhat different interpretation in the two analyses due to differences in the structure of the two estimated impact-assessment models. The multiplier effects were measured with reference to a different standard of comparison, or baseline, in the two studies. In the subsample analysis, the estimated multipliers for

<table>
<thead>
<tr>
<th>Average Group Size</th>
<th>U.S.</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>1108-1495</td>
<td>-0.998</td>
<td>-0.505</td>
</tr>
<tr>
<td>1496-1702</td>
<td>-5.246</td>
<td>-5.233</td>
</tr>
<tr>
<td>1703</td>
<td>-7.439</td>
<td>-6.082</td>
</tr>
</tbody>
</table>

Table 4. Estimated Long-Run Multipliers: U.S. and Canadian Misery Index Subsample Data
the two larger group categories (groups approximately 1500 or larger) give the estimated decline in the misery index measured relative to the mean level of the index during months in which the average size of the Super Radiance group was less than the 25th percentile, 1108. In the full-sample analysis, however, the estimated declines are measured relative to the mean of the misery index during periods in which the Super Radiance group was less than 1500 (approximately the 50th percentile). If the effect of the TM-Sidhi group on collective consciousness produces a reduction in the misery index which is positively related to the average size of the group, then one would expect to find smaller multipliers in the latter study, all else equal.

For the subsample, statistically significant reductions in the misery index for the U.S. were found at lags 0 and 7 for a Super Radiance group averaging 1496 to 1702, and at lags 0, 5, and 7 for a group averaging 1703 or above. These parameter estimates were highly significant taken together ($p = 5.5 \times 10^{-5}$). For Canada, statistically significant reductions in the misery index were found at lags 6 and 8 for a TM-Sidhi group averaging 1496 to 1702, and at lags 5 and 8 for a group averaging 1703 or above. In the case of Canada these estimated coefficients were also highly significant jointly ($p = 5.7 \times 10^{-16}$). Thus for the subsample data, the null hypothesis of no effect of the Super Radiance group on the misery index for both the U.S. and Canada must also be strongly rejected.

5. CONCLUSION

This study tests 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, as measured by the sharp decline in Okun's misery index of inflation and unemployment for both the U.S. and Canada during the period 1979 to 1988. Using recently-developed tools of time series analysis, an impact-assessment analysis of monthly data for this period found evidence of highly statistically significant reductions in Okun's misery index for both the U.S. and Canada attributable to the influence of the largest TM-Sidhi group in North America. These reductions were found to occur, on average, 2 to 8 months after periods in which the average size of the Super Radiance group exceeded the predicted critical threshold of 1500 participants, approximately the square root of one percent of the U.S. population. For both countries, the estimated reductions are highly statistically significant: the null 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. These empirical results, therefore, lend strong support to the hypothesis of a causal relationship between the misery index and the collective practice of the TM and TM-Sidhi program.

Also supportive of a causal interpretation of these results is the finding that the proportionate reduction in the Canadian misery index attributed to the Super Radiance group, while very large, was smaller than the corresponding reduction in the U.S. index. As noted in Section 2, this result is consistent with Maharishi's theory of collective consciousness, which suggests that the theoretical Super Radiance threshold for influencing both Canada and the U.S. is larger than the critical threshold for the U.S. alone. Because this higher threshold for influencing all of North America was reached fewer times over the period 1979 to 1988 than the lower threshold for the U.S., it is to be expected that the proportionate effect on the quality of life in Canada would be less. The same reasoning can also explain why the rising trend of the Canadian index was reversed at a later date than for the U.S. index.

The case for a causal interpretation of these findings is strengthened by the findings of Cavanaugh, King, and Ertuna (in press) who found an even larger and more significant effect of the Super Radiance group on the U.S. misery index after statistically controlling for the impact of key economic influences on the index over the same sample period. The most widely accepted explanations of the high unemployment and inflation of the 1970s attribute the stagflation of that period to (1) a rapid rise in energy, food, and other crude materials prices, and (2) excessively rapid monetary growth (Bruno and Sachs, 1985; Helliwell, 1988). Likewise, it is well known that both inflation and unemployment are highly correlated with business-cycle fluctuations. Using multiple-input transfer function methods, Cavanaugh et al. (in press) statistically controlled for the effect on the misery index of these three economic factors by including in their estimated TF equation specific measures of monetary growth, the rate of change of an index of crude materials prices, as well as a measure which closely reflects business cycle fluctuations, the growth rate of industrial production.

While the economic factors included in the study of Cavanaugh et al. (in press) did significantly contribute to the explanation of movements in the U.S. misery index, the estimated effect of the Super Radiance group continued to be highly statistically significant ($p = 3.2 \times 10^{-9}$). Also, the estimated reductions in the misery index attributed to the Super Radiance group were very large. For a Super Radiance group averaging 1500 to 1699, the long-run multiplier was $-7.61$ points. This decline represents 54.0 percent of the total decline of 14.1 points in the
misery index from its peak to the end of the sample period in 1988. For a Super Radiance group averaging 1700 or more, the multiplier was -7.65 points, equivalent to 54.2 percent of the total decline of the index from January 1980 to April 1988.

Further evidence in support of a causal interpretation of these findings is provided by Cavanaugh and King (1988) who found that the Super Radiance group significantly contributed to large reductions in the rate of change of crude materials prices over the period 1979 to 1988 ($p = 2.6 \times 10^{-5}$). 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. This result suggests that the Maharishi Effect may have helped to dampen the negative supply-side shocks that are widely believed to have been the leading cause of the worldwide high inflation and unemployment in the 1970s and early 1980s (Bruno and Sachs, 1985; Helliwell, 1988).

Further evidence consistent with a causal effect of the TM-Sidhi group on the misery index is provided by Cavanaugh, King, and Titus (1989) who found evidence of a unidirectional influence of the Super Radiance group on the misery index, with no evidence of significant feedback to the size of the group. Their findings demonstrate that fluctuations in the size of the Super Radiance group temporally lead the misery index, while the reverse is not true. Also supporting a causal interpretation is the fact that more than 30 other studies of the Maharishi Effect using other measures of the quality of life have similarly rejected the null hypothesis of no effect of the Super Radiance group.

Taken together, the findings of these studies of the influence of the group practice of the TM and TM-Sidhi program on Okun’s misery index of inflation and unemployment suggest that Maharishi’s Vedic Science and Technology offers economic policymakers an effective new instrument of economic policy. The weight of existing evidence clearly supports the conclusion that any government seeking to lower inflation and unemployment, and thereby improve the economic quality of life for the nation, would be prudent to make support for the collective practice of this technology of consciousness an integral part of its national economic policy.

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